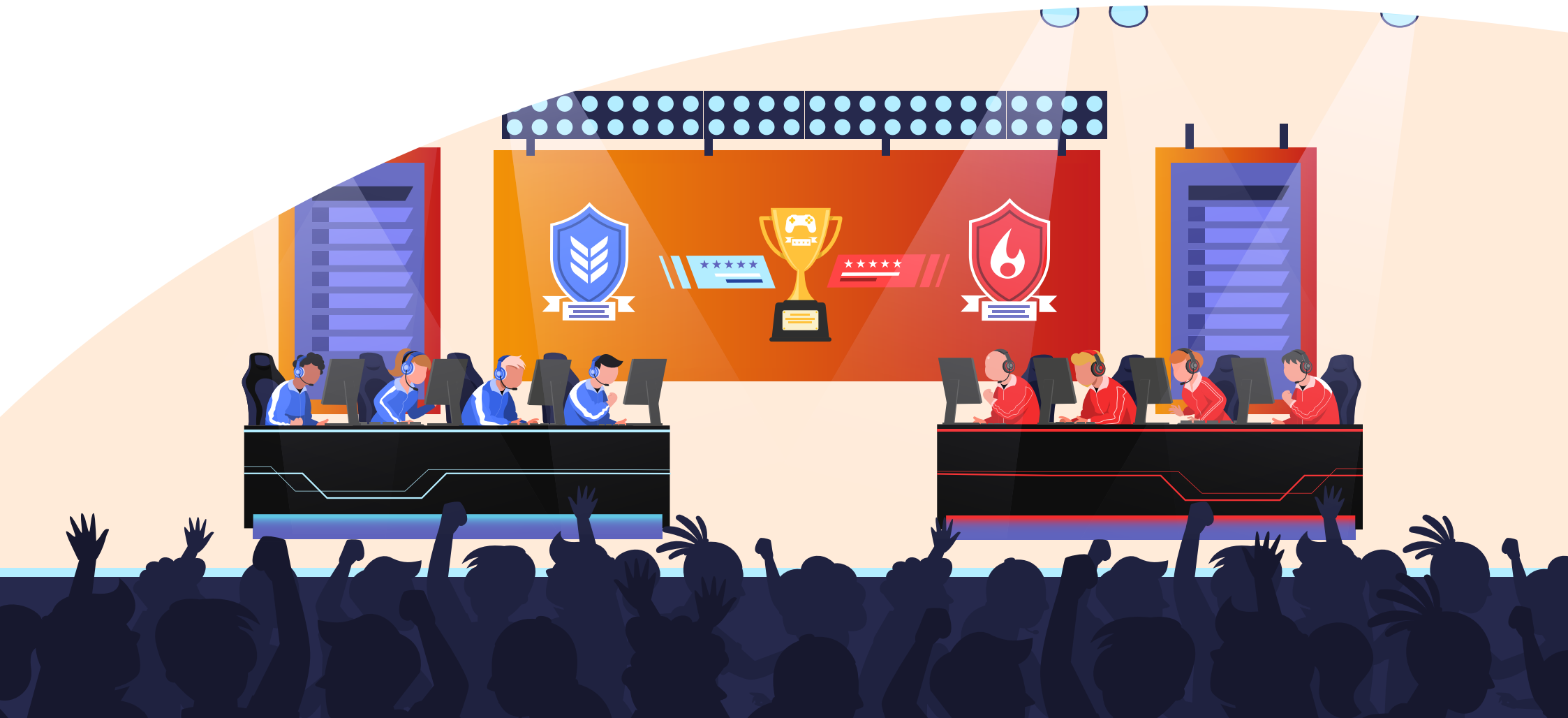


# Knowledge Agenda Esports

## Performance Enhancement



# Contents

|                                                              |    |
|--------------------------------------------------------------|----|
| Foreword                                                     | 3  |
| Introduction                                                 | 4  |
| The road to the Knowledge Agenda                             | 5  |
| 1. Performance indicator: Coaching styles                    | 8  |
| 2. Performance indicator: Training methods and programmes    | 11 |
| 3. Performance indicator: Talent recognition and development | 14 |
| 4. Performance indicator: Performing under pressure          | 17 |
| 5. Performance indicator: Sleep/wake cycle and recovery      | 20 |
| Literature                                                   | 22 |
| Publication details                                          | 25 |

# Foreword

## A starting point for research into esports

Esports, professional (or semi-professional) competitive gaming, has seen huge growth all around the world since 2010<sup>[1]</sup>. The competitive – and increasingly professional – esports environment makes for an interesting field of research on elite sports (and sport in general). This Knowledge Agenda Esports is a result of the growing societal and scientific relevance of this topic. It provides a starting point for research into performance enhancement in esports and contains the most relevant questions by Dutch esports coaches and staff. The research studies provide coaches and staff in esports practice with tools to take esports in general to a higher level of professionalism.

## For esports coaches and staff and researchers

The knowledge questions in this Agenda provide a starting point to researchers interested in performance in esports. The Agenda was composed in collaboration with Dutch esports coaches, staff and researchers working in the field of sport science. Taking these questions as a starting point grounds the practical relevance of research.

## In a broader perspective

There are more knowledge agendas, such as the National Knowledge Agenda Sport and Exercise, which also go into elite sports<sup>[2]</sup>. Given that esports is relatively new and has not yet been included in existing knowledge agendas, the current Agenda offers some initial guidelines. Our goal for the future is to

align this Agenda with existing knowledge agendas, bringing together the two worlds of sport and esports in research as well.

## World first

This Knowledge Agenda is internationally pioneering. As far as we are aware, there is no knowledge agenda geared towards performance enhancement in esports yet. This document, therefore, provides a unique insight into how science and the esports practice can be integrated. This means that this Agenda is not only of potential added value for research in the Netherlands, but also for research on a global scale. The original Dutch version of this Agenda is available at [Kennisbank Sport & Bewegen](#).

## Proud

As the Knowledge Centre for Sport & Physical Activity Netherlands, we are proud to have drafted this first Knowledge Agenda Esports together with esports coaches and scientists in sport (and other fields). This is the first step towards encouraging research into esports in general. A new field, after all, offers other opportunities besides performance. Examples include topics relating to business, health, inclusivity, institutionalisation, media, sociology and law.

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# Introduction

## Esports as a elite sports

Esports, professional (or semi-professional) competitive gaming, requires top performance<sup>[1]</sup>. Although esports has not been recognised as an elite sport in the Netherlands<sup>[3]</sup>, the niche is evolving into a professional elite sports environment. It does remain a challenge to develop into a durable sector<sup>[4]</sup>. Esports athletes, teams and organisations aim for maximum performance, just like in traditional elite sports (and sport in general). More and more attention is being paid to the performance of esports athletes, which means expectations are also rising. The national esports industry association, for instance, aspires for the Netherlands to be amongst the best esports countries in the world<sup>[5]</sup>. But what guidance should esports athletes receive? What questions does this raise? The Netherlands has often been a worldwide frontrunner when it comes to elite sports science. This knowledge helps coaches and staff make well-considered choices to influence performance. Not only traditional sport should benefit from this knowledge, but esports coaches and staff should too. This first Knowledge Agenda provides a starting point in this respect.

## Needs of esports coaches and staff

A good knowledge agenda is created bottom-up. What do esports coaches and staff want to know? What issues do they face in their day-to-day practice? This Agenda contains their questions, structured and translated for science, providing the latter with practical insights for relevant research.

## Driving force for knowledge sharing and research

There is a relatively small amount of literature on performance in esports. We have seen an increase of research into esports over the past year<sup>[6, 7]</sup>, but there is a large need for longitudinal and large-scale research into such topics as esports athletes' health<sup>[8]</sup>. In the interests of the durability of the sector, it is important to keep sharing the results of ongoing and new research.

## Reading guide

This Knowledge Agenda consists of descriptions of the five most important indicators of performance in esports according to coaches. Every indicator is supported by relevant background information from practice, as well as scientific insights. In addition to this background information, the most important main and sub-questions suggested by professional esports coaches and staff have been included. The selection of these questions was very deliberate. They are by no means the only questions that can be asked and can serve as inspiration for new knowledge questions.

All indicators relate to performance and there is some overlap between them. For example, sufficient sleep influences the extent to which an esports athlete can perform under pressure and mental fitness is trained in a training programme. It is important to not only develop and use knowledge relating to separate themes, but also across and between themes.

Prior to discussing the five performance indicators, we will explain how the Knowledge Agenda came about and who contributed to it.

# The road to the Knowledge Agenda

What did the road to the first Knowledge Agenda for performance enhancement in esports look like?

The 'Knowledge Agenda Esports: Performance Enhancement' was created in four steps:

## 1. Determining relevance: Do science and practice have a need for a Knowledge Agenda Esports?

The first step was to determine the relevance of a Knowledge Agenda Esports. The idea of a Knowledge Agenda was suggested to some stakeholders in science and practice, such as the Lectorenplatform Sport & Bewegen (platform of professors in sport and exercise science of Dutch universities of applied science), the Watertoren-overleg (association of Dutch full professors in sport science at the academic level) and Next Level Esports. They saw it as an added value in initiating esports research.

## 2. Taking stock: What are the most important themes relating to esports performance?

Topsport Topics made an overview of the most important performance indicators in traditional elite sports. These indicators were sent to esports coaches for consultation. Based on their insights, they selected the top-five indicators on which this Agenda is based: coaching styles, training programmes and methods, talent recognition and development, performing under pressure, and sleep/wake cycle and recovery.

## 3. Prioritising: Which questions have priority to perform better in esports in practice?

Together with scientists and under the guidance of the specialists of Topsport Topics, the coaches worded and prioritised the performance indicators. This involved focus groups for each indicator and an online

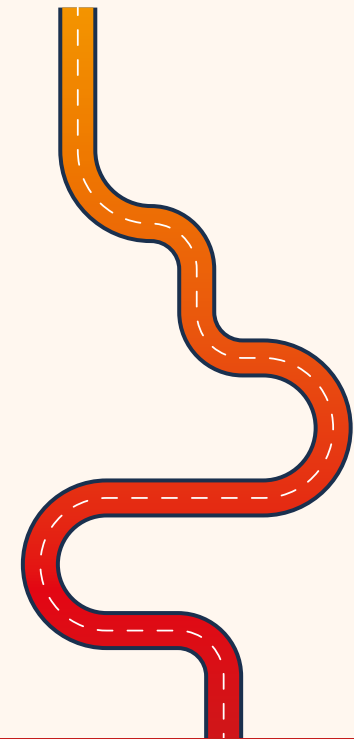
questionnaire. The structure with main questions branching out into several sub-questions was chosen to accommodate both scientific and practical questions.

## 4. Elaborating: What is the state of affairs of the themes within esports?

The Knowledge Centre for Sport & Physical Activity Netherlands elaborated and described five indicators. Wherever possible, the descriptions are supported by scientific insights and insights relevant to practice. Every theme was discussed with esports coaches and staff and Topsport Topics.

## Putting into practice and other performance indicators

This Agenda is both a starting point and a tool for carrying out research into esports, but it is not the final goal. Our aim is for esports to be taken seriously in research and to be structurally incorporated into knowledge agendas revolving around sport and exercise. Just like ball sports, strength sports, mind sports and martial arts, these virtual sports should be part of structural research in sport. This would mean that in an ideal world, a specific Knowledge Agenda Esports would not be necessary. It is also important to stress that the five selected performance indicators are not the only relevant avenues of research. Other indicators relevant to performance include physical training, injury prevention, nutrition and social environment factors.



## Who contributed?

Professionals from research and the esports practice collaborated on this Knowledge Agenda. The esports practice had the biggest influence on the substantive questions in this Agenda. In other words, it does not concern a systematic study of existing literature. These professionals know what knowledge is needed in practice.

### Esports coaches and staff

Together with Next Level Esports, the Knowledge Centre for Sport & Physical Activity Netherlands approached esports coaches and staff to contribute. As a first step, stock was taken of how many Dutch esports coaches are professionals (or semi-professionals). As esports has not been around for very long, the estimated number of Dutch-speaking coaches ranges from 50 to 100. Out of this group, twenty-five esports coaches and staff were invited and twenty-one ended up contributing to the creation of this Knowledge Agenda. Invitations were based on the coach's professionalism, the level on which they operate and the diversity of the games in which they are active. The latter criterion served to avoid having too many experts with the same background.

The esports coaches and staff spend an average of 28 hours per week providing guidance to esports athletes and teams. They are jointly active in eight different games and employed by seventeen different esports organisations. Their average coaching experience is five years.

### Researchers

Five researchers from universities of applied sciences and research universities, with some experience in esports and/or in a specific research field related to the performance indicators, were asked for their input. These researchers were chosen from a list of eighteen interested researchers nominated by the Watertoren-overleg and the Lectorenplatform Sport & Bewegen.

### Topsport Topics

The specialists of Topsport Topics promote elite sports (and sport in general) by making new scientific information available to sport practice and by giving scientifically-founded answers to questions from the national elite sports programmes. Topsport Topics contributed to the creation of this Agenda.

# Coaching styles



## 1. Performance indicator: Coaching styles

The climate a coach creates for their team and players influences the athlete's personal development and performance<sup>[1, 2]</sup>. A caring climate geared towards the development of an athlete or team will enable elite athletes to get satisfaction from their learning process, to enjoy training and to deliver a better performance. All of this is desirable if one wishes to be successful in sport. Coaches have a strong influence on the climate and, by extension, on performance<sup>[3, 4]</sup>. In literature, very little is known on esports coaching, particularly coaching styles in esports. An esports coach faces special challenges, such as the international, digital and complex character of esports<sup>[5, 6]</sup>. They have to provide remote coaching in a digital environment and deal with a shortage of good examples, a constantly changing Meta \* and a lack of training programmes for esports coaches. All of this leads to three interesting questions.

### 1.1 Coaching styles in esports

The coach plays an important role in a team. A coach's style can help a team, but also create an unsafe environment, giving players stress and leading to lower self-confidence<sup>[7]</sup>. Esports is a relatively young sport, which lacks standardised training programmes for esports coaches<sup>[5]</sup>. A training programme can help a coach with certain skills, such as developing a positive esports culture<sup>[13]</sup>. This can contribute to improving performance and creating positive esports experiences for players. As yet it is unclear what coaching styles esports coaches use<sup>[5, 6]</sup> and how they influence the performance culture (and general culture) in teams and organisations.



## KNOWLEDGE QUESTIONS

How does the coaching style influence the performance of an esports athlete or team?

What coaching styles are used most in esports and how do these affect performance and culture?

What needs do esports coaches have when it comes to improving their coaching skills?

How should a training programme for esports coaches be organised?

### 1.2 Coaching in a digital environment

Esports mostly takes place in an international and digital world<sup>[5, 8]</sup>. Esports athletes do a lot of remote training, playing and discussing compared to traditional sport. Digital collaborating and coaching gives rise to challenges that are not very common in traditional elite sports, such as limited face-to-face contact<sup>[9]</sup>. There is not a whole lot of knowledge yet on creating a digital elite sports climate and the role a coach may take in this respect. For proper guidance of esports athletes and their teams, more insights are needed about the role of the coach in the digital esports context<sup>[10]</sup>.



## KNOWLEDGE QUESTIONS

How does the digital esports environment influence the role of the coach?

What advantages and challenges are presented by coaching in a digital environment?

What are the practical implications of digital coaching and guidance of esports athletes? And how do coaches and staff deal with them?

What are the digital prerequisites for an elite sports climate?

### 1.3 Building a successful esports team

Some esports games are played with a team, such as League of Legends, Counter-Strike: Global Offensive and EA SPORTS FC/FIFA 2V2. It is therefore important to build a team. Just like in traditional sport, a team's cohesion and dynamics influence performance<sup>[11]</sup>. Research amongst football and rugby players, for instance, showed that the stronger the players identify with their teams, the healthier they are and the fewer burn-out symptoms they have<sup>[11]</sup>. In esports, this is a challenge. A team is changing all the time<sup>[10]</sup>. Due to the digital playing environment, team members mostly see each other online, with little face-to-face contact. This may have an influence on team building and the quality of communication within the team<sup>[9, 12]</sup>.



In the interest of strengthening collaboration, bootcamps \*\* are organised prior to important tournaments and competitions to allow teams to physically meet. Coaches indicate that these in-person meetings appear to have a positive effect on collaboration and on the atmosphere<sup>[10]</sup>.



## KNOWLEDGE QUESTIONS

### How do you build a successful team in esports?

How do you work on the sense of team using mostly digital means?

How can a coach motivate their players (digitally or face-to-face)?

How do you bring different international cultures together?

What effect do bootcamps have on the performance of esports teams in the short and long term?

\* Meta is a term for the best way to play a game by using the characters, items or other variables in that game. In League of Legends, for example, small changes are made every two weeks, which lead to a "shift in the meta". That is, a change in the optimal way of playing the game [6].

\*\* A bootcamp is a training camp. Esports teams regularly come together for an in-person training session of a few days prior to important tournaments or competitions, or at a certain moment in a season (for instance in the run-up to a new season).



# Training methods and programmes



## 2. Performance indicator: Training methods and programmes

Periodisation is the planning and executing of training sessions – including training activities, frequency, intensity and volume – with the goal of optimally preparing an athlete to perform<sup>[1]</sup>. Whereas periodisation in traditional sport is generally geared towards physical performance<sup>[2]</sup>, this aspect is less important in esports. Esports is more about cognitive skills (making choices, focus and memory) and in-game skills (fine motor skills and having knowledge about the meta)<sup>[3]</sup>. Although in traditional sport more attention is paid to integrating recovery, nutrition and psychological and technical skills into the training programme, there is still quite some ground to cover on these elements – the exact elements that are essential in esports<sup>[3]</sup> – in scientific literature<sup>[2]</sup>. Furthermore, in esports there is a shortage of effective game-based training methods to train specific in-game skills such as map awareness, team strategy, hand-eye coordination and visual perception<sup>[4, 5]</sup>. The limited availability of these methods is related to the complex world of gaming and esports, where rights are owned by game publishers and developers, which means the development of game-specific training activities (like practising corner kicks, position play, finishing and passing in football) has not received a lot of attention in the majority of games<sup>[4]</sup>.

### 2.1 Developing a training programme

To develop esports athletes' skills, training programmes are composed. Just like in traditional sport, skills can be trained by investing time. As a result, esports athletes spend most of their time gaming (competitive and training). Research shows, for instance, that CS:GO professionals clock over 16,200 competitive training hours in a 10-year period. This is a far greater number of hours than international football and field hockey players put in<sup>[6]</sup>. But does more always mean better? A lot is still unknown about developing a training programme for esports athletes. How much and how long should you be gaming? How do you train physical and mental health? More insights into developing these training programmes are required to offer better guidance to esports athletes and teams<sup>[4]</sup>.



#### KNOWLEDGE QUESTIONS

**What does the optimal training programme of an esports athlete look like?**

What performance indicators do esports athletes need to train to improve their in-game performance? How can these indicators be trained?

What is the optimal ratio of performance indicators (such as mental and physical health) when it comes to in-game training and training outside of the game?

What is the role of periodisation in the training programme of an esports athlete? And how can it be applied?

### 2.2 Out of game trainingsmethoden

Whereas in traditional sport it is possible to add variety to training activities, this is complicated in gaming. At the moment, it would appear that a coach is dependant on the in-game possibilities to develop training exercises<sup>[5]</sup>. In the game EA SPORTS FC / FIFA, for instance, it is possible to train specific game situations like corner kicks and free kicks. In other games, such as League of Legends, it is only possible to play actual 'rounds'. This seems to limit the variety of practice material for enhancing in-game performance. More insights are needed on whether out-of-game methods have an effect on improving in-game skills (and, if so, which out-of-game methods are effective)<sup>[4]</sup>.



#### KNOWLEDGE QUESTIONS

**What is the effect of specific out-of-game training methods on esports athletes' in-game performance?**

What training methods can be developed outside of the game to train specific skills (such as knowing where to look) to improve performance?

Which out-of-game training methods are most effective in training specific skills required to improve in-game performance?

### 2.3 Performance enhancement using data

In esports, digital tools are used, such as the video game, controllers/keyboard and console/PC. This means that it is relatively easy to extract data from the game. There are complete dashboards (e.g. in Dota 2) about an individual's gameplay. Coaches want to know how to best use these data to improve an esports athlete's performance.<sup>[4]</sup>



#### KNOWLEDGE QUESTIONS

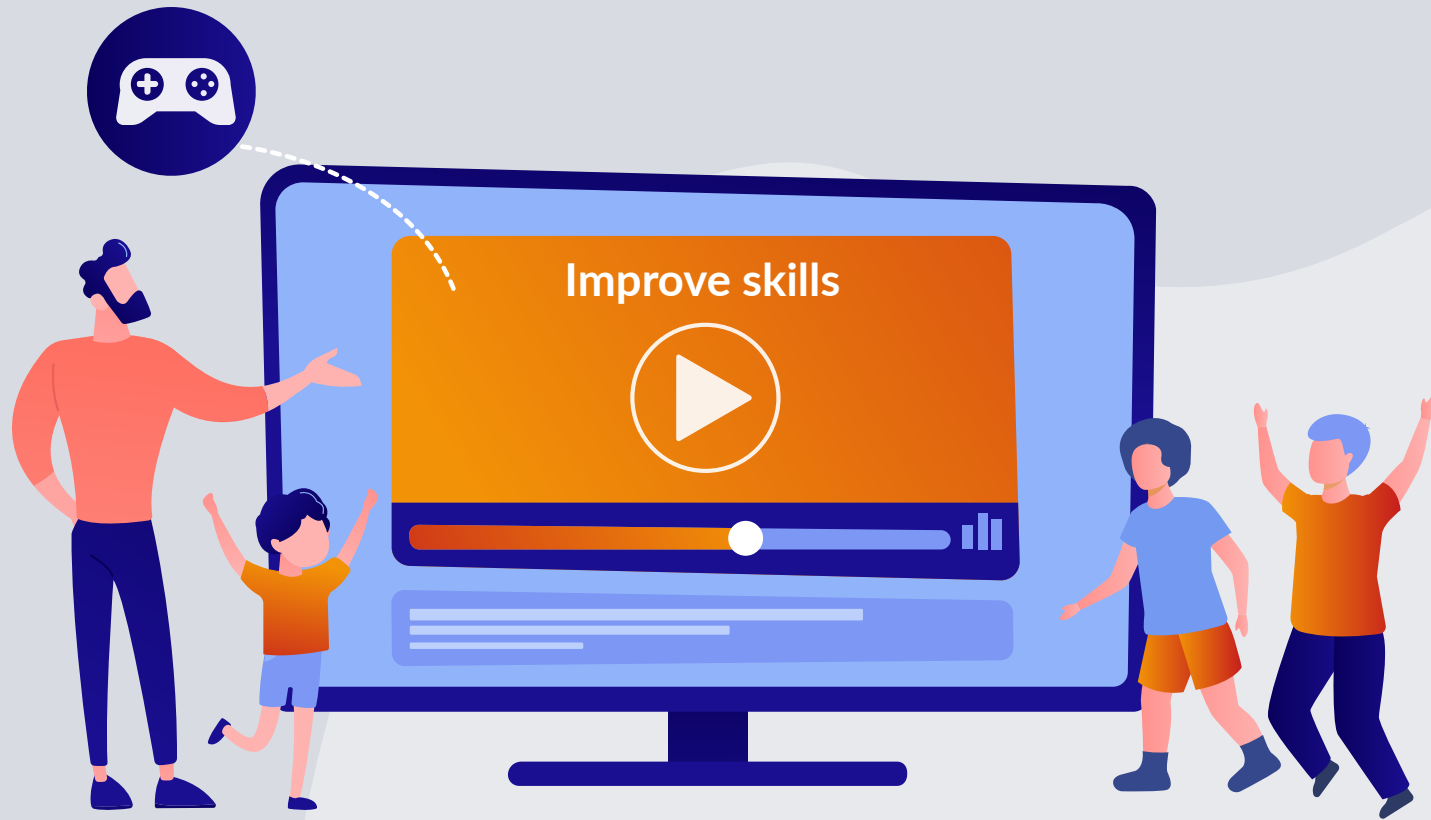
What role can data play in improving esports athletes' performance?

How can data be collected within different esports games?

How can we make relevant data available and understandable to esports athletes?

How can esports coaches and staff use data to improve performance at the individual and team levels?





# Talent recognition and development

### 3. Performance indicator: Talent recognition and development

Talent recognition is an important theme in sport, including esports. Just like traditional elite sports clubs, esports organisations try to keep talented players or take them from other teams, in the hope of securing the stars of tomorrow<sup>[1]</sup>. In esports, where teams often have limited financial means, early selection of top talents may bring a club both sporting and financial success<sup>[2]</sup>. When talented players are in training, they need guidance and support to develop. But talent development is not a straight line. A given training programme will not lead to the same performance by every talent. To optimally describe, guide and frame the process of talent development in spite of the above, models such as the Deliberate Practice Framework and the Developmental Model of Sport Participation (and derived models) are often used in traditional sport<sup>[3]</sup>. The Deliberate Practice Framework advocated early specialisation and targeted training of sport-specific skills<sup>[4]</sup>. The Developmental Model of Sport Participation, on the other hand, says that it is not necessarily disadvantageous to have fun trying one's hand at different sports at a young age<sup>[5]</sup>. There is no proof from long-term effect studies that athletes will eventually reach a higher performance level if their development is in accordance with a certain model<sup>[6-7]</sup>. Conversely, there are several cross-sectional and retrospective studies showing that a progression from playing and trying out different sports to structured training and specialisation at a later age makes for versatile athletes, who are still capable of reaching the very highest level<sup>[8-9]</sup>. But how is this for esports?

#### 3.1 Skill profiles per game and discipline

For traditional sport, it is known how talent can be recognised based on specific indicators. For esports, it is still relatively unknown which performance indicators and skill profiles are required per game and discipline<sup>[10]</sup>, making it more difficult to recognise talent. Insights are required about the different profiles per discipline and game<sup>[10-11]</sup>. It is important to distinguish between the games, because different cognitive (and other) skills are required for every game and discipline. Shooter games (e.g. Counter-Strike: Global Offensive), for instance, place more emphasis on response time and focus than strategy games (e.g. StarCraft II), where absorbing information and planning and decision-making skills may be more important<sup>[10, 18]</sup>.



#### KNOWLEDGE QUESTIONS

To what extent can performance indicators and skill profiles in esports be determined per game and discipline?

What performance indicators and skill profiles are important for esports games and disciplines?

To what extent do skills required for esports games and disciplines overlap and differ?

How can esports organisations implement skill profiles to scout and develop talent?

#### 3.2 Methods of talent recognition and development

In addition to having insight into performance indicators and skill profiles, it is important for talent development centres and esports teams to attract and guide talent. Esports coaches indicate that talented players are currently scouted based mostly on ranks and leaderboards (individual performance) and through personal networks<sup>[11, 13]</sup>. To do this in a responsible and fair manner, it is important to gain insight into available methods for effectively recognising and guiding talent in esports<sup>[11, 18]</sup>.



## KNOWLEDGE QUESTIONS

**What methods (subjective and objective) are there to recognise and guide talented players in esports?**

From what age can talented players be responsibly scouted and trained to become esports athletes?

What psychological traits should one look for when profiling and selecting talented esports athletes?

How can you ensure a good transition between the amateur and semi-professional/professional levels? How can you make the transition as smooth as possible?

### 3.3 A durable career for esports talent

In traditional sport, early specialisation is often undesirable. It is said to involve risks in the physical and psychosocial realms<sup>[12]</sup>. This is an interesting topic in esports as well. To what extent should one develop a talent geared towards a specific game? Or is it preferable to focus on games within a specific discipline or even games from different disciplines? What should also be taken into account in this respect, is that esports is a relatively young sport, with games and game ecosystems that are rapidly changing. Financial security is not always a given. Furthermore, the peak age for different games seems to be relatively low. For League of Legends and Dota it is reported to be between 22 and 27 years of age<sup>[14]</sup> and for Battlefield around 20 years of age<sup>[15]</sup>. Add to this that the average

pensionable age for esports athletes is very low (in their twenties) and career length is short due to the decline of cognitive functions, injuries and physical and mental health problems<sup>[16, 17]</sup>, and that makes the development of a durable career for an esports athlete essential. More insights are needed into talent and career development to make the right considerations in development programmes for esports athletes (particularly young ones)<sup>[11, 18]</sup>.



## KNOWLEDGE QUESTIONS

**In what way should talented esports players be trained for a durable career from a young age?**

What is the influence of early specialisation in a game on the durable development of an esports career compared to that of providing a broad training to talented esports players?

To what extent are skills from a specific game transferrable to other games and disciplines?

How does an esports athlete's career progress? What are the challenges when it comes to having a durable career?



# Performing under pressure





#### 4. Performance indicator: Performing under pressure

Performing under pressure is inextricably linked to esports. Because esports athletes experience pressure, they may become nervous which can lead to performance loss. This is one of the factors deciding who finishes on the podium or just next to it<sup>[1]</sup>. Athletes experience pressure in situations where a lot is riding on good performance. If the demands placed upon them exceed what they think they can do, this causes a nervous feeling: stress<sup>[2]</sup>. Stress is a normal physiological response. The goal of this response is to prepare the body to deliver a performance. Too much stress can lead to worse performance than one would expect based on an athlete's actual level<sup>[3-5]</sup>. How people deal with stress and performing under pressure is not a given. It can be learned and developed<sup>[1]</sup>. Although the role of physiological factors is obviously an important performance indicator in esports as well, research on this is still limited<sup>[6, 9]</sup>. What researchers emphasize is that there is a performance culture similar to that in traditional sport. There are different internal (team performance, problems communicating to fellow team members, toxic behaviour, lack of team objectives) and external (audience, media interviews, technical problems and social media) stressors that can impact performance by esports athletes<sup>[7, 8, 10]</sup>. Given this highly competitive culture in which relatively young esports athletes have to perform under the guidance of inexperienced (and often self-taught) coaches who are also young, it is essential to be aware of the stress experienced by esports athletes and the way they deal with it. This may contribute to the improvement of their mental health and their performance.

#### 4.1 Influence of performance psychology on performance in esports

Just like in traditional elite sports, esports athletes need to perform under high pressure. There is always the danger of psychological problems and mental overload. What's more, esports athletes are often young, have not been taught to be elite athletes and are in direct contact with the community through social media and streaming<sup>[10, 11]</sup>. To promote health and performance in esports athletes, it is important to acquire an insight into the aspects that put pressure on these athletes and into how they can deal with these aspects<sup>[12]</sup>.



##### KNOWLEDGE QUESTIONS

**How does performance psychology influence esports athletes' performance?**

What aspects put pressure (or perceived pressure) on esports athletes and teams? What support needs do coaches and esports athletes have in the realm of psychology? How do coaching needs of esports players and traditional athletes differ? How does the (sometimes toxic) community influence the perceived pressure in esports athletes? And what would be the best way of dealing with this for esports athletes?

#### 4.2 Providing psychological guidance to esports talent

Mental guidance for esports athletes is often only provided to international elite teams. This kind of guidance is generally limited in less wealthy organisations. It can also be assumed that, due to factors such as the lack of a formal education structure, head coaches have insufficient knowledge on mental pressure to help esports athletes in this regard. It is important to gain insight into how psychological guidance can be provided to esports athletes at all levels<sup>[12]</sup>.



##### KNOWLEDGE QUESTIONS

**How can we best psychologically guide young talented esports players from amateur to semi-professional level and then to professional level?**

What environmental factors influence a young gamer's mental health? What risks and advantages do the environmental factors entail? How can we implement performance psychology in the development processes of talented esports athletes?

### 4.3 Elite sport mindset in esports athletes

Often, esports athletes are relatively young men (16 to 24 years of age) that have found their way to the top with little or no guidance. The organised training structure for talented gamers is limited. They go from 'home' to the stage. As esports athletes do not go through a long development process guided by professionals, their self-regulating mindset may be underdeveloped. For coaches and players, it is important to acquire insight into creating a elite sport mentality amongst gamers<sup>[12]</sup>.



#### KNOWLEDGE QUESTIONS

How do you create the right elite sports mindset in esports athletes?

How does mental resilience influence an esports athlete's performance?

How does the social context influence an esports athlete's performance?

How does physical health influence an esports athlete's performance (in particular: mental performance)?

How does financial reward affect a player's motivation?



# Sleep/wake cycle and recovery



## 5. Performance indicator: Sleep/wake cycle and recovery

Sleep is essential to recovery, training adaptation and delivering and improving elite performance. Elite athletes often have to deal with situations that can lead to a bad night's sleep, such as long trips and the accompanying jet lags, sleeping in hotels and early or late training sessions and matches. Pre-game tension and injuries can also negatively affect sleep. All of this means that sleeping problems are common in elite athletes. Around 50% to 78% experience at least some sleeping problems and 22% to 26% even have a severely disrupted sleeping pattern<sup>[1,2]</sup>. Athletes who sleep too little perform worse<sup>[2]</sup>. Shortage of sleep decreases athletes' speed and accuracy. Furthermore, athletes suffering from lack of sleep are less focused, less capable of learning and more likely to take bad decisions<sup>[3]</sup>. Particularly in esports, which places high cognitive demands on players (just like chess, for example), sufficient sleep is essential to performance<sup>[4,11]</sup>. Although research into esports athletes' sleep-wake cycles is limited, several researchers suggest that these athletes may have more sleeping problems than traditional elite athletes. Many esports athletes participate in nighttime training sessions, are exposed to blue light before sleeping, compete internationally and experience stress. These factors can lead to inconsistent sleeping schedules and abnormal sleeping patterns<sup>[5-8]</sup>. Esports coaches and staff also indicate that they have practical questions about the sleep-wake cycle<sup>[9,10]</sup>, which makes it an interesting theme full of research opportunities.

### 5.1 Influence of sleep on performance

Esports athletes often play their matches and engage in individual (or joint) training in the evening or at night, creating a different sleep-wake cycle than in traditional elite sports<sup>[5-8]</sup>. Greater insight into the sleep-wake cycle and its influence on performance is required to provide better guidance to esports athletes in the area of sleep<sup>[9,10]</sup>.



#### KNOWLEDGE QUESTIONS

**How does sleep influence esports athletes' performance? And how do you deal with that as a coach?**

Are there known positive or negative consequences of esports athletes' sleep-wake cycles (circadian) for performance?  
What is the influence of sufficient/insufficient sleep and rest (recovery) on the mental health of esports athletes during tournaments and competitions?  
What measures should a coach take in addressing the sleep-wake cycle in the training programme? And how do you implement these measures?

### 5.2 Influence of gaming on sleep

As esports athletes often play their matches and engage in individual or joint training in the evening, coaches and staff have questions about the effects of screen light (blue light) and the high level of cognitive effort on sleep quality<sup>[10]</sup>.



#### KNOWLEDGE QUESTIONS

**What is the influence of gaming (including such factors as screen light and cognitive effort) on sleep?**

What is the effect of being exposed to screen light while gaming on sleep?  
How is sleep affected by high cognitive effort (cognitive arousal) while gaming?  
What guidelines are in place (or could be developed) to optimise gamers' quality of sleep?

### 5.3 Organising the sleep-wake cycle

Important tournaments and competitions are often played in a physical location, instead of in the online environment where training sessions and part of the regular matches take place<sup>[6]</sup>. During these physical events, esports athletes must therefore take into account a different sleep-wake cycle. To make the transition as smooth as possible, insights are needed about the adaptation of the sleep-wake cycle in esports<sup>[10]</sup>.



## KNOWLEDGE QUESTIONS

**How do we organise the sleep-wake cycle during physical tournaments and competitions in order to keep performing at the highest possible level?**

How do you deal with the sleep-wake cycle when offline tournaments no longer take place at night but training sessions do, which changes the cycle? How do you best prepare esports athletes in this respect? What jet lag strategies can be devised to optimise performance in tournaments and competitions?

### 5.4 Recovery on match days

During tournaments, esports athletes often have to play multiple matches in a single day. In between these matches, time is allocated to recovery. These recovery periods are utilised in different ways, which raises questions on the best way to utilise such a period. Some esports athletes play more practice matches to stay focused, while others choose not to play<sup>[10]</sup>.



## KNOWLEDGE QUESTIONS

**How do you organise your recovery on match days to keep performing at the highest possible level?**

What options does esports offer for shaping the between-game recovery process?

What is the influence of different methods of recovery on the esports athlete's performance?

What is the best way for esports coaching staff to deal with rest and recovery in between matches and tournaments?



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