

The Perceived Stress Rating Tool for balancing stress and recovery in team sports – case Pelicans U20

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<p>Ice hockey player in Finland, by the age of 20, lives in very challenging operational environment. For helping players to cope in that environment, there exists a need for a tool to use in team sports for the purpose of helping to control the stress and recovery balance. For two consecutive years, the Pelicans U20-team utilized a modified tool to rate perceived stress. Overall stress value became the basis of the author's coaching philosophy: homeostasis in life must remain throughout different periods in sports.</p> <p>Stress is a more complex phenomenon than is commonly thought. Stress can arise externally or internally, and the connections of different stressors are still not fully reported. Recovery from different types of stressors demand a variety of methods which are based on individual differences of the athlete. Balancing stress and recovery in everyday life is a challenge for everyone inside and outside of sport.</p> <p>To understand the operational environment in which the U20 player lives is the basis for being able to increase an individual player's awareness of the athletic lifestyle. Ice hockey takes a large role in the player's life. To better understand the connections between the young player's environment and life, it is necessary to analyse also ice hockey more carefully.</p> <p>The objective of this case study is to present the Perceived Stress Rating Tool. This thesis describes how the tool was utilized. Different stress and recovery variables are presented in the theoretical framework and in through concrete case examples. Also presented are the important philosophies of balance in life and the holistic perspective in coaching. Those factors have major influence on long term athlete development.</p> <p>Experiences of utilizing the Perceived Rating Tool to follow balance in stress and recovery were encouraging. The Rating Tool was at the same time simple and accurate. Significant information from an individual player's current manners in life were found through the use of Rating Tool. Psychosocial stress and state of health were easier to point out when players' had to evaluate themselves. The Rating Tool helped both the coach and the player in the discussion of critical topics. Various recovery methods were determined based on the type of stressors involved. Coach and player could, for example, decide together to change the periodization cycle in physical conditioning. Adjusting load in exercises or controlling the amount of games were also possible solutions. Increased social interaction between coach and players supported the holistic perspective in coaching.</p> <p>Monitoring overall stress and recovery is crucial in athlete development. Usually the challenge is not overtraining but under-recovery. The selection of the method is not crucial. What makes the difference is how to utilize the selected method systematically. The aim is to find proper tool for the needs of specific team. The Perceived Stress Rating Tool is a good way to monitor and evaluate overall stress and the effect of different stressors.</p>	
Keywords Stress, recovery, perceived rating tool, homeostasis, holistic	

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1 Introduction

Coaching in modern sports has continued to evolve during the last decade. The role of the coach has become more like a mentor. The coach is responsible for raising self-aware athletes. The athlete on the other hand is mainly responsible for developing his own career. Sport is a demanding profession and becoming a professional athlete requires a long-term process behind the scenes. Goal-directed athletes are able to analyze their long-term development process and utilize proper tools for help.

In modern western culture the rhythm of life is rapid. People face constantly changing situations every moment. Affairs happen increasingly interactive and multiple devices control everyday life. Pressures that the society sets for people have been increasing over the decades. Modern athletes face the same phenomena. From this perspective, the significance of the role of recovery in sports and life in general has increased. It is a real challenge to balance stress and recovery in the long-term athlete development process.

This thesis presents a model for balancing stress and recovery in team sports. Pelicans U20 ice hockey team used the Perceived Stress Rating Tool between 2013 and 2015. Two seasons verified that the tool was very reliable and helpful for both coach and athlete to systematically follow the current state of overall stress. This thesis is a case study and the theory relies on the Grounded Theory model. This leaves author scope to attach theory to one's own experiences. Analyses are executed by selected coding.

Through utilizing the rating tool author became convinced that homeostasis in life should remain in long-term development process. The risk to diseases or injuries would decrease and continuous development would be more evident. The newest opening in team sports is to add stressors together and analyze overall stress value systematically. The Rating Tool was also utilized in a holistic purpose to increase interaction between coach and athlete.

A majority of stress and recovery monitoring devices in sports are devised for business profit. Methods measure limited variables like exclusively game or exercise stress. The Perceived Stress Rating Tool took into consideration multiple stress variables and recovery possibilities. The Tool is provided free of charge and no electronic devices are needed. The author hopes that this thesis will increase the awareness of the causes of stress and a variety of recovery methods.

2 Stress and recovery

Different methods are available for monitoring stress and recovery. Advantages and limitations exist within each method. For example, measuring lactates require control practices and from hormones the results are not ready right after the measurement. As of this writing, measuring lactates or sampling hormones or biochemicals are not widely used in team sports. Orthostatic test and basic HRV-analyses (heart rate variation) may be confounded by anxiety or mental arousal. The same limitations are also mentioned in the Firstbeat recovery test. (Firstbeat Technologies 2009, 3.)

A better understanding of measurement and monitoring methods is crucial for coaches to deepen one's understanding of stress and recovery. Perhaps the best method has not yet been discovered, but, as a coach, it is important to know how the existing ones work and how they can be used to help in the daily coaching process.

2.1 Stress

The stress state is defined as increased activation in the body, induced by external and/or internal stress factors, during which sympathetic nervous system activity increases and parasympathetic activity is decreased (Firstbeat Technologies 2009, 2). The best measurement method for physical activity as an external factor are sensors that react without delay and recognize change of activity. According to Pärkkä (2011, 4) those sensors are accelerometers, magnetometers, angular rate sensors and GPS location sensors.

Repeated training can be considered a positive stress. The adaptations caused by training improve body functions: capacity for energy production, oxygen delivery, muscle contraction and other mechanisms that enhance exercise performance. (Kenney, Wilmore & Costill 2015, 348.) The supercompensation principle is well known in sports. This principle includes both the breakdown process (training) and following recovery (rest) process. (Kenttä & Hassmén 1998, 1.) All athletes experience some degree of fatigue during repeated days and weeks of training. This type of fatigue is typically relieved by a few days of reduced training or rest and a proper diet. Overly intense training might, on the other hand, cause athletes an unexplained decline in performance and physiological functions that extends over weeks, months, or years. This condition is termed overtraining. (Kenney, Wilmore & Costill 2015, 352.) Accumulating training-stress will inevitably lead to increased risk of injury, disease, burnout and/or overuse syndrome (Kiely 2016, 2). Suitable amount of stress improves performance, but a greater amount than the person is

capable of handling weakens performance. The actual capacities for stress determine how much stress an individual person can tolerate. Three major capacities, neuromuscular, psychological, and social, have been identified. (Kenttä & Hassmén 1998, 13.) Stress reactions change hormonal regulation, stimulate metabolism, and accelerate blood circulation and heart rate (Duodecim 20/2000).

Precise cause or causes resulting in a decrease in performance are not fully understood (Kenney, Wilmore & Costill 2015, 352). Physiological, psychological, biochemical, and immunological symptoms must be considered, both independently and together (Kenttä & Hassmén 1998, 1). Physical environment, social pressures, loneliness, and individual thoughts about the demands of outside environment are some psychological causes for stress (Duodecim 20/2000). Psychological testing may reveal early-warning signs more readily than the various physiological or immunological markers. However, directing attention to psychophysiological cues serves the great purpose: increasing athlete self-knowledge. (Kenttä & Hassmén 1998, 1.)

Long-term stress is often measured on a perceived stress level scale either directly or as observed through changes in behaviour. Reliable technical measurements are bed sensors, actigraphy and bed illumination sensor used together with self-assessed stress level. (Pärkkä 2011, 4.)

2.2 Recovery

Recovery is defined as decreased activation in the body during relaxation, rest and/or low intensity working, related to lack of external and internal stress factors when parasympathetic activity is great and sympathetic activity is low. The autonomic nervous system plays a major role in maintaining the body's homeostasis. The autonomic nervous system consist of the sympathetic and parasympathetic nervous systems. Both systems run without voluntary control. The sympathetic nervous system prepares the body for challenging situations and is activated during physical activity and mental or cognitive tasks. The parasympathetic nervous system has the opposite role: increased parasympathetic activity enables recovery. (Firstbeat Technologies 2009, 2.)

From the perspective of homeostasis, the training process is an exercise of stress management. The duration, course, and severity of muscle soreness, muscular dysfunction, and the appearance of markers of fatigue can vary considerably depending on the duration, intensity, and type of exercise. (Hausswirth & Mujika 2013, 216.) A variety of planning and periodization strategies are held as tools for balancing imposed training

stress with appropriate rest. The recovery phase must be considered an integral component of the training process. Therefore, the attention in its programming and management has to be at the same level as the exercise sessions themselves. (Hauswirth & Mujika 2013, 219.) Various recovery and regeneration techniques are employed to expedite the athlete's return to an uncompromised state of training readiness (Kiely 2016, 2). Practical applications to be considered are diet, cold-water immersion as a cooling method, and active recovery when performance must be repeated in a short period (Hauswirth & Mujika 2013, 219).

It has been suggested that the best way to treat overstress (physical overtraining, psychosocial stress, or a combination of these) is by matching the treatment with the specific symptoms. Four main categories of treatment have been identified: nutrition and hydration; sleep and rest; relaxation and emotional support; and stretching and active rest. (Kenttä & Hassmén 1998, 8-9.) The aim of each recovery activity should be to restore homeostasis and to allow the adaptation to the individual stress. Full recovery is possible only when psychobiological homeostasis is attained. (Kenttä & Hassmén 1998, 13.) Coaches often have a wide understanding of training principles and they can control the periodization phase and variety of different training patterns. The uncontrolled factor, on the other hand, is an individual's response to planned training and recovery. There exist a narrow range of studies concerning recovery and there are still many unknowns. Many circumstances related to recovery are uncontrolled –life can't be full controlled. Perhaps that is why the current topic among coaches is under-recovery rather than overtraining. (Kellman 2010, 101.) The methods to measure recovery are mentioned in the previous chapter. Measuring stress underlines also the state of recovery.

2.3 Balancing stress and recovery

Where an imbalance between training and recovery, exercise and exercise capacity, stress and stress tolerance occur, so-called "staleness syndrome" sets in. This is better known as overtraining. Stress is the sum of training and non-training stress factors. By this definition, different types of stress contribute to the total level of stress which may provoke, and result in staleness. (Kenttä & Hassmén 1998, 7.)

Monitored training load units can be either external or internal. Traditionally, external load has been the foundation of the most monitoring systems. External load is defined as the work completed by the athlete, measured independently of his or her internal characteristics. Power output-measuring devices, for example, allow the continuous measurement of work rate. The team environment is a challenge for ensuring appropriate

monitoring of individuals. Individuals may respond differently to a given training stimulus, and the training load required for adaptation may differ significantly from one athlete to another. In team sports, time-motion analyses, including global positioning system (GPS) tracking and movement pattern analysis via digital video, are becoming more popular for monitoring athletes. (Halsen 2014, 140-143.)

Most of monitoring methods used in sports are invented for profit and they might be quite expensive. They may also need electronic devices to produce and analyze the data. On the other hand, questionnaires and diaries can be a relatively simple and inexpensive means of determining the training load and subsequent responses to that training. The Rating of Perceived Exertion (RPE) is one of the most common means of assessing internal load. The use of RPE is based on the notion that an athlete can monitor their physiological stress during exercise as well as retrospectively provide information regarding their perceived effort post training or competition. However, all these rely on subjective information, which may need to be corroborated with physiological measurements. (Halsen 2014, 140-143.)

Hauswirth & Mujika (2013, 28) stated that by following a periodized training program, the symptoms of overtraining can be avoided. The basic features of periodized training should include a structured plan that introduces variation into training by modifying exercises according to specific needs of each individual athlete. Failure in periodization results either undertraining or overtraining (Hauswirth & Mujika 2013, 23). Still, because of the individual responses to stress and different stressors, the multitude of factors is not simple and easy to cope with. Periodization itself is problematic in team sports where demands are wide and competition period lasts months. (Hauswirth & Mujika 2013, 25.) To reach adaptation in a training program the athlete must break his limits and shake homeostasis, but at the same time, overreaching should occur for a limited time to give body chance to recover. In sports the whole training/rest –ratio is finally understood to be crucial for long-term development.

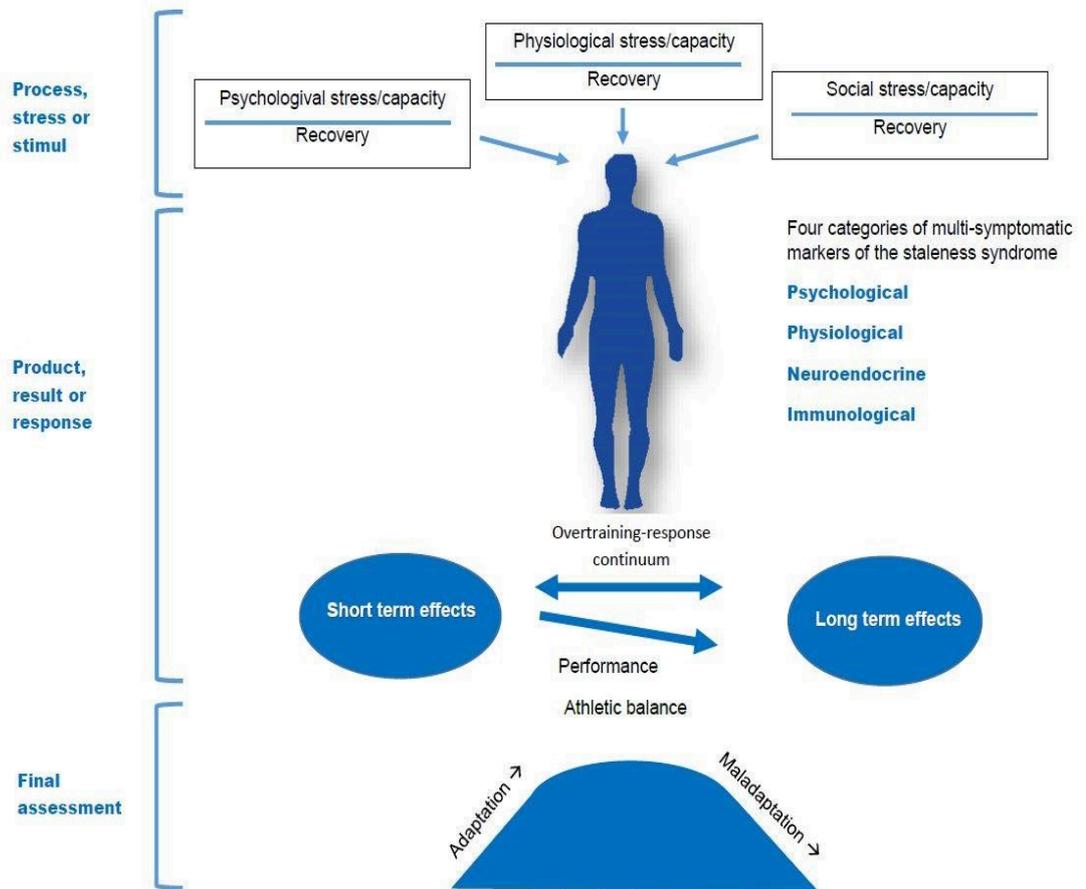


Figure 1. An overview of the overtraining and recovery process. Modified picture from Kenttä & Hassmén (1998, 15).

3 Ice hockey

Figure 2 provides an overview of ice hockey and player development. In the center of the game is a player. The figure is a framework for player and team development (Mero, Nummela & Keskinen 1997, 531). Trainers planning the periodization of training loads between games are also under continuous challenge. Factors to be considered are multiple: number of training days between games; games played away or home; stage of a season; importance of a game; and players in or out of the roster. These demands, coupled with the expectations of the fans and the sponsors of the team, make the challenge difficult to solve. (Hauswirth & Mujika 2013, 26.) In next chapters the author presents a deeper overview of the player and team development demands.

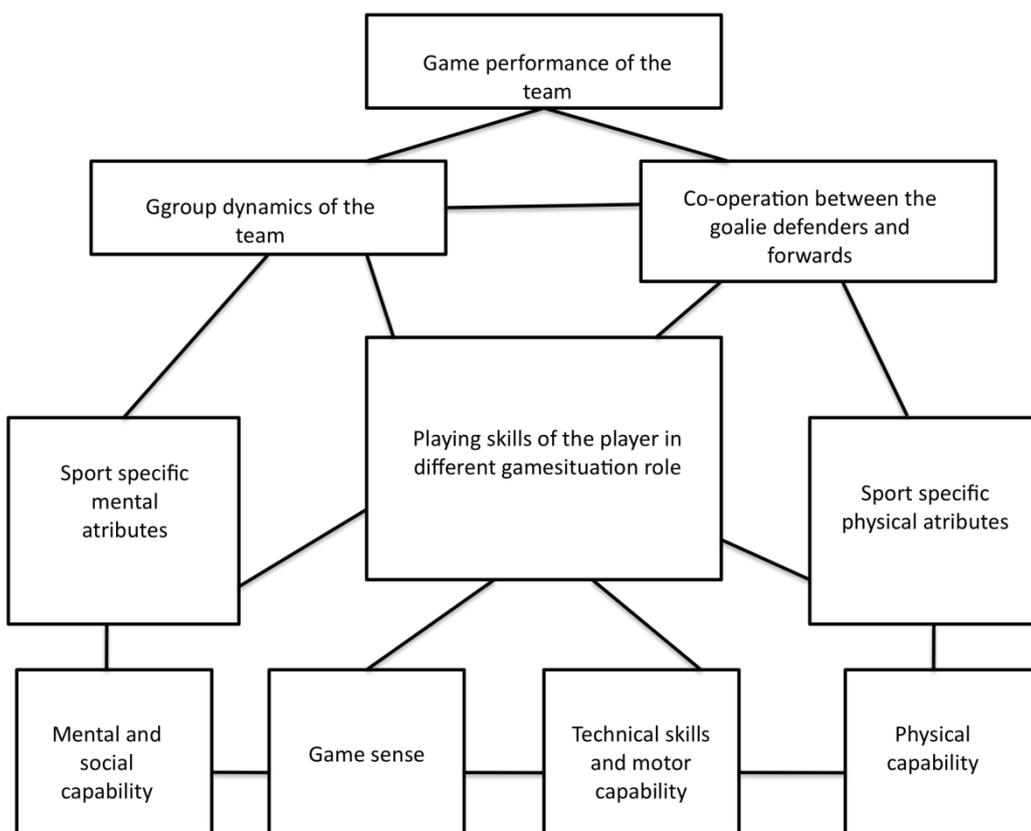


Figure 2. The capabilities needed from an ice hockey player. Capabilities become simplified to the attributes of the game and after all the players co-operation becomes team performance in the game. Modified from Mero, Nummela & Keskinen (1997, 531).

3.1 Physical and motor capability

Aerobic and anaerobic capacities, and general strength, specific strength and technique together are the neuromuscular capacities for resisting stress (Kenttä & Hassmén 1998, 13). In addition to the bioenergetics demands of ice hockey performance, the practicing

strength and conditioning professional must have a biomechanical understanding of the movement patterns associated with the sport. Task analysis indicates that hockey involves coordinated multi-joint, multi-limb movement patterns, and rapid rates of force development in executing the technical skills of skating, passing, shooting, and body checking. (Allen 2002, 42-52.)

In hockey, duration of the one shift is on average 30-60 seconds. During an entire game, player skates approximately 5-7 kilometers, and 250-300 meters during a shift. The game itself and skill performances involve short-term, maximum power efforts. (Summanen & Westerlund 2000, 19.) Different anaerobic energy systems are the main source, 60-70%, to produce energy to actions on ice (Laaksonen 2011, 27-28). Both, the aerobic and anaerobic energy systems, are still needed. To work well the anaerobic energy system needs to have also well trained aerobic system. Ice hockey demands also high body mass, exceptional strength and good ability to produce power. (Laaksonen 2011, 25.) Aerobic energy system has a significant role in ice hockey even though the event is mostly done in high tempo. Ice hockey player needs aerobic endurance to save anaerobic energy, to recover from shifts and to fulfil anaerobic energy level. (Laaksonen 2011, 26-27.)

The stress of the game has also been studied by monitoring heart rates. The heart rate provides an overall picture of stress level. In an ice hockey game, the average working heart rates of the players vary between 170-174 beats per minute. The recovery time after a 30-60 second work period varies between 3-5 minutes on average. The durations of the rest period is individual and might change between different players. During the resting, heart rates can drop to 110-120 beats per minute. (Summanen & Westerlund 2000, 20-21.)

Strength means a lot in for example contending in corners. Straight skating power depends on lower body power. Acceleration and changing direction are also depended on the power. Power in checking situations, shooting and the rhythm of skating are depend on upper body muscle power. Hip area and core are the base of all movement. (Laaksonen 2011, 29-30.) Speed and agility are also important physical abilities in ice hockey. Agility and quickness to react in a game situation are necessary needed. Maintaining and accelerating speed is also needed in a game. It's not easy to be able to maintain good technical quality for example in full speed skating. Therefore the player needs to have also good physics in every way. (Laaksonen 2011, 30-31.) Flexibility is important to avoid injuries and to be able to get full power to movements like skating, shooting and checking. Lower body muscles, hip area and lower back area are the most

important ones to stretch. (Laaksonen 2011, 32.) Figure 3 presents physical and technical demands for individual ice hockey player.

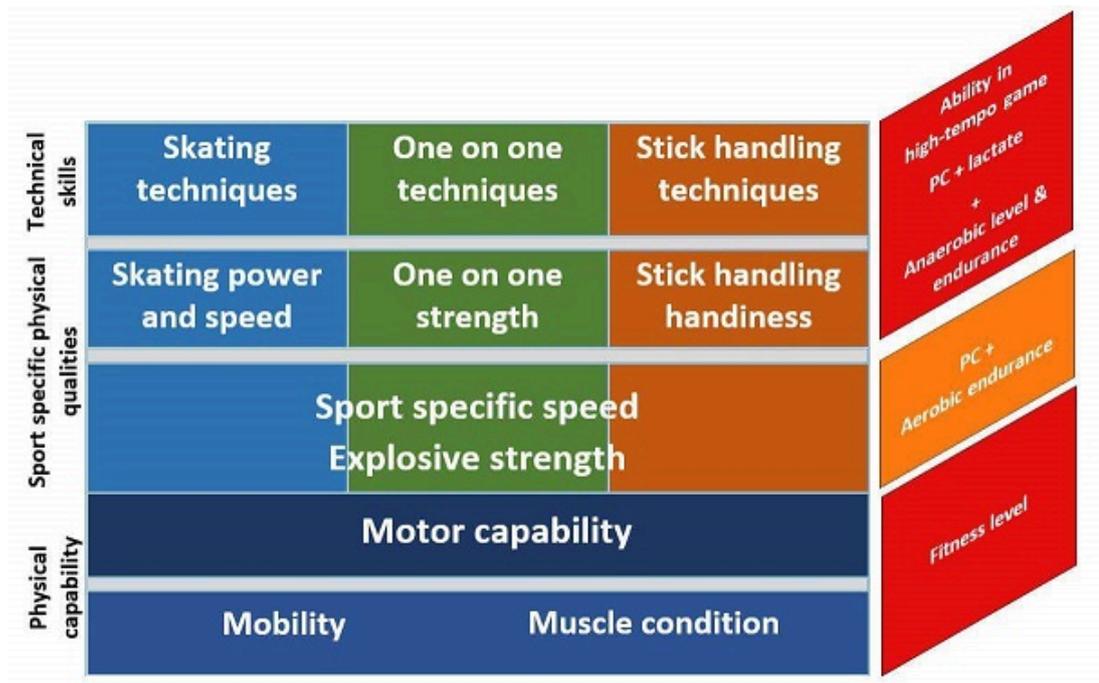


Figure 3. Physical and technical demands of ice hockey. Modified from Summanen & Westerlund (2000, 22).

3.2 Technical skills

Skill learning process means series of events in our body which are reached through many repetitions and which leads to permanent changes to produce movement. During the learning process our body contains many parallel processes. (Lampinen & Forsman 2008, 435.) Skilled performance is always a result of thousands of repetitions (Hakkarainen & al 2009, 237).

The most efficacy skating style comes by combining the optimal skating technique and physiological qualities of a player. Skating itself can be broken down to smaller pieces. Balanced and low enough skating position creates readiness to react and makes it possible to produce more power to every stride. Swinging arms and being able to use upper body as a part of a movement are creating the rhythm and balance. Full extension on a stride produces the power. Quick return of the leg is part of the skating frequency. Speed is broken to these three parts: technique, power and frequency. (Koho & Luukkainen 2012, 62-63.) A technically sound skater is mechanically more efficient and uses less energy and delays fatigue and tires slower during performance (Twist 2007, introduction 14).

Ice hockey is all about scoring and preventing scoring. This is why it is important to keep the puck in own team and trying to move the puck to a place where it is easy to score. Usually the easiest and fastest way to move the puck is passing it. There are even more different kinds of passing types than ways to shoot. The skilled player can execute multiple different types of passes: easy pass by turning wrists, hard pass by hitting the puck, backhand passes both ways and saucer pass on the air. (Koho & Luukkainen 2012, 65-67.)

Controlling the puck is one of the most important skills in ice hockey. Carrying the puck, skating with the puck to all directions, faking the opponent, covering the puck, deflecting shots... – in all those situations the player needs skills to control the puck. In the game the focus should be in the actions of a game instead of controlling the puck head down and that is not easy. Thinking the opponent trying to steal the puck or checking at a same time makes it even harder to do. (Koho & Luukkainen 2012, 64-65.)

Most scores are done by shooting. In game there is presented shots from carrying the puck, loose pucks or one timer. The basic shooting techniques can be divided in wrist shot, snap shot, slap shot and backhand shot. If we think the theory of thousands of repetitions it means that the player has to shoot the amount of each shooting techniques. Shooting tens of thousands shots takes some time so this is technical skill the players have to do a lot. (Koho & Luukkainen 2012, 67-68.)

3.3 Game sense

Ice hockey is a goal scoring game with two objectives, to produce a goal to the own team and prevent the opponent from scoring. These objectives have divided ice hockey to defensive game and offensive game. (Mero, Nummela & Keskinen 1997, 532.) These categories are divided as defensive zone defensive game, defensive zone offensive game, neutral zone defensive game, neutral zone offensive game, attacking zone defensive game, and attacking zone offensive game (Savolainen, K. 4 Sep 2008).

Playing skills can be divided in offensive and defensive playing skills. Both two have also subcategories. In offensive play there are two separate game situation roles: puck carrier and non-puck carrier. Both game situation roles have inside them different needs for playing skills. In defensive game there are a player defending the puck carrier and a

player defending the non-puck carrier -again two different game situation roles. Overall explanation to playing skills is the ability to use technical skill in various game situations and in different game situation roles. (Koho & Luukkainen 2012, 68-69.)

Offensive and defensive game phases can also be broken down in to targets. Offensive game targets are: 1. Scoring, 2. Winning the space, 3. Keeping the puck (“making the space”), 4. Readiness to defend. Defensive game targets are: 1. Prevent scoring, 2. Prevent winning the space, 3. Steal the puck, 4. Readiness to attack. These targets or priorities are not giving direct or accurate answers, how the player should react in different game situations. Priorities give guidelines to teams and players in what order they should assess the options to react. Actually it means that the ownership of game belongs to players who make decisions inside the game situations. Opponent is always one decision behind the one made by the player. (Koho & Luukkainen 2012, 138-155.)

For individual player good game knowledge means that he is on ice able to make decisions that are beneficial for the team. The good game knowledge also helps the player to use his physical, mental and technical skills better on game situations. Game knowledge can be divided in three categories: understanding the game, reading the game and decision making. (Mero, Nummela & Keskinen 1997, 534.) Understanding the game means how well the player knows team sports goals and principles on various game situations. Reading the game means observing the situations on ice and taking into consideration possible options how the game continues after different situations. At last the player makes decision what is the game skill he uses in various situations. (Mero, Nummela & Keskinen 1997, 534-535).

3.4 Mental and social capability

Psychological stress and social stress require more attention in the body-mind performance context. Social stress is defined as the result of interactions with other people. Social stressors may arise from life in home, friends, colleagues at work, coaches, teammates and competitors. The capacity for resisting psychological stress arises from self-confidence, resilience, attentional capacity, motivational level, attitude control, positive energy and capacity for visualization. (Kenttä & Hassmén 1998, 13.) In context of psychological aspect of recovery variables like motivational climate, peer pressure, pressure from sponsors and institutions (national governing bodies and clubs), pressure from parents and family members must take into consideration (Hauswirth & Mujika 2013, 51-52). The capacity for social stress consists of the ability to create, handle and maintain relationship with others (Kenttä & Hassmén 1998, 13). Crucial is to take care of

the training climate and every athlete's personal goals. Second phase is taking care and respect of recovery periods over the season. Finally remember appropriate recovery: athletes should also take into consideration the psychological aspect and take every week time to plan or attend social events that are different from athletic events. (Hauswirth & Mujika 2013, 51-52.)

Ice hockey game event is a huge entertainment event. Due media spectators can follow the event without participating the event themselves. Professional sport, media and the spectators are in tight interaction. Fans are always there. Sport can respond to needs of a spectator: sensing the aggressive feelings, competitive aspect, identify taking risks and achieve something. Those motivate the spectator monitor and participate in sports. The game event atmosphere and experiences in an event are based on feeling the community around you when people having the same mindset are gathering together. (Koho & Luukkainen 2012, 14-17.)

In team sports and professional leagues the game schedule gives a structure for planning the athletic program of the team. The amount of games has increased during recent years. Games and travelling also are activities, which consume most energy of the athlete. The competition on the international level has come harder and harder every year. It is not anymore enough to practice and compete well, it is more and more important, how athletes spend the time between physical activities. A player has to be an athlete 24 hours in a day and 7 days in a week. (Westerlund 2015, 35.)

The individual qualities to indicate mental toughness in ice hockey are need for achievement, aggression, self-confidence, independency and capability to do things under a pressure. Other qualities monitored from the player are the dominancy, narcissism and the state of controlling the feelings. (Mero, Nummela & Keskinen 1997, 543.) Need for achievement is the willingness to set goals and the drive to head towards them. Positive aggression is shown by energised and tough play in different game situations. Self-confidence is the realistic and positive self-image and trust for own possibilities. Independency is the ability to do things by self. Capability of doing things under pressure is demonstrated by acting and doing things in a normal way also in different and hard circumstances. Controlling the feelings is compared to sense of accomplishment. It expresses the players empathising into what he does, the ability to be one what he does, an ability to build up an optimal sense of accomplishment and get out the performance level needed for other abilities. It also means a good resilience for pressure. (Mero, Nummela & Keskinen 1997, 543-544.)

Task and social cohesion are two independent components of team cohesion. Task cohesion reflects the degree to which members work together to achieve a specific goal. Social cohesion reflects the degree to which members of a team like each other and enjoy being members of the team. Consequences of the team cohesion include team stability, behavioral outcomes, and absolute and relative performance effectiveness. Relative to team and individual performance, research has consistently shown that task cohesion leads to enhanced performance in interactive team sports. (Cox 2002, 328-343.) In addition to increased athletic performance, there are numerous other positive consequences associated with increased team cohesion. These include collective self-efficacy, sports retention, sensitivity to the disruptive effects of self-handicapping, and psychological momentum. (Cox 2002, 328-343.)

3.5 Philosophy of balancing overall stress and recovery

In modern society and today sports the effectiveness and amount of practices are not often the reason blocking development of athletes. The challenges are more often faced in recovery. In Firstbeat's material the intensive recovery follow-up is the suggested way to notice whether the athlete has elevated risk of overtraining. The information can be utilized in recognizing signs of excessive fatigue. With follow up one can track whether it is safe to continue overreaching period or better to lighten up training. During the easier training period recovery status should improve. Intensive training should not be restarted before recovery values are at least close to those of well-recovered state. (Firstbeat Technologies 2009, 6.)

The modern rhythm in life is rapid. Social media and interactive lifestyle surround players with many challenges and pressures from society. Athletes in team sports face constantly changing situations every day. Team where young player plays in can change even every week. Player might play under several coaches during one week. All coaches have demands arising from the needs of their team. Coping with all demands the sports event and the operational environment sets, is daily challenge for coach and athlete. Player rarely has one coach responsible for his development and communicating with other team's coaches. Individual programming for exercise periods is, as mentioned earlier in chapter 2.3, problematic in team environment. Because all the facts described the ownership of athlete's career should be his despite of all the coaches working with athlete. According Halson (2014, 140) the athletes who are involved the monitoring are also feeling more involved in their training program. This empowers them and increases their sense of ownership.

Methods concerning external load, often measure or they are used to measure, only some parts of the performance. Game or practice related stress factors and recovery during night time are examples for measured variables. The developed, and later in this thesis presented, The Perceived Stress Rating Tool educated players to analyze their own body and readiness to physical stress. The self-knowledge of athletic lifestyle increased. They also learned to change their weekly periodization while maintaining the longer period planning (mesocycle).

Using the Perceived Stress Rating Tool in a team environment actually widened the author's perspective of the whole phenomena. Philosophy that overall stress should be in balance with recovery was assured by utilizing the tool. In that way the best performance for athlete and his long-term development could be ensured. In homeostasis there is capacity to face extra short term stress and recover from that. Homeostasis also would decrease the risk to diseases or injuries. Maintaining good state of health the athlete will face the best practice days –the ones he is present.

4 Defining case

“Worship your every day” –was the sentence where all this started from. Target was to help the players to play or practice in their best way every single day. Continuous development for young players is crucial. The players are just jumping into professional ice hockey and they have to perform all the time better to get contract from professional or semi-professional adult teams. Author was assistant coach in Pelicans U20 and responsible for physical conditioning in the team. From that perspective author created a tool to help both, coach and the players, to the continuous development. Perceived rating tool was modified for the needs of that specific group and arise from their operational environment. The picture below makes visible the U20 player’s operational environment in life and in sports around the performance.

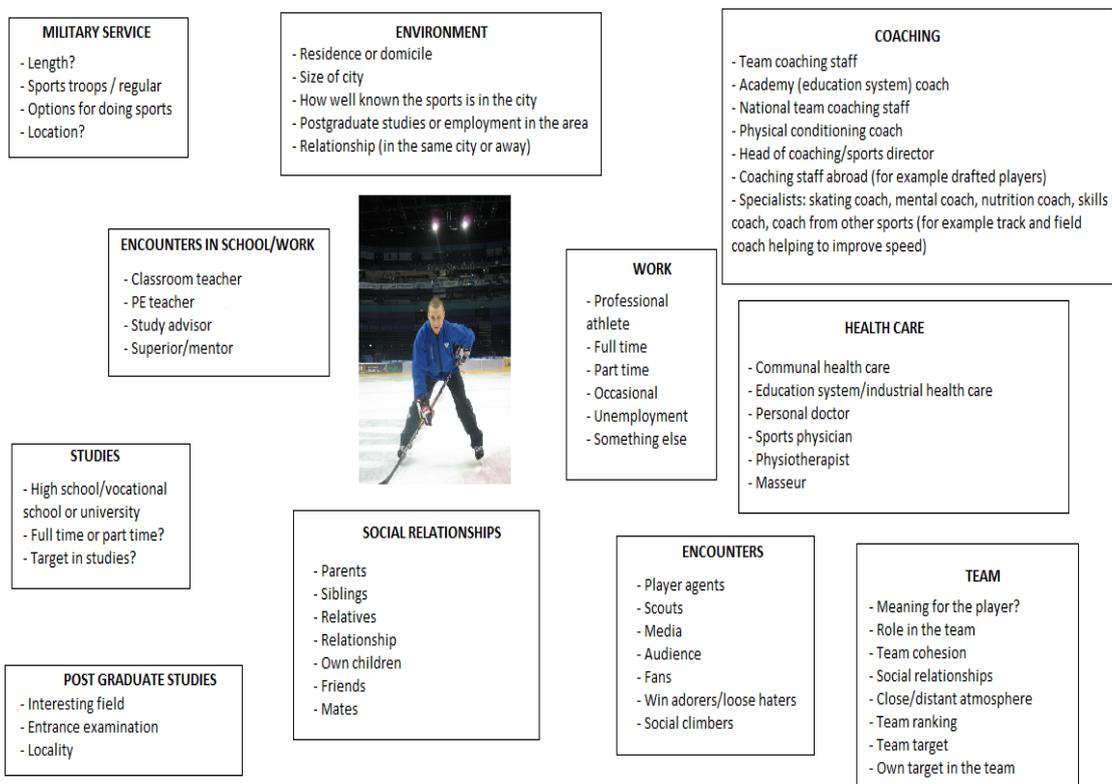


Figure 4. U20 Players operational environment.

Case was set in U20 Pelicans team during seasons 2013-2015. The team played in U20 Finnish national league. Team’s home town Lahti is located in southern Finland. Club has also men’s team in Finnish elite level. Pelicans organization co-operates closely with Mestis-level (second highest league in Finland) team Peliitat, Men’s team Peliitat plays in Heinola which is situated 30km from Lahti. In U20 team there were players playing men’s games either in Lahti or Heinola. Some players even played U18 games in Pelicans’ organization. Some of the players represented also junior national teams in tournaments

or even in World Championships. At the same time almost every player was studying or working daily. Some players were doing their military service during the season. Some lived by themselves and some still with the families. It was a real challenge to combine all these facts so that continuous development could be possible.

4.1 Perceived stress rating tool

The Perceived Stress Rating Tool (figure 5) was utilized through two seasons in a row. The rating tool highlighted the players, who were under- or overtraining. Also valuable information from psychosocial stressors were discovered. Because of different type of stressors the rating tool was not used always the same way. Still it was simple and quick tool for increasing athlete and coach awareness of current matters behind the performance. Coach highlighted the considerable values with green, blue or red colors (figure 5).

Scouts and possible future employers are present in and evaluating game performances. Games are also the most stressful sports situations during the young athlete's week. In season 2013-2014 team played overall 70 games. During 2014-2015 team played 59 games. Difference is explained by the bigger amount of play-off games during season 2013-2014. In regular season all teams play between September and February 48 games. Games were played both weekdays and weekends. Play-offs start at February and the season is finally over latest at the late March. Pre-season games took a place in early August and were played during weekdays.

Continuous development, especially at young ages, takes place mostly in practices. At the team level Pelicans started pre-season in 2013 and 2014 at the middle of April. In both seasons team practiced around 250 times together. The amount of practices include both morning on-ice practices during academic year and on-ice evening practices during season. The practice amount also includes separate physical exercises in early June. During summertime players had five weeks long individual practice period. Team came back together and started on-ice practices late July. Physical off-ice exercises run daily throughout the calendar year. The physical conditioning periodization was individual for every player, and it was done together with the players. Periodization followed as well the phases of the hockey season as time periods in school (for example the exam weeks). Periodization was mirrored constantly to perceived stress rating tool's overall value.

Average U20 player in Finland is in the cross-road of life options. Behind are already several years of investment for athletic lifestyle and ahead are studies and selecting a

profession. At the same time players are often moving from childhood home to their own - alone or with someone else (friend or partner). The players are not professionals so they are involved in education system or working life. Incomes are not regular and sources for money are various (parents, club, employer, social security). Because of the various and totally individual aspects for psychosocial stress the evaluation number was also used as a discussion opener with the players of high value ratings. For the player it was often easier to scale himself four or five than come straight to a coach to talk for personal issues. But when coach came to a player to talk with issues behind high mental status number, conversation was usually easier to start.

Fatigue, injuries and infections were evaluated and monitored weekly. Scale from zero to five was accurate enough for getting the information from players. In state of health the rating tool was only part of actions taken to help the players. Highly rated players could easily be advised to further investigations to a physiotherapist, masseur or a doctor. Player could rate himself high (four or five) for multiple reasons. Adjusting physical stress according the health state rating was important in everyday life. For example the upper respiratory infections were often issues that the players didn't take serious by themselves. Still those symptoms effected the performance and recovery. The rating tool was the key to increase discussion between players and coach. Tool together with discussion also increased player's self-knowledge of facts that effect the performance.

Pelicans U20 2013-2014		Stress rating tool				
		Scale 0-5: 0=no activity, 1=minor activity, 2=some stress				
		3=stress but recovery ok, 4=accumulating stress, 5=extremely stress				
Week 33						
Player	Games	On ice exercise	Physical exercise	Psychosocial stress	State of health	Overall stress
Player 1	0	2	3	1	0	6
Player 2						0
Player 3						0
Player 4	3	3	3	1	1	11
Player 5						0
Player 6	0	2	3	1	2	8
Player 7	3	2	3,5	2	1	11,5
Player 8						0
Player 9	4	2	2	0	1	9
Player 10	3	3	2	3,5	3	14,5
Player 11	0	3	2	1	2	8
Player 12						0
Player 13						0
Player 14	0	1	2	2	2	7
Player 15	4	3	3	2	4	16
Player 16	3	3	3	1	3	13
Player 17						0
Player 18	1	3	3	3	2	12
Player 19	4	2	3	4	2,5	15,5
Player 20	0	3	4	2	2	11
Player 21	3	3	3	2	2	13
Player 22	2	3	3	1	1	10
Player 23	3	3	2	0	0	8
Player 24	1	3	3	4	1	12
Player 25	4	3	3	4	2	16
Player 26	2	2,5	3	1	4	12,5
Player 27	0	0	0	4	5	9
Player 28						0
Player 29	2	3	3	3	3	14
Player 30	2	2	3	1	3	11
Player 31	4	4	2	3	1	14
Player 32	4	4	2	3	1	14
Player 33	3	3	3	3	0	12

Figure 5. Perceived stress rating tool.

Green overall value was pointing out decreasing value from over twelve to fewer than twelve. Red color meant accumulating stress in different subscales or over twelve -value in overall stress. Details from twelve as overall stress value are further reported more closely. Blue color was notice for strict following to monitor if the overall value was either increasing or decreasing.

4.1.1 Scale and criteria

Players evaluated themselves after the last performance of every week. Evaluation was done in five different categories. Categories arose from the players' operational environment and were selected by the coach. Physical stress, stress in games and exercises were all important to follow individual. Rating games and exercises separately was important because of different amount of events (players were involved in several different teams). Individual physical exercise planning (periodization) was cause for rating physical stress separately. To help the player to stay focused on ice hockey they had to

also evaluate the psychosocial stress. Category included all mental challenging situations (work, school, relationship, game performance etc.) that players faced in their lives. State of health was important to follow because it has impact for all other categories. If body already is in stress the capacity for external influences has decreased. Evaluation scale in all five categories was from zero to five.

Scale	Criteria
0	No activity
1	Minor activity
2	Some stress
3	Stress but recovery
4	Accumulating stress
5	Extremely stress

Figure 6. Rating tool scale and criteria.

Coach submitted ratings on computer and monitored values together with players. Originally the intention was to follow all categories separate and react for accumulating stress in each category. This became quickly impossible. Player suffered for example extremely stress already in U20 team games and was still called up to play for men's team. Then the physical stress in on-ice and physical exercises had to keep very low to balance high load. With only limited amount of players this separate category balancing could be possible but when the amount of players arose over 30 the ratings became time consuming to monitor. The idea from summarizing all values together for balancing overall stress was lot quicker and simpler to monitor. Maintaining the homeostasis in life became also the author's philosophy. Tool indicated already after a few weeks in use that overall value (homeostasis) should be near twelve to ensure continuous development. That was pointed out from players' performance in exercises and games. Improving physiological test values also supported the statement. Good atmosphere in the team and high team cohesiveness also pointed out that players stress and recovery were in balance. Idea behind remaining good mood despite of minor set-backs in life is that resisting extra stress is possible if life is in homeostasis. This evaluation was based on team staff's subjective evaluation and observations. Author will report more detailed overview from these later in findings.

4.1.2 Utilising collected information weekly level

Players filled in their ratings either after the last performance of the week or latest on Monday morning. Coach submitted ratings on computer and checked every player's ratings during Monday. Monday was also the day when player's state of health in every

team (men's elite team, Peliitat U20 and U18) was monitored. After the medical evaluation all teams filled their rosters for upcoming week. Every U20 player had his own home team and he could maintain his career development plan despite of the team he played in upcoming week. The team where the player played the upcoming week had direct impact of his physical conditioning periodization. Based on previous week stress ratings and starting week schedule (games and exercises), the conditioning periodization was individually modified. Every week set own unpredictable problems for the periodization. Everything (schedules, teams, traveling, exercises, school, working, health and stress) was connected together and coaching seemed to be more like coping in the chaos than planning everything in advantage. In this chaos the personal rating tool was extremely helpful for coach and athlete. Several problems which had effect the performance were solved based on the values rated on the tool. Because of increased self-knowledge, also the players could solve the exercise periodization problems by themselves and the effectiveness of daily exercises increased. Before the rating tool the players were more passive objects and they were daily waiting the training programs from coach. After the team started to use the tool the players became more independent and took more responsibility from their own training and development –they wanted to solve the problems for becoming better every day.

4.2 Methodology

Coaches and players weren't searching right or wrong, they were searching working ways and tools to use together. Team coaches' holistic approach to coaching process and the way evaluation tool was utilized proved the chosen method to be useful for team. The stress players experienced, was always individual. In Pelicans' case the variability of perceived stress was large. This was based on totally different game and exercise load, as well as different life situations where players were. Based on individual differences inside the team environment, analyses would not be generalized. This supports choosing qualitative method instead of quantitative method. The baseline in qualitative research is to make visible the real life actions. The idea of this is diversity of life. In qualitative research drive is to examine target as holistic as possible. Results are conditional explanations limited certain place and time. The aim is to find or discover facts more than verify already existing matters. (Hirsjärvi, Remes & Sajavaara 1997, 157.)

Author uses selective coding method for presenting information from rating tool data. This signifies that author selects core categories out from data in order to form the grounded theory. Through selective coding, core categories are the lenses through which a "story" can be told. The process involves a number of stages that make visible the psychosocial

processes going on among individuals and/or group of people. One of the key features in grounded theory is theoretical sampling. Sampling helps to make theory more general. This is achieved by seeking to minimize and maximize the selected differences and similarities between core categories and the relationships between them across case. To find strong similarities across categories helps to build confidence in the emerging theory. Attempting to find categories that contradict the theory may help to locate unexpected data and perhaps the emergence of new perspectives. (Gray 2009, 508-509.)

4.2.1 Case study

Studied object is specific, limited and unique. There would not be the exact same situation or people ever again. In that sense forming universal theory based on this data and analyses will not be possible. Instead of that the thesis will present perspectives and knowledge to consider similar situations. Also the tool used in this case is possible to modify in the available situations in the future.

Argument behind case study is that understanding human activity requires analyses both it's development over time, and the environment and context which the activity occurs. Case studies are used to gain this holistic understanding of a set of issues, and how they relate to a particular organism. These issues are often researched using a variety of methods, including experimental methods, over and extend period of time. (Gratton & Jones 2010, 107.)

4.2.2 Grounded theory

Data collection process was done during authors working period 2013-2015 in Pelicans U20 team. Data was analyzed on weekly level in co-operation with other staff and the player's. Utilizing information on the benefit of young player's continuous development was also done during the working period. Further analyses have been done afterwards for coaches' education and for this thesis.

Grounded theory has been defined as discovering, developing and provisionally verifying through systematic data collection and analysis of data pertaining to that phenomenon. Unlike the deductive approach, grounded theory does not begin with prior assumptions, hypotheses, research questions or literature underpinning the study. New theoretical positions or understanding may emerge through data. In grounded theory the researcher

works with participants constructing actively the data to get beyond analysis multiple layers of meanings. (Gray 2009, 502.)

4.3 Findings

In this chapter author will present different case examples which will concretize theories of overall stress and recovery. Through those examples also the hypothesis of homeostasis in life will strengthen. The body and mind connection will be presented through interesting cases.

4.3.1 Overall value and continuous development

When analyzing more depth the players number 20 and 32 (in rating tool roster) it is identified that during the season 2013-2014 number 20 had average weekly overall stress value 11,2 and number 32 had average value 12,5. Both players had continuous development graph pointing up all the time and they started the season 2014-2015 in Pelicans men's team roster. U20 team started to use the rating tool early August (week 33) in 2013. Because of that the first physical test diary in figure 7 has been selected from that time. Next diary in the same figure has been selected from the last days in 2013. At spring 2014 both players were in men's team and did different physical tests so it is impossible to compare those results to previous ones. The meaning of this selection in figure 7 is to point out that weekly overall stress value near twelve predicts continuous development. In figure the green color means improvement, orange the same result and red means decreased result. Although there are some red results the overall graph of the player's development was still pointing up.

PELICANS U20 2013-2014									Date	30.7.2013
Roster	Sit up	Push up	Chin up	5-jump	1-leg squat		Speed endurance			
					left	right	1.	2.	3.	
Player 20	41	45	14	13,35	16	20	53,18	54,84	55,41	
Player 32	42	38	9	13,4	26	30	52,93	54,82	58,86	
PELICANS U20 2013-2014									Date	29.-30.12.2013
Roster	Sit up	Push up	Chin up	5-jump	1-leg squat		Speed endurance			
					left	right	1.	2.	3.	
Player 20	43	41	18	13,1	12	14	52,6	54,24	54,66	
Player 32	41	40	12	13,4	31	30	52,26	52,41	56,44	

Figure 7. Selected physical test results from two players.

Few other notable examples present also from the same players. Player number 32 is one year younger than player number 20 and he had also several years less quality physical training behind than player 20. Player 32 had in the beginning of autumn 2013 five weeks (weeks 36-40 in yearly calendar) rather high overall stress values (13.5, 13.5, 16.5, 14.5 and 12). Because of poor training history and younger age coach monitored the overall stress rate very strictly with this player. Team had almost full roster of players and it was possible to put player aside from the roster. Conditioning coach presented the values to head coach and suggested assessment that risk for disease or injury was high because of the several week's high state of physical stress. Long discussion followed and based on that the player was actually sent home to rest for a weekend. After the full recovery the overall values drop back down to 11 and stayed at 10.5 also week after that. Diseases and injuries were avoided and player could continue practicing and playing at full effort afterwards. Player number 20 is a great example from the player who gives full effort every day no matter was it practice day or game day. He was present in practices and games every week during the season 2013-2014. Actually he played all 48 regular season games and all 12 play-off games during the season. To be able to give full effort every day, the state of health has to be good all the time. Player 20 has rated his state of health only three times number four (accumulating stress) during the whole season. He basically was not suffering long lasting diseases or injuries at all. His average weekly overall stress value during the season was 12.5.

On season 2013-2014 the amount of injuries stayed very low. In this case the author himself was responsible for strength and conditioning coaching and rehabilitation in the team. Author has two previous experiences from same age category teams and their strength and conditioning programming. Even there is no statistics of injuries available author's statement is worth noticing because of his history in coaching. Compared to previous experiences in Pelicans U20 the repetitive strain injury amount was lower than other teams. During the whole season there existed only three lower body injuries which might consider repetitive strain injuries. With different training or programming it could have been possible to have positive impact also on existence of those injuries. All other injuries were trauma based and arose mostly from game situations. The biggest difference between the experienced teams was that in Pelicans U20 the overall stress was monitored and based on that the changes to periodization were made. Straight comparing between the different teams is not possible because the players are not the same and there is a plenty of other variables during the season. Because of great amount of similarities this still allows to make an assumption that homeostasis in life has impact on avoiding repetitive strain injuries. At the same time the physical test results got better

during the season which presents that homeostasis in life will still allow the continuous development in athlete's career.

4.3.2 Need for holistic perspective

Although the rating tool was helpful, it wasn't solid in every case. Player number 26 is example of the importance of holistic perspective. During the autumn 2013 he was playing his second year in U20 team, performing his practical training in restaurant, living his own and having a girlfriend in a different city. As a person player 26 is pedantic and conscientious performer and that is the way he tried to operate his life in the middle of various demands. After less than two months from the beginning of late summer he was already burnt out. First came the high psychosocial stress and after two weeks player and coaches decided together that player should rest from team events two weeks. Two weeks extended one more week before the player was back in roster. During this three week's period the player still didn't rest from school because the physical load was not accumulating before the break from the team. However he had more time to visit in parent's home and time to spend with his girlfriend. When the player was back in roster everything seemed to be alright. First month after the break coach and player managed to balance with stress and recovery. On the second month the stress started to accumulate despite of all changes done for example in the periodization and lifestyle. This phase lasted one month and then the player totally broke down.

Week	Player	Games	On ice exercise	Physical exercise	Psychosocial stress	State of health	Overall stress
33	Player 26	2	2,5	3	1	4	12,5
34	Player 26	2	3	2	1	1	9
35	Player 26	2	3	3	3	2	13
36	Player 26	0	1	1	5	3,5	10,5
37	Player 26	2	2	3	5	2	14
38	Player 26						0
39	Player 26						0
40	Player 26						0
41	Player 26	1	2	2	2	1	8
42	Player 26	3	3	3	3	1	13
43	Player 26	0	2	3	3	1	9
44	Player 26	3	2	4	3	0	12
45	Player 26	0	3	4	4	2	13
46	Player 26	2	3	3	3	2	13
47	Player 26	2	3	3	3	1	12
48	Player 26	0	3,5	4	4	3	14,5
49	Player 26						0
50	Player 26						0

Figure 8. Case example from the importance of holistic perspective.

This case example can't be named the "staleness syndrome" but lot of similarities there still is. Pelicans Men's team had Omegawave –system in use and U20 team players had also change to use it in special cases. During that 16 week period the player was several

times able to use omegawave –measurement. Omegawave is based on heart rate variation and analyses the state of sympathetic and parasympathetic nervous systems. Omegawave analysis correlated well with player’s perceived evaluation and weekly overall stress value. The sympathetic nervous system activity was elevated but not alarmingly high. The origin of the state where the player ended up is still mystery. Doctors, coaches and player himself have afterwards named some aspects which have had impact on the physiological state player is suffering. Those effectors are player’s personality-type, weekly under-recovery and thyroid insufficiency. Since that player has searched help from different doctors and medical specialists but still after three year’s he has physiological symptoms and is unable to work or study.

4.3.3 Surrendering

Through following two case examples the author describes how body and mind are connected and that should be the fundamental in stress and recovery evaluation. At season 2013-2014 player number 24 was playing his last season in U20 team (next season he was going to be over aged in U20 team). From the first week of 2014 his spot in roster was dependent about the amount of healthy forwards in rosters. First five weeks player rated his psychosocial stress by high numbers. Coach asked the reason for high ratings and player admitted it was the spot in roster. After sixth week he rated the same scale only by number two. At the same time his effort on practices decreased dramatically. Coach did intervention again at the start of seventh week but it was already too late for getting the player fight again for his spot. On that same week the player already became sick. In this case coach and the player both knew what was going on but the support for the player was either wrong kind or too short. So basically what happened was that first he was willing to fight for his spot in roster and after five weeks battle the mind gave up. He was still present in practices but lost his effort in there because the mindset was already surrendered. When parasympathetic nervous system wasn’t active anymore the body also gave up on disease.

When the play-offs started at the season 2013-2014 player number four was waiting his turn to play. He started the play-offs as a backup goalie. At that time he rated his psychosocial stress as numbers 0 and 1 (two weeks period). When he finally got his chance to play the pressure was too high for him. On one away game where he was playing he injured “dramatically”. One on one straight attack came towards own net and own defender prevented opponent scoring by dragging the opponent down. Both players glided towards the goalie and he stayed down on the ice after the bump. The doctor and trolleys were needed to get the goalie off from the ice. At the locker room doctor had to cut

the gears off because the goalie was such in pain and assumption was that he would have severe injury. After the game became clear that goalie had only contusion on the arm despite of all drama. After that week goalie rated his psychosocial stress as number four and state of health as number 0 (no activity). After that incident there was no way the team could trust the goalie anymore and coaches couldn't put him on the net again. High psychosocial stress had far reaching consequences for the whole athlete career. On following season 2014-2015 the goalie played anymore U20 Mestis (lower level compared the previous season) and on season 2015-2016 he played only in men's third and fourth divisions.

4.3.4 Utilising rating tool on different seasons

The Perceived Stress Rating Tool for Pelicans U20 team arose from the need to control at least somehow the overall stress load the young athletes are facing every day. Pelicans U20 started to use the rating tool on week 33 at the season 2013-2014. First few weeks took in place to familiarize the tool for the players and find the right way for coaches to use it. It became clear very quickly that the information what was possible to get out from the data, the tool produced was valuable and beneficial. In U20 team the players already did the individual physical conditioning periodization together with the coach. The rating tool was a very good way to get them even more involved and support the ownership of the player's. Now they also had a chance to have impact on their weekly planning and connect it to their plan inside the mesosycle (several weeks' period).

Below are some of the facts which were connected to the holistic view that was the cornerstone of the team coaching staff. The organization did not put any pressure for the team success because the U20 team only task was to produce qualified players for the men's team. The injured player's amount in whole organization and co-operative Peliitat-team was low during the season 2013-2014. Those are the key facts which had impact on the way the rating tool information was utilized for balancing stress and recovery. Because of the low amount of injuries on season 2013-2014 it was possible to put players aside from the roster just to give them rest during a period were the stress load was heavy. No matter who the player was, top scorer or fourth line grinder, when the stress was getting too high or lasting too long, the player could be helped for programming the schedule again or putting the player aside for recovery. Utilizing the rating tool weekly and leaning systematically on the information the tool produced, actually increased players' trust and willingness to take care of being active on using the tool –positive spin existed.

On season 2014-2015 the main difference was the amount of injuries in both men's teams (Pelicans and Peliitat). When Pelicans men's team lost players for injury, they filled their roster from Peliitat or U20 team. When Peliitat lost players, either for injury or filling Pelicans' roster, they filled their roster from U20 team. For Pelicans U20 team this practically meant that their roster was always incomplete. This on the other hand forced Pelicans U20 team to use players, who were already having accumulating stress load or who weren't fully recovered from for example upper respiratory infections. Coaches faced the situation that they were not able to react for rating tool's information weekly level. Players on the other hand started sometimes to see the whole rating tool pointless because the information wasn't used the same way than previous season. That led to situation that coaches had to more often remind players to fill in the ratings –negative vicious circle was born. Still the tool wasn't worthless and team got out the same amount of data than earlier. Two season's longitudinal collection of data presents multiple experiences and assumptions to use in future coaching.

5 Discussion

For presenting this kind of case the qualitative method is right choice. All stories are unique and there would not be the same situations or persons ever again. The whole case (perceived stress rating tool) arose from Pelicans U20 coaching staff's holistic coaching philosophy. Utilized methods could be modified and used also in the future. The Perceived Stress Rating Tool was invented for helping daily performing. There were no prior assumptions. The assumptions and factual connection of different scales arose afterwards. The idea behind grounded theory is to verify through systematic data collection discovered and developed phenomena. Researcher has also worked with participants constructing actively the data to get beyond analysis multiple layers of meanings. Theoretical sampling is another cornerstone in grounded theory. Through sampling author was able to present the perspectives that are connecting the existing theory base and practical implementation. The rating tool and the way how to utilize it were both under critical evaluation. Critics were faced in some player cases and in comparing the utilization of tool in different seasons. Despite of critics the rating tool still remains on more positive consequences than negative aspects. The chosen methods and theory base have been proved to be right by connecting successfully concrete case examples and theoretical framework.

5.1 Conclusion and future suggestions

To remain the homeostasis in life is crucial. In homeostasis person is able to survive from external or internal stressors. Background for understanding the homeostasis in life arises from stress and recovery. One has to first understand external and internal stressors in different environments. As important is to understand various recovery manners. Balancing between these two aspects in life is already greater challenge. For coach it is tough to combine player's individual qualities, their physical periodization, team's games and every player's life. This gets even harder in team sports where the amount of people expands. Same process has to be done with 20-40 players. This is something where simple tools are needed for help.

Even the perceived rating tool was very good for increasing the self-knowledge of the young player's, it still had some limitations. Tool didn't take into consideration different personalities and the effect of that on the ratings. For example those players who were responsible and pedantic could think their stress level lower than the ones who were more careless. To help to understand these differences a good interaction between player and coach should be accomplished. Interaction is helping both to recognize early enough the

upcoming challenges in balancing stress and recovery. By utilizing rating tool the amount of interaction increase and the interventions in challenging situations would be quicker. Weekly rating and evaluation could definitely be changed of daily or periods of only few days. That would easily be possible with the newest mobile applications or just trusting players even more. Self-aware young athletes could actually rate and evaluate their ratings mostly by themselves. Idea in future coaching should aim raising self-aware athletes who would be responsible for their own career.

Some modification of stress and recovery rating should include to every coaching process. There already exist multiple different methods and devices for monitoring stress and recovery balance. The amount of quality low-cost mobile applications is for example increasing rapidly. Athlete's perceived ratings should not also be underestimated as a tool to use in coaching process. How to utilize the chosen method for successful development defines still more than the chosen method itself.

As a result in the future studies author hopes simple advices for combining different stress levels and stressors to different type of performances. For coaches and athletes would be helpful to check from for example table that certain stress level allows perform following practices.

5.2 Thesis writing process

It has been clear already after the season 2013-2014 that this is the topic the author wants to present to the wider audience. At first it might have been the tool itself that has been worth of presenting but at least today it's not the invented rating tool but the whole holistic philosophy of homeostasis in life. This actually became clear during the writing process and it was very much same what happened when utilizing the rating tool at the autumn 2013. Then the overall stress value became more and more important even the original idea was to control the separate areas of athletes' operational environment. The philosophy of homeostasis in life has become all the time clearer. This was actually the reason for author to ask to be committed for current job as a player development coach in one Finnish ice hockey club. The employer is willing to foster the same kind of philosophy throughout the junior hockey teams. Work with younger (U13) hockey players strengthens every day the idea for being your best every single day actually makes the difference between the players who will success. On the contrary, writing thesis from the same issue, gives good background for analyzing daily work in team environment as well as educating other coaches for understanding and taking into consideration these same topics.

All past experiences were clear in author's own mind but the challenge was to put all that in form which allows also same information to others. Author's own personality and the way to express himself has often been more "read between the lines" or "mystery" –type, but through this writing and explaining process the own ability to provide an explanation for different matters has developed. Through process also all the player cases and examples have got the clear form and they have been introduced in logical order. For the author the big picture is clearer and the know-how of the topic has deepened while searching material and writing the theoretical framework.

It has been quite a challenge to work in ice hockey full time (during season six days a week) and writing thesis at the same time. That experience has underlined the importance of homeostasis also in author's personal life. Simultaneous extra hours in work and reduced leisure time because of writing thesis have both driven the author to accumulating stress. One free day inside the working week isn't any more enough for recovery. After finishing thesis the stress load decreases but because of the six days in week working the total recovery is possible only after four weeks –during the Christmas time.

References

Cox, R.H., Sport Psychology: Concepts and Applications, 2002, McGraw-Hill, Inc., 1221 Avenue of the Americas, New York.

Duodecim 20 / 2000. Stressin elinjärjestelmien mittaaminen (Measuring stress in organic systems). URL:

http://duodecimlehti.fi/web/guest/arkisto?p_auth=vdLOdGe3&p_p_id=Article_WAR_DL6_Articleportlet&p_p_lifecycle=1&p_p_state=maximized&p_p_mode=view&_Article_WAR_DL6_Articleportlet_viewType=viewArticle&_Article_WAR_DL6_Articleportlet_tunnus=duo91828&_Article_WAR_DL6_Articleportlet_p_frompage=uusinnumero

Accessed: 10th of October 2016.

Firstbeat Technologies 2009. Heart Beat Based Recovery Analysis for Athletic Training.

URL:

https://www.firstbeat.com/app/uploads/2015/10/Recovery-white-paper_15.6.20153.pdf

Accessed: 28th of October 2016.

Gratton, C. & Jones, I. 2010. Research methods for sports studies. 2nd ed. MPG Books Group. UK.

Gray, David E. 2009. Doing Research in the Real World. 2nd ed. Sage Publications. Cornwall.

Hakkarainen Harri, Jaakkola Timo, Kalaja Sami, Lämsä Jari, Nikander Antti, Riski Jarmo, 2009. Lasten ja nuorten urheiluvallmennuksen perusteet (The basics of coaching children and adolescents). VK- Kustannus Oy. Lahti.

Halson, Shona L. 2014. Monitoring Training Load to Understand Fatigue in Athletes. Sports Med 2014; 44 (Suppl 2): 139-147.

Hausswirth, C. & Mujika, I. 2013. Recovery for performance in sports. Human Kinetics. United States of America.

Hirsjärvi, S., Remes, P. & Sajavaara, P. 2007. Tutki ja kirjoita (Search and write). 13. painos (13th ed.). Otavan kirjapaino. Keuruu.

Kellman, M. 2010. Preventing overtraining in athletes in high-intensity sports and stress/recovery monitoring. *Scandinavian Journal of Medicine and Science in Sports* 2010; 20:95-102.

Kenney, W. Larry, Wilmore Jack H., Costill David L. 2015. *Physiology of Sport and Exercise*. 6th ed. Human Kinetics. United States of America.

Kenttä, G., Hassmén P. 1998. Overtraining and Recovery – A Conceptual Model. *Sports Med* 1998 July; 26:1-16.

Kieley, J. 2016. A New Understanding of Stress and the Implications for Our Cultural Training Paradigm. URL:
https://www.researchgate.net/publication/296060661_Essay_A_New_Understanding_of_Stress_and_the_Implications_for_Our_Cultural_Training_Paradigm
Accessed: 28th of October 2016.

Koho, V. & Luukkainen, S. 2012. *Jääkiekon Ytimessä –lajitietoa harrastajille ja ammattilaisille* (In the heart of ice hockey –knowledge to participants and professionals). UNIPress.

Laaksonen, A. 2011. *Jääkiekon lajiansalyysi ja valmennuksen ohjelmointi* (Ice hockey analysis and programming the coaching), Jyväskylän Yliopiston Valmennuksen jatkokurssi 2, lopputyö (2nd Follow-up course of coaching in University of Jyväskylä, degree work).

Lampinen Kyösti , Forsman Hannele. 2008. *Laatua käytännön valmennukseen* (The Quality of practical coaching). VK- Kustannus Oy, Lahti.

Mero, A., Nummela, A. & Keskinen, K. 1997. *Nykyaikainen urheiluvalmennus* (Modern Coaching). 527-544, Gummerus Kirjapaino Oy, Jyväskylä.

Pärkkä, J. 2011. *Analysis of Personal Health Monitoring Data for Physical Activity Recognition and Assessment of Energy Expenditure, Mental Load and Stress*. VTT Technical Research Centre of Finland.

Savolainen, K. 4.9.2008. Unpublished education material. HAAGA-HELIA University of Applied Sciences. Degree Program in Sport and Leisure Management.

Summanen, R., Westerlund, E. 2000. Todellista sykettä jääkiekkoon (The Real Beat into Ice Hockey). Polar Electro Oy. Suomi.

Twist, P. 2007. Complete Conditioning for Hockey. Human Kinetics. United States of America.

Westerlund, T. 2015. Stress and recovery of players in Kontinental Hockey League. HAAGA-HELIA University of Applied Sciences. Degree Program in Sport and Leisure Management.