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**IDEAS FOR THE NEW PRACTICAL
GUIDELINE FOR REHABILITATING
ATHLETES WITH OVERTRAINING
SYMPTOMS IN MEDICAL CENTER
FENIX**

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ABSTRACT

Overreaching and overtraining are states where the athletes usually experience a decrease in performance and physical and psychological symptoms for which they seek help. Overtraining syndrome (OTS) is a sport disease that requires treatment and rehabilitation, and it takes time to recover from it.

The objective of this developmental task was to find ideas on how to rehabilitate and help athletes to recover when the symptoms of overreaching and overtraining have emerged. This developmental work was done for Medical Center Fenix.

This thesis was made as a developmental task, and it rises on the methods of qualitative research. It combined systemized data search and health care specialist interviews. With these two sources, ideas for rehabilitation and recovery process were discussed.

This study showed that the data is limited to the overtraining rehabilitation process and for this reason interviews gave support to build up ideas. Ideas were found for the treatment and rehabilitation process and how it would be possible to proceed with it from the beginning till the return to sport state. Rest, sleep, nutrition and self-awareness are important for rehabilitation and recovery. Recovery periodisation plan should be a part of the training. Prevention of overtraining is important, and periodisation of sport is part of it, so this sport illness would not build up from overreaching to overtraining state.

Hopefully these ideas will give Medical Center Fenix some base line how to keep on developing the practical guideline for athletes with overtraining symptoms and how multi-professional teams can help athletes with this illness.

Keywords: overtraining, rehabilitation, recovery, treatment

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1 INTRODUCTION

Overtraining is interesting ensemble because it combines the physiological and psychological sides off sport disease. It gives us possibility to see this sport disease and its rehabilitation combining this holistic way of seeing athletes. In this phenomenon physical training and other stressors leads also to psychological outcomes. This also gives multidimensional expectations to rehabilitation and recovery process of this illness. This thesis rises from the desire to understand this concept and its complexity to athletic performance.

Overtraining have been defined as a “sport-specific” decrease in performance together with disturbances in mood state and this kind of underperformance stays even if the athlete recovers weeks or months. Overtraining syndrome and nonfunctional overreaching have same kind of symptoms and can be difficult to distinguish. Diagnose between these is eliminating other illnesses and diagnose can be done afterwards watching out the recovery time of athlete. (Meeseum et al. 2012, 186–188.)

When watching out for evidence from the last 10 years it is still clear that research has watched out for overtraining and overreaching of athletes from many perspectives but still little of this phenomenon is understood. Researchers, health care experts, coaches and athletes have found out that overtraining is not an easy concept, and it must be watched out from many perspectives to get some kind of understanding of how to help athletes with this sport illness. (Meeseum et al. 2012.186–188.)

To produce specific physiological and psychological outcomes coaches and athletes should manipulate both training and recovery strategies. The aim should be to enhance performance and minimize the risk of developing nonfunctional overreaching, overtraining syndrome, other illnesses, and/or injury’s. (Kellman et al. 2018.240-241.) Training continuum arises from undertraining and in too stressful situations can lead to overtraining. Origin of training lies in many aspects of sports, but the main concepts are training, fatigue, and recovery from it. (Carfagno & Hendrix 2014,45.)

Hypotheses of the pathophysiology of overtraining origin have been made. The arises from different kinds of biochemical changes in athletes' body. (Kreher & Schwards 2012, 129.) This also may give the understanding why symptoms of overtraining vary highly individually. Symptoms are usually catabolic, and body is first in "alarm" mode. As time and training goes on exhausting of resources appear. (Uusitalo 2015, 2345.)

Medical Center Fenix was founded in 2020 and specialised sport clinic was opened in 2021 in the city of Porvoo. Fenix Sport clinic has specialists that share zeal to treat athletes, sportswomen and men so that they can stay active and reach their goals. Sport clinic focuses in is athlete's health, rehab coaching, injuries, and overall performance. (Lybäck 2021.)

This master study aim is to find out ideas for new practical guideline for Medical Center Fenix and Sport clinic how to rehabilitate athletes with overtraining symptoms. Study questions took shape around the recovery and rehabilitation process of overtraining and how it can be enabled with the cooperation of athlete, coaches and sport clinic services. Ground of the study arises from developmental task and answers to study questions wanted to be find found work oriented way. This also gives for the new organization possibility to deep co-operation between the specialist working in the clinic. Also, the knowledge about the overtraining and rehabilitating this illness inside the medical center wanted to be found and compound with the systemized review done, to understand the phenomenon of overtraining.

First the data around the overtraining was searched via different databases and hand search from the last decade. Systemized review wanted to find answers of overtraining as a sport illness and how to treat and rehabilitate it. Recovery and rehabilitation ideas wanted to be found via data. It came clear that limited data is available, so this gave the idea found the information from the specialist from the medical center.

Interviews were done to health care specialist who have experience working with overtrained patients. Theme interview body was shaped from the gathered information and specialist were interviewed about the treatment and rehabilitation of overtraining. Total number of interviews was five and one specialist were founded outside the medical center to get deeper information about the subject that showed to be unfamiliar. Content from interviews was inductively analyzed.

2 MEDICAL CENTER FENIX

Medical Center is located at Porvoo Finland and was opened in august 2020. Fenix wants to offer local healthcare services. Their vision is to offer diverse services that are easily accessible for all customers. Company's first strategy goals are to develop customer processes and job satisfaction. Digital services are also an important part of Medical Center Fenix future. Company core values lie in local, flexible, easily reachable, customer-oriented services that can be given with both national languages which are Finnish and Swedish. Medical Center Fenix wants to be 100 % domestic. The Medical Center has 55 specialists working and 10-15 nurses taking care of daily routines. (Medical Center Fenix, n.d, Fenix vision and strategy.)

Medical Center Fenix has many kinds of health care experts working and many kinds of medical equipment is found. Medical Center has its own asthma ja allergy clinic, diabetes clinic, mental health clinic and sleep apnea clinic, laboratory and imaging equipment. Diagnosing and treating patients is done with modern equipment and systems. (Medical Center Fenix n.d, Fenix vision and strategy.)

Fenix Sport clinic has been a part of medical center services from the beginning. At the end of 2021 via service design done by Lybäck & Heikkinen, Sport clinic found a vision on how to see sports medicine that is produced in Fenix Sport clinic. The athlete and hers/ his health are the focus and main target. Sport clinic gives expertise that is focused on sport health, sport injuries, rehab coaching and

sport performance. Fenix Sport clinic has many health care professionals sharing the same passion for sports health care. This expertise and customer centered thinking are the main drivers of clinic work. (Lybäck 2021.)

Fenix Sport clinic moved to a separate location at the beginning of 2022. The sport clinics experts are from many medical specialties: physicians from many specialties like orthopedist, surgeons, cardiologist and nurses, physiotherapists, naprapath, nutritionist, and sport psychologist. Fenix Sport Clinic wants to offer services and experts that are focused on sport illnesses and injuries. Fenix Sports surgeons operating office is located at Helsinki. (Fenix Sport Clinic 2022.)

3 OVERTRAINING AS AN SPORT ILLNESS

When watching out for evidence from the last 10 years it is still clear that studies has watched out for overtraining and overreaching of athletes from many perspectives but still little of this phenomenon is understood. Researchers, health care experts, coaches and athletes have found out that overtraining is not an easy concept, and it must be watched out from many perspectives to get some kind of understanding of how to help athletes with this sports illness. To produce specific physiological and psychological outcomes coaches and athletes should manipulate both training and recovery strategies. The aim should be to enhance performance and minimize the risk of developing nonfunctional overreaching, overtraining syndrome, other illnesses, and/or injury's. (Kellman et al. 2018,242–243.)

First scientific literature about overtraining have been found in the 1930s and till today studies have proposed that overtraining affects between 20-60% of athletes through-out their careers (Weakley et al. 2022,675). During athletes' careers the risk of overreaching and overtraining comes compounded. In survey studies 60 % of female and 64% of male elite runners have been reported experiencing at least one episode of overtraining syndrome during their career. This can be compared to 33% of non-elite runners. The syndrome is more common in fast performers in swimming and the risk is positively related to skill level. There is also evidence that athletes who go through overtraining syndrome

are at a heightened risk of relapse. It is also unclear if some individuals are more predisposed to developing overtraining syndrome. (Meeseum et al. 2012, 189.) Prevalence of overtraining is higher on individual sports and in elite or pro level but is also found on athletes on lower level. It is more found in individual- than in team sport. 10-20 % of athletes tell they have been on an overtraining stage during one season and even 60 % during their whole sport career. (Uusitalo 2015, 2344–2345.)

Extreme condition practices in resistance training with high-volume and high-intensity and multiadaptive nature might have increased risk of non-functional overreaching or overtraining syndrome if the balance of training and recovery is appropriate. There can be found minimal evidence of true overtraining syndrome in strength and resistance sports. (Bell et al. 2020.) Monotonous and high-intensity resistance training might lead to overtraining syndrome and decrease of performance can be an indicator (Grandou et al. 2019).

Many studies underlie the same problem and difficulties in studies of overtraining and the major problem is the lack of common and consistent terminology as well as standardized way of doing diagnosis for athletes with overtraining syndrome (Brukner & Khan 2009, 878–879) (Meeusen et al. 2013, 187). It is difficult to give any specific numbers on the prevalence of overtraining because not all studies clearly indicate the time frame of data collection, but studies show that athletes who go through overtraining symptoms are at high risk of developing overtraining syndrome (Meeusen et al. 2013, 189). Overtraining is experienced in the field of sport, but still little data is available describing how physiological and psychological symptoms manifest (Weakley et al. 2022, 678–679).

In Minttu Hukka's lecture she described relative energy deficiency in sport (RED-S) and Female athlete triad (FAT) syndromes as similar to overtraining syndrome but still different illnesses. In the FAT there are found changes in bony structures, hormonal changes, low energy intake and eating disorders, distorted body image and mental health problems. RED-S also involves men and, in this syndrome, the main reason is on low energy intake. These syndromes may not have any

changes in training loads but more in nutrition. (Hukka 2021.) Harri Selänne lectured about differences between athletes overtraining and athlete's burnout. He said that overtraining can be seen as a sudden appearance of various symptoms and burn out a more prolonged feeling that everything is not functioning as it should be, and training is no longer inspiring. (Selänne 2022.)

Meeseum et al. (2012, 187) says that there is no common and consistent terminology in this field and some scientists have proposed that rather than overtraining this syndrome should be renamed as unexplained underperformance syndrome. This terminology has not spread. In this study the focus is only on the concept of overtraining and definitions that have been found in most of the studies and other similar syndromes or sport illnesses are not included.

3.1 Overreaching, overtraining, and overtraining syndrome

Meeseum et al. (2012, 188) defines overtraining syndrome as a "sport-specific" decrease in performance together with disturbances in mood state and this kind of underperformance stays even if the athlete recovers weeks or months. Overtraining can be seen as a process of excessive training and overtraining syndrome can be seen as a neuroendocrine disorder. Overreaching can be described with similar symptoms but in a more transitory nature. (Brukner & Khan 2009, 879–881.)

Potential triggers for overtraining syndrome can be increased training load without adequate recovery, monotony of training, excessive number of competitions, sleep disturbances, stressors including personal life, previous illness, attitude exposure and heat injury episode. (Krehen & Schwards 2012, 135.) Overtraining can be seen as a process of intensive training with the possibility to develop nonfunctional overreaching or overtraining syndrome. Overtraining can also be separated into functional overreaching (FO), nonfunctional overreaching (NFOR) and overtraining syndrome (OTS). The distinction between NFOR and OTS is very difficult because athletes show and experience the same kind of symptoms and problems, but the difference is the time needed for performance restoration. There might be absence of

psychological signs associated with these conditions. (Meeseum et. al. 2012,187.) The difference between NFO and OTS is the time needed to recover, which is identified more easily after complete rest. The difference cannot be seen by the severity of the symptoms (Carfagno & Hendrix 2014, 45–46).

Supercompensation is an adaptive improvement in performance and can also be called as a functional overreaching. Athletes training and recovery are in balance and decrease after the training period lasts usually up to 2 weeks. (Carrard et al. 2021, 670–671.) Overreaching is a short- term decrement in performance capacity (Meeseum et. al. 2012, 187).

When decrement in performance lasts longer duration (usually 3-4 weeks) and is not followed by supercompensation the term nonfunctional overreaching (NFOR) can be used. If reduced capacity lasts more that 3-4 weeks and supercompensation does not occur athletes can be experiencing overtraining syndrome. (Carrard et al. 2021, 670–671.) When intensive training leads to stagnation or decrease in performance that is not resumed for several weeks or months this stage can be called nonfunctional overreaching (NFOR) and overtraining syndrome can be seen as a continuum of this stage (Meeseum et. al. 2012, 188).

In a prolonged state of overload, the athlete's physical performance and ability to train are impaired. The athlete has symptoms suggestive of illness without clear explanatory findings. The overload state is thought to be caused by physical overload, but usually the accumulated load is also caused by factors unrelated to training. (Uusitalo 2021, 2344–2345.) Maybe these are reasons why overtraining can also be called under recovery. Origin of overtraining lies in many aspects of sport. Overtraining can arise from training, lack of nutrients and wrong kind of nourishment, lack of sleep, constant being on the move and psychological load. (Meeseum et al. 2012, 188.) Figure1 shows the pathway from undertraining, acute overload and functional overreaching to overtraining (Carfagno & Hendrix 2014, 46) (Kreihen & Schwarzs 2012, 129).

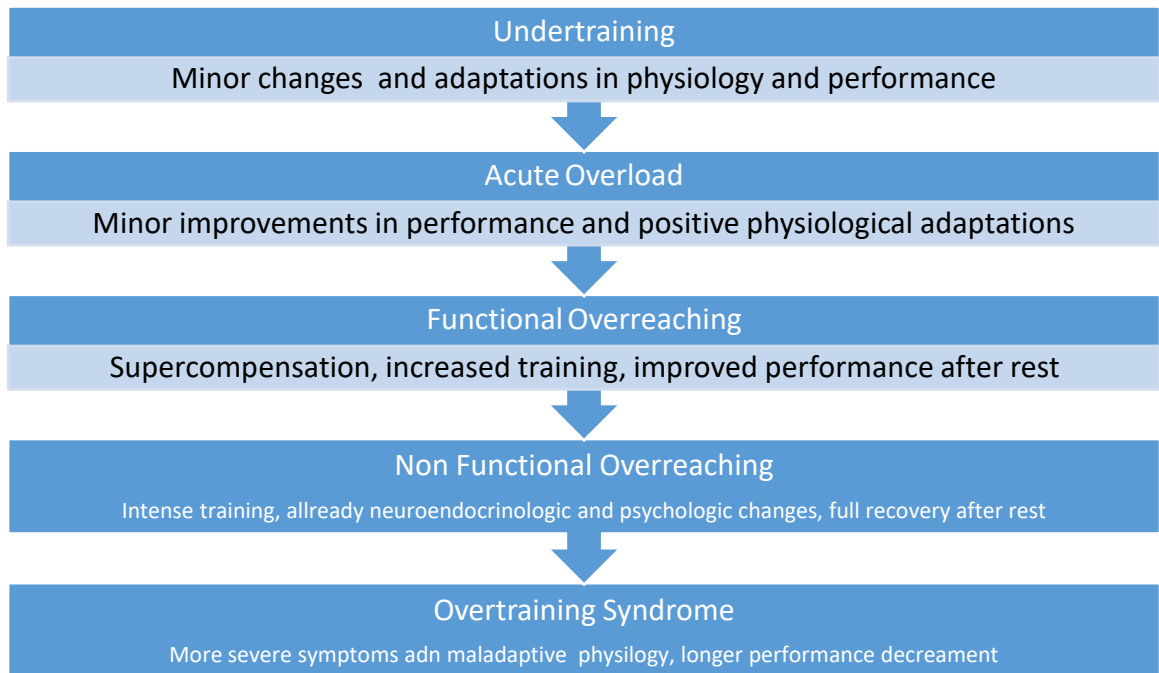


Figure 1. Pathway to overtraining (Carfagno & Hendrix 2014; Kreher & Schwads 2012)

3.2 Mechanism underlying in overtraining syndrome

When trying to understand illnesses it is important to try to understand where it rises. What are the underlying reasons why the illness takes its form and how these could be rehabilitated. Studies give many explanations of what happens physiologically and psychologically in the athlete's body and mind during overreaching and overtraining syndrome. Numerous hypotheses have been reported about pathophysiology of these conditions and each have their strengths and weaknesses (Kreher & Schwads 2012, 129–130) and not a single hypothesis can explain all aspects of OTS (Carfagno & Hendrix. 2014,45).

In the cytokine hypothesis it is thought that continued intense training and absence of recovery and rest inflammatory response can become amplified, chronic, and pathologic. Muscle contractions and joint actions can cause microtrauma to tissues. There has been reported systemic inflammation and hormonal changes when athletes are going through overtraining syndrome and it is thought that cytokine mediators may be responsible for some of the changes. (Kreher & Schwads 2012, 133.)

In the hypothalamic hypothesis the dysregulation of the hypothalamus and its axes has been seen as a potential mechanism for nonfunctional overreaching and overtraining syndrome. Athletes going through overtraining have primarily changes in cortisol, adrenocorticotrophic hormone, testosterone, and estrogen. (Carfagno & Hendrix 2014, 47–48.)

In the glycogen hypothesis it has been thought that low muscle glycogen can impair performance because of inadequate fuel for the training. In some research it has been proposed that decreased glycogen can cause overtraining syndrome, but the link appears to be weak. (Kreher & Schwards 2012, 132.) Decreased levels of branched- chain amino acids (BCAA) and increased oxidation in continuum to decreased glycogen levels and the first two are involved in central neurotransmitter synthesis and thereby the reason for fatigue development. (Carfagno & Hendrix 2014, 48.)

The BCAA hypothesis is has limited application when thinking the underlying mechanism of overtraining syndrome. In this hypothesis it is proposed that when training BCAA levels decrease and allow more tryptophan into the brain, and this elevates central 5-HT (neurotransmitter serotonin) concentration. When the 5-HT amount may rise so high, it can induce the state of fatigue in the individuals, and it may be connected to other overtraining syndrome symptoms like mood and sleep disturbances. (Carfagno & Hendrix 2014, 49.) The central fatigue hypothesis has same system and it proposes also that 5-HT alterations may lead to overtraining syndrome (Kreher & Schwards 2012, 132).

The oxidative stress hypothesis it is proposed that oxidative stress may become pathological and can cause inflammation, muscle fatigue and soreness. Athletes who are experiencing overtraining may have diminished responses to exercise included stress and this way be more vulnerable to oxidative damage. It has been reported that resting markers of oxidative stress are higher in overtrained athletes. (Kreher & Schwards 2012, 132.)

There has also been classical concept that overtraining syndrome can be seen as a sympathetic or as a parasympathetic way (Meeseum et. al. 2012, 188). The autonomic nervous system hypothesis: the dominance of parasympathetic activation and decreased sympathetic activation can lead to performance inhibition, depression, fatigue and bradycardia. Some studies have shown decreased nocturnal urinary catecholamine excretion. Decreased sympathetic activation can also be caused by decreased organ sensitivity to catecholamines. Heart rate variability has also been seen as an indicator of autonomic functions. (Kreher & Schwards 2012, 132–133.) Screening autonomic dysfunction by heart rate variability testing may be a good way to detect overtraining syndrome and recovery from it in endurance athletes (Kiviniemi et al. 2013, 77).

3.3 Symptoms and diagnose of overtraining syndrome

While reading the studies about overtraining it is clear that diagnose of this sport illness is not an easy subject. Studies have been trying to find tests that could detect overtraining syndrome and the diversity of the tools and biomarkers highlights the fact that overtraining syndrome affects multiple body systems (Carrard et al 2022, 670). Many physiological changes, biochemical changes, hormonal changes, immunological changes, and psychological changes can be found when person that has overreaching or overtraining symptoms (Brukner & Khan 2009, 879–881).

Markers that have been found potential for diagnosing overtraining syndrome are specific hormones like basal hormones, neurotransmitters, and metabolites, as well as psychological, electrocardiographic, electroencephalographic, and immunological patterns. This is also reflecting its multisystemic nature on overtraining syndrome. Many tools can and should be used when detecting overtraining syndrome. For example, investigating athletes eating patterns, psychological state for example with the Profile of Mood State (POMS) questionnaire, body composition, heart rate variance (HRV), cardiopulmonary exercise test (CPX), electroencephalography (EEG and insulin tolerance test (IIT). Endocrine and Metabolic Responses on overtraining syndrome (EROS)

longitudinal study has conducted a lot of publication about tools and markers to detect overtraining syndrome. (Carrard et al. 2022, 670–671.) These biomarkers and tools from Carrard et al. study (2022) are shown beneath in Figure 2.

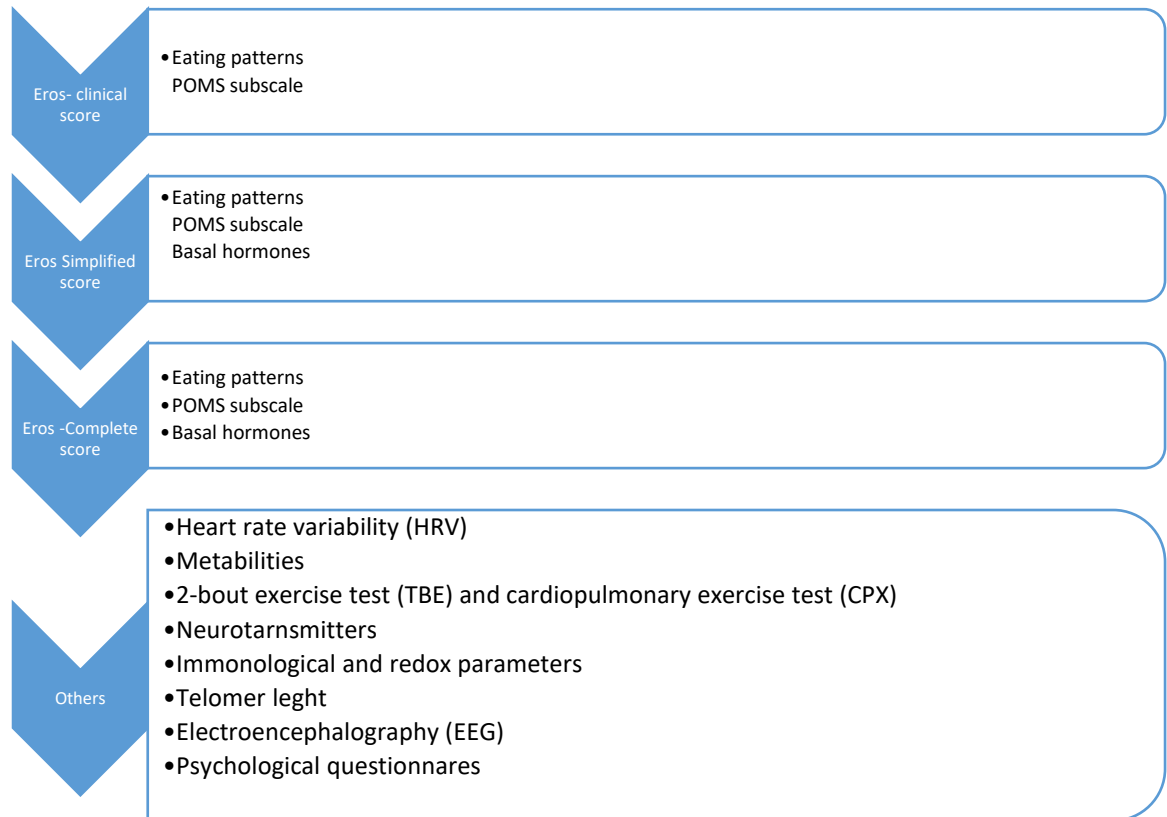


Figure 2. Overview of tools and biomarkers potentially for overtraining syndrome diagnosis (Carrard et al. 2022)

Overtraining symptoms can be decrease in performance, fatigue and powerless feeling, sleep disorders, changes in appetite, problems in digestion, repeated infections, heart symptoms and arrhythmia, shortness of breath, muscle pains, involuntary muscle spasm, problems in coordination and reaction times, changes in mood, negative thinking, inability to concentrate, headaches, changes in menstrual cycle and disturbance of sexual activity. (Kreher & Schwards 2012, 134–136.)

Overtraining diagnose can be done only afterwards athlete have already have symptoms because difference between nonfunctional overreaching and overtraining syndrome is the amount of rest needed for performance restoration.

The recovery time can last from weeks to months, and it can't be known in advance. (Weakley et al. 2022, 675.) Athletes experiencing overtraining symptoms have been reported to have immune suppression and increased stress levels and they are likely to experience disturbances in sleep, self-perception, and mood factors. (Wyatt et al. 2013, 21.)

4 RECOVERY AND REHALIBILITATION IN SPORTS

In the consensus statement of recovery and sport it is said that recovery is seen as a multifaceted (e.g., physiological, psychological) restorative process relative to time. In case an external or internal factors that disturb humans, biopsychosocial balance affects individuals' recovery status. Fatigue can be seen as a condition of augmented tiredness due to physical and mental effort develops. Recovery and fatigue thereby can be seen on a continuum, and these are jointly affected by physiological and psychological determinants. Recovery is an umbrella term and under that can be found different modalities of recovery such as regeneration or psychological recovery strategies. (Kellman et al. 2018, 240–242.)

Recovery can be distributed between passive, active, and proactive approaches. Passive methods may be external methods like massage or implementing a state of rest characterized by inactivity. Active recovery involves physical activities like cooldown aimed at compensating the metabolic responses of physical fatigue. Proactive recovery means choosing activities customized to individual needs and preference and this can be for example social activities. Recovery can also be divided in to short-term, midterm, or in long-term restoration. There is high intraindividual and interindividual variability of the recovery process. Popular recovery implementations are for example power napping, cold water immersions, contrast water therapy, stretching, whole-body cryotherapy, compression garments, massage, intermittent pneumatic compression, electrostimulation, sauna, far-infrared therapy. Different recovery activities can be tested to the nature of the present stressors. (Kellman et al. 2018, 241–242.)

Recovery monitoring can be done via biological approaches ranging from physiological and biochemical to hormonal and immunological markers. These can be watching out hear rate (HR), heart rate variability (HRV) during rest and exercise. For the parameters it is important to also check hydration, circadian rhythm, environment, and medication to exclude any potential confounders. Biomarkers can be assed via blood samples, urine, and saliva. Increased frequency in the occurrence of colds and unresolved viral infections are represented in overtraining. (Heidari et al. 2019, 3–4.)

Changes in psychological state can be measurement of recovery in reaction to acute or chronic training loads. Preventive approach of monitoring alterations in moods, stress, and recovery prior to manifestation of symptoms appears to be most beneficial. Three most commonly used instruments are Multicomponent training Distress Scale (MTDS), Profile of Mood States (POMS), and RESTQ-Sport. Social factors monitoring can also be used cause functioning social environment with supportive climate can serves a strong protection against the adversities in sport settings. The Daily analysis of Life Demands for Athletes (DALDA) is a self-report measurement tool. Self-monitoring tools for different aspects of athlete's performance are important. (Heidari et al. 2019, 4–5.)

In a sport specific way of rehabilitation, it can be seen as a requirement to help individuals return to their previous level of function. Every athlete is an individual who brings her/his personality and lifestyle factors to the therapy room so skillful rehabilitation can't be the same recipe for everyone. Every athlete has specific post-injury sporting goals, level of skills and degrees of competitiveness and all of this influence the rehabilitation program. This doesn't mean we can't have some general principles or guidelines to underpin every rehabilitation program. It is important to point out to the patient realistic, approximate time frames for recovery, but these cannot be seen as promises. It is important to set short- and long-term goals. Progress of rehabilitation can be divided into initial stage, intermedial stage, advanced stage and return to sport stage and the therapist should monitor the patient's progress on each stage. Physiological and

psychological parts of rehabilitation should be watched out. (Brukner & Khan 2009,102–103, 174–175.)

4.1 Overtraining prevention

Best ways of treating sport illnesses like overtraining are preventing it happening (Meeseum et al. 2012; Rocha, Marques, Costa 2012; Uusitalo 2015). Screening and education are the key components of prevention. Performance measures, observation of training loads and mood questionnaires can help in preventing the progression from FO to NFOR and OTS. (Kreher & Schwartz 2012, 136.)

Retrospective questionnaires, training diaries, physiological screening and direct observation methods are the four best ways of preventing OTS (Meeseum et al. 2012, 198).

Different type of fatigue occurs in different kind of training. Metabolism, tissue damage, neurological changes, psychological demands, and environmental factors have each different kind of effect on athletes' performance. Also, different kinds of intense training leads to recovery times that vary from minutes to days, and these should be noticed. (Rocha et al. 2012, 73.)

Prevention of overtraining symptoms can be reduced by appropriated training programs and carefully thinking what kind recovery time and training is needed. Lightened training and rest seem to be therapeutic agents capable of effecting recovery and nutrition plays also key role. Avoiding excessive monotony of training is important and training intensity should be individualized. Physicians and coaches should understand and be aware of the multiple stressor's athletes have in their life. (Meeseum et al. 2012, 200.)

Training that has been based on periodicity needs to be followed and registered using training log. Training can be subjectively evaluated by the intensity of a single training session as rate of perceived effort (RPE) and the total duration of training session. These parameters can be summated weekly individually to find out daily mean and standard deviation of training load. Illnesses and injuries

should also be noted. These can be matched with the recovery process. Athletes can also evaluate the perception of recovery and total quality of recovery process (TQR) can be watched out against RPE measurements. Subjective (perception) and objectives (action) aspect should be watched out to understand the quantitative and qualitative aspects of overtraining syndrome to speed up the recovery process. (Rocha et al. 2012, 71–72.)

Rocha et al. (2012, 74) present “the recovery pyramid” that has four levels. First the base level covers the rest, sleep, and nutrition. Second level covers periodization, reactive programming, and cooldown. Third level instructs recovery pool work, compression skins, ice baths, contrast bathing and massage. The fourth level is responsible for strategies such as psychological and environmental approaches with individual focus and omega wave.

It needs to be understood that both training and recovery activities can be manipulated by coaches to produce specific physiological and psychological outcomes (Kellman et al. 2018, 242–243).

4.2 Overtraining recovery and rehabilitation

Kellman et al. (2018 p.240–241) define recovery as a multifaceted restorative process relative to time. Recovery can be as an umbrella term that consist of many modalities of recovery such as regeneration or psychological recovery strategies. Studies have limited information about recovery, rehabilitation, and treatment of overtraining. Still some consistencies have been reported about curing from overreaching and overtraining. Heidari et al. (2019 p. 3) writes that recovery plays important role in minimizing risk of negative outcomes of performance such as overtraining, injuries and psychological disorders.

Treatment of overtraining syndrome is to supports recovery and treating the symptoms athlete has. Best ways to prevent overtraining is the athlete’s self-knowledge and good confidence these gives possibility to make changes if athlete feels that fatigue and recovery are not in balance. Easiest way is to follow personal scales about the training effect and fatigue. Also watching out resting

heart beats and orthostatic heart beats can give information about training loads. (Uusitalo 2015, 2348–2349.)

Rest and sleep are the most obvious methods of enhancing recovery. Passive rest and obtaining sufficient sleep are important and least on rest day is needed every week especially during heavy training periods. Athletes might need encouraging to different interest that does not include sports. Athletes can be given advice to sleep that amount that they feel wakeful during the day. (Meeseum et al. 2012, 199–200.)

Fatigue can be related to too low nutrition intake and overreaching can be at least partly attributable to a decreased in muscle glycogen levels. This can result in higher circulating levels of catecholamines, cortisol and glucagon in response to exercise while insulin levels are very low. Hard training and carbohydrate depletion, dehydration and overall negative energy balance seem to be linked to development of overreaching symptoms. Athletes should be advised to understand the hydration and energy intake to meet the demands they have. (Meeseum et al. 2012, 199–200.)

The information, process, and effectiveness of different approaches about recovery and rehabilitation of overtraining is poorly understood. Endocrine and metabolic responses of overtraining syndrome are recovery from it have been evaluated by EROS study. Athletes recovering from OTS can be divided to early recovers, late recovers, and non-recovers. The early markers of recovery might be used as a marker for athletes with OTS to predict the success of their recovery and plan their future careers. (Cadebiani et al.2021, 1181.)

Cadebiani et al. (2021, 1175) used 12-week protocol that included increase of overall caloric intake, full interruption of training followed by return to training progressive, nonpharmacological recommendation for improvement of sleep quality and sleep hygiene and if needed individual management of personal stressors. This protocol was watched out to understand the endocrine and metabolic responses of overtraining syndrome.

Cortisol ja prolactin were the first hormonal responses that showed improvement followed by growth hormone, insuline-like growth factor (IGF-1) and free triiodothyronine (T3). Early in the recovery process was found the complete normalization of testosterone, estradiol and T:E-ratio. Full normalization of catecholamine levels was found after 12 weeks. During the recovery usCRP decreased and creatine kinase normalized after 12 weeks intervention. lactate levels might take more than 12 weeks to normalize and those were found to remain relatively altered. Hormonal and biochemical parameters show improvement during 12 weeks unlike body metabolism and composition. Body fat was significantly higher athletes with OTS. It is reinforced that body composition does not always result from a simplistic calculation of caloric intake, nitrogen balance and training patters. (Cadejani et al. 2021, 1180–1181.)

Treatment of overtraining syndrome is rest but relatively rest can be used and can be more appropriate. If stress, depression and/or anxiety is increased via full rest relatively rest with well-defined expectations can be used. Training can start from 5-10 minutes daily until 60 minutes is tolerated. Volume should be prior to intensity. Mental health experts can be used in multidisciplinary management. selective serotonin reuptake inhibitor in suggested cause of the similarities between depression and OTS. Trazodone or amitriptyline can be used for sleep complaints. (Kreher & Schwartz, 2012, 136.)

4.2.1 Psychological perspective for overtraining recovery

Only one case study was found on the systemized review that watched out only about psychological rehabilitation of overtraining albeit this illness is defined with mood disturbances. Birrer (2019, 55–56) tells that athletes with early signs of nonfunctional overreaching and overtraining syndrome typically show a specific pattern of mood disturbances and monitoring mood, and stress-recovery is important. On holistic view of treatment, it should contain biological, psychological and social functioning.

Brief therapies are regarded to be the most appropriate and these can include for example relaxation techniques for anxiety, techniques to verbalize fears and emotions, and find alternative responses to stressors. Athletes having overtraining symptoms in recovering from those are always in danger training at higher intensities than planned because their already weakened self-esteem is suffering even more when must fall behind their training partners. (Birrer 2019, 56–58.)

Treating the person not the athlete is the main theme. Weekly mood and stress-recovery monitoring with POMS was used. The interplay between all stressors and the individual's coping resources are main part of effective psychological treatment. Cognitive behavioral therapy, psychological-skills training, mindfulness and acceptance-based interventions can be used. (Birrer 2019, 56–58.)

5 PURPOSE, AIM AND RESEARCH QUESTIONS OF THE DEVELOPMENTAL TASK

The purpose of this developmental task was on the base and idea side of new of new practical guideline. The aim was to find knowledge base for the new practical guideline for Medical Center Fenix and Sport clinic to rehabilitate athletes with overtraining symptoms. Research questions are shown below.

Research questions

1. How can people with overtraining symptoms be helped to recover in Medical Center Fenix?
2. How can people with overtraining symptoms be rehabilitated in Medical Center Fenix?

Practical guidelines are a good way to improve the quality of care received by patients, empower patients, and direct the planning of interventions. Idea is to promote interventions of proven benefit and discourage ineffective or potentially harmful interventions. (Guerra-Farfan et al. 2022.)

6 STUDY DESIGN, DATA COLLECTION AND ANALYSIS

In developmental study design, first developmental challenges and meaningful subjects are watched out and you must have a good plan. Plan gives you goals you want to reach with your task. Finally, all work is analysed and usually in this stage there are already new developmental ideas (Ojasalo et al. 2014, 20 - 23.) Qualitative research methods are good when you want to expand health science knowledge and produces theoretical descriptions of phenomena about which there is no previous knowledge or finds new perspectives on phenomena that are already partially known. Qualitative research can produce new theory and evidence-based information (Kylmä et al. 2003, 610-611).

This study is a developmental work and it rises from qualitative research to find out new ideas for rehabilitation process of overtrained athletes. Little is known so new ideas wanted to be found on through studies and practical knowledge. First the literature was searched and from this the themes for the interviews was developed. Interview request was sent via email to 75 person and 9 persons meet the criteria for interviews and 5 of took part into this study. Theme interviews were done and analysed via inductive content analysis. Research permit was asked from Medical Center Fenix.

In developmental task design we are balancing between research study design and developing work environment (Ojasalo et al. 2014, 23-24). First the literature was searched. Developmental literature review was done by systematic review method that differs from a systematic one in that it is usually done by one researcher, while in a systematic review there are usually two or more researchers (Kunnala 2022).

In this study the keywords and databases were identified by doing searches about overtraining and recovery and rehabilitation of overtraining syndrome, to try to find out what would suit the best study questions and finding out key words.

Literature was screened and searched on the databases of PubMed, EPSCO, SPORTdiscus and Medic. Manual search was also done. Key words were overtraining, overreaching combined with recovery, rehabilitation, and treatment. "Under recovery" word search did not provide any new information. Studies published during the period 2012 - 2022 were included. If there was a possibility to use peer reviewed sources this was done. Literature was searched on English or Finnish and focus on athletes. The Medic database consist of articles in Finnish.

The total number of literature search was 962 and these were scanned via title, keywords and abstract. Including criteria were that literature material should be about humans, athletes and have information about both sides overtraining and healing from it. Exclusion criteria were that language was not English or Finnish, the information was not related to overtraining or overreaching and if the study was on cellular level or not about athletes. It was found that little has been written about rehabilitating and recovery from overtraining. For the theory base of this study systematic reviews and meta-analyses about overtraining syndrome were included to get the overall information about this sport illness even if those articles had only little information about rehabilitation and recovery part of the overtraining syndrome. Overtraining as a phenomenon wanted to be understood and the recovery, rehabilitation, and treatment for this condition. Duplicates were removed.

Total amount for reading this was 30. After these phases the total number of articles was 15. Only one source came out from manual search and one sports medicine book was used. Literature description is seen on appendix number one. Table 1 shows the process on literature search from identification, screening to included sources.

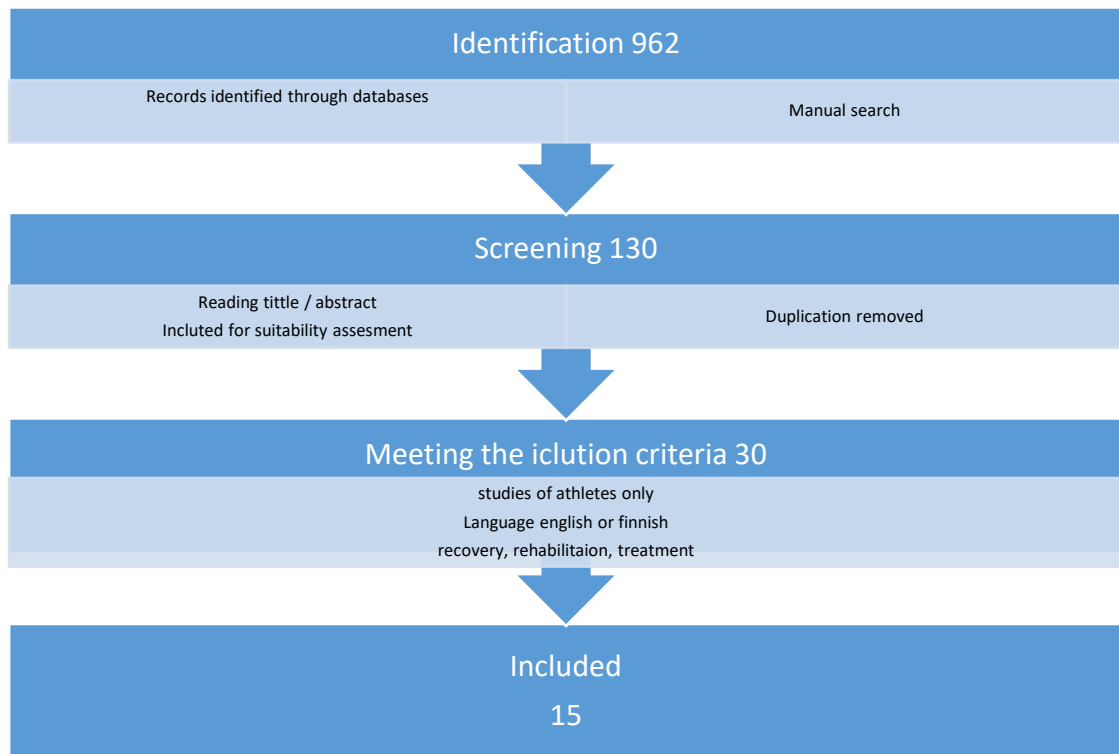


Table1. Literature search

6.1 Theme interview body

After the outline of theoretical base and the systemiced review the interview body was developed. Interview body is the main part in theme interviews and should be done from theoretical frameworks (Hirsjärvi, Hurme 2010, 40-45). This developmental task emphasizes development action study methods and materials wanted to be gathered as much as possible in a work-oriented way. This is the reason for themes to be only indicative and order of processing themes was free. Key question was asked and after that a deepening question were given if needed. In theme interviews predefined themes and questions related to those are sifted through (Saaranen-Kauppinen, Puusniekka 2006).

Three pre- interviews were done before the main interviews. Two different experts from physiotherapy and rehabilitation and one physician were asked to go through the interview themes. Afterwards it was discussed about what they would add or leave out from themes. One theme was remodeled. Their answers were also watched out to decide if the themes were giving deep enough information about the topic. Themes and examples can be seen in Table 2.

Pre information about the participants	Name, age, education, how many years have been working in healthcare
Diagnose of overreaching / overtraining	For example What kind of symptoms Where to start
Rehabilitation	Beginning What to considers How to watch out the progress Continuum protocol for rehab
Back to Sports	How to make the desions What to consider Control protocol
Treatment at Medical Center Fenix	Pathways for good quality who in what part of the treatment / rehab What facilities is in center something new needed

Table 2: Theme interview body

6.2 Participants

Specialists who have information about the topic and those who would want to be part of the idea searching group for new practical guideline wanted to be founded inside the Medical Center Fenix. External expertise was also found on because it came relevant to find deeper information about the topic. This study interviews can be seen also as specialist interviews. In this kind of interview, the persons are chosen because it is expected that they have information and knowledge about the subject that is incomplete and scattered. (Alastalo and Åkerman 2010, 372–374.)

All the healthcare specialists at Medical Center Fenix were be sent a short inquiry via email. Total number 74 of emails were sent. The first email defined this project and was set up to find experts who have experience about the topic. The health care specialist could decide if they would want to take part in this study. This message was sent two times for one month.

For those who replied they have experience about the topic were sent another inquiry and detailed information about study. These specialists were asked to individual interviews and the number was 11. In this study the total number of individuals who wanted to take part in the theme interviews was 5. One individual interview took time around 60 minutes. Time was decided by the specialist taking part to the interview. If Interviews were done face to face it was recorded by two phones. One of the phones has extra microphone and other is for safety of getting the information. If participant asks interview by digital meeting it was done by Meets or Teams. These interviews were recorded and saved by the software. Inquiry for interviews is shown in appendix three.

6.3 Analysis

In this study the analysis was done inductively. Although sometimes it is difficult distinguish between inductive and abductive analysis because these have much in common. In the analysis of qualitative data questions are submitted to material and this way information is gathered from the phenomenon studied (Tuomi & Sarajärvi 2018, 104). Information gathered via interviews and the analyzing it is always cyclic. Analyzing data may already start at the collecting phase and there is no one right way of doing the analyzing. (Seitamaa-Hakkarainen 2023.) In this study the analyzing begun right after interviews.

The information that is gathered by interviews is transformed in to written text by transcription and then it will be read thought multiple times. Usually, main stages for data analyzing are decontextualization, recontextualization, categorization and finally compilations. (Bengtson 2016, 9-13) Seitamaa-Hakkarainen (2023) points out that in analyzing phase new perspectives will be founded and whole process encapsulates analysis and synthesis. In this developmental task interviews were read and listened many times before recontextualization phase.

Next phase will be finding and determining classification framework and category's which arises from study themes and from the data collected.

Unit of analysis needs to be defined and the meaningful content should be found. The smallest ideas and meaningful thoughts are searched. In this study on sentence or a body of thought was seen as code. Next the data founded will be coded and organized. Classification should be based on comparison. Finding connections, interpreting them, and making conclusion will be done. (Seitamaa – Hakkarainen 2023.) In this study codes were found and turned into open codes. Example of this process can be seen in appendix number two. With open codes subcategories were found which leded to themes. Main themes gave the overall picture about treatment of overtrained patient.

The main stages of data analyzing in this study gave the structure for result. After open code analysis the subthemes started to rise. These gave the pathway to developing themes and finally when watching out this whole the main themes were founded. Results are based on codes, open codes, subthemes, themes, and main themes. In the Figure 3 is shown the main themes and themes of this study.

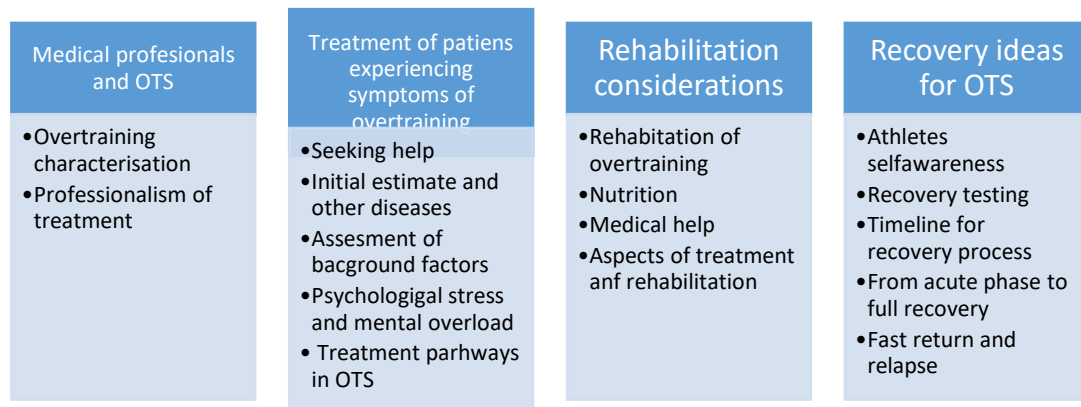


Figure 3. Study main themes and themes

7 RESULTS

Several interviews had specialization and research in the field of sports medicine, also especially on athlete's performance, training loads, overtraining and its treatment. Results are presented from the four main theme perspective medical professional perspective and overtraining, treatment of patient experiencing symptoms of overtraining, rehabilitation of overtraining and recovery ideas for overtraining. Direct quotations are key descriptions of the topic, and these are named by the interview.

7.1 Medical professionals and overtraining

The first main theme gives an overview of the overtraining characterization and physiology. Each interviewee reflected on the prevalence of overtraining based on the patients they met, as well as made observations about the characters of athletes. The professionalism of treatment and multi-professionalism were highlighted in interviews. In consideration of treating overtraining symptoms, it was clear that every professional thought about the necessity of multi-professionalism in terms of good treatment. An example of analysis can be seen in Figure 4 which shows how first part theme, subthemes and open codes was developed. These lead to first main theme: Medical professional and overtraining.

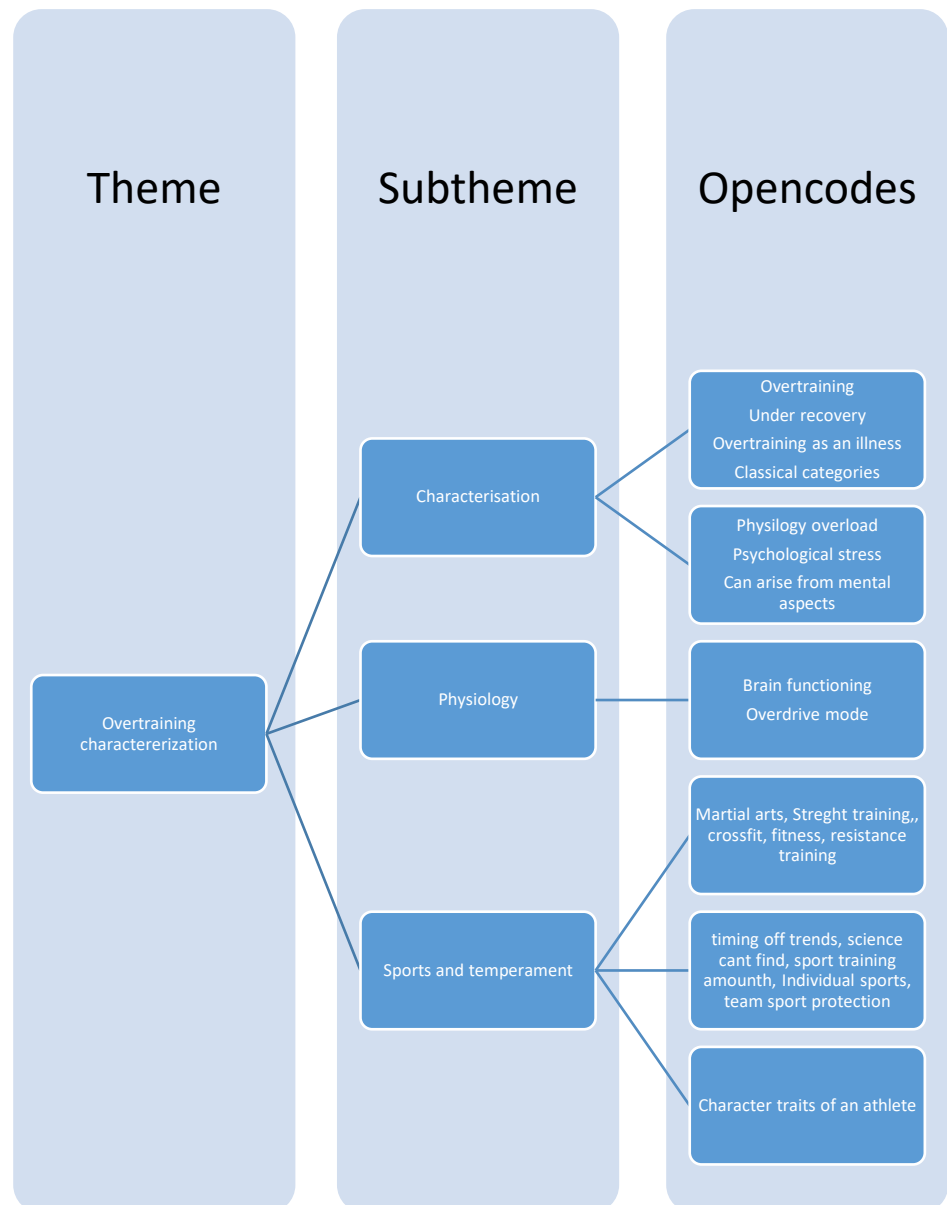


Figure 4. Example of inductive content analysis showing pathway from open codes to theme. These are under main theme: Medical professionals and overtraining

7.1.1 Overtraining characterization, physiology and sports

The overtraining condition was described in the interviews as overexertion, under recovery, and the overtraining state was seen as a long-standing illness that needs to be treated. The classic categorization of overtraining was seen as a mismatch between training and recovery. The interviewees also saw it as important to understand the division between physical and mental overload.

According to the interviewees, the root cause of overtraining can come from either side. In the interview situations, almost every interviewee voluntarily considered how overtraining could be described in the best possible way.

Then you must separate what is physical and what is mental and overload. The state does not exclude the fact that it can come from a mental state (interviewee1).

The interviewee physiologically described a disturbance in the feedback system of the brain caused by overtraining. The function of the cerebral cortex, midbrain and pituitary gland is disturbed. These areas go to overrun, and this state needs to be disconnected.

The interviewees had experience in each of the different sports, who they have treated according to overtraining. The interviewees experienced, that in a certain period of time some sports may stand out because they are popular. Sport specific training load amount withdrawal was seen as a predisposing factor as well as individual sports. Seasons in team sports can be a protective factor against overtraining. Endurance style training, that has a lot of power training was seen a typical style of sports among overtraining.

Several of the interviewees also had experience in managing the overtraining condition of strength sports. Some had also taken care of people training in fitness and crossfit sports. In addition, martial arts from individual sports and team sports hockey were mentioned. According to the interviewees, people experiencing symptoms of overtraining is found on different kinds of sports, and science has not yet been able to find all sports in which overtraining symptoms or this sport illnesses occur. The interviewees felt that there is still little study on the subject. In the interviews, it became clear that athletes who come for treatment can have a pedantic and self-flagellating personality trait.

7.1.2 Professionalism of treatment

It emerged from the interviews that the interviewees thought a lot about who is the best specialist to treat which area and how the patient receives the best possible treatment. They had a clear view of who or whom they would refer the patient to so that he or she would be well examined and treated. The important points in the analysis were treatment decisions, multi-professionalism and evaluation of own expertise. In figure number five the content analysis from this chapter from open codes to themes is shown.

The examinations that are performed on the patient are guiding in terms of treatment. The overtraining must be confirmed with examinations so that it can be treated, and treatment can be started when the symptoms are understood. The interviewees described how important it is to first get confirmation that it is an overtraining as an illness. overtraining can be treated as long as the person is otherwise healthy.

But he/she has these clear symptoms of being overtrained, that's right, then of course you have to take care of it (interviewee 2).

In the interviews, it became clear that the assessment of the whole picture is important in treatment. You must start looking at the whole picture and take advantage of the holistic treatment of a person. The influence of many factors on the patient's condition should be considered in treatment.

The description of multi-professional care was emphasized in all interviews. The physician must be primarily responsible for the treatment, but it is important to utilize the team. Several interviewees felt that at Medical Center Fenix the overtraining can be managed well and that all team members play an important role in managing it.

According to interviewees, the physician and others involved in treatment should have the ability to evaluate their own expertise. The interviewees felt that treatment should be done according to one's own specialization and that the

sports physician is the professional with the primary responsibility. The interviewees said that sports physicians have good definitions and criteria for treatment.

Multi-professionalism was one of the presented entities in the interviews. In addition to the physicians's assessment and treatment, the interviewees highlighted the use of the expertise of other medical professionals in making a diagnosis and implementing treatment. In the treatment of mental problems, consultation with psychiatrists was felt to be important. In the assessment of nutrition, consultation with a nutritionist was felt to be essential. A cardiologist can be consulted to rule out heart diseases.

All the interviewees pointed out that the psychological aspect should be taken into account in the treatment of the patient. All the interviewees said that they would use the help of psychiatrists to rule out mental illnesses, and their assessment was considered important. The interviewed physician's had experience that some patients benefit from being with a psychologist or psychotherapist. Special expertise in sports psychology and sleep medicine was felt to be important. The interviewee also wondered why not also the so-called "coaching" could be used in treatment.

We can be taken care of this situation very well here. After all, we have an exceptionally good team, specifically these specialists who can take care of it (interviewee 4).

Combining nutritional therapy with treatment was always felt to be important. According to the interviewees, a nutritionist who is familiar with athletes' nutrition and understands this type of nutrition is the best option. As a support measure, nutritional therapy should be reviewed to see if the nutritional side is in order.

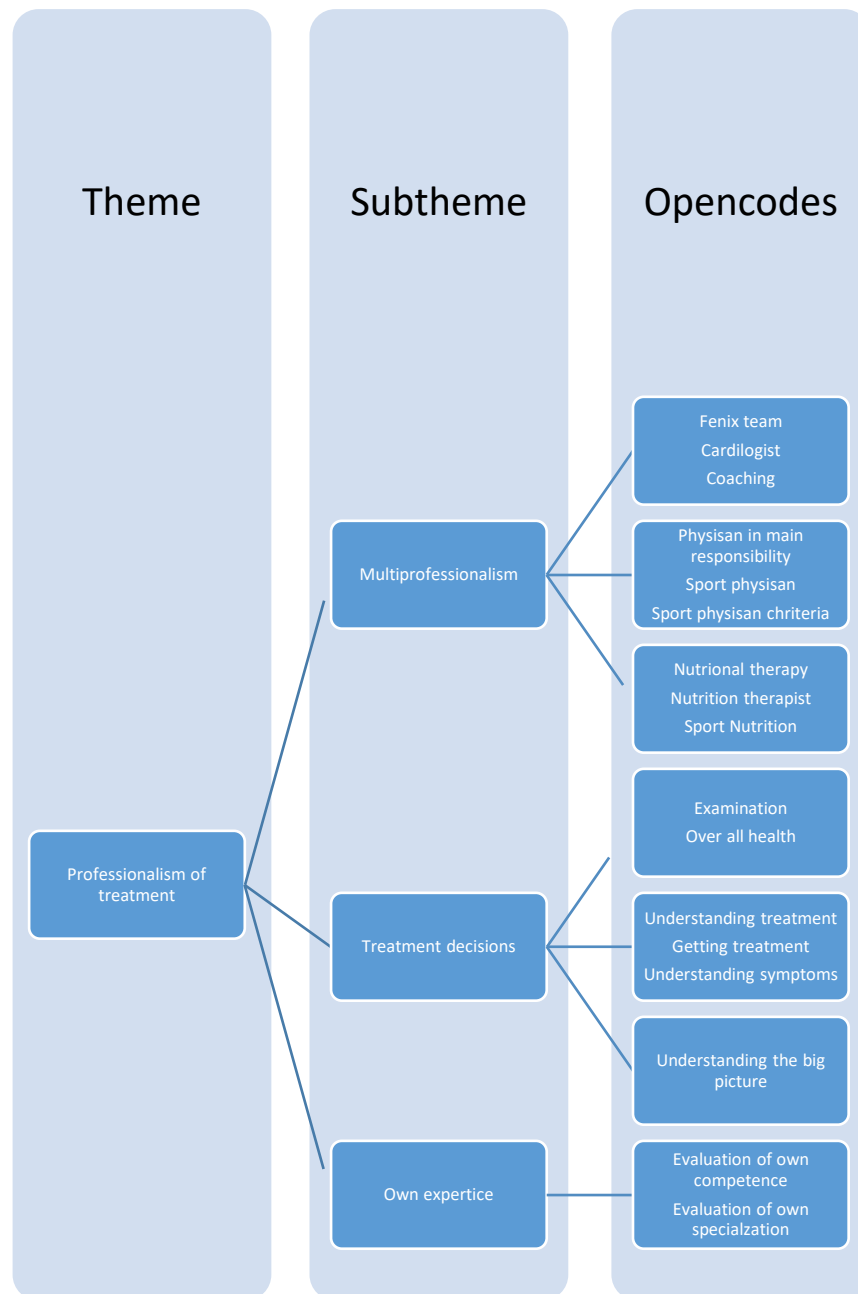


Figure 5. Example of inductive content analysis and creation of theme professionalism of treatment. main theme is medical professionals and overtraining

7.2 Treatment of patient experiencing symptoms of overtraining

The interviews revealed events that begin after the patient seeks treatment. The interviewees described overall how it is important to evaluate the underlying influencing factors and to conduct thorough testing before treatment starts. The exclusion of other diseases, especially heart diseases, became an essential point. Consideration of psychological components was felt to be important. In

Figure 6 is shown content analysis of this section from main theme, themes and subthemes.



Figure 6. Content analysis of second main theme, theme and subthemes

7.2.1 Seeking help and treatment

The interviewees said that patients seek treatment when they notice changes in their condition. Treatment of overtraining status is often achieved due to long-standing symptoms, but patients in the acute phase are also treated. The development of stress, the presence of other diseases and the possibility of doping are evaluated at the reception. It would be important for the evaluation of the athlete's condition to be able to contrast with the previous one, because people have different symptoms.

The interviewees said that almost always the patients themselves have noticed an abnormality in their own being and describe their symptoms, the most important of which is the inability to perform. The interviewees say that patients often have vague symptoms, palpitations and fatigue. Patients can tell how they cannot exercise even if they want to. According to interviewers, it may also be that the patient's close circle or coaching has noticed the symptoms.

Well, they usually come with the same question, "Training is not going well"? It's pure like that, like native physical overtraining, so usually you want to train, but you can't. (interviewee2).

The interviewees feel that some kind of uniform profile of symptoms can be created, although generalizations are difficult, and individuality should be considered. Symptoms can start suddenly, and it is difficult to find any other explanation for them. Patients notice a drop in performance and an increase in heart rate. Strength levels may drop, compression strength may weaken, and fine motor skills may also suffer, there may also be changes in reflexes. However, by observing the symptoms, it is often possible to find out about the presence of the condition of overtraining in the patient.

The interviewees had the experience that, in terms of time, people often come for treatment when they have already had symptoms for a long time. Some patients, however, enter on overreaching stage, which has progressed from a normal state. Patients can notice themselves and nervous system and hormonal

changes can be found in them. The patient's body's own regulatory mechanisms no longer work normally.

Several interviewees felt that it would be good to have standard measurements of the athlete taken in the past, so that they could be compared with the current state. In this way, there would be a basis for comparison for the initial measurements, because the fact that it is not possible to contrast the results with the previous one can cause problems with the diagnosis.

7.2.2 Initial estimate and other diseases

The interviewees thought that exclusion for other diseases is the first thing on their mind. The patient's condition is assessed through symptoms and a spectrum of symptoms, and a comprehensive interview is conducted. The interviewees wondered what else could be behind it because the diagnosis of overtraining is confirmed by excluding other diseases. It is important to treat the initial stage carefully because other diseases can be more easily ruled out.

The interviewees described many exclusions and considerations for other diseases. Consideration of serious illnesses is paramount, and the interviewees wonder if there could be some other hidden illness in the background. Findings of cardiac origin, as well as diseases affecting the respiratory system such as asthma and mycoplasma should be ruled out. The presence of infections should be considered, and the endocrinologist should consider the causes of the symptoms. The symptoms may also have other than somatic causes and this should be kept in mind.

According to one of the interviewees, feeling involved with the substances and methods of doping should also be evaluated. This is something patients don't always want to bring up. Symptoms caused by prohibited substances and methods need special treatment.

7.2.3 Assessment of background factors

According to the interviewees, it is clear that overtraining occurs when there is a disproportion in recovery, and this results in a collapsed fitness level. Recovery time from training has been inadequate, as has often been sleeping. Patients are surprised by how little movement is stressful.

After all, a person endures no matter how hard workout, if only she/he has the recovery time in proportion to it, i.e., sleep and rest days (interviewee 1).

. The interviewees have noticed that the patient's nutrition is often inadequate and there has not been enough food. All nutrients, i.e., proteins, fats and carbohydrates, have not been eaten sufficiently. Inadequacy of vitamins should also be considered. Nutrition is important to get fixed.

So, over the years, one of the topics of discussion is that it is very common and sometimes you think you are eating enough and even too much. Usually, it's the other way around (interviewee 2).

According to the interviewees, it is important to assess how much the patient has moved and exercised. Athletes are often unable to estimate their own optimal amount for training. The interviewees talked about how sleep problems are common in overtraining patients. The treatment of sleep disorders was felt to be very important because difficulty sleeping decreases recovery. Early morning awakenings and inability to sleep are typical. It is also good to assess the possibility of sleep apnea. The interviewees have also noticed that many overtrained patients have long-term sleep problems. Sleep was also seen to influence the psyche.

Because athletes themselves often don't realize how much they train, when they might be watching how much others train in order to achieve optimal results (interviewee 2).

All the interviewees emphasized several times during the interviews that iron deficiency should be evaluated and, if necessary, consulted with a physician

specializing in this. Iron is an important part of oxygen transport, and its deficiency is common. This causes anemia especially in women. Examining hemoglobin is important for everyone. Menstrual disorders and hormonal disorders can also be common in women. In men, erectile dysfunction can be part of the symptoms.

7.2.4 Testing and findings

The interviewees described what kind of tests they use for patients. Performance should be tested and evaluated in the evaluation of the overtraining. Basic laboratory tests played an essential role in confirming the diagnosis and planning the treatment. The state of the heart and lungs should be evaluated with appropriate experiments and tests. Some of the interviewees also said that they used ready-made surveys. The existence of mental stress should be considered. The interviewees said that there is no specific test suitable for overtraining and there is not just one clinical value that can be monitored.

Because not all of us majors are studied in those clinical labs if there is such a psychological component (interviewee 1).

The interviewees said that basic laboratory tests are done after the initial survey. Blood tests map hemoglobin, infections, anemia, cortisol concentrations. After receiving the results, the treating physicians consider if everything in these tests is okay. The tests aim to find a physical explanation for the symptoms. The interviewees described certain tests and values that they particularly want to use and see regarding the overtraining mode.

This included ferritin, which has a slow therapeutic response. However, the interviewee said that patients often feel better if the values have been low and they can be raised. Disturbances of the thyroid gland and hypothyroidism should be ruled out. The drop in testosterone sometimes explains the symptoms of fatigue, and a drop in the testosterone level is seen in connection with

overtraining. Disorders of testicular function should be considered, such as patients with testosterone deficiency.

According to the interviewees, symptoms related to the respiratory system occur in patients with symptoms of overtraining, and specialist consultation is sometimes required for these. A chest X-ray examination is used if necessary. The interviewees told how patients often experience shortness of breath symptoms and these are examined with, for example, spirometry.

7.2.5 Cardiac findings

The interviewees felt that heart examinations must be done accurately and properly. Exclusion of cardiac causes such as myocardial infections should be investigated. During the examination, however, innocent findings may be found, which do not mean the existence of heart disease. An electrocardiogram (EKG) is a commonly used test, and if necessary, a heart ultrasound is also performed.

In our place we are directed to rule out heart findings. Quite often, they are quite innocent side findings that are not related, but that should be properly investigated (interviewee 4).

The interviewees described how a long-term EKG study, or Holter study, is assisted by a nurse, from whom the patient obtains the necessary equipment and instructions. The nurse's role is important in the instructions, so that the results of the measurements are as accurate as possible. ECG registration times vary from two to three days, and at the same time the patient keeps a diary of what he or she does. The device is returned to the nurse, who sends the data for examination, and when they arrive, the physician pronounces the results and conveys the information to the patient.

I know that there have been endurance athletes like this and heart symptoms while moving, and they been left with such symptoms (interviewee 5).

The interviewees also talked about studying heart rate variability in connection with overtraining. This was mostly done with First Beat hardware. Recovery can also be assessed from heart rate variability.

7.2.6 Psychological stress and mental overload

The interviewees described in many ways how the existence of other factors such as psychological stress should be taken into account from the beginning. Mental load, stress and overload were mentioned several times in the interviews. However, the interviewees found it difficult to distinguish between physical and psychological stress. However, the interviewees said that they feel that all stress is equal, and that the treatment of the mental component is essential.

Yes, in many of them there is also the mental side because we cannot separate it from the mental and the physical, because they reflect each other (interviewee 1).

You have a lot of mental stress, so it takes that capacity away from the physical side and vice versa (interviewee 2).

According to the interviewee, it is difficult to distinguish between an athlete's burn out and overtraining. According to the interviewees, it should be kept in mind that it may be primarily depression. Secondary depression was perceived as a normal reaction when the patient has overtraining symptoms, and the situation is difficult.

Some of the interviewees said that they take POMS surveys from time to time and felt that they provide a good standard of the athlete's condition. POMS surveys had been used with Olympic-level teams. The interviewees felt that different meters can be used in clinical work, such as a feeling meter on a scale of 1-10. Athletes should be asked about their experience with stress levels and workload.

7.2.7 Treatment pathways in overtraining

The interviewees said that it is important to consider treatment measures from the beginning so that the disease does not recur. The diagnosis is often confirmed during rehabilitation when you can see how the treatment works. The patients themselves have also been able to do their own monitoring. Once the diagnosis is confirmed, the treatment can proceed in a planned manner. According to all interviewees, it is important to emphasize that treatment takes time and is done evenly. Timeliness, evaluation and understanding of the underlying issues, nutrition balance, exercise evaluation, sleep rhythm, iron deficiency and consideration of certain gender-dependent factors emerged as relevant topics in the treatment guidelines.

The interviewees brought up several times that it is necessary to carefully assess how long the situation has been going on. In an acute situation, i.e. if it is a period of overtraining lasting a few weeks or less than a month, it is expected to pass quickly.

It is quite remarkable, as in that way the disease is completely treatable. If you don't have patience, they won't get better (interviewee 2).

The interviewees talked about how people themselves today monitor their body functions with various devices such as smart watches. This makes it possible for them to be able to notice the heart rate changes themselves and start to think about the possibility of illness. The situation may have progressed in such a way that there have been no clear symptoms, but the meter readings have changed. From the meters, a person's own assessment of the normal state can be obtained, and the heart rate fluctuations can be seen. According to the interviewees, no specific meter such as the Oura ring was perceived as the best, but they were perceived to work with the same algorithms. According to the interviewees, measurements are a good way to increase self-awareness and assess recovery, but for some patients, measurement brings additional stress.

Yes, because someone can evaluate it, yes, with these good things, especially that sleep and that recovery and other things, that maybe it's so important that they themselves learn to know (interviewee 3).

7.3 Rehabilitation of overtraining

It is hard to define in practical medicine where first treatment moves to rehabilitation state and what is under the recovery category. In the analysis for overtraining treatment many aspects came out. Evaluation of states and balance searching are important in rehabilitation. Nutrition balance raised to be topic in many parts of the interviews. Medical treatment was discussed with physicians. Finding boundaries in training and recovery was founded to be important aspect of rehabilitation. Some recovery ideas and timelines were highlighted in the analysis. In figure 7 is shown content analysis of this section from main theme, themes, and subthemes.

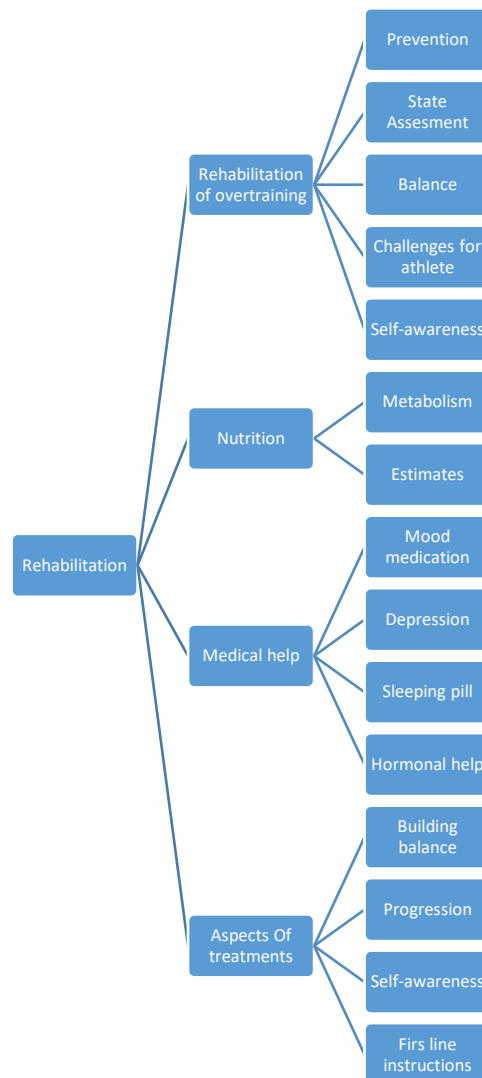


Figure 7. Content analysis of the third main theme, themes and subthemes

7.3.1 Rehabilitation of overtraining

The interviewees agreed that prevention is important in the treatment of overtraining. Raising awareness about the possibility of overtraining is important because it is difficult to treat the illness if you do not understand what it is about. Some of the interviewees felt that the seasonality of training protects against the development of overtraining.

The interviewees described how, at the beginning of the rehabilitation, the severity of the overtraining symptoms should be assessed in order to assess the need for the amount of rest. It is good to estimate the time needed for rehabilitation and recovery. The activation of the sympathetic nervous system based on the heart rate can be one aspect from which the need for rest is assessed. The interviewees agreed that the treatment of overtraining is to focus on rest. Exercise for a good mood, stretching and walking is practiced at the beginning.

The interviewees said that the body's search for balance is what they focus on, and heart rate balance is monitored. The foundations for performance, i.e., sleep and nutrition, must be taken care of. In its simplicity, rehabilitation requires time and follow-up, no pop art or single drug is the treatment.

The interviewees described how, for an athlete, getting ill from overtraining is a difficult situation. Being unable to work is a difficult situation for anyone, including for an athlete if it is her or his job. A diagnosis can make you feel better, or it can lead to a breakdown.

You don't have to train for 3 months! So, tell that to a competitive athlete or someone who aims high, it's the end of the world for them (interviewee 3).

The interviewees described increasing the athlete's self-awareness about the signs of their own body as an important point. They should learn to recognize when training and recovery are out of balance. The body's warning signs are an important source of information for an athlete.

7.3.2 Nutrition

The interviewees described the importance of nutrition in several areas of the interview. In rehabilitation, some people think that a high-carbohydrate diet can be tried, and some felt that there is no need for carbohydrate refueling. However, several interviewees believed patients eat too few carbohydrates. The most important message for athletes is that you can't recover if you don't eat well. An athlete can be taught to assess basic metabolism and understanding of how exercise increases the need for food.

Texts come through the therapists that almost every time they have to increase the carbohydrates, because they have eaten too few of them (interviewee 1).

7.3.3 Medical help

The interviewees brought out different views on the use of medical means in the rehabilitation of overtraining. The use of Propal was told by one interviewee because of its mechanism affecting the heart rate. You can consider trying antipsychotics if mood symptoms are strongly present. The use of these should always be evaluated. Some of the interviewees said that, according to experience, many people do not benefit from this type of medicine and their use is discontinued at receptions.

According to the interviewees, a person's assessment of their own mood is important and depression symptoms should be assessed together. Medicines were not always felt to be necessary, even if it was clinical depression. According to the interviewees, it is essential for the physician to assess whether depression is a reactive or a primary condition.

All interviewees described sleep symptoms related to overtraining, so the use of sleeping pills should also be evaluated. Some of the interviewees temporarily prescribe sleeping pills such as Mirtazapine. According to the interviewees, the use of these should be appropriate for treatment and long-term use should always be carefully evaluated. Improving sleep with medicine was perceived as good if you cannot sleep otherwise. Some of the respondents also preferred melatonin. In general, it is good to review sleep hygiene issues.

In some of the interviews, it became clear that hormonal treatment is used to bring this aspect into balance for the patient. The hormones used were testosterone and possibly other anabolic hormones, which are evaluated in the treatment process.

7.3.4 Aspects of treatment and rehabilitation

The interviewees told how building a balanced body is an essential part of rehabilitation and recovery. The body's reaction must be rebuilt correctly. This is done through experimentation. Several interviewees thought that it would be good if there was a table about the recovery process and healing times that could be used in treatment. For the athlete, the emphasis can be placed on bringing him or herself into balance, and first it is important to rest and get rid of fatigue, and then let's start exercising. Everyday chores are important according to the interviewees.

According to the interviewees, it is important to progress in rehabilitation little by little and build aerobic base training from the beginning. We proceed as is physiologically reasonable, and at the beginning even a period of 2-4 months of aerobic base training may be appropriate. Aerobic base is built before strenuous strength training. We start the sport in very small amounts, like 10 minutes at a time. At first, this kind of training may seem simple and boring to the athlete.

The interviewees said that exercise can make you feel bad and that even walking can give you a too violent heart rate response at first. The interviewees have also

noticed that practicing the athlete's own sport can bring symptoms, but some other sport does not. Things other than exercise can cause symptoms, and the interviewees describe how, for example, saunas, social situations, stress, or any strain on the autonomic nervous system can bring on symptoms.

The interviewees say that they find the initial instructions simple and written instructions are good. Increasing the athlete's awareness of the rehabilitation and recovery process is essential.

7.4 Recovery ideas for overtraining

The interviewees emphasize that a light start at the beginning is important. The patient can do light maintenance exercise after the fatigue has eased. Heart rate should be kept low. You can progress from light walking to jogging. The start of sport training is determined by the of the sport and how hard it is. There was a proposal to suspend sports training for at least one month. It can be difficult for an athlete to do sport training only lightly.

The importance of keeping the heart rate low and monitoring it are key to monitoring recovery. You don't want your heart rate to increase in any activity, such as climbing stairs. Orthostatic testing came up in the answers of the interviewees and their use is preferred. Heart rate variability is also monitored.

The interviewees suggested 2-4 weeks of total rest. This should not be passive because the body can react badly to that as well. Daily chores are taken care of and it is often noticed that sleep also starts to improve with rest.

. After the initial delimitation in exercise is done, the limits related to sports can be started. In rehabilitation and recovery, it is important to define at which levels to start. Delimit by an expert came up in the speech of several interviewees. The specialist should assess the total load and the body's endurance should not be tested too quickly. It is preferable to stay below the limits at the beginning rather

than upper limits. The recoil in the bad direction comes from raising the stress levels too quickly.

. The interviewees told how the body's tolerances are tried carefully and it should not be done too often. Diet, heart rate and state of personal vibes taken into account when increasing exercise and training. Knowledge of the functionality of the recovery process can be a good measure of the functionality of the additions. Advancement in training is done carefully.

In several stages of the interview, increasing the athlete's understanding of sleeping and other rest came up. Going through sleep hygiene is part of rehabilitation and how you sleep is an important part of recovery. In figure 8 is show content analysis of this main theme: Recovery ideas for overtraining patients.

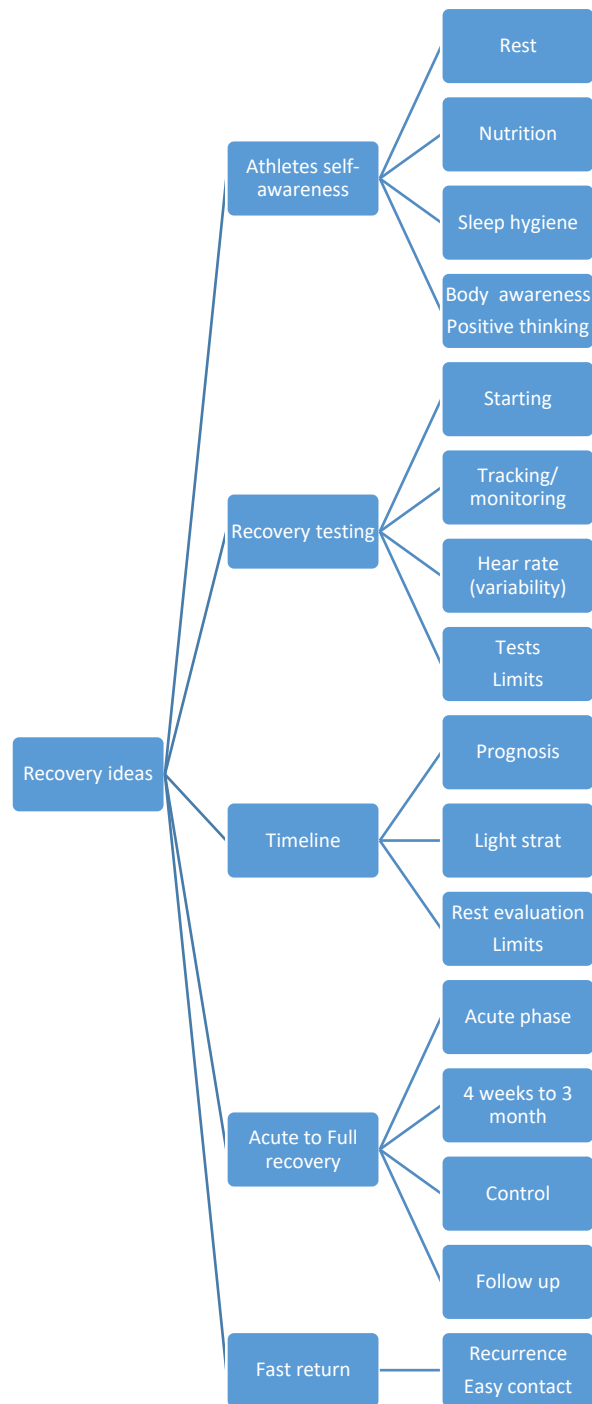


Figure 8 Content analysis of the fourth main theme, themes and subthemes

7.4.1 Athletes' self-awareness

The interviewees also urged to hear what the athlete finds pleasant and what she or he finds comfortable in planning the rehabilitation. Stressful situations are minimized at the beginning. One interviewee considered, for example, adding mindfulness training to rehabilitation.

The interviewees said that the athlete's aversion to training is also a good measure and the experience of one's own feeling is important. If you feel good during exercise, it indicates recovery. The athlete can also be taught to listen to the sensations of the body, so that he will understand in the future what a good recovery feels like. An athlete's understanding of training compensation is essential.

Several interviewees pointed out that in rehabilitation it is important to also focus on achieving positive thinking. An athlete can easily get caught up in negativity and it would be good to get them out of the mind. Managing "worry hours" could be part of rehabilitation, i.e., a short period of time spent worrying and then trying to return to positive thinking. For example, the question of when an athlete feels energetic can guide thinking in the right direction.

7.4.2 Recovery testing

The interviewees felt it was important for the athlete's well-being that monitoring is done. Monitoring can also be done by a physiotherapist or a coach. Intermediate meetings are good and if the athlete's sport coach can join, that would be good. However, this is rarely the case, the interviewees said.

The interviewees felt it was important that there is some kind of monitoring and physiological response that is monitored during rehabilitation. Monitoring the stress level is essential. Monitoring is considered individually for each athlete, and it must not cause stress for the athlete. Monitoring the athlete's mood was also felt to be important and this is done with surveys. Monitoring the feeling also helps the athlete to find a knowledge of one's own body again.

As previously mentioned as important points in rehabilitation and recovery, the monitoring of heart rate and heart rate variability was considered. Testi Selänne's name came up in interviews with the so-called as a field test. One of the interviews describes this test, in which submaximal push-ups are performed and the

improvement of the overtraining state is evaluated according to their heart rate response.

The interviewee talked about the test they used, which is described next based on what they said. The prerequisite for Test Selänne is that the heart rate at walking level is below 120. The athlete does 4 x 10-second sprints, in which the heart rate should rise to about 70% of the maximum. After this, wait a maximum of 5 minutes and the heart rate should return to walking level. Several of these sprints are made, preferably at least 4, and if the heart rate does not return to walking level, the test is stopped. If the heart rate level "passes" the test, it can be considered that the recovery is good and the rehabilitation plan can be progressed towards, for example, sports training.

The interviewees are sometimes involved in the athletes' training situations, and in these it is easy to ask about the athlete's health. According to the interviewees, structured surveys can also be used like the POMS survey.

7.4.3 Timeline for recovery process

The interviewees felt that rehabilitation and recovery are likely, and they have a positive view that the majority of athletes recover from overtraining. The athlete's understanding of rehabilitation and motivation to improve is important and that is the task of the treating specialist. It is good for the athlete to understand that healing takes time, but the result is often good.

The interviewees had various estimates of what the recovery time from overtraining is like. A temporal estimate cannot be deduced from laboratory tests, and a comparison must be made, whether it is a nervous system overload or a condition more related to tissue fatigue. The estimate of time is related to the severity of the condition and how long the overtraining situation has developed.

The mildest cases are rehabilitated in weeks, and in severe cases it immediately stretches to more than a month. Half a year or a year is very common. The longest rehabilitation times have been years, and some will not be able to

withstand even light training in a few years. During the long rehabilitation and recovery processes, the athlete's mind about the career can also change and other things take the interest elsewhere.

The interviewees also had experiences of how overtraining does not improve the condition so well that a sports career can be continued. There have been athletes whose condition does not improve with rehabilitation, and sometimes their condition and condition remain poor. According to those challenged, being involved with the psychological component slows down healing.

7.4.4 From acute phase to full recovery

The interviewees described slightly different temporal estimates of rehabilitation and recovery. However, treatment of the acute phase was particularly important in everyone's opinion. The first two weeks are therapeutically important and from there on towards three months of treatment. The acute phase is followed by the physician's instructions, and then the response is thought about in more detail rather than subjective experiences. For a short period at the beginning, we monitor how the body starts to recover.

The interviewees felt that it is important to monitor the progress of rehabilitation between one month and six weeks. The body's various biological rhythms and repair mechanisms need at least six weeks for initial healing. After this, it is possible to assess how the rehabilitation is progressing and what kind of recovery methods are still needed.

According to the interviewees, at three months it is again good to assess the level of recovery and it is a good time for a control period. If a rehabilitation plan is needed from now on, it will be made for the next 3 months.

The interviewees felt that due to the slowness of the healing, it is important to control the situation. In this way, the implementation of the gradual plan can be monitored. Control visits can also be done in connection with training. Once the acute phase has been overcome, the athlete's subjective experiences are

therapeutically emphasized. It is important to ask about the athlete's condition and information. Even in this situation, it is good for the athlete to understand his own limits and limits on training. The interviewees felt that the state of overtraining can be repeated.

7.4.5 Fast return and relapse

The interviewees shared their experiences of returning to sports training too quickly and the risk of illness recurrence. It is important that the athlete has recovered properly so that the risk of recurrence does not increase. It may be that the athlete does not understand that he has not recovered properly, and instead of one episode, he has several overtraining episodes within a short period of time. It is difficult for an athlete to understand this set.

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You must emphasize them very, very sensitively to contact, often you have to follow them for a long time, of course it depends on the person (interviewee 4).

It is especially important that it is easy for the athlete to contact the treating professionals if she/he feels that she is getting worse during or after rehabilitation.

8 DISCUSSION

The purpose of this developmental task was on the idea phase for the new practical guideline for the Medical Center Fenix. The aim was to find knowledge and ideas for the base of a new practical guideline for Medical Center Fenix clinic to rehabilitate athletes with overtraining symptoms. In the reflection the systematic literature review data and interview results are introduced as a dialogue.

8.1 Diagnose and rehabilitation of patients with overtraining symptoms in Medical Center Fenix

Importance of correct diagnose is understandably important for treatment and rehabilitation. Meeseum et al. noted in their consensus statement (2012 p. 187–198) that although knowledge of central mechanism of overtraining syndrome there is still high demand on early diagnose tools for this sport illness. Differential diagnosing is important and can only be done excluding out other causes of performance lost and mood changes. They also provided “a check list” for practitioners to help the diagnosing process of overtraining. It also became clear in the interviews that making a diagnosis is not easy and often requires many professional assessments of the patient's condition. For this reason, it came relevant in the interviews that the treatment is carried out multi-professionally and led by a sports physician.

From the knowledge from inside of the Fenix medical team basic medical testing and laboratory tests to start the diagnosis and treatment of the overtraining syndrome patient or nonfunctionally reached patient can be done at Medical Center Fenix, as well as multi-professional treatment and testing for overtraining symptoms. The use of Meeseum et al. (2021, 198) “check list could be good base line for diagnose of overtraining. The follow-up of these measurements should be done consistently and thus get the measurement results to support the course of the treatment and recovery process.

Carrad et al. (2021) give in their own review suggestions on biomarkers and methods that can be used to help diagnose overtraining. These markers have been introduced previously in the theory section figure 2. The use of nutritional habits and the POMS questionnaire are primary in terms of diagnostic and treatment. To these can be added basal hormone testing in laboratory. Testing of physical performance and body composition can be done if necessary. In her article, Uusitalo (2015, 2347) suggests the following as primary tests: complete blood count, CRP concentration, fasting blood glucose value, TSH concentration, serum AST and cholesterol concentration. These can be supplemented with several laboratory tests, ECG measurements, spirometry, clinical performance tests and, if necessary, spiroergometry.

Underlying mechanism of overtraining has not been found but as in theory basis, it is described many alternative options is founded. (Carfagno, Hendrix. 2014;130-134; Kreher & Schwards 2012, 129–130). In interviews the central nervous system presence in this illness came forward. For specialist treating and rehabilitating athletes with overtraining symptoms it is good to understand these underlying mechanisms to understand the complexity of recovery from this illness. It not only sore muscles and fatigue that needs to be treated, rather the complexity of overtraining needs to be understood.

It is clear that the definition for overtraining syndrome has developed despite of the lack of conformity of diagnostic tools, symptoms and treatment of this illness. Overtraining syndrome is a “sport-specific” decrease in performance together with disturbances in mood state and this kind of underperformance stays even if the athlete recovers weeks or months. (Meeseum et al. 2012, 188.)

Still there are difficulties to distinguish between overreaching and overtraining symptoms. This is the main reason why in this study we are talking about treating patients with symptoms of overtraining cause there is so fine between overreaching and overtraining. According to the interviews that patients should be treated same way from the beginning and the recovery time defines the state of this illness.

Weakley et al. (2022, 675–681) founded that still the studies have failed to provide the evidence about overtraining characterization and data from this should be gathered from the field. In the interviews this also came into light. Overtraining symptoms vary from patient to patient, and it is difficult to tell the main symptoms coincidentally. The variety of symptoms is a challenge, but as the patient data accumulates, one could think about whether the medical center could collect information of the symptoms of overtraining patients.

Weakley at al. (2022, 680–681) reminds us of that difference between functional overreaching, nonfunctional overreaching and overtraining syndrome should be kept in mind. This topic was also noticed in the interviews and separating overreaching from overtraining seem to be difficult. Some distinctions should be made so that the treatment can be correctly done and can be targeted correctly. It seems that this can be done during the rehabilitation process. Meeseum et al. (2012, 187) present a division regarding training and overtraining. Since this condition can often be diagnosed afterwards the start of treatment, the acute phase should be similar for everyone and from then on it should be determined by how the recovery progresses.

Few of the data source (Bell at al. 2019) discussed about overtraining appearance in resistance and strength training. This was also discussed in interview´s because participants had experience in treating athletes from this kind of sports. It came clear from both sides that this phenomenon needs to be studied more and science does not understand this combination yet. Patients seeks help for overtraining symptoms, and they need to be treated.

8.1.1 Focus on prevention

Both studies and interviews underline the importance of prevention of overtraining. OTS is mainly due to an imbalance in the training and recovery ratio, so it is relevant for athletes and their coaches to understand training load and recovery (Meeseum et al. 2012 189). It is important that athletes and sport coaches engage in the prevention and treatment of symptoms of overtraining.

As Kellman et al. (2018,242–243) write, to produce specific physiological and psychological outcomes coaches and athletes should manipulate both training and recovery strategies. The aim should be to enhance performance and minimize the risk of developing nonfunctional overreaching, overtraining syndrome, other illnesses, and/or injury's.

It would be good to have protocol for young athletes to teach them about the ideal training load and the importance of recovery. Sports coaches need to be challenged to prevent sports related illnesses. In the ideal world all illnesses and injuries could be prevented but in sports where people try to find ways to exceed their personal, national, and international limits also difficulties will probably appear. From the sport specified naprapath perspective we will have this kind of problems because in sports people will always try to find human limits and we just need to be prepared with intervention when injuries or illnesses occurs.

Weakley at al. (2022, 679) proposed 3-step testing verification process for athletes. This process involves testing athletes when they are healthy, testing again if OTS is suspected and testing at least 4 weeks positional suspicion. The interviewees found it problematic situations where athletes experiencing symptoms of overtraining had no previous testing and follow-up, because it would often help diagnose process and treatment follow-up.

Weakley at al. (2022, 679) prosed also that valid objective assessment of the athlete's psychological state is required. Verifying symptoms of psychological maladaptation should be assessed both in second and third testing occasion. The interviewees had used the POMS questionnaire with athletes or mapped the patients' psychological state with individual questions about psychological well-being.

8.1.2 Rehabilitation of sleep, nutrition, medication and mental aspects

Rest and sleep are the most obvious methods of enhancing recovery. Athletes can be given advice to sleep that amount that they feel wakeful during the day.

(Meeseum et al. 2012, 199–200.) In the interviews, it became clear that the importance of sleep in the recovery and in the treatment of overtraining symptoms is particularly important. Sleep was seen as an equally important component as proper nutrition.

From the interview it came clear that sleep hygiene instructions should be part of overtraining treatment. It would be good to monitor the patient's amount of sleep and get information about how She/ he slept before arriving at the treatment. The athlete's understanding of the sufficiency of his own sleep may be insufficient, or sleep may be disturbed by factors that can be clarified. Sleep polygraphy is possible at Medical Center Fenix, and the possibility of heart and heart rate monitoring during sleep should be considered as part of the treatment.

Fatigue can be related to too low nutrition intake and overreaching can be at least partly attributable to a decreased in muscle glycogen levels. This can result in higher circulating levels of catecholamines, cortisol and glucagon in response to exercise while insulin levels are very low. Hard training and carbohydrate depletion, dehydration and overall negative energy balance seem to be linked to development of OR symptoms. Athletes should be advised to understand the hydration and energy intake to meet the demands they have. (Meeseum et al. 2012, 199–200.) These same themes came up in the interviewees, and participants carefully pays attention to whether the energy intake was sufficient in relation to the training. The interviews also revealed that the athletes themselves do not know how to assess sufficient energy intake and assess the adequacy of different energy nutrients. For these reasons, it would be especially important that in the treatment of overtraining, the possibility of consultation with a nutritionist who understands the demands of athletes in terms of nutrition should always be used.

Some of the studies (Kreihen & Swards 2012, 136; Uusitalo 2012, 2348) and interviews proposed the use of medication for the treatment of overtraining symptoms. Medication for sleep difficulties and psychological problems may be necessary according to interview findings. It came also clear from the interviews

that is very important to follow the use of medication if prescription is given.

Medical use may be indicated but needs to be followed carefully.

Mental health experts can be used in multidisciplinary management. Selective serotonin reuptake inhibitor is suggested cause of the similarities between depression and overtraining syndrome. Trazodone or amitriptyline can be used for sleep complaints. (Kreher & Schwartz, 2012, 136.)

Birrer (2019, 55–56) tells that on holistic view of treatment, it should contain biological, psychological and social functioning. The interviewees said that it is important to use the consultation of psychiatrists and psychologists if the patient has mood problems and if she/he needs medicinal treatment for them. There are also scientific ideas for specific psychological treatment (Birrer 2019) and it would be good to use them for this illness, where mood symptoms are part of the whole picture.

There was only a little specific evidence in data search about how rehabilitation and recovery from overtraining should be done. Uusitalo (2015, 2349) writes that treatment should be based on the symptoms, support recovery processes, carefully instructed instructions and it should be followed up. The interviews also revealed that symptoms are individual, and people need different help to recover. For example, some patients need medicinal treatment, some require psychological help, and for some, short-term rest instructions are enough. In the treatment of overtraining, it is therefore important to consider individual factors and build multi-professional treatment based on them. The interviews also revealed that precise instructions and the monitoring of their implementation, linked to the monitoring of improvement, are essential in terms of treatment. The main responsibility for the treatment and its follow-up is the attending sports physician, but the treatment can also be attended by experts in the field of rehabilitation, such as physiotherapists and naturopaths specialized in sports.

8.1.3 Different stages of recovery and heart rate monitoring

Rocha et al. (2012, 74) proposed recovery strategies levels from one to four for the baseline of recovery. These are not specific for overtraining but for overall

athletes' recovery. First stage is covering rest, sleep and nutrition. In other studies (Heidari 2019 et al. 3; Meeseum et al. 2012, 199–201) also rest is the first step to recovery. This also came up in the interviews, that the most important aspect in the beginning is total rest. In the beginning, the rest for a short time should be one that allows only everyday related movement. However, if symptoms reduce, soon experiments can be done with exercise and this can clearly have a positive effect on mood if the diagnose is overtraining rather than burn out of the athlete. In the interviews, there was a lot of talk about the fact that not training is a difficult place for athletes and not necessarily physiologically necessary in the long run.

Heidari et al. (2019, 3–6) gives proposals for monitoring the recovery status and they give different tools for biological, psychological, and social approaches. Also, other studies (Meeseum et al. 2012; Uusitalo 2015) support the necessity of heart rate monitoring in monitoring training and recovery. In the interviews, it became clear that heart rate monitoring, orthostatic tests, HRV monitoring, and more specific tests are necessary for treatment and recovery monitoring. The interviews showed that athletes often do this kind of monitoring independently and the necessary equipment is easily available. Instructed heart rate monitoring and performing an orthostatic test can therefore be instructed on athletes and thus get information on how biology reacts in connection with treatment and recovery. No specific suitable for everyone values can be given, but monitoring reflects individual values.

Additional interventions for recovery have been presented in Kellman et.al (2018, 240–242) consensus statement which gives ideas for recovery routines that aim to maximize performance and preventing negative developments of overtraining and other injuries and illnesses. Recovery modalities can aim to regeneration or psychological strategies depending on what is in the need of the athlete. Recovery can be seen as a passive, active and proactive point of views. Passive methods can be for example massage, active cool down and proactive social activities.

There can be found many interventions to change the recovery-fatigue continuum. Intervention can be divided into short term, middle term and long term interventions (for example power nap vs extended periods of sleep). Different organ systems need different time to recover from stress. Recovery interventions between the exercise sessions may lead to greater recovery. These can be for example cold water immersions, contrast water therapy, whole-body cryotherapy, compression garments, massage, sauna) and these needs also be periodized and modified to meet individual needs (Kellman et.al 2018, 242.)

In the interviews it came clear that athlete's self-awareness about her/his body and mind should be increased. Interviews told that athletes may not know how their body reacts to training and what are overreaching and overtraining symptoms. But it came clear that athletes can learn and have good sense when they are recovering properly. Recovery methods should be programmed and found in the micro cycles on recovery strategies (Kellman et.al 2018, 243).

In the interviews and theory base advocate the coaches and other specialist working with athletes to understand the importance periodization in training and recovery. Coaches' involvement in prevention and rehabilitation of overtraining is essential cause of their key role in the interface with athletes.

8.2 Reliability

This master thesis is a developmental task, the key commitments of the approach chosen for its reliability assessment and objectivity are chosen from qualitative research. In qualitative research, it is usual to assess reliability through four criteria, although there is no one unambiguous right way to do it. These criteria are credibility, transferability, dependability and confirmability. (Tuomi & Sarajärvi 2018, 162–163.) The purpose of qualitative research is not to create generalizations but to create a deep understanding (Hirsjärvi & Hurme 2010, 32). The purpose of this development task was to find ideas and understanding on how people experiencing symptoms of overtraining can be treated and rehabilitated at the Medical Center Fenix.

For the credibility researcher needs to think is the data collected and reconstructions a good representation of the reality (Tuomi & Sarajärvi 2018, 162–163.) It's clear that only little data is found on overtraining, treating patients with it and about the rehabilitation process. Only 14 study met the criteria for the included study. Already at the beginning, it was noticed that there is little written material on the rehabilitation of overtraining, and for this reason, in addition to a literature review, the theme interviews with experts were planned. Since this study was based on working life and was done at the Medical Center Fenix, it was hoped that the interviewees would be found inside the Medical Center. 75 were sent a survey to participate, of which 9 stated that they had information on the subject. Six of them participated and the number is quite low which may affect the quality of the work. Reasons for drop out is not known. But the hectic work life, unfamiliarity with the subject and quite young work community may have affected.

During the interviews, it was noticed how specific knowledge was needed for the understanding of rehabilitation of a patient with overtraining symptoms, and for this reason, a specialist in this field was asked to participate in the interviews from outside the medical center. This made it possible also to increase the competence of the medical center. However, only five interviewees were obtained, and the number could have been greater, and more specialties should be represented. The small number and similarity of interviewees may affect the depth of the study material.

Qualitative aspect is a good way to find information when there is not much previous information about the researched object (Hirsjärvi & Hurme 2010, 32). Qualitative study design is always linked to the environment where the data has been collected and this must be kept in mind when thinking about statistical generalizability of the information (Kylmä & Juvakka 2007, 55). In this study the aim was to find idea and information about overtraining and how to help people with this illness. Results gives information about how this sport illness and its treatment is considered in Medical Center Fenix.

Verifying interpretations plausibility and trustworthiness needs to be done. (Bengtson 2016.) When the material was analyzed, attention was paid to the fact that the entire material could be attached to the work. Analysis of the material was made inductively, and open codes, subthemes, themes, and main themes were developed. Example of this process can be seen in figures 4 and 5.

Clinical and practical guidelines have always a problem in that they are developed by different groups that each have their own perspective, goals and intended uses. Reliability of clinical and practical guidelines can be considered untrustworthy up to 50% of the cases and it must be understood that this can carry serious consequences for patient 'safety, resource, and health economics burden. This needs to be considered carefully in every healthcare community who is developing practical guidelines. (Guerra-Farfan & Garcia-Sanches 2022). In this study the aim was to find out ideas for the new practical guideline. This is only the first step in the cyclic developmental work in Medical Center Fenix and it must be kept in mind when considering using the information in other in connections.

Dependability and confirmability are considered in this study next ways. Guidance has been requested and received during the implementation of methods and work. On behalf of the XAMK, two teachers have evaluated the different phases of the work, and the working life supervisor has given his comments and evaluated the progress in the different phases of the study. The progress of the development study has taken place in stages, and after each stage an effort has been made to evaluate how well they have succeeded. Repairs and considerations of work were made constantly.

Literature assessment was done systematically. This was the first time for the thesis author to use this method. This makes it possible that something could have been overlooked because the method was not already familiar. The literature was collected from several sources and an effort was made to find sources that corresponded to the research questions as well as possible.

Inexperience of the interviewer can also affect the dependability of the study. There were no surprising situations in the interview situations, and they went as planned. The interviewees were clearly used to being asked about many healthcare-related topics and they produced interesting material for this study. However, the interviewer was not very experienced in research interviews or in content analysis and this of course affects the creation of the material.

Content analysis beginning was on listening on reading through the interviews many times. Then the coding the whole material was done. Creating subthemes was done carefully at paying attention to what rises from the material and thinking what classifies the theme. The themes and main themes were carried out after this process. But on the content analysis human nature must be kept on mind when thinking about reliability and validity (Columbia University Irving Medical Center 2023). Sometimes it is hard to distinguish between inductive and abductive analysis because it's difficult to complete think the analyze without the information gathered to the basis of the work and for the interviews. This was also a topic talked about in the guidance from the teachers and inductively approach was chosen. Conclusions were carefully thought after the whole process. Only very little generalizability can be done from this developmental work because it took place in limited environment.

8.3 Ethics

For this developmental task permission was asked from Medical Center Fenix. In health care studies need to have base from science and it never can be based only on a curiosity of the phenomenon. Study outcomes needs to be valid. Values behind the research and effect it has on the health care need to be thought. (Kylmä & Juvakka 2012, 144) It is also important to think about the meaningfulness of the subject because it is a good base for the study (Hirsjärvi & Hurme 2010, 66). This developmental task raised from the experience of the writer that overtraining is a difficult sport illness and need to be treated both

physiological and psychological side and as science wanted to be found for the base on treatment.

In accordance with general ethical protections in research it must be kept in mind to respect the human dignity, privacy, self-determination and other rights of the subjects in the study. The main goal is always not to harm subjects or communities that are playing part in the study. Risk, damages and harms need to be considered carefully before action (Kallinen, Kinnunen 2022).

In this developmental task these aspects were kept in mind when watching out for experts who could take part into the interviews. Information about the developmental task and interviews was send in advance so participants would know how their information and identity is taken into account. Participants were given code so information about them was not seen in analysis. They were also given the possibility not to participate at any time they did not feel comfortable. According to Kallinen and Kinnunen (2022) all participants need to be treated equally and respect their human rights. In this study all participants were seen as equals. The information they provided was equally valuable. All material was kept only by the author, and it was disposed after the work was complete. Interview data protection was taken care of.

Finnish Advisory Board on Research Integrity (2012) specifies the rules for good quality scientific research and says that it can be ethically accepted and reliable and its results believable only if a study of good scientific practice has been carried out by the common rules. Good scientific practice was used through the developmental work.

8.4 Conclusions

This developmental study gave many ideas for the practical guideline. Treatment and rehabilitation athletes with overtraining symptoms need to be multi-professional cause symptoms vary from patient to patient. Differential diagnosing is important. Biological, physiology and psychology sides of symptoms needs to be noticed and treated. Monitoring and following up patients' recovery is

important. Prevention and athlete's self-awareness are important tools to reduce overtraining as a sport illness. According to this study it can be said that athletes may need help to understand the training but also the recovery possibilities and periodization of these both.

Rehabilitation process starts with rest and continues to light training. Return to sport need to be done by gradually. Biological, physiological, and psychological testing should be done during the rehabilitation. Sleep and nutrition are important in recovery. Sometimes medication is also needed, and this is evaluated by specialist physician. Based on this study for the overtraining treatment grades from one to three should be used and these are shown in appendix 4.

8.5 Developmental ideas

Method of continuous development and idea- or brainstorming with specialist should be used continually. The professionalism of each specialist needs and should be recognized so that the customer receives appropriate and the best possible treatment. Medical Center Fenix has many specialists who can treat patients with this disease.

A manual for rehabilitation program of overtraining should be developed in the future. Effectiveness of rehabilitating programs should be evaluated with athlete and sport specific case studies. It is clear that overtraining syndrome and symptoms has many different aspects in endurance than in strength sports. It would be interesting to know what kind of temporal entities, treatment methods and recovery methods related to the rehabilitation of overtraining are used in other parts of Finland and the worldwide now and in the future.

Athletes' illnesses can be very multidimensional and require multi-professional skills on treatment. The development of this is certainly important in all medical- and training centers.

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APPENDIX 1. References of overtraining, overreaching and rehabilitation, treatment, recovery

article / resource	Authors/ year	Publisher	Method	Findings/ relevans	Conclusion s
Training over the Edge: Understanding the Overtraining Syndrome	Rocha F, Marques M, Costa A. 2012	Nova Science Publishers		Overtraining	Diagnosing overtraining is difficult and tools for it are still lacking. no specific interventions for treatment are yet found.
Recovery and performance in sport: consensus statement	Kellman, Bertollo, Bosquet, Brink, Coutts, Duffield, Erlacher, Hanson, Hecksteden, Heidari, Kallus, Meeusen, Mujika, Robazza, Skorski, Venter, Beckmann, 2018.	International Journal of Sports Physiology and Performance 2018, 13, 240-245	Consensus statement	Recovery over all	Recovery recommendations
Prevention, Diagnosis and treatment of the overtraining syndrome: Joint consensus statement of the European	Meeusen, Duclos, Foster, Fry, Gleeson, Nieman, Raglin, Rietjens, Steinacker, Urhausen 2013	Medicine & Science in Sports & Exercise. American College of Sports Medicine. p186-205	Overtraining Joint Consensus Statement	OTS	Comprehensive article about many sides of OTS

College of Sport Science (ECSS) and the American College of Sports Medicine (ACSM)					
Urheilijan ylikuormitustila	Uusitalo A. 2012	Duodecim 131:2344-50	Review	Overtraining	Article about OTS, diagnosing it, treatment and prevention
Overtraining syndrome in the Athlete: Current Clinical Practise	Carfagno D, DO, CAQSM, Hendrix J. 2014	American College of Sport Medicine p.45-51	Literature review	Overtraining	OTS develops insidiously in months but understanding this disease is developing. Screening, testing, red flags and prevention.
Overreaching and overtraining in Strength Sports and Resistance Training : a Scoping Review	Bell L, Ruddock A, Maden-Wilkinson T, Rogersin D. 2020	Journal of Sports Sciences. Sheffield Hallam University	Scoping review	Overtraining	OTS in strength and resistance resistance. There can be found minimal evidence of true OTS in these sports. More diagnostic tools is needed.

Diagnosing Overtraining syndrome a scoping review	Carrard J, Rigort A-C, Appenzeller-Herzog C, Colledge F, Königstein K, Hinrichs T, Schmidt-Trucksäss A. 2021	Sports Health. vol14 no5, p.665-673	A Scoping Review	Overtraining	There is many potential and specific way to diagnose OTS but it is multisystemic in nature. Manuscores need to be validated in larger samples and female athletes.
Overtraining Syndrome Symptoms and Diagnosis in Athletes: Where is the Research? A Systematic Review	Weakley J, Halson S, Mujika I. 2022	International Journal of Sports Physiology and performance. Human Kinetics. 2022, 17, p. 675-681.	Systematic Review	overtraining, recovery	yksikään tutkimus ei kerro vastausta onko otsissa suorituskyky, psyykkisiä muutoksia oikeasti. otsia nähdään kenttätöissä mutta dataa siitä on vielä vähän
The Overtraining syndrome: a Meta-Analytic Review	Wyatt F, Donaldson A, Brown E. 2013	Journal of Exercise Physiology online.2013 vol16 Number 2. p12-23	a Meta-Analytic Review	overtraining	Considerable immune suppression and increased stress in the athletes who

					experience the OTS.
Rowing Over the edge: Nonfunctional Overreaching and Overtraining Syndrome as maladjustment - Diagnosis and Treatment from a Psychological Perspective	Birrer D. 2019	Case Studies Sport and exercise Psychology, 2019, 3, 50-60. Human Kinetics	a case study	overtraining, treatment	
Overtraining Syndrome: a Practical guide	Kreher J, Schwarzs J. 2012	Sports Health 2012vol.4, no. 2, p. 128- 138	Review		
Multidimensional monitoring of recovery status and implications for performance	Heidari J, Beckmann J, Bertollo M, Brink M, Kallus W, Robazza C, Kellman M. 2019	International Journal of Sport Physiology and Performance. Human Kinetics	A review	Recovery	Monitoring athletes recovery need mena perspectives. Biological, psychological and social monitoring can be used
Novel Markers of Recovery from Overtraining Syndrome: The EROS-LONGITUDINAL Study	Cadegiani F, Silva P, Abrao T, Kater C. 2021	International Journal of Sport Physiology and Performance. Human Kinetics1 175-1184	Longitudinal study	Recovery from OTS	Athletes have many changes in hormonal level. After 12 weeks interv., athletes affected by actual OTS disclosed mix of non-, partial and

					full recovery proces. OTS is a complex as its occurrence.
Overtraining in Resistance Exercise: an Exploratory Systematic Review and Methodological Appraisal of the Literature	Grandou C, Wallace L, Impellizzeri F, Allen N, Coutts A, 2019	Springer Nature Switzerland AG	Systematic review	Markers of overtraining, mechanism underlying maladaptive res. training conditions	overtraining may be related to frequent high-intensity and monotone resistance training.
Altered relationship between R-R interval and R-R interval variability in endurance athletes with overtraining syndrome.	Kiviniemi A, Tulppo A, Hautala A, Vanninen E; Uusitalo A. 2013	Scandinavian Journal of Medicine & Science in Sports 2014:24, 77-85.	OTS group vs. Non OTS group testing	Overtraining recovery.	Correlation between RRI and vagally mediated RRI in these two groups. Detecting >OTS and recovery from it.
Kirjat					
Clinical Sports Medicine	Bruckner P, Khan K. 2019		Book	Basic knowledge of sports medicine	

APPENDIX 2. Example of analysis. Open codes, codes and subthemes

<p>CHARACTERISATION PHYSIOLOGY SPORTS AND TEMPERAMENT</p>	<p>Overtraining Under recovery Overtraining as an illness Classical categorisation</p>	<p>Overtraining or underrecovery are both used.</p>
		<p>Which is the overtraining syndrome, where I have used the same word for it as illness.</p>
		<p>But if we're talking classically about the overtraining of athletes and exercisers, then that's a different matter.</p>
		<p>Overtraining is what is used</p>
	<p>Physiology overload Psychological stress Can arise from mental aspects</p>	<p>After all, the state does not exclude the fact that it can come from a mental state.</p>
		<p>Then you have to separate what is physical and what is mental and overload</p>
		<p>Physical overload is what is used</p>
	<p>Brain functioning Overdrive mode</p>	<p>There we go into overdrive and it has to be cut off somehow if we end up with this physical overtraining.</p>
		<p>A kind of feedback system of the cortex layer of the brain and then the midbrain or/and pituitary gland.</p>
	<p>Martial arts Strength training crossfit Fitness Resistance training Character traits of athlete</p>	<p>Person who is being hard on self.</p> <p>Then of course, also the nature of being such a pedant</p> <p>From crossfit, yes coming from there.</p> <p>I think it's an endurance athlete to be the most ordinary</p> <p>When training comes most of from gym, so it's pretty hard for the body</p> <p>Maybe there are more from individual sports but you can see also some team athletes.</p> <p>Guys from gym I have seen here.</p> <p>Out of many sports, the most from martial arts.</p> <p>Then often if it has come from there through muscle training, doing a lot of crossfit or gym training that has increased quantitatively a lot</p> <p>From one sport to another, fitness athletes and crossfit sports</p> <p>There have been those strength trainees, and at one point it feels like there were a lot of them.</p>

APPENDIX 3. Interview inquiry

Dear Receiver,

I am processing a thesis that is part of Naprapathy master studies at Southeastern Finland University of Applied Sciences. I politely ask for your help in collecting the material for the thesis.

I would like you to participate in a research theme interview, which aims to find out the recovery and rehabilitation of patients experiencing overtraining symptoms. The main focus is on how to rehabilitate them and enable them to return to training and sports. All the scientific and experiential information you provide is important. The research is carried out by Sini-Marja Heikkinen, a master student at the Southeastern Finland University of Applied Sciences. I also work as a practitioner at Medical Center Fenix in Porvoo.

I kindly ask for permission to interview you, if possible, during March 2023 at an agreed time. We can conduct the interview face-to-face or via digital channels (teams, meets, etc.). There is only one interview and it lasts about 60-90 minutes. I will contact you by email so we can agree on the arrangements you want and a more precise time.

I will keep the information you provide for the research strictly confidential, and the participants will not be identified in the thesis publication. I hope you will respond positively to my request to include you in the interview. If you don't want to be contacted, you can message me about it.

Best regards for your cooperation

Sini-Marja Heikkinen

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Appendix 4. Treatment and rehabilitation ideas and timeline proposal

Treatment and rehabilitation of athletes with overtraining symptoms in Medical Center Fenix.

Base line for diagnose	<ul style="list-style-type: none"> • Sport physician consultation • Laboratory testing • POMS or other mood scale • Check list • Multi-professional consultation for differential diagnoses
Differentials diagnose options and multi-professionalism	<ul style="list-style-type: none"> • Cardiologist • Psychiatry • Nutritionist • Specialist in respiratory diseases • Depends on individual symptoms
Special testing for athletes	<ul style="list-style-type: none"> • Performance testing • EKG • Spiroergometry • HRV • Body composition • Psychological testing
Timeline and grades	<ul style="list-style-type: none"> • Duration of symptoms • Estimation of grade of overtraining state to estimate the recovery time from 2 weeks to years • 1- functional overtraining phase (2 weeks) • 2- nonfunctional overtraining phase (2-4 weeks) • 3- overtraining syndrome (4 weeks to on years)
Multi-professionalism of treatment	<ul style="list-style-type: none"> • All who are in diagnose making process • Physiotherapist • Naprapath

Rehabilitation process

Phase 1 Acute	1-2 weeks for beginning
Rehabilitation goals	Individual recovery process evaluation Sleep quality Nutrition balance Estimation of medication Normal daily living, no exercising (total rest) Participation as a spectator to team practices if needed Mood balance
Precautions	No exercising Evaluation of heart symptoms, respiratory illnesses ja mental state. If needed cardiologist consultations If needed psychiatry consultations If needed special respiratory testing
Additional interventions	Evaluation of last year training periodization. Specific instructions for recovery process. Specific information and consultation about sleep and nutrition. Consultation for sport psychologist. Consultation for nutritionist. POMS or other mood scale.
Criteria to progress	Heart rate responses (resting heart rate, orthostatic test) HRV responses Laboratory testing Sleep quality improvement Nutrition quality improvement Mental state improvement Next follow up

Phase 2 Beginning of exercise	2 weeks-4-6 weeks
Rehabilitation goals	Individual recovery process evaluation Enough of sleep Nutrition balance Estimation of medication Normal daily living, some exercising (relative rest) Participation as a spectator to team practices if needed.
Additional intervention	Follow up can be done by rehabilitation specialist.

	<p>Try outs for walking, starting from 10 minutes.</p> <p>Try out for other sports (easy level).</p> <p>Specific information and consultation about sleep and nutrition.</p> <p>Consultation for sport psychologist</p> <p>Consultation for nutritionist</p> <p>POMS or other mood scale</p> <p>Social interventions if it feels relevant</p> <p>Testi-Selänne</p> <p>Self-awareness training</p>
Criteria to progress	<p>Individualized responses to symptoms</p> <p>Heart rate responses</p> <p>HRV responses</p> <p>Laboratory testing</p> <p>Sleep quality improvement</p> <p>Nutrition quality improvement</p> <p>Mental state improvement</p> <p>Next follow up</p>

Phase 3 Continuum of exercise	4-6 weeks- 3 month – individual timing
Rehabilitation goals	<p>Individual recovery process evaluation</p> <p>Sleep normalization</p> <p>Nutrition balance</p> <p>Estimation of medication and is there a need for a continuation.</p> <p>Normal daily living + exercise increase</p>
Additional intervention	<p>Evaluation of the coming training periodization.</p> <p>Recovery programming</p> <p>Self-awareness</p>
Criteria to progress	<p>Individualized responses to symptoms</p> <p>Heart rate responses</p> <p>HRV responses</p> <p>Laboratory testing</p> <p>Sleep quality improvement</p> <p>Nutrition quality improvement</p> <p>Mental state improvement</p> <p>Next follow up</p>

Phase 4 Return to sport	3 month- time needed
Rehabilitation goals	<p>Back to normal sports and periodization</p> <p>New normal in training and recovery</p>
Additional intervention	Understanding athletes' individual recovery responses for future use.

Criteria to progress	Individualized responses to symptoms Heart rate responses HRV responses Laboratory testing Sleep quality improvement Nutrition quality improvement Mental state improvement Easy follow up possibility if symptoms come back
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