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THERAPEUTICAL EXERCISES BASED ON FINDINGS FROM KINESIOLOGICAL ANALYSIS

Knowhow for floorball A-juniors and their coaches

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LIND, KAISA:
Terapeuttiset harjoitteet perustuen kinesiologisten analyysien tuloksiin
Tietotaitoa salibandyn A-junioreille sekä heidän valmentajilleen

Fysioterapian opinnäytetyö 74 sivua, 4 liitesivua

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TIIVISTELMÄ

Tämä opinnäytetyö perustui salibandypelaajien toiminnallisiin anatomisiin ongelmiin ja terapeuttisiin harjoituksiin, jotka kompensoivat ja ennaltaehkäisevät kyseisistä ongelmista johtuvia urheiluvammoja. Pelaajien kinesiologinen analyysi sisälsi niin sanotun ryhtianalyysin, lihastestausta sekä tasapainotestin keskittyen lihasepätasapainoon, –lyhyyksiin, ylirasituksiin ja lihasheikkouksiin sekä toiminnallisiin ongelmiin. Lajispesifiset terapeuttiset harjoitteet suunniteltiin yksilöllisesti vastaamaan analyysien tuloksia, mutta perustuivat lähinnä proprioseptiikan ja tasapainon parantamiseen. Pelaajien analysointi ja suositellut harjoitteet perustuvat kliinisiin kokemuksiin urheiluseura Tatran Střešovicessä (Praha, Tsekki) vaihtovuoden aikana suoritetusta työharjoittelusta. Opinnäytetyö tehtiin yhteistyössä nuoria urheilijoita kartoittavan tsekkiläisen Nicneboli.cz –projektin kanssa, joka oli osa työharjoittelua. Analysoidut pelaajat olivat kahden suomalaisen salibandyseuran A-junioreita.

Rekisteröityneiden pelaajien määrän perusteella salibandy on kasvanut toiseksi suosituimmaksi joukkuelajiksi niin Tsekeissä kuin Suomessakin ja etenkin jälkimmäisen menestys kansainvälisissä kilpailuissa on parempaa kuin missään muussa joukkuepalloilulajissa. Salibandyä koskien Suomessa on kuitenkin tehty akateemisia tutkimuksia suhteellisen vähän. Syvän katsauksen luomiseksi, käytettiin toiminnallisen opinnäytetyön tutkimuksellisessa osassa laadullista tutkimusta ja sisällönanalyysiä tiedon analysoimisessa sekä kokoamisessa.

Opinnäytetyön tavoite oli tuottaa yleistä tietoa toiminnallisista ongelmista, jotka johtuvat salibandyn peliasennosta, –puolesta ja pelinomaisesta liikkeestä. Opinnäytetyöllä haluttiin tuottaa valmentajille ja pelaajille helppoja, loukkaantumisia ennaltaehkäiseviä terapeuttisia harjoituksia löydettyjä ongelmia vastaan.

Tulokset osoittivat, että peliasento ja –puoli johtavat tiettyihin lihasepätasapainoihin sekä ryhtimuutoksiin, jotka ovat näkyvissä jo junioripelaajilla. Huomioiden yleisimmät salibandyvammat, on merkittävää, kuinka yleisiä esimerkiksi polven ja nilkan epästabiliteetti ja virheasennot olivat. Tarve tämänkaltaisille pelaajakartoituksille ja juniorijoukkueiden valmentajien kouluttamiselle on välttämätöntä, jotta ehkäistäisiin kasvavien urheilijoiden tulevaisuuden terveysongelmia.

Avainsanat: salibandy, juniorit, kinesiologia, peliasento, kätisyys, terapeuttinen harjoittelu

Lahti University of Applied Sciences
Degree Programme in Physiotherapy

LIND, KAISA:
Therapeutical exercises based on findings from kinesiological analysis
Knowhow for floorball A-juniors and their coaches

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ABSTRACT

The bachelor's thesis was based on functional anatomical problems encountered in floorball players and on therapeutical exercises to compensate and prevent injuries resulting from these problems. The kinesiological analysis of players included so-called postural analysis, muscle testing and balance test concentrating on the muscle imbalances, shortness, overload and weakness and functional anatomical problems. The sport-specific therapeutical exercises were individually planned to meet the results from each of the analysis, but were mostly based on improving proprioception and balance. Both the analysing of the players and the recommended exercises were after clinical experiences from clinical practice in sports club Tatran Střešovice during an exchange year in Prague, the Czech Republic. The thesis was carried out in cooperation with Czech Nicneboli.cz –project of monitoring young sportsmen, which was part of the clinical practice. The analysed players were A-juniors from two Finnish floorball clubs.

Floorball has grown into second most popular team sport by number of registered players in both the Czech Republic and Finland and success in all international competitions especially in the latter country is better than in any other team ball sports. However, floorball has been the subject of academic researches relatively little in Finland. To provide a deep overview into the subject, qualitative research method and content analysis were used to analyse and gather the information for the functional thesis.

The aim of the thesis was to provide general information about the functional anatomical problems resulting from playing posture, laterality and playing movement. The thesis also aimed to provide coaches and players with easy therapeutical exercises as injury-preventive against these found problems.

The results showed that playing posture and laterality lead into certain muscle imbalances and postural changes, which can be seen already in junior floorball players. Taking into account the most common floorball injuries, it is alerting how common for example knee and ankle instability and faulty postures were. The need for this kind of monitoring of players and educating junior team coaches is essential to prevent further health problems of the growing athletes.

Key words: floorball, juniors, kinesiology, playing posture, laterality, therapeutical exercises

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1 FOREWORD

During its relatively short history, floorball has grown into the second most popular team sport by number of registered players in Finland as well as in the Czech Republic. In both countries floorball already attracts more junior players than traditionally popular ice hockey, being second to only football. Finland and the Czech Republic (together with Sweden and Switzerland) are considered as the ”big four” of floorball, but so far the Czech national team success has been modest compared to that of Finland who are reigning world champions in men and boys under 19.

In Finland there are altogether around 46 000 registered players, of which U19 boys make up to 19 500 – slightly more than men (IFF 2011). Even though floorball has grown to be such a popular sport, it has been the subject of academic research relatively little especially in Finland. Most of the previous studies are created from the point of view of demands of the sport, its physical training and common injuries. There is no research concerning the effects of playing posture, laterality and playing movement on the muscles and other body structures, but clinical experiences show that they may be significant and predisposing to injuries.

The now 3-year-old Nicneboli.cz –project was founded in order to create a concept for monitoring overall health state of young athletes. The student was fortunate enough to participate in the project as her clinical practice during a Czech exchange year and thus got an opportunity to carry out the thesis with them. The thesis gives the Czech physiotherapists a view of the Finnish floorball field and provides information about how knowledge of the coaches and different training routines in both countries affect the anatomical stereotypes of the players. Finnish physiotherapists, especially in the sports field, are likely to benefit from the research results and the examples of sport-specific exercises. This kind of monitoring of young players and realising the importance of injury prevention and compensatory exercises is important for their future careers. The thesis also gives junior coaches some tools to take these things into account in their training routines.

The year abroad provided the student with a lot of clinical experience with young athletes through monitoring, exercising and rehabilitation. Since physiotherapy does not have such a strong position in floorball fields yet or in sports in Finland in general, it was felt that sharing the knowledge could help the Finnish youth coaches in their daily work with the junior-aged players. Floorball is ”the one” sport for the student, thus it was obvious to do something in relation with it, since there is so much unreleased potential in the junior players and possibilities to improve and hone the training routines.

Due to the lack of previous research and thanks to used examination methods being Czech, the theory is mainly based on Czech publications, but also on silent information from clinical practices and own floorball experiences. The practice-based thesis includes a qualitative research done by the research patterns from the Czech cooperative project and examples of recommended therapeutical exercises. The outcome of the thesis (results from analyses and exercises) are most beneficial when considered together, but may also be used separately. The aim of the research is to point out the most common functional anatomical problems in floorball juniors and deepen the knowledge of both players and coaches about the problems brought by the playing posture, laterality and playing movement.

2 IMPORTANCE AND AIM OF THESIS

Due to the playing posture and laterality, certain muscle imbalances and postural changes can be seen already in junior floorball players, which reminds about the importance of diverse sport experiences and compensatory exercises in the youth. Also structural problems increase injury risk, thus keeping up muscle balances and taking into account the individual anatomical characteristics should be part of everyday training routines. Problems related to posture and muscle imbalances are easier to repair in the youth than in adulthood, since the earlier you start the preventive and compensatory exercises, the more effective the results are. These factors should be taken into account when already coaching the youngest juniors, but at the latest in A-category, since these are the last junior years of the players before moving up to adult categories. In adult categories the training routines and matches are on a totally different level concerning for example play hardness and quality and quantity of trainings.

Since there are no previous studies concerning the subject of the thesis on floorball in Finland, the wide goal of the thesis was to provide general and basic information. The need for floorball-related academical research is not yet realised at its fullest, even though it is a constantly growing and expanding relatively young sport and Finnish success in international competitions is better than in any other team ball sports. However, due to the young age of the sport, most juniors are not coached by professional trainers, but by ex-players, older juniors or someone’s parents, who naturally do not have the resources and knowledge to create diverse enough training. Therefore the need for this kind of monitoring of players and educating junior team coaches is essential to prevent further health problems of the growing athletes.

The importance of the thesis for physiotherapists is evident especially in the sports field. The kinesiological analysis is a ready examining pattern and the recommended exercises may bring new sport-specific ideas not only to training and rehabilitation of floorball players, but may be beneficial for other athletes too. The results can guide not only the coaches but also physiotherapists treating floorball players to focus on correct factors in training and rehabilitation and base clinical conclusions in sport-specific manners. The goal concerning developing the physiotherapy field was to present junior team coaches a new perspective of how players and coaching can benefit from the physiotherapeutic point of view. The cooperative project also benefitted from the thesis, thanks to receiving academical research based on their examination patterns and view to Finnish floorball.

All in all, the research problem and objective of the thesis cover the most common functional anatomical problems in floorball, which should be concerned in athletic development and training. The aim was also to create and present sport-specific exercises to address these problems. These two points were handled keeping in mind that the goal was to widen the knowledge of not only the coaches but also the junior players themselves.

3 DEMANDS OF FLOORBALL AS A SPORT

Floorball may be started as early as at the age of 6, when small players seem to be as tall as their sticks. The trainings at this age are all about having fun and enjoying experiencing the sport, but at the same time the coaches try to teach basics of ball control through simple exercises and play itself. The youngest players to have their own competitions organised by the national floorball federations are usually aged 7–8.

Floorball is a sport which emphasizes speed technique skills. The basic work for reaction speed and frequency type of movement should be done already with the youngest juniors, so that when puberty begins, focus can be transferred into developing speed technique and explosive speed strength (Kysel 2010, 130). Players aiming to the top should have their technique as ready as possible by the age of 12, when the sensitive period for sport-specific skills ends and these skills will be established (Korsman & Mustonen 2011, 169). However, it must be kept in mind that even though the sensitive period ends, it does not mean that the junior should concentrate to only one sport from this age forward.

Just like in other sports, the base for all sport-specific skills is motor coordination and skills, which include skills related to ball control and moving, as well as balance and coordination (Korsman & Mustonen 2011, 80). The sport-specific movement in floorball consists of quick turnovers of situation and thus quick changes of direction, which from the point of view of moving emphasizes the importance of balance and movement control.

3.1 Playing posture and playing side

As seen in the image on page 6 (IMAGE 1. Typical playing posture), the typical playing posture in floorball is low, forward leaning squatting position, where the centre of weight is moved in front of the body. According to Korsman and Mustonen (2011, 153) the angle for hip joint is created at 135° and for knee 120°. The horizontal movement is on flexed knees, which puts big stress on m. quadriceps femoris and at the same time results into the muscles of back thigh getting weaker and overstressing lower back muscles. Also m. triceps surae muscles are loaded from constant standing and moving on the toes, because the player needs to be alert for quick changes of direction and speed. When the center of weight lowers on flexed knees, the angle for ankle joint results into somewhat 80° (Korsman & Mustonen 2011, 153).

IMAGE 1. Typical playing posture.

The playing performance is not only about moving in the field, but also about ball handling skills and scoring. Ball control must be on a high level in order for the player to be able to concentrate on the quickly changing game situations and decision making (Korsman & Mustonen 2011, 77). The quick, soft movements of basic ball control and tricks involve mostly muscles of forearm and wrist, but it must be kept in mind that the activation of muscles is different in both hands due to the strong laterality. In stick handling the upper hand produces power through supination and lower through pronation of forearm and internal rotation of shoulder.

In general, Tomanec (2010, 28) specifies muscles used in ball control, passing and shooting as including mostly front part of deltoideus, m. biceps brachii, m. triceps brachii and muscles of the forearm. In the passing movement the muscles can be further defined as m. deltoideus, m. pectoralis major, m. triceps brachii, m. biceps brachii and supinator and pronator muscles of the forearm, also m. latissimus dorsi may be involved (Kytka 2012). The involvement of muscles depends on the hand (lower vs. upper), used passing technique and whether the pass is made by forehand or backhand. Shooting techniques can be roughly divided into wrist shots and swing shots depending on where the power mainly comes from.

When imagining the activation of muscles from a left-handed player's view (left hand lower, right hand higher), the muscles working in a wrist shot in right hand are rotator cuff, m. biceps brachii, m. brachialis and extensor and flexors of the wrist. M. deltoideus together with the rotator cuff, stabilisers of the scapula and m. latissimus dorsi work as a stabilator of the shoulder girdle throughout the movement. In lower hand, here in the left hand, m. triceps brachii makes the movement together with muscles stabilising the shoulder and scapulae. In comparison to the wrist shot, in swing shot the role of wrist flexors and extensors is far less significant. In addition to the shoulder and scapula stabilisers, m. deltoideus and m. pectoralis major activate in the upper hand during swing shot. (Kytka 2012.)

Control of the shoulder girdle is one of the main factors in keeping up the optimal playing posture and stick handling (Korsman & Mustonen 2011, 224). In relation to the effects of playing side, the dominant hand holds the stick higher, which affects not only strength and tightness of the arm and shoulder muscles, but also leads to opposite shoulder situating lower. This can be seen in the image on page 6 (IMAGE 1. Typical playing posture).

Playing side affects the imbalanced development of muscles, which can be seen especially in the abdominal and back muscles. Trunk rotation is an essential part of the shooting and to some extent also passing techniques, because it brings more power into the movement while balance is shifted forward onto the front leg. Thus insufficient or uneconomical activation of abdominal and back muscles will result into power escaping from the shooting (Korsman & Mustonen 2011, 84). Synergist pairs formed by mm. obliquus abdominis show muscle imbalances easily, since during the trunk rotation one muscle chain is constantly loaded more than the other. In a rotational movement to the right, right m. obliquus internus and left m. obliquus externus are activated, thus this chain may result stronger in left-handed players. The functional muscle chain on the backside of the body can be traced from m. tensor fasciae latae through m. gluteus maximus, m. quadratus lumborum and thoracolumbar fascia to m. latissimus dorsi and scapula stabilisers. The trunk rotation in the shooting techniques affects especially the unbalanced development and tightness of m. tensor fasciae latae, m. gluteus maximus and m. quadratus lumborum and thoracolumbar fascia. (Kytka 2012.)

Whereas the field players have specific requirements due to the stick handling and playing posture, goalkeepers have their own challenges needing to be mobile, agile and stable at the same time. The saving postures of goalkeepers vary individually, but the traditional kneeling position is basis for all of the variations. Typically the kneeling position is slightly wider than shoulder width and the weight is on the knees, on which the sideway movements are executed. The saving posture requires support of deep abdominal and back muscles, which is highlighted even more when the goalkeeper moves to make a save (Korsman & Mustonen 2011, 122). In addition to the endurance and speed strength abilities of lower extremities, the support of middle body is essential, because the reactions for saves have to have a stable base even though the saving positions themselves are unstable and dynamic. Overall, the naturalness of the posture is most important, since it must not complicate or disturb the saving movements and goalkeepers spend the whole game in it just occasionally getting up. (Korsman & Mustonen 2011, 120.)

3.2 Sport-specific movement

Floorball differs from many ball sports due to its characteristic movement, since field player’s performance consists mainly of quick starts, turns, twirls and decelerations rather than long stints, which would require more long-term endurance.

Due to these characteristics, floorball puts a big load especially on ankles and knees and muscles supporting them (Korsman & Mustonen 2011, 218).

During a floorball game player's heart rate moves on average between 150-170/min., naturally depending on the game situation and play position, but one change (for field players) lasts from 20 to 120 seconds (Tomanec 2010, 29). In order to maintain an optimal work output, one change should last from 30 to 50 seconds according to Korsman and Mustonen (2011, 150). In the highest leagues a match has three 20-minute-periods, where time is stopped always from referee's whistle and continued when the ball is put back into the game.

Due to the interval nature of movement, quick game speed and size of the play field (20x40m), training focuses on developing reaction speed, explosiveness, speed strength and speed endurance instead of long-term endurance and maximum strength and speed. Explosiveness has a centered role for field players especially in shoots and the first 3–5 accelerative steps and changes of direction, to which goalkeepers in turn need to know how to react by positioning and saves. Sport-specific speed needed in floorball is divided yet into movement speed and speed technique, from which especially the level of speed technique is essential. Speed technique reflects the ability of neuromuscular system to work fast and appropriately. Its importance is emphasized, since a floorball player needs to control not only the ball, but also the opponent and tactics in quickly changing game situations. (Korsman & Mustonen 2011, 151, 154–155.)

Kulju and Sundqvist (2002, 104) remind that goalkeepers are expected to be overall even more athletic than field players and that the old idea about goalkeeper being the one physically in worst shape, is not near the truth in top level floorball. Goalkeepers need to be physically fit, since as Kulju and Sundqvist (2002, 104) put it, this helps concentration, reflexes and coordination to work at full output throughout the game.

As stated before, all movement which a goalkeeper does, happens on his knees. Thus the lower extremities need to have good endurance to maintain the readiness to make saves throughout the game and adequate speed strength for the quick movements in different directions (Korsman & Mustonen 2011, 123). Most goalkeepers prefer one leg over another as the power source to the sideway movements. This leads to an uneven loading of knee joints and structures like menisci and ligaments and leg muscles, where the imbalance is most effectively seen in mm. vasti; usually m. vastus medialis leading to be more powerful than m. vastus lateralis. Due to the movement patterns, hip abductors and adductors need to be in good shape and especially range of motion of hip is a main factor affecting the fluency of the saving movements. Good body awareness and support from middle body are needed to decelerate and stop the saving movements. (Korsman & Mustonen 2011, 134–135.)

3.3 Balance skills and game sense

Balance skills are needed to create a stable base for sport-specific handling skills, moving and their combinations. The level of both dynamic and static balance skills can be seen in field players when doing tricks and bluffs or in 1 on 1 situations shoulder against shoulder and in goalkeepers always in their saving posture. Handling skills should have a stable base and be technically on a high level, because the player needs to be able to carry out quick changes of rhythm and playing direction with the ball and protect and control it regardless of the game situation (Korsman & Mustonen 2011, 77, 80).

Passing and shooting skills do not consist of only technique, but also tactics and game sense. Game sense is a combination of understanding and reading the game and decision making, which enable the player to make quick decisions whether to move forward with the ball, pass it or shoot. Understanding team tactics and using game sense is what it is all about, because the movement of non-ball players is essential for the attack to progress. Kulju and Sundqvist (2002, 107) define that during one game there are on average 80–130 so called organised attacks, which may or may not result into scoring a goal.

Game sense, positioning and balance are the qualities that top goalkeepers need to possess and work on. Hand-eye-coordination and reaction speed are non-arguably another key characters in goalkeeping, especially since the start speed of the ball is high. Official speed record is 205,0km/h by Finnish player Otto Tikka (Spinflo 2010).

3.4 Common injury risks

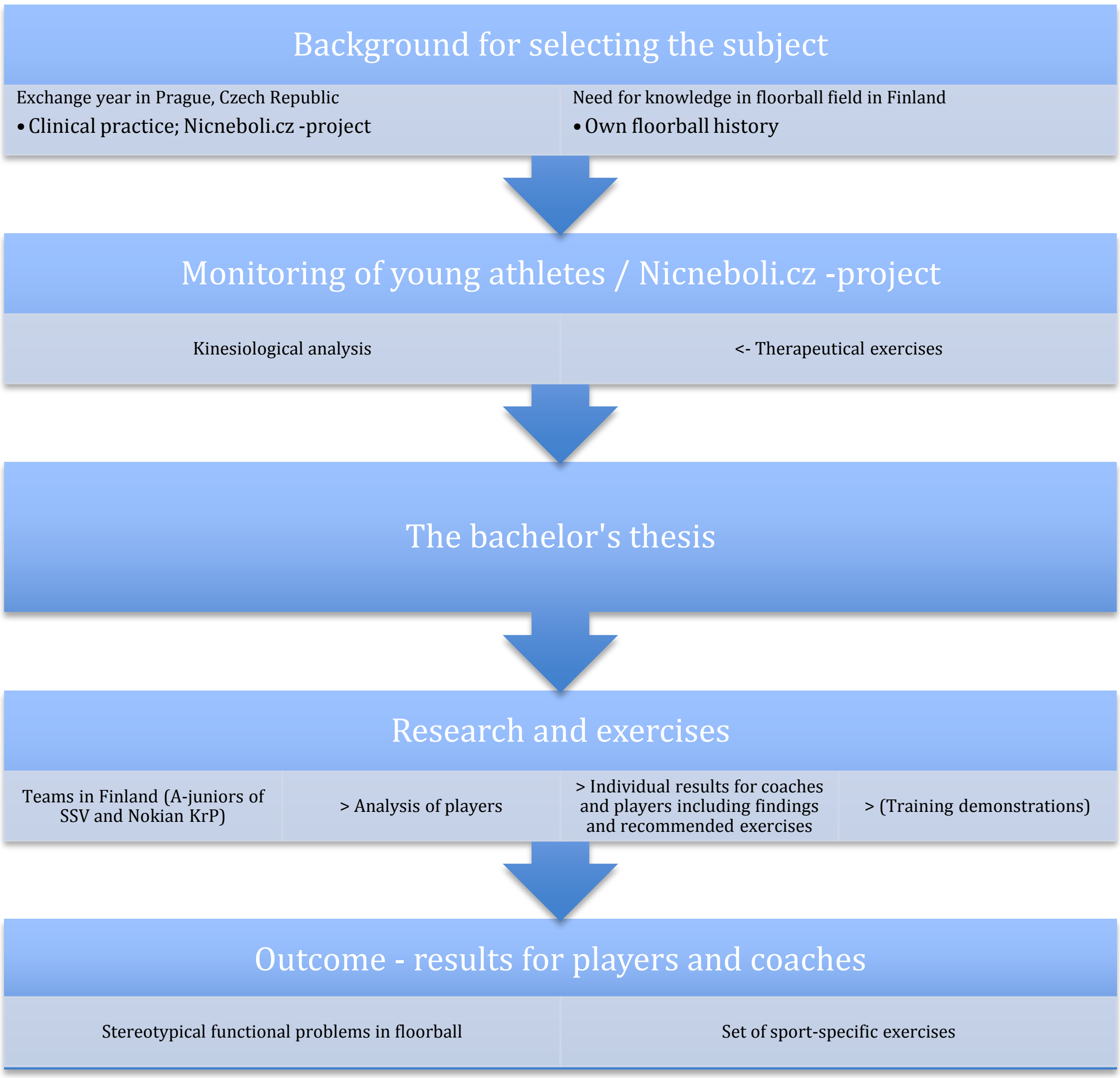
Injury rate in floorball is the fifth highest of all sports in Finland – 10,9 injuries for 1 000 play hours (Lahtinen 2010, 9). In the research done by Pasanen (2009, 51) female players got injured during matches at rate of 40,3 injuries / 1 000 hours, whereas in trainings the same rate was only 1,8 / 1 000 hours. The injury rates in male players are less researched. However, most floorball injuries are not serious and correct injury-prevention and compensatory exercises could effectively prevent even the more serious ones, which include mostly ankle and knee ligament injuries. In addition to sprains and overload injuries of soft tissues, typical injuries include muscle strains, muscle contusions and torn tendons. All in all, about 70–85% of the injuries are acute, from which half happen without a contact with another player (Korsman & Mustonen 2011, 230).

Knee and ankle related injuries are typical to floorball due to the sport-specific movement and usually the non-contact injuries happen because of losing postural control in situations concerning sudden deceleration or turn of movement. In a season long research the most common injury sites divided as follows: 27% knee, 22% ankle and 12% thigh (Pasanen 2009, 52). During season 2010–2011 in clinical practice at Tatran Střešovice the most common injuries without a question were ankle sprains on varying severity levels. In clinical practice done at Salibandyseura Viikingit during season 2011–2012 among common injuries were ankle sprains and muscle strains of thigh and calf muscles.

4 FUNCTIONALITY AND RESEARCH OF THESIS

The thesis was realised as a functional thesis, thus combining a practical research and writing the thesis report. Practice-based thesis realised in cooperation with worklife supports also the professional growth of the student, since through commission the student gets to solve work-related, practical problems (Vilkka & Airaksinen 2003, 17). The research part of the thesis was done using qualitative research in order to enable a deep, new insight into the subject. This decision was made since the term kinesiology is relatively unknown in the world of physiotherapy in Finland. In the Czech Republic physiotherapy and clinical reasoning are based on the principles of kinesiology and it is one of the main subjects in the degree programme in physiotherapy. Also even though floorball has grown to be the second most popular sport by the number of registered players in Finland and the success of the national teams is better than in any other ball sport, it has been the subject of academic research relatively little.

The process of the thesis is illustrated in the paragraph on the following page. The process and creating the theory base was started during the summer 2011 spent in Prague, the Czech Republic after the exchange year. Combining experiences and knowledge accumulated during the exchange and one's own sport – floorball – was a clear choice. It was decided with the cooperative project that the student will use the examination methods of their project to monitor a couple of Finnish floorball junior teams and that the thesis will also include therapeutical exercises for the found problems. The exercises presented in the thesis were limited to those for a couple of the biggest problems. The outcome of the thesis was formed by individual analyses and selected set of exercises for each examined player. The data was collected and analysed during autumn 2011, when also the coaches and players received the individual results. The data was further analysed in the winter using content analysis in order to be presented in the thesis as classified and quantified for better presentation of the results.



4.1 Nicneboli.cz -project

The idea for the project Nicneboli.cz raised from seeing how the insufficiency of medical and physiotherapeutical monitoring affects young athletes at the beginning and during their sports careers. Mostly the situation results from lack of time and means and absence of successful overall concept for medical specialist and physiotherapy screening. Nicneboli.cz was founded to provide a complex concept to provide overall health check-ups for the athletes and gather sport-specialised information from doctors, physiotherapists, fitness trainers, masseurs and other rehabilitation professionals in order to better the worsening health state of young athletes. The worsening of health state can be seen in form of recurring injuries due to insufficient rehabilitation and as functional damage to the body, for example postural changes. (Douda 2012a.)

For the participating teams and athletes, the project offers medical examination by cooperating specialist doctors, sport testing (including for example VO2max, resting and stress ECG and spirometry) and physiotherapeutical monitoring of musculoskeletal problems like poor posture and muscle imbalances. Also rehabilitation of injuries and therapeutical, condition or compensatory training and regeneration (massages, mobilisation etc.) are offered by the sports rehabilitation professionals of the project. Consultation and advice on nutrition are available if needed. (Douda 2012b.)

The kinesiological analysis used in this thesis are done by the examination pattern developed for the project by its physiotherapists. So far the physiotherapists have analysed approximately 1 000 participants within the project. The group of participated athletes consists of athletes competing in national leagues up to national teams (floorball and volleyball). Most represented sports include floorball, football, volleyball and beach volleyball mainly by teams from Prague, where the project works.

4.2 Information retrieval

When collecting the theory for the thesis in order to create an overall view of floorball as a sport and to reflect the empirical findings to sport-specific factors, there were available one brand-new Czech and one brand-new Finnish publication about floorball. They both supported own experiences and knowledge about the sport and its demands. Thanks to the role of physiotherapy in Czech sports field and manual physiotherapy in general, the theory for the kinesiological analysis is mainly based on familiar Czech publications. One thesis (Lahtinen 2010) had to be used, since there is no other academical research concerning the injuries among junior floorball players. In order to argue the effects and importance of recommended exercises, research results from other ball sports were used due to the lack of floorball-specific ones. The researches were retrieved from the free Mendeley data base (www.mendeley.com) and PubMed (www.ncbi.nlm.nih.gov/pubmed/).

In the lack of written specific information about muscle activation in playing posture and through shooting, only student's own knowledge for the sport and clinical practice in Prague and generally known silent information was available. Thus one floorball player (Kytka 2012) was interviewed to be able to reflect one's own thoughts concerning the muscle involvements.

4.3 Research

The theory for the anatomical stereotypes had to be built using empirical data as a base due to the lack of published knowledge in the subject area (Saaranen-Kauppinen & Puusniekka 2009, 17). The qualitative data collection was made using a ready analysis pattern from the cooperating Nicneboli.cz –project, so there was no need to create any method for the examination of the players.

According to Vilkka and Airaksinen (2003, 64) when doing qualitative research for a functional thesis, the most important thing is not the amount but the quality of data, since the criteria of quality is based on diversity of the data and how well it answers the aims of the thesis. Two A-junior teams and their head coaches were approached through acquintances and both agreed to participate with their players in the research. All together 20 players from Nokian Kristityt Palloilijat (Nokian KrP) and 21 players from Salibandyseura Viikingit (SSV) took part in the examinations. The coaches informed their players about the examinations and selected the participating players. The only criteria for the participation from the student's side was playing in or at least training with the A-junior team of the two participating floorball clubs. The players were analysed in August-September before the beginning of the season 2011-2012 by the student herself. In the examination situations all the findings were written and saved to student's laptop to distinctive Word-files.

It must to be taken into account, that there were some presumptions due to having examined athletes (including floorball players) with the same monitoring pattern during the clinical practice in Prague. Thus, the observation (here: the examination situation) was partly structured due to the previously developed clinical examination routines. As explained by Saaranen-Kauppinen & Puusniekka (2009, 61), the previous knowledge about the subject may help to decide and recognise what is important in the observation. Because of the previous experiences, there was no need to pretest the analysing methods and how the situation works best. The previous knowledge helped also in the content analysis of the collected data.

5 KINESIOLOGICAL ANALYSING

The kinesiological analysis used in the thesis is carried out after one belonging to the project Nicneboli.cz, thus including postural analysis and balance test (combination of Trendelenburg and Romberg) as well as palpation part to get an overview of the condition and activity of the muscles. Before the physiotherapeutical examination the athletes answered a couple of question regarding their playing position and laterality and previous or current injuries. The examination form is included as Appendix 1a and 1b, but is available only in Czech. All used examination methods and tests are basic physiotherapeutical tests used in the Czech Republic, which are known to correspond to the measured factors.

As belonging to the project, the athletes received an overall analysis that concentrates on pointing out the structural and functional problems like muscle imbalances, weakness and tightness and to examine joint mobility and condition of ligaments. It is known that strong functional change in adolescence can lead into sustaining structural problems (Seppänen, Aalto & Tapio 2010, 100). Thus paying attention to both structural and functional problems is necessary. Every analysis also included individually chosen recommended exercises targeting the main problems.

Muscle imbalance is known to affect firstly through absence of muscle coordination and later as changes in muscle tonus and movement patterns. The already overloaded muscles carry out these new patterns, whereas the weak muscles participate less and less therefore weakening even more. As a result, the muscle imbalances and wrong movement patterns get stronger and deeper, possibly leading into structural changes in related muscles. The changes are defined as shortening of overused and lengthening and hypotonia of weakened muscles. Hypotonia decreases the muscle tonus and is linked to decreased muscle activity, which also leads into the muscle loosing its mass. Véle (2006, 137) presents a simple model for the above process: overloaded agonist usually leads to hypotonia of its antagonist. (Kozlovská 2011, 14.)

5.1 Postural analysis

The standard posture observed from the side is determined as having a straight line starting from the earlobe going down to acromion process and through hip, knee and ankle joint (Seppänen et al. 2010, 101). However, the posture must be observed also from behind and front of the body. The following subchapters concentrate on what details are concerned in the postural analysis part of kinesiological analysis.

5.1.1 Position of ankles and foot arch

Remark: pronation vs. supination of the ankles; shape of foot arch

The examination of ankle position can be done by checking the position of lateral and medial malleoli bones. When the medial malleolus is dropped down, the ankle is said to be in pronation, where the lateral side of the instep is elevated from the ground and foot arch is usually lowered (Véle, 2006, 260–261). Supination is the opposite movement, where space between sole and ground is increased and the weight is mostly divided onto the lateral side of instep.

Muscle imbalance between the muscles producing pronation and those producing supination worsens the posture of the ankle, since lig. calcaneonaviculare plantare controls the amount of pronation eventually giving in when over-pronation is present. Janda (2004, 243, 249) defines m. tibialis anterior as the main shortened muscle to hold supinated position and also links shortened m. peroneus and pronation. Ankle position differing from the neutral has to be noticed, since it leads into abnormal biomechanical loading and thus problems of knee, hip and even spine. Biomechanically wrong load may lead into for example permanent flexion of the first metatarsal (hammertoe) due to the stress on m. flexor hallucis longus and bad stability. Particularly pronation can lead into for example Achilles tendon pain, plantar fasciitis and sesamoiditis.

When it comes to examining the pronated or supinated ankle and foot arch, it has to be taken into account whether correcting the faulty posture of ankle or knee decreases the position and degree of lowering of foot arch. As a result it can be reasoned if the problem is functional or structural. For example according to Véle (2006, 106) the pelvic position and particularly the position of femur in relation to the hip may affect the foot arch. The external rotation of femur turns the ankle into supination, thus usually increasing the foot arch – in comparison to the internal rotation, when the ankle is turned into pronation. Functional pronation, and especially the lowered foot arch following from it, leads to the athlete overloading the medial side of instep and medial ankle ligaments. In case of supination, the overload results on the lateral side and ligaments.

Most important functions of the longitudinal arch are maintaining the weight distribution in balance and working as a shock absorber, these being affected in the case of lowered arch. Loss of foot arches (also known as flat foot) puts more stress on plantar fascia and tends to thicken it (Hendrickson 2009, 470). It is to be remembered that lowered arch can be present also in ankle supination. The vertical arch is situated in the front part of the instep and if being lowered, the arch needs to be supported in order to give more space for the nerves and bloodvessels crossing the area. (Footbalance System Ltd. 2011.)

M. tibialis posterior is the main muscle responsible for the shape of the foot arch making it lower and predisposing ankle pronation if tight. According to the degree of lowering of the arch m. tibialis posterior and its tendon result overloaded. However, also m. tibialis anterior, m. flexor digitorum longus and m. flexor hallucis longus participate in shaping the foot arch. For example tightness of m. tibialis anterior will produce high medial arch (Hendrickson 2009, 461). Véle (2006, 261) reminds that the shape of the arch depends not only on the muscles, but also on the function and condition of the ligaments and joints supporting and strengthening the posture. The role of metatarsals is not to be forgotten, since they prevent full foot extension during load.

5.1.2 Distribution of weight

Remarks: weight on toes vs. heels; laterality

Totally symmetrical distribution of weight is more of an exception than a rule, but in a normal standing position 50% of the weight is on the heels, while the rest is on the front parts of instep. Most of the weight is carried by the first metatarsal. The weight is divided according to internal factors such as shape of foot arch, location of centre of gravity, position and configuration of axial body and position of head of femur. Division of weight affects the posture of the whole body, since it is created on the three arches of instep: low lateral side, low diagonal and higher medial side of foot arch as seen in Véle's image below. (Véle 2006, 184–185.)

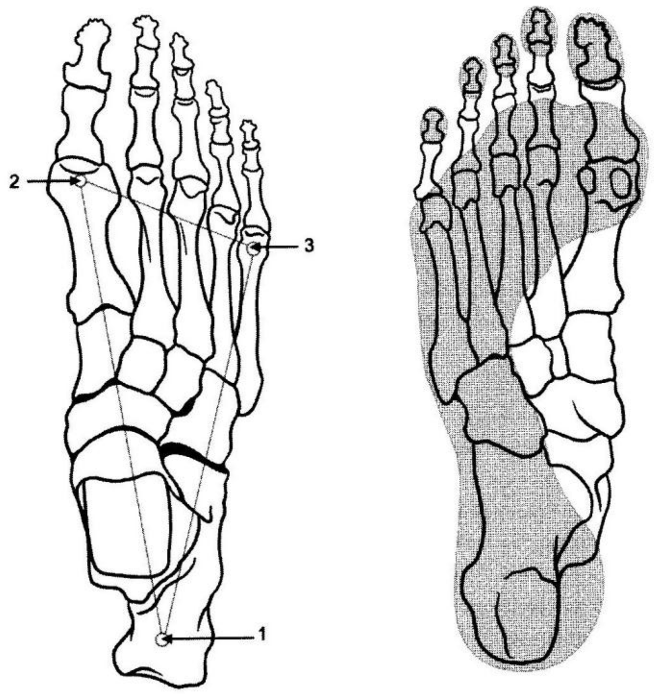


IMAGE 2. Distribution of weight on standing base. (Véle 2006, 186.)

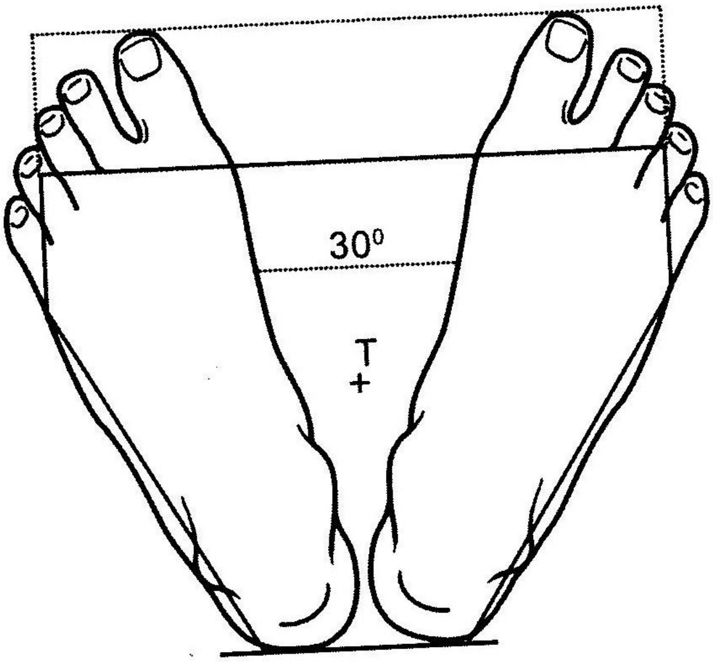


IMAGE 3. Standing base + - ideal point for centre of weight. (Véle 2006, 185.)

Standing base is rated as normal, if the heels are in a 30° degree angle as defined by Véle (2006, 185). The ideal center of gravity is considered to locate between the feet situated just anteriorly to the ankle bones as marked with a plus in Velé's picture above.

5.1.3 Achilles tendon and calf muscles

Remarks: size, shape and symmetry

Laterality may affect the development and strength of calf muscles and Achilles tendons. M. gastrocnemius (belongs to m. triceps surae) is relaxed in static standing position, but works during phasic movement, whereas the deeper muscle – m. soleus – is constantly active due to its tonic character. Thus m. soleus has tendency to shorten and this results especially from weak shin muscles. (Véle 2006, 259.)

5.1.4 Position of knees

Remarks: internal vs. external rotation; overextension (genu recurvatum); varus vs. valgus

For the knees to be in neutral position they should not be in overextension nor in internal or external rotation and patellae should be heading straight in the direction of the leg bones (Véle 2006, 257). Eyeing the height and direction of popliteal lines may help in determining the direction of possible knee rotation, but Véle (2006, 257) evaluates the rotations based on the position of patellae: if femur is in external rotation, the patella heads laterally and vice versa. The shape of foot arch is thus related to the position of knees so that when the knees are in internal rotation, the ankles are usually in pronation and the foot arches lowered as shown in Véle’s image below (Véle 2006, 106).

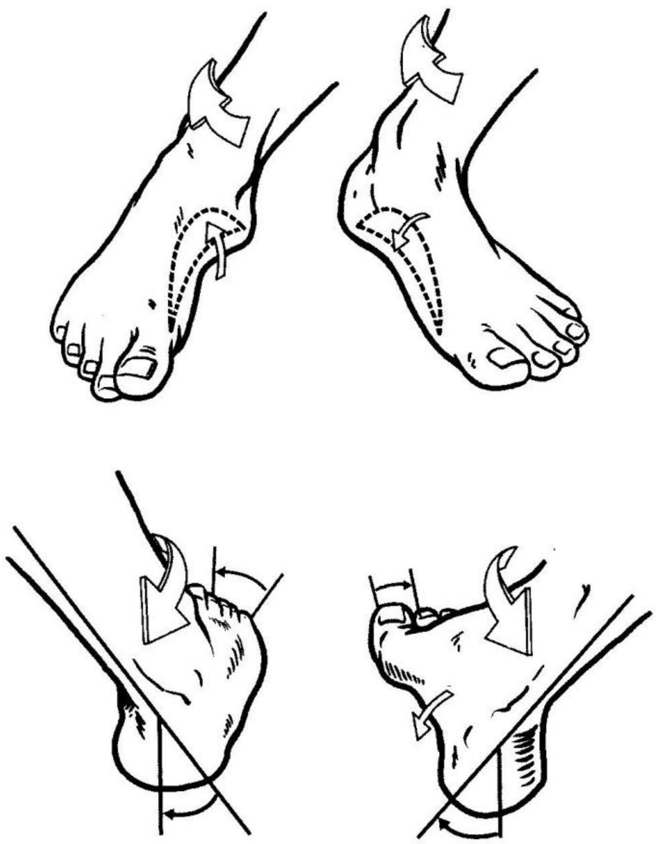


IMAGE 4. Effect of knee rotation on foot arch. (Véle 2006, 107.)

According to Janda (2004, 228) shortened m. biceps femoris may lead to valgus posture of the knees, whereas shortening of m. semitendinosus – semimembranosus to varus. Véle (2006, 223) points out that shortened m. tensor fasciae latae and m. gluteus minimus guide the knee into internal rotation thus exposing to valgus posture. The effect of these muscle shortnesses is to be kept in mind when determining the position of the knees and whether it is functional or structural.

5.1.5 Position of pelvis

Remarks: anterior vs. posterior pelvic tilt; lumbar lordosis in relation to the norms

Véle (2006, 187) highlights the importance of checking the activity of abdominal and back muscles and testing m. iliopsoas when examining the hip position and symmetry. He reminds that overloaded muscles or possible block in sacroiliac-joint can affect the actual hip position and thus for example mobilising the blockage would immediately normalise, or at least ease, the posture.

Posterior pelvic tilt is characterised by straightened lumbar lordosis, which is usually result from shortened abdominal muscles and hip extensors (mainly mm. hamstrings and m. gluteus maximus). At the same time hip flexors, particularly m. iliopsoas and m. rectus femoris, are weakened, as well as m. quadratus lumborum and m. erector spinae in its lumbar parts.

The anterior pelvic tilt is markedly more common faulty posture and is easily noticeable from its trademarks hyperlordosis and protruding abdomen. The position is mostly due to combination of weak back thighs, abdominal and gluteal muscles, shortened m. iliopsoas, m. rectus femoris and m. tensor fasciae latae and tight low back. Hendrickson (2009, 104) yet adds to these shortness of m. sartorius and adductor muscles. According to Janda (2004, 202) shortened m. iliopsoas can cause scoliotic behaviour in affected parts of the spine.

Lateral pelvic tilt is usually due to shortened m. tensor fasciae latae and m. quadratus lumborum and weakness of m. gluteus medius on the opposite side. If m. gluteus medius or m. gluteus minimus is constantly contracted, pelvis stays low on the side of contracture and femur can be medially rotated. Firstly it has to be made sure that the appearing lateral pelvic tilt is not due to one leg being shorter than the other. (Hendrickson 2009, 104, 110.)

Possible pelvic rotation can be determined by the position of iliac spine. If one posterior superior iliac spine is moved forward compared to the other, external rotators on that side (m. iliopsoas, m. quadratus femoris, n. gemellus and m. obtu-rator) and opposite side’s internal rotators (m. adductor magnus and m. piriformis, and mm. hamstrings in hip flexion) are usually shortened.

5.1.6 Spine

Remarks: difference between structural and functional scoliosis

Spinal column is evaluated on lumbar, thoracic and cervical segments comparing the lordosis and kyphosis and possible lateral curvatures (scoliosis) to the norms. With too much curves the spine is often hypermobile and unstable and with too little it results stiff (Hendrickson 2009, 96). Persistent trunk rotation may give the impression of scoliosis, since the way of the spine appears to differ from straight. Possible scoliosis is to be examined through leaning forward, since based on whether the suspected scoliosis straightens or not, it can be determined if the problem is functional or structural.

Functional scoliosis is usually due to muscle imbalances such as muscle tightness and shortness on that area or leg-length difference. Most commonly scoliosis on a limited segment is due to shortened paravertebral muscles (m. erector spinae), coming out as concave to the side of shortened muscle. It must be noted, that shortened m. quadratus lumborum appears to elevate hip on the affected side, thus pulling the vertebrae to scoliotic posture on that segment. (Janda 2004, 56, 59.)

Hendrickson (2009, 161) mentions that structural reversible scoliosis results from structural changes that are due to possible reversible ligament shortening or chro-nic muscular hypertonicity. He describes m. quadratus lumborum, m. erector spinae, m. psoas major and m. obliquus abdominis as shortened muscles limiting lateral flexion toward the side of the contraction.

5.1.7 Trendelenburg–Romberg

Test: combination of Trendelenburg and Romberg as a 3-phase-test. In first phase one leg is held in front of the body at 90° knee and hip flexion. In second phase athlete straightens his arms in front of the body and the last step is closing eyes. The test is finished on the level, where athlete has big problems with balance.

Remarks: Trendelenburg's sign; overall balance; distribution of weight – toes vs. heels; stability of ankle and knee; pelvic shiftings; back or side tilt and trunk rotations

As Buckup (2004, 153) describes, the pelvic and trochanteric muscles, namely m. gluteus medius and minimus, on the weight-bearing side are supposed to contract and elevate the pelvis on the unsupported side. Therefore the Trendelenburg test is considered positive, if hip on the side of lifted leg falls down representing insufficient gluteal muscle support. Usually weight and thus also centre of weight are automatically transferred onto the supporting leg, but this mechanism is not possible if the abductor muscles (for the most part m. gluteus medius) are weak.

In addition to function of abductor muscles, combined Trendelenburg–Romberg gives information about balance and ankle and knee stability. Mechanical instability refers to ligament laxity, whereas functional instability is defined as recurrect sprains and/or the feeling of giving way. Causal factors include proprioceptive deficit, muscular weakness or absence of coordination. According to Hendrickson (2009, 419) the tightness of mm. hamstrings increases knee instability.

If balance is normal, the last phalanx is lying along the ground, whereas in case of weak balance the posture is stabilised by taking support from the floor with the phalanges. The bodily correction patterns and movemens in order to maintain balance progress from distal to proximal. Therefore it is logical that first sign of growing imbalance appears as plantar flexion of the toes, which is used to widen the support surface. Next in line the calf muscles are activated followed by thigh muscles and muscles of upper body and upper extremities, what can usually be seen as abduction of shoulders. (Véle 2006, 112.)

5.1.8 Thomayerova

Test: Athlete leans slowly down towards toes with head and hands leading the movement. Knees must stay in extension throughout the movement. It must be noted that if there is asymmetry in the length of legs, it needs to be corrected before the test.

Remarks: hypermobility in lumbar spine; behaviour of spinal column; activation of back muscles when returning to upright position and activation of abdominal muscles in leaning backwards

The normal position is when athlete reaches the ground with his hands. In this case the degree of hypermobility relies on whether he touches the ground with just fingertips or with the whole palm. If the ground is not reached at all, the remaining distance is marked down in centimetres. Buckup (2004, 5) reminds that good hip mobility can compensate for segmental stiffenings in the spine. He notes that when not reaching the floor, the hip function may be impaired due to for example presence of Laségue sign, shortening of mm. hamstrings or mobility of lumbar spine.

Véle (2006, 225) represents a mechanism called overtaking phenomenon, which is also examined during the test. While the athlete leans down to his toes, therapist has his thumbs on both PSIS, thus possible overtaking phenomenon can be noticed when other thumb dislocates superiorly with the movement. This can be also due to muscle spasm in m. iliopsoas or SI-block. (Véle 2006, 226.)

The profile and behaviour of the spinal column are scrutinised throughout the movement, which helps to localise possible joint blocks in the spine. The blocked, hypomobile areas do not move vertebrae by vertebrae but rather as a package. The activation and symmetry of back muscles is examined when the athlete returns to upright position. Tightness of paravertebral muscles are usually related to joint blockages. Shortened or overloaded paravertebral muscles in lumbar segments can lead to limited motion of hip and pelvis and as a compensation increase kyphosis in the cervical spine.

Activation of abdominal muscles is examined when the athlete leans backwards, while trying not to help the movement from the knees. When the abdominal muscles activate correctly, the muscles should slim down.

5.1.9 Position of scapulae

Remarks: symmetry; faulty postures

The muscles stabilising the scapulae to the posterior thoracic wall are m. serratus anterior, m. trapezius, mm. rhomboidei and m. levator scapulae (to some extent also m. pectoralis major). If position of scapula differs from neutral, some of these muscles are weaker than usual. If the medial line of scapula is raised and not stabilised to the thorax, m. serratus anterior is weakened and the position is named scapula alata. Mm. rhomboidei are weak, if also the inferior angle of scapula is off and laterally rotated. (Véle 2006, 316.) Martin and Fish (2008, 1) determined that in case of paralysis of m. trapezius, the lateral boarder of the scapula is winging. It is also possible for the superior line to be raised, which results from weakness of m. levator scapulae. Kibler and McMullen (2003, 145) suggested that tightness of m. pectoralis major or short head of m. biceps brachii might create a forward pull on scapulae.

When examining the position of scapulae, it is to be noted that increased thoracic kyphosis and cervical lordosis may from their part lead into excessive scapular protraction and acromial depression. Cervical lordosis can result from tightness of posterior cervical muscles or fascia or that of anterior clavicular fascia. These tightness can affect both scapular retraction and protraction as well. (Kibler & McMullen 2003, 143, 146.)

Since scapula is part of the shoulder girdle, many conditions involving the shoulder joint will cause secondary problems related to scapular motion and position and vice versa. Abnormalities in the rhythm of movement between scapula and shoulder joint are called scapular dyskinesis. Dyskinesis may result in ineffective energy transfer and increase stress on tissues around the shoulder, since the kinetic chain from legs and trunk to arm and hand go through the scapula. Scapular dyskinesis is often recorded as non-specific answer to shoulder dysfunctions, because no specific pattern of dyskinesis is associated with specific shoulder diagnosis (Kibler & McMullen 2003, 142).

Scapula alata is known to usually appear together with forward rotated shoulders. Thus the abnormal position of scapula can also lead into limited range of motion in for example flexion and internal rotation of the shoulder (Janda 2004, 85). Martin and Fish (2008, 6) also suggest that if scapula is not stabilised against the thorax, forward flexion of the arm may be limited or even impossible past horizontal level. Scapulothoracic motion asymmetry is reported being found in 64% of patients with anteroinferior shoulder instability and 36% of these patients presented the asymmetry as scapular winging (Hayes, Callanan, Paxinos & Murrell 2002, 500).

5.1.10 Shoulder line and shoulders

Remarks: symmetry of shoulder line; position of shoulders

Asymmetry of shoulderline and differences in height and position of shoulders are normal. Raised shoulder line is usually due to tightness of m. trapezius. Due to the connecting muscle chains and the structure of shoulder girdle, position of shoulders is always connected to position of scapula as explained widely in the previous subchapter. Kibler and McMullen (2003, 142) reported, that 68-100% of shoulder injuries occur with alterations in scapular position and motion. Painful shoulder conditions can inhibit activation of scapular stabilizing muscles (Kibler & McMullen 2003, 144).

In their research Kluemper, Uhl and Hazelrigg (2006, 59) pointed out that protracted shoulders may be caused by shoulder muscle imbalance, where stronger internal rotator and adductor muscles might pull the clavicle and scapula forward over the weaker antagonist muscles, namely external rotators and abductors. Mainly responsible for limiting the abduction of shoulder is shortened m. pectoralis minor, which leads into the shoulder rolling forward. The most commonly affecting muscles along with m. pectoralis minor are tight m. infraspinatus and m. subscapularis and weak m. serratus anterior, mm. rhomboidei and m. trapezius. (Janda 2004, 76.) According to Hendrickson (2009, 160), short upper trapezius and m. levator scapulae together with weak middle and low trapezius cause elevation and protraction of the shoulders. Also m. teres major contributes to rounded shoulder posture by pulling scapula into protraction (Hendrickson 2009, 254). Tight and short m. latissimus dorsi has its part as well (Hendrickson 2009, 106).

5.1.11 Position of head

Remarks: flexed, extended or rotated position

Increased cervical lordosis is known to result from tightness of posterior cervical muscles or fascia or that of anterior clavicular fascia and weakness of neck flexors (Kibler & McMullen 2003, 143). M. sternocleidomastoideus and scalene muscles (anterior and medial) tend to be short and tight in this forwarded posture, which eccentrically loads m. levator scapulae (Hendrickson 2009, 200, 251). In case of tight m. sternocleidomastoideus, the chin can appear to be slightly rotated to the affected side according to Janda (2004, 84). Examining the neck muscle tightness, it must be kept in mind that between anterior and medial scaleneus muscles, go the common carotid artery and nerves of brachial plexus. When mm. scalene and m. sternocleidomastoideus are tight, the risk of thoracic outlet syndrome is increased.

5.2 Palpation and tests

Palpation gives information about the condition and elasticity of the tissues, but also about their dynamic reactions to physical contact, thus representing the functioning of nervous system. The areas of increased tonus can be examined through passive and active motion in palpation. (Véle 2006, 131.)

Innervating motoneuron determines whether the muscle is tonic (mostly postural muscles) or phasic, from which tonic muscles have tendency to shorten and phasic to get weaker. In general, flexor muscles are considered to shorten more than extensors, because of them being genetically older and being more frequently two-joint-muscles than the extensors. The deep muscles are also considered to show more tendency to shorten than more superficial muscles. (Véle 2006, 148.)

The areas of muscle spasms can be noticed already from enlarged muscle bellies, since here the tension is involuntarily increased also in the resting muscle tone. Spasms and other reactions in muscle tissues can also appear only in certain range of motion. Muscle spasms may be reflex changes due to for example joint blocks. Véle (2006, 139) reminds that muscle spasms may also result from nociceptive stimulus and thus the spasms can originate from central nervous system. When persisting for a sufficiently long period of time, the spasms lead into pathological changes in the affected muscle tissues. (Rychlíková 2002, 31; Véle 2006, 136–137.)

Shortened muscles lead to decreased range of motion in the related joints, whereas hypermobility is generally connected to muscle weakness and loose ligaments and observed as increased passive range of motion. Hypermobility strains the joint structures and muscle insertions and also worsens proprioceptics and thus also postural control. (Véle 2006, 137.)

Joint blocks are based on anatomical shape of the joint, its size, freedom of joint capsule, flexibility and strengthening systems. Functional blocks are not just local, mechanical problems limited to a certain segment, but may cause dysfunctions and limitations also in other joints and reflex answers in other structures away from the blocked joint. The reflex changes can be seen in all muscles, which are innervated from the same spinal segment in case of vertebral blocks. (Rychlíková 2002, 20, 27; Véle 2006, 144–145.)

5.2.1 Supine

In particular tightness of the following muscles is palpated: m. rectus femoris, m. iliopsoas and m. pectoralis major. All the two-joint thigh muscles have a tendency to get shorter, which may result into limitations in knee flexion. Especially m. pectoralis major and minor may be found shortened and in relation to this the shoulders tend to tilt forward.

5.2.1.1 Mobility of shoulder joint

The mobility of shoulder joint is examined in flexion and extension in elbow extension and internal and external rotation in 90° elbow flexion and shoulder abduction. Normal range of motion for extension is 40° and for flexion 170°. Internal rotation of the shoulder joint is carried out by m. subscapularis, m. pectoralis major, m. latissimus dorsi and m. teres major, which are shortened when external rotation is limited. If internal rotation is decreased, the muscles participating in external rotation, namely m. teres minor, m. infraspinatus and m. supraspinatus, are shortened. According to Véle (2006, 273) first direction to show limitation of movement in shoulder is external rotation. (Rychlíková 2002, 115–116.)

5.2.1.2 Mobility of hip joint

The internal and external rotations of hip joint are examined in 90° knee and hip flexion, where the range of motion for external rotation is 50–70° and internal 20–30° (Rychlíková 2002, 201). However, in hypermobile cases even greater motion can be achieved, but whatever the case, range of motion should be symmetrical on both sides. According to the examination method explained by Véle (2006, 250), the therapist holds the examined leg one hand above the knee and other above the ankle and makes the movement moving the leg (femur) to external and internal rotation.

External rotators of the hip are three times stronger than the internal rotators and have greater tendency to shorten, thus causing decreased internal rotation (Véle 2006, 250). Vice versa; if internal rotators are shortened, external rotation will result limited. The group of external rotators, including m. piriformis, m. obturatorius externus and internus, m. gemellus inferior and m. quadratus femoris, has basically no other functions besides external rotation. If m. piriformis is shortened, the leg on the affected side may appear to be shorter and may seem to be in external rotation. The most important muscles of internal rotation include m. gluteus medius and minimus together with m. tensor fasciae latae. Chronic shortening of m. tensor fasciae latae can result from for example overpronation or supination of ankles, uneven length of legs, tight hamstring muscles or muscle imbalances between front and back thigh.

When examining the hip joint it is to be taken into account that the trunk and low extremity muscles always affect its function, since due to the covering fascias and muscle chains, the muscles of that area are mechanically and functionally in close cooperation. Movement coordination has an important role in the function of hip joint and lack of it may lead to worsening of overall function, even more so than weakness of just one muscle, which the others are able to compensate. (Véle 2006, 250.)

5.2.1.3 Patrick sign and stretch test of m. iliopsoas

Patrick sign, also known as stretch test of m. piriformis, is tested after Véle (2006, 250). The patient is tested in supine position with tested leg flexed in knee and lying sideways sole turned near the other knee. To exclude any hip movement, the anterior superior iliac spine on the non-tested side is stabilised and the tested leg is let fall down by its own weight. If the abduction is limited, therapist can try push the tested leg lower from the knee and therefore examine passive abduction and end feeling of the movement. However, normally the knee of abducted leg almost touches the examining table and the abduction is fluent, thus deviations from these are counted as positive test results. If the athlete reports about an uncomfortable feeling behind the trochanter, the test is marked positive and m. piriformis shortened. (Véle 2006, 250.)

Véle (2006, 250) reminds that also shortened adductor muscles can lead to a positive test result and it is usual for the position to be felt as a stretch to this muscle group. Tight adductors can for their part decrease also internal hip rotation. If any groin pain appears during the movement, it can be sign of Legg-Calvé-Perthes disease, which is the most common form of aseptic avascular necroses (Buckup 2004, 154).

For the test on m. iliopsoas, the athlete lies on his back and holds the opposite leg flexed in hip and knee near his body, whereas the tested leg is in hip extension over the edge of examination table. In case of shortened m. iliopsoas, the tested leg goes into flexion and does not stay under horizontal level. In case of shortened m. iliopsoas, its antagonist m. gluteus maximus has tendency to weaken. Also shortness of m. tensor fasciae latae can be seen as it pulls the leg to lateral direction to abduction and possibly also into external rotation. Spasm of m. iliopsoas may also lead into persisting hip flexion and cause abdominal pain due to tightness near the insertion of the muscle. It is also known to increase pressure on the lumbar spine. (Véle 2006, 222, 242, 248.)

5.2.1.4 Mobility of patella

The movements are tested in craniocaudal and mediolateral directions after Rychlíková (2002, 179); therapist moves the patella in the wanted directions when the tested leg is in extension in a supine position.

According to Buckup (2004, 169) normal physiologic findings during patella examination include symmetrical mobility of the patellae and any crepitation or tendency to dislocate are not to be found. If lateral or medial mobility of patella is increased, the laxity of knee ligaments or contant patellar subluxation or dislocation is to be expected. Crepitation suggests chondropathy or retropatellar osteoarthritis. (Buckup 2004, 169.)

The movements of patella are often limited due to head of either m. vastus medialis or m. vastus lateralis pulling it to one side (usually to lateral direction), therefore affecting the function of the whole knee joint. Especially in case of coxarthrosis, m. quadriceps femoris is usually shortened and since its tendon attaches to patella, the movements result restricted. Also shortness of the other muscles in the knee area may decrease the mobility of patella. (Rychlíková 2002, 179.)

5.2.1.5 Knee ligaments (lig. cruciata and collaterale) and menisci

The crucial knee ligaments are tested in supine position in 90° knee flexion and 45° hip flexion (also known as anterior drawer test). The therapist holds the tested leg with his hands on proximal part of calf and thumbs ventrally on medial and lateral joint cavity. The posterior crucial ligament is tested in dorsal direction when tibia is pushed backwards towards fossa poplitea. The ventral direction is for anterior crucial ligament. As Buckup (2004, 200) describes, chronic insufficiency of anterior crucial ligament is present when there is visible anterior displacement of tibia with soft endpoint feeling. (Rychlíková 2002, 182–185.)

Another examination of posterior crucial ligament is extension test. The tested leg is fixated above the patella in full extension and the movement is done by the therapist grapping athlete’s ankle with the other hand and moving it to ventral direction.

Collateral knee ligaments are tested in supine position in knee extension, with the therapist fixating the knee on its superior and inferior edges crosswise from lateral and medial direction. The movement is done to tibial and fibular direction with the hand above the knee doing the movement and the lower hand fixating.

The menisci are important in guiding motion and ensuring knee stability, but they also transmit and distribute compressive stresses between femur and tibia (Buckup 2004, 176). Anatomic factors predispose the medial meniscus to a far higher incidence risk than the lateral meniscus according to Buckup (2004, 176). The menisci are tested after Kaltenborn (2010, 162); the tested leg is in 90° hip flexion and therapist with one hand fixates the joint cavity ventrally in the partially flexed knee and with the other grips the ankle and realises the movement turning the leg to internal and external rotation.

5.2.1.6 Activation of abdominal muscles

The therapist passively raises athlete's extended legs to about 75° hip flexion and asks him to keep the legs up with abdominal muscles. Lower abdominal muscles and the activity of m. transversus abdominis can be tested separately so that the athlete is asked to hold his legs up in 90° hip and knee flexion. The abdominal muscles should slim down towards the spine and lumbar lordosis should not increase. Increased lumbar lordosis is marked down as opening scissors syndrome.

Remarks: symmetry of muscle activation; opening scissors syndrome; degree of diastase

Thanks to the activity of m. transversus abdominis, the abdominal muscles are pulled down towards the spine during inhalation. Therefore weakness of the transversus muscle can easily be seen due to absence of this phenomenon. Transversus and the multifidus muscles along the spine are supposed to work together, thus stabilising the spine and pelvis and decreasing the pressure on vertebral discs by even 40%. (Véle 2006, 219.)

During exhalation and abdominal exercises navel is drawn towards the strongest segment of m. rectus abdominis (Janda 2004, 48). If there is asymmetry between the muscle chains consisting of m. obliquus externus and internus, navel is drawn to the stronger side (Janda 2004, 49).

Diastase is also known as abdominal separation, where right and left half of m. rectus abdominis are separated. Normally the sides are joined at linea alba and the condition may be due to weak abdominal muscles.

5.2.2 Prone

In prone position especially looseness and symmetry of Achilles tendons are compared, since laterality affects the development of the tendons as well as calf muscles. From the muscles particularly the condition of following muscles is examined: m. triceps surae, mm. hamstrings, thigh adductors, m. gluteus maximus and medius, m. tensor fasciae latae, m. piriformis, m. quadratus lumborum, m. erector spinae, mm. rhomboidei, m. trapezius and m. levator scapulae. The muscles are discussed closer earlier in the chapter concerning postural analysis and thigh adductors, m. piriformis and m. iliopsoas in supine examinations.

In order to test the activation of back muscles, the athlete is asked to perform back muscle exercise by raising upper body off the ground with hands under forehead.

Remarks: symmetry of muscle activation; order of activation – back, gluteal, leg muscles

Back muscles on one side are usually stronger due to laterality. If the order of muscle activation differs from the norm, it can be noticed whether the athlete overloads gluteal or hamstring muscles based on which are activated first. If performing the movement activating only back muscles, the athlete overuses especially muscles in the lower back.

5.2.3 Sitting position

When athlete sits with legs extended in front, apart from general posture and support from abdominal muscles, also muscles tightness and especially that of lower parts of m. erector spinae and mm. hamstrings can be seen when reaching for the toes.

In the following image Chaitow (1997, 100) presents the different postures changing according to the muscle tightness and shortness in question. A-picture represents the situation where m. erector spinae and posterior thigh muscles have normal length. In B there are tight m. gastrocnemius and m. soleus and the inability of dorsiflexion of feet indicates tightness of plantar-flexor group. C is typical posture when mm. hamstrings are tight and posterior pelvic tilt can be seen also when sitting as in the picture. The posture in case of low back m. erector spinae muscles is shown in figure D. When mm. hamstrings and low back muscles are tight, but upper back muscles overstretched, the posture looks like in E. If also mm. hamstrings are slightly stretched (F), the player may reach his toes, but the low back stays flat not curving smoothly as it should. G represents the case of tight low back muscles, mm. hamstrings and calf muscles. If the low back muscles are very tight, the lordosis can be maintained even in flexion as seen in H. (Chaitow 1997, 100.)

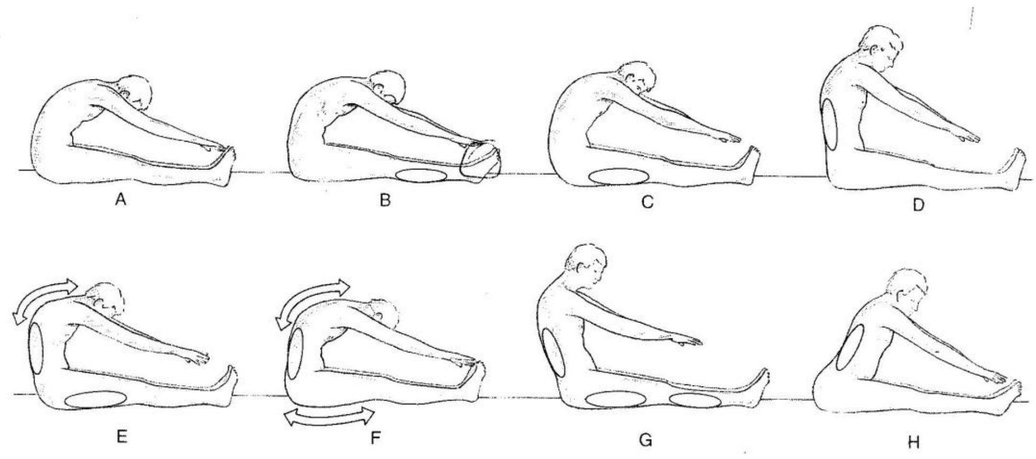


IMAGE 5. Tests for shortness of the erector spinae and associated postural muscles. (Chaitow 1997, 100.)

Possible movement restrictions in the elbow are also examined in the sitting position. The therapist makes a supination-pronation movement fixating the proximal head of radia and realising the movement gripping the wrist of the athlete.

6 CONTENT ANALYSIS OF COLLECTED DATA

All the result forms from the monitorings were individually processed in order to base the recommended exercises on each players' distinctive findings. To develop a more generalised, stereotyped information for the coaches, the data (41 player analyses) was more closely analysed using content analysis. As a data analysis approach, content analysis guides the process into creating empirically based theory (Saaranen-Kauppinen & Puusniekka 2009, 91). It also helps in creating a classified presentation of the research results, which suited the needs of the thesis.

The data was handled using abductive approach, where the resulting theory is formed mainly based on the empirical data. However, abductive approach does not exclude using already existing theories to argue and explain the findings (Tuomi & Sarajärvi 2002, 99). For example some findings related to playing posture or laterality were explained also by already existing knowledge concerning playing posture in floorball.

The analysing process from reduction to abstraction in order to form the categories of exercises needed to correct the problems and classify the found qualities is explained in more details in the following subchapters.

6.1 Reduction and quantification

The content analysis started with reduction (coding) and quantification of the examination forms. Coding and quantification were used to summarise and clarify the presentation of the collected data. All the unnecessary parts (non-significant findings) were left uncoded during the reduction. After examining all the players of the two teams, that is to say having collected all the planned data, the data analysis was started by colour coding certain words and phrases appearing in the analyses of the players. Also mind-maps were used to clarify and later on to help find the similarities during clustering phase.

Due to the previous experiences with the kinesiological analysing from exchange year, the light relations to the presumptions may have affected the naming of the codes, concepts and categories arising during the sorting process. Some code examples arising from the data include for example supination of ankle, anterior pelvic tilt, forward tilted shoulders and winged scapula (scapula alata).

As a part of the content analysis, coding usually precedes for example quantification, thus being important for the analysing process (Saaranen-Kauppinen & Puusniekka 2009, 84). Quantification was used as a way to clarify and present how often certain functional problems appeared in the data and the tables are presented in the chapter with presentation of the results.

6.2 Clustering

Clustering the codes, which were developed during the reduction, further continued the data analysis. In clustering the findings were sorted out to groups based on similarities. Thus for example all the problems related to ankles were in one group and those related to knees or hips in their own groups.

6.3 Abstraction

In the last phase of the content analysis, the findings were sorted hierarchically into subcategories and categories. Here it was decided to name the categories according to what kind of exercises were recommended to the certain problems arising from the data. Therefore the codes from clustering groups were rearranged and some of them were moved higher to name a subcategory. For example problems related to ankles could at the end be found in all four categories, which were named according to the need of strengthening and muscle coordination exercises, stretching exercises, proprioceptive exercises and compensatory exercises.

The final sorting of codes can be found at the end in Appendix 2a and 2b. The strengthening and muscle coordination group was sorted to include such problems as discoordination of thigh muscles, wrong hip posture called anterior pelvic tilt and scapula alata because of muscle weakness they result from. All of the functional problems in this category need specified strengthening exercises, just like the ones in the category of stretching exercises need stretching to resolve them.

Another main reason for anterior pelvic tilt is shortness of certain muscles, which is why anterior pelvic tilt was included also in the stretching group. Shortened muscles, such as m. piriformis and other hip rotators lead into various problematic situations, which could be prevented by stretching the shortened muscles. Stretching exercises include yet forward tilted shoulders.

Instability of ankles and knees and their wrong postures can be bettered through proprioceptive exercises and this is really important since ankle and knee injuries are the most common serious injuries in floorball. The last category includes muscle imbalances due to playing side and playing posture, which should be compensated.

7 RESULTS FROM ANALYSES

Altogether 20 players from Nokian KrP and 21 from SSV were analysed. From these, 5 were goalkeepers (2 from Nokian KrP and 3 from SSV) and 36 field players (all together 12 defenders and 24 attackers). For the season 2011-2012 the age limit in the category of A-juniors was set to players born between 1991-1993 (Salibandyliitto 2011). However, it is possible for younger players to participate in higher categories, which explains why there were younger players participating in the examinations from both teams. Both teams are relatively young in their category, the majority of players being born between 1993-1994 as seen in the Table 1. Some of the analysed juniors train and play also in the men's league team of their club.

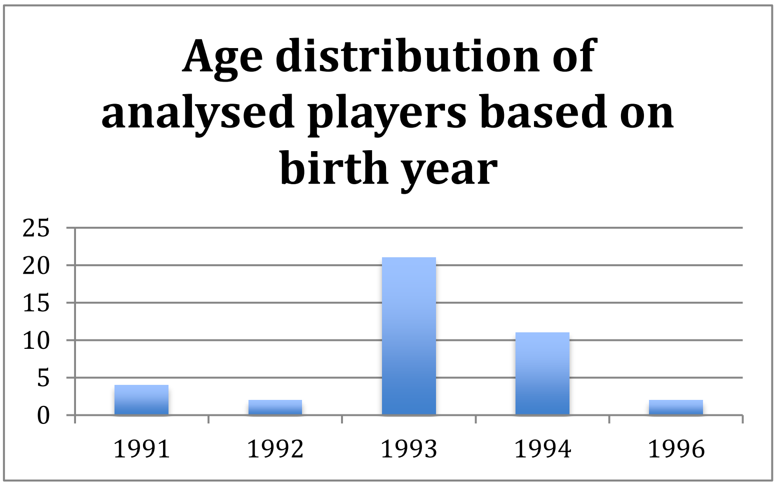


TABLE 1. Age distribution of analysed players based on birth year.

Other basic information to be taken into consideration about the analysed group is that 32 of 36 (89%) field players were left-handed, thus playing holding the stick with left hand lower. Three out of five goalkeepers recorded right as their dominant throwing hand and three goalkeepers had stress-related problems with the shoulder of dominant hand. All in all 34 of 41 players (83%) had had injuries varying from ankle sprains and knee ligament injuries to broken bones (wrist, clavicula, metatarsals) and dislocations in shoulder and knee joint. All previous injuries were recorded, so not all of them had happened during floorball trainings or matches.

7.1 Muscle imbalances, weakness and tightness

Muscle imbalances were most clearly seen in back and abdominal muscles, which were one-sidedly developed in almost all of the players. M. quadratus lumborum and m. pectoralis major showed one-sided shortness among field players. Some differencies were found even in leg muscles – mostly m. gastrocnemius and thigh muscles. The analyses showed that 13 players hold their head rotated to the playside and 10 to the opposite side, while the rest had relatively neutral head position. Weakness of gluteal muscles was seen in the Trendelenburg's test. Abdominal muscle weakness is further discussed in the subchapter with results concerning functional problems.

Back muscles were most commonly overstressed – 35 out of 41. M. quadriceps femoris was found overstressed in just 6 of 36 field players and one goalkeeper out of five. Some of the players recorded regular massages, which was visible in their examinations and palpation.

Some specific findings concerning goalkeepers were more frequent tightness of hip rotator muscles. As a whole, the usually shortened muscles among field players include m. trapezius, m. levator scapulae, m. pectoralis major, m. erector spinae, m. quadratus lumborum, m. iliopsoas, m. piriformis, mm. adductores, m. tensor fasciae latae and hamstring muscles as seen in TABLE 2. Most alerting problems being with m. tensor fasciae latae and hamstring muscles, m. trapezius and m. levator scapulae. The shortening of m. piriformis and other internal and external rotators of hip can be seen also in the limited range of motion of hip joint. Internal rotations were limited bilaterally in 11 players and in addition one player had unilaterally limited range of motion. External hip rotations were limited (bilaterally) only in two players.

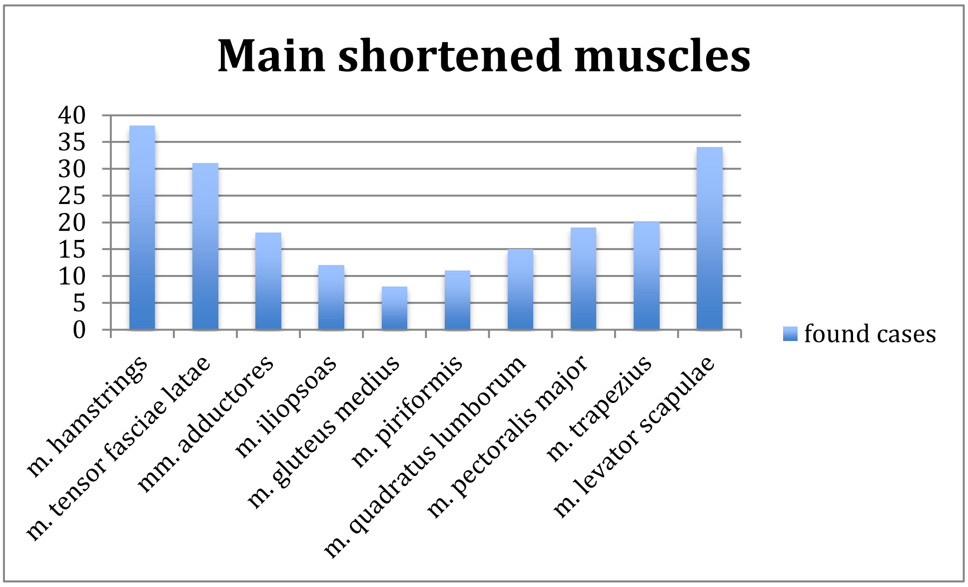


TABLE 2. Main shortened muscles.

7.2 Functional problems

In addition to presenting the knee and ankle joint stabilities, the combined Trendelenburg–Romberg served as a balance test and showed that 39 out of examined 41 players had weak balance. The weak balance was shown by not only ankle and knee instability, but also by trunk rotation and tilting in lateral direction or backwards and exaggerated stabilising movements with upper extremities.

Many of the players had slack knee ligaments, the problem being mainly in the posterior cruciate knee ligaments (bilaterally 25 out of 41 players, unilaterally 5 players) as presented in TABLE 3. However, there was also a few slackenings of anterior cruciate ligaments (5 players) and a couple of medial or lateral collateral ligament loosenings.

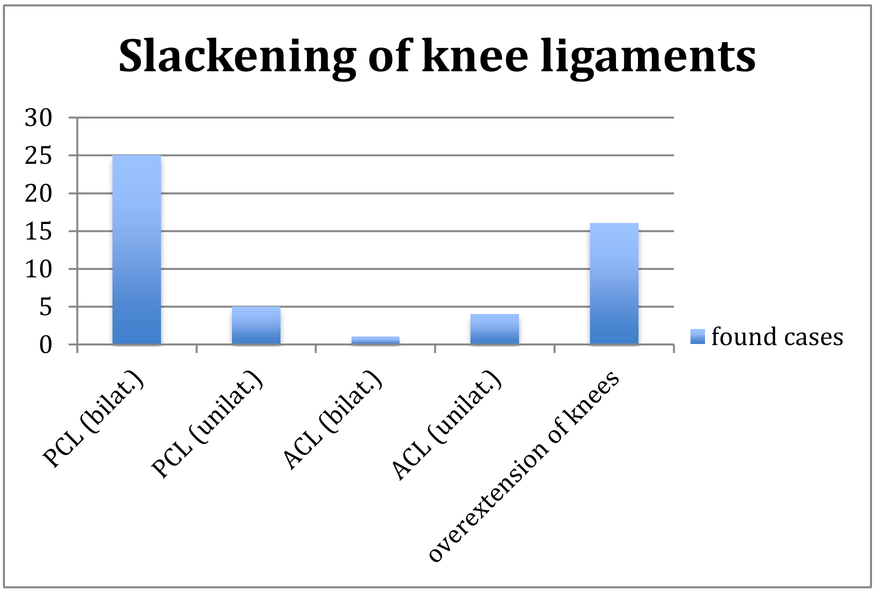


TABLE 3. Slackening of knee ligaments.

In the next page in TABLE 4 and 5 are presented found knee and ankle positions. Half of the players had internal rotation of knees, which, however, was mainly a functional problem resulting from shortened m. tensor fasciae latae and m. gluteus minimus. As explained by Véle (2006, 106) internal rotation of femur may lead into the functional ankle pronation thus also lowering the foot arch, which was visible among the players with internal rotation of knees. External rotation of the knees was less frequent (12 players). Recarding the structural knee malignments, varus posture was two-times more common than valgus (9 vs. 4).

Functional ankle overpronation was significantly more common faulty posture than oversupination (18 vs. 8 cases). From the structural faulty postures of the ankle valgus was considerably more common than varus. Lowered arches were remarkably common as well (mostly only functional problem), but were mainly related to overpronation of the ankle(s) even though also mainly activity of m. tibialis posterior affects the shape of the foot arch. Only a couple of players reported using special insoles.

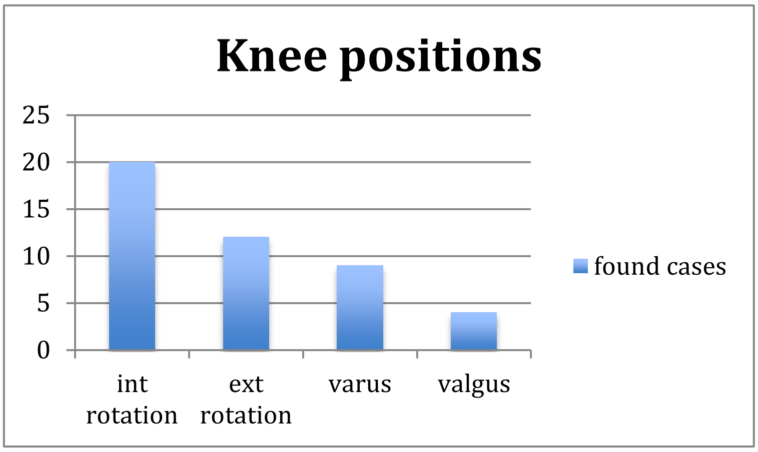


TABLE 4. Knee positions.

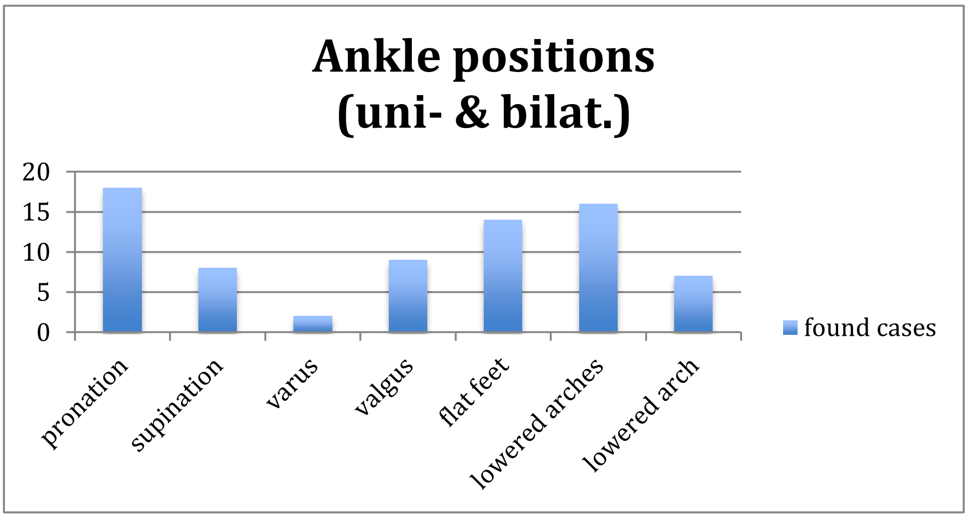


TABLE 5. Ankle positions.

Shoulder protraction was found in 31 of 41 players and even though the position can be resulted from shortened m. pectoralis major, only 16 of these players were reported with shortness of the muscle in question. There were various muscles recorded to be behind unstable, malpositioned scapulae (named under general term scapula alata), but altogether such cases covered 27 out of 41 examined players.

Wrong activation of back muscles was tested by the player performing back muscle exercise, while the order of muscle activation was recorded. Right order of activation is back > gluteal > leg muscles, thus everything else than this was considered to be wrong. As seen in TABLE 6, there were only a couple of players who performed the back muscle exercise in a correct order.

Weak muscle activation in abdominal muscle tests was examined in a couple of different tests and observations were put down. As shown in Table 6, all of the players had weak abdominal muscles, but the degree varied significantly. Some had relatively strong abdominal muscles, but activation of m. transversus abdominis was weak. Opening scissors syndrome results from weak abdominals just like diastase, which was visible in over half of the players. 25 players were reported to have anterior pelvic tilt, where weak abdominal muscles have a big effect.

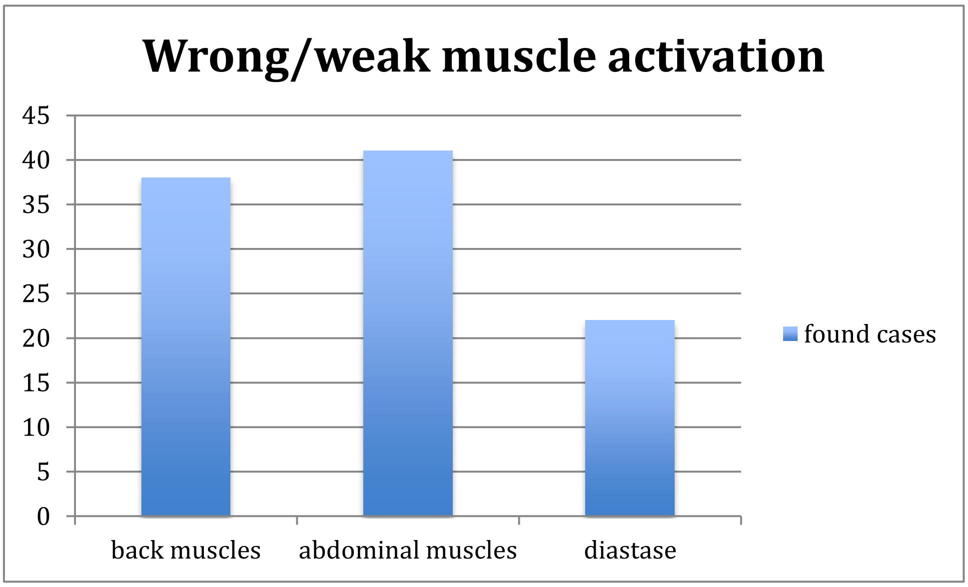


TABLE 6. Muscle activation.

8 CONCLUSIONS FROM RESULTS

The results of the analyses confirmed the silent information accumulated from clinical practices in floorball clubs and student's own floorball experiences. The findings were logical concerning the generally known facts based on the playing posture, laterality and movement in the field. Some connection between muscle development and strength and laterality was found especially in arm muscles, m. pectoralis major and trunk muscles. The found functional problems concerning ankle and knee joints were alerting taking into account the most common injury sites in floorball.

8.1 Muscle imbalances, weakness and tightness

In floorball the most common problems relating to muscles imbalances, weakness and tightness are due to playing posture and laterality and absence of sufficient amount of compensatory exercises and regeneration. One-sided development of certain muscles is a logical result among field players due to the strong laterality and trunk rotation when shooting. The most commonly found shortened (m. tensor fasciae latae, mm. hamstrings, m. levator scapulae and m. trapezius from its upper part) and overloaded muscles (low back and between scapulae and neck) confirmed the clinical experiences.

8.1.1 Muscles of trunk and neck

The forward-leaning playing posture and laterality result in the overstress of back muscles in absence of not enough compensatory exercises and regeneration as seen in the results of the research. The few players who recorded having regular massages, did not have problems with their lower back or on the level of thoracic spine.

Even though the forward-leaning playing posture may usually lead into abdominal muscles getting weaker, the yet more visible finding was one-sided development of abdominal and back muscles. Muscle chains consisting of m. obliquus abdominis muscles lead into one of the chains being significantly stronger due to constant one-sided rotation movement in shooting and passing techniques. Left-handed players use mostly rotation to the right, thus resulting with stronger left-right diagonal (left m. obliquus externus – right m. obliquus internus) in the absence of enough compensatory exercises. However, this was not clearly oustanding in the results, since the bigger problem concerning abdominal muscles was their overall weakness discussed later in chapter concerning functional problems. In general also the back muscles were stronger one-sidedly, but the more significant problem was wrong activation when performing the back muscle exercise.

Commonly found tightness of m. quadratus lumborum (15 out of 41 players) was usually also one-sided because of the laterality affecting the playing posture. This tightness is related to that of thoracolumbar fascia and may cause problems with lower back. From clinical experiences it is clear that stretching the thoracolumbar fascia is almost non-existent among floorball players, which explains its wide tightness and back problems related to m. quadratus lumborum.

The internal hip rotation was limited bilaterally in 11 players, which tells about the tightness of external hip rotator muscles and absence of their proper stretching. The stretching positions for gluteal muscles may feel easy and simple, but they need to be done properly in order to affect the deep muscles.

Because of the low playing posture, seeing other players in the field requires holding head in a forward extended position, which usually causes neck flexors (mm. scalene, m. longus colli, m. sternocleidomastoideus) to get weaker and m. trapezius for its higher parts to result overloaded. At the bench the unergonomic sitting posture with forward thrusted head supports this overloading. Forwarded position of the head explains from its part the common tightness of m. levator scapulae, since according to Hendrickson (2009, 251) the posture loads the muscle eccentrically. Laterality can also be seen in the tightness of neck muscles, but surprisingly the analyses showed that 13 players hold their head rotated to the playside and 10 to the opposite side. No clear reason or logic as to why was shown, but a couple of players said their computer screens home are situated on the side of the rotation.

8.1.2 Muscles of extremities

The sport-specific horizontal movement during a floorball match is mostly on flexed knees in a forward leaning playing position, which causes overload of m. quadriceps femoris, while muscles of back thigh get weaker. Thus, it is surprising that m. quadriceps femoris was found overstressed only in 6 out of 36 field players (and one goalkeeper out of five). However, front thigh is one of the most ”liked” and easiest muscle groups to stretch, which may explain the low frequency. The playing movement also stresses m. triceps surae because of movement on the toes and according to Véle (2006, 259) especially m. soleus has tendency to shorten due to its tonic character. Even though this was not shown in the research results, it may partially explain the amount of calf problems met in clinical practice.

Since the stick is held by one hand higher than the other, the shoulder of lower hand usually results lower. In some cases m. pectoralis major was found to be shortened only one-sidedly, which is most likely due to playing posture and difference in stick handling as also Kysel (2010, 135) has pointed out. For example it is known that m. pectoralis major activates mainly only in the upper hand during swing shot.

8.1.3 Goalkeepers

Some notable specific findings concerning goalkeepers result from the saving position and their typical movement. The most loaded areas for goalkeepers are the small muscles around the hip joint, groins, leg muscles, gluteal and abdominal muscles. According to the research the goalkeepers had more hip rotator tightness than the field players. As also Korsman and Mustonen (2011, 124) have pointed out, the goalkeepers need to especially remember the importance of stretching hip flexors and rotators, groins and knee flexors and muscles around ankles. The laterality of throwing hand did not appear to create any muscle imbalance among the examined goalkeepers, but three of five goalkeepers did have stress-related problems with the shoulder of their dominant hand.

8.2 Functional problems

Almost none of the examined players showed good balance through the combination of Trendelenburg and Romberg’s test, yet a balanced base is needed for the sport-specific stick handling skills and moving to enable the player to concentrate on the performance technique and win 1 on 1 situations. Balance skills are important for goalkeepers too, but from one’s own experiences training focused on balance and proprioception are widely not part of the team training routines in floorball. However, in Czech they are considered as an important part of the individual gym training.

Structural problems concerning ankle and knee position (varus and valgus postures) were also present, but were not significantly common and cannot be affected through exercises. It must be kept in mind that persisting functional problems, which are not taken care of, may lead into structural changes.

8.2.1 Ankle and knee position and stability

Functional instability is often defined as feeling of giving way and recurrent sprains, whose causal factors include for example proprioceptive deficit, muscular weakness and absence of muscle coordination. Stability of both knee and ankle joints is really important for floorball players, since ankles and knees are put under big load due to the sport-specific movement. Most of the injuries are known to be non-contact injuries happening because of loosing postural control which proprioception controls. Considering the occurrence of ankle and knee ligament injuries in floorball, it is worrying how common knee and ankle instability were in the collected data.

Especially the ankle instability cases were often related to previous ankle sprains or wrong posture of the ankle, namely overpronation or supination. In case of functional overpronation (18 players out of 41) and thus lowered foot arches, the medial ankle ligaments are constantly overloaded and especially lig. calcaneonaviculare may eventually give in leading into mechanical instability. Lowered foot arches were present in 16 players bilaterally and 7 players unilaterally.

Almost all of these cases were functional problems related to ankle overpronation, which thus could be handled through bettering the ankle posture and proprioceptics.

Surprisingly and worryingly many of the players had slack knee ligaments, the problem being mainly in the posterior cruciate knee ligaments (bilaterally 25 out of 41 players, unilaterally 5 players). Some of the reasons for slackening of knee ligaments include lack of muscle coordination and muscle imbalances between front and back thigh and weak mm. vasti, which are the most important muscles for stability of the knee joint. According to Hendrickson (2009, 419) the tightness of mm. hamstrings increases knee instability and this relation could be seen in the research data.

8.2.2 Shoulder protraction and scapula alata

Shoulder protraction was present in 31 of 41 examined players, which is relatively worrying. This functional problem is known to result from shoulder muscle imbalance (stronger internal rotators and adductors and weaker external rotators and abductors). Hendrickson (2009, 160) reminds that also shortness of upper trapezius, m. levator scapulae and weak middle and lower trapezius affect the shoulder protraction. The single most responsible muscle for the protraction is m. pectoralis minor, but also shortness of m. pectoralis major may lead into the shoulders tilting forward. Still m. pectoralis major was found shortened only in 16 players, thus it can be concluded that the problem results mostly from rotator muscles instead.

Scapula alata is known to appear together with forward tilted shoulders, since shoulders and scapulae form the shoulder girdle together. Scapula alata results from weakness of some of the scapula stabilisers and was almost as common as protracted shoulders (27 of 41 players). The muscle imbalances and weakness leading to these two faulty postures result from laterality and playing posture, where one hand holds the stick higher easily resulting into one shoulder situating upper compared to the other. Also the playing posture and short stick guide the player into leaning on the stick, which supports the shoulder protraction.

8.2.3 Activation of back and abdominal muscles

As seen earlier in Table 6, huge problem among the examined junior players seems to be the incorrect activation of abdominal and back muscles. This is straight result from poor muscle coordination and muscle strengthening exercises done with a wrong technique. Thus it is worrying that the basic strengthening work of abdominal and back muscles is not done correctly before puberty. The middle body support is essential for both field players and goalkeepers, which makes the results even more concerning.

The weak abdominal muscles affect also the anterior pelvic tilt, which was found in 25 players out of 41. However, weakness of abdominal muscles is not the only reason for the functional faulty posture, but also weak mm. hamstrings and gluteal muscles have their part. Tightness of m. iliopsoas and m. tensor fasciae latae are known to affect the anterior pelvic tilt as well and especially m. tensor fasciae latae was shortened in most of the examined players. All of these factors are clearly connected to the playing posture in floorball and were common findings in the research as well as seen in clinical practices.

9 THERAPEUTICAL EXERCISES

The recommended exercises were selected from the equivalent category (strengthening and muscle coordination, stretching, proprioceptive and compensatory exercises) formed during the content analysis. The exercises themselves are based on experiences from clinical practice during an exchange year and knowledge on floorball. According to the findings from kinesiological analyses, each of the 41 players received individually chosen examples of exercises. The exercises were mostly concentrated on muscle and joint structure strengthening through exercising proprioceptics and muscle coordination in order to prevent injuries and correct muscle qualities like imbalances.

Two common and alerting problems were selected to the thesis to present some examples of the exercises recommended. Improving proprioceptics and balance have an important role especially in relation to the instability of ankles and knees. In addition to the knee and ankle instability and wrong functional postures of these joints, also combination of forward tilted shoulders and instable scapulae need specific exercises. These two are especially highlighted because knees and ankles typically have the highest injury risk and scapulae and shoulders are most easily affected by the laterality and playing posture, with the unergonomic sitting posture at the bench supporting these postural changes.

Coaches of the participated teams asked for possibility for practical guidance to the recommended exercises, thus it was agreed some trainings to be held. The training sessions were during the time period from September to November (Nokian KrP 20.9, 6.11, 11.11 and SSV 21.10) before or after team's own field trainings. These trainings worked as a teaching situation for both the players themselves and the coaches. This was because, the coaches need to be able to correct the exercises, since if the technique is not learnt in a right way, learning away from the incorrect movement patterns later can take years (Seppänen et al. 2010, 100). It is important that the coaches explain the negative effects of wrong technique, because thus the players more likely understand the significance of correction and aim for a clear performance (Seppänen et al. 2010, 57). However, in order to keep the thesis in the limits of bachelor's degree, the training sessions were left out of the thesis report.

9.1 Sport-specifity of therapeutical exercises

Thanks to the clinical experiences in Prague, the importance and benefits from sport-specific exercises in sports rehabilitation as well as in general athletic training are without a question considered obvious from student's point of view. Sport-specific exercises are specified as exercises duplicating an exact movement in certain segment of sports skill. The exercises must involve the same type of muscular contraction and the same range of motion as the sports performance.

Combining clinic-based and sport-specific exercises in rehabilitation is considered to prepare athlete's body for a successful return to sports activity after injury. The combination of these two methods is considered to speed the return, since thanks to sport-specifity the tissues are stressed in a manner in which they are required to function during sports performance. The competitive nature of sports field makes it necessary to use an aggressive approach in rehabilitation, which may be supported by sport-specific exercises also thanks to their psychological advantages. (Beam 2002, 205–207.)

Sport-relatedness has a psychological and motivating factor, since completing sport-specific exercises athlete's self-confidence is likely to increase. The positive psychological outlooks should allow a smooth transition to competitive performance. It is logical to presume that sport-relatedness in preventive exercises is motivating for the players and also may help develop some sport-specific skills.

Besides athlete's main sport, also other sports can be used beneficially in the rehabilitation process, since as Baker and Côté (2003, 14) put it, development of fundamental motor skills seems to be transferable across sports and activities, which have similar general capacities. Baker and Côté (2003, 19) found out that athletes who required fewer hours of sport-specific practice to reach expertise in their main sport, had typically experienced larger variety of sporting activities compared to those with higher amount of sport-specific practice.

9.2 Proprioceptive and balance exercises

As with all therapeutical exercises, it is always important to emphasize proper technique and thus the exercises should be familiarised at slow speed (Beam 2002, 208). The chosen exercises especially in relation to the instability of ankles and knees are based on bettering proprioceptics. This requires relatively careful and concentrated ground work with the basic exercises, since especially junior players are usually not familiar with these kind of exercises. Proprioception is understood as unconscious internal perception of movement and knowledge of body's orientation in space. For the ankle to know where it is in relation to other objects, the ankle proprioceptors must work properly. Thus it is more likely prevented that the ankle results in a position where it is in high risk of injury.

Lajch and Witkowski (2010, 65) concluded that coordination skills develop rapidly between age period from 11 to 19 years, the mean increase of all coordination skills being 57,1%. Also significant change in static and dynamic balance and movement coordination was reported in their research. Improvement of coordination skills is known to be more difficult after the age of 16 years and requires more time, even though it is still possible even in elite athletes especially if special targeted approaches and methods of coordination training are used. However, according to also student's own experiences, it would be beneficial for the players to start balance and proprioceptive trainings already in the early junior years in order to benefit from the sensitive age of coordination and balance development. (Ljach & Witkowski 2010, 65.)

9.3 Exercises for shoulder girdle

Scapular dysfunction is commonly present together with forward tilted shoulders and shoulder dysfunctions, since scapula and shoulder are part of the shoulder girdle. The recommended exercises are directed towards these problems, since both were found to be alertingly common and control of the shoulder girdle is one of the main factors keeping up the optimal playing posture and stick handling as Korsman and Mustonen (2011, 224) also pointed out.

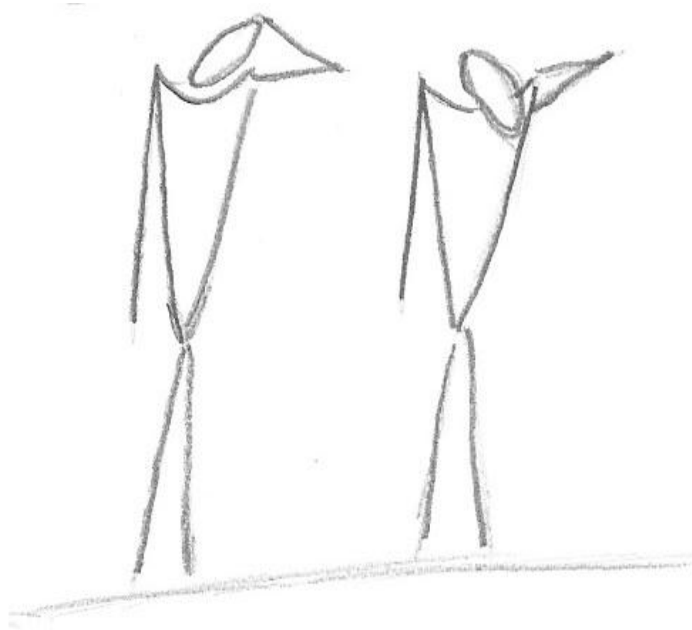
According to Kibler and McMullen (2003, 142), rehabilitation of scapular dyskinesis should concentrate in restoring normal scapular activation patterns by kinetic chain approach. As stated before in case of weakness or dysfunction in scapular musculature, normal scapular positioning, mechanics and scapulohumeral rhythm may become altered and also shoulder dysfunction results. Most of the abnormal biomechanics and overuse injuries that occur about the shoulder girdle can be traced to alterations in the function of the scapular-stabilizing muscles. Thus it is important to recognise the importance of rehabilitating and training the shoulder girdle as a whole and not distinguish shoulder and scapula.

Two most important muscles for scapular stabilisation are m. trapezius and m. serratus anterior, because these have the most influence on the position and movement of the scapula. Other important muscles are determined as mm. rhomboidei, m. levator scapulae and m. latissimus dorsi. Thus in case of scapular winging and dyskinesis resulting from weakness of some of these muscles, strengthening is the main mean of correction. Rotator cuff fatigue may lead to secondary scapular dyskinesis, therefore the scapular exercises should be combined with exercises to strengthen the rotator cuff and stretching the muscles affecting the forward posture of shoulders.

Strength imbalance between weak anterior shoulder muscles (especially m. pectoralis minor) and external rotators and abductors and stronger internal rotators and adductors may pull the shoulders forward thus producing protracted posture (Kluemper et al. 2006, 58–59). Shoulder rehabilitation is usually based on improving coordination and strengthening concentrated on the rotator cuff, deltoid and scapular stabilizer muscles in order to enhance stabilizing action of rotator cuff muscles at glenohumeral joint (Hayes et al. 2002, 502). Kluemper et al. (2006, 58) found that stretching program of anterior and strengthening of posterior shoulder muscles significantly reduced forward shoulder posture in swimmers. In particular stretching m. pectoralis major, m. levator scapulae, upper trapezius, m. latissimus dorsi, m. infraspinatus and m. teres minor is considered important (Kibler & McMullen 2003, 149).

9.3.1 Exercise examples

A. Stretching of m. trapezius, m. levator scapulae and m. pectoralis major



Stretching m. trapezius as seen in the figure on the left. Bring left arm up and place the palm on top of your head with fingers pointing towards right ear. Bring left ear towards left shoulder by gently pulling with the left hand. Hold the position for 30 seconds and repeat on the other side. Remember not to raise your shoulders.

IMAGE 6. Stretching of m. trapezius and m. levator scapulae.

Stretching m. levator scapulae as seen in the figure on the right. Position your head at 45° degree from the midline eyeing downwards. Bring left arm up and place on top of the head with fingers pointing towards neck. Gently pull your head down with the left hand. Hold the position for 30 seconds and repeat on the other side.

Position yourself close to a wall. With bent elbow on the wall, lean slightly forward and away from the stretched arm while keeping your arm pressed firmly against the wall. Hold the position for 30 seconds and repeat on the other side. It must be remembered that m. pec-toralis major has fibres in three different ang-

IMAGE 7. Stretching m. pectoralis major.

les, thus it is important to stretch the muscle in all of these. Remember not to let your shoulder raise.

B. Strengthening mm. rhomboidei

Lie on stomach on a mat and place elbow-flexed arms down by your side. Lift the upper body slightly off the floor and then squeeze the shoulder blades together as far as you can with holding hands above the ground on your sides. Bring and straighten your hands slowly in horizontal plane above your head. Hold the contraction for 10 seconds and then bring your hands back and relax down to the floor.

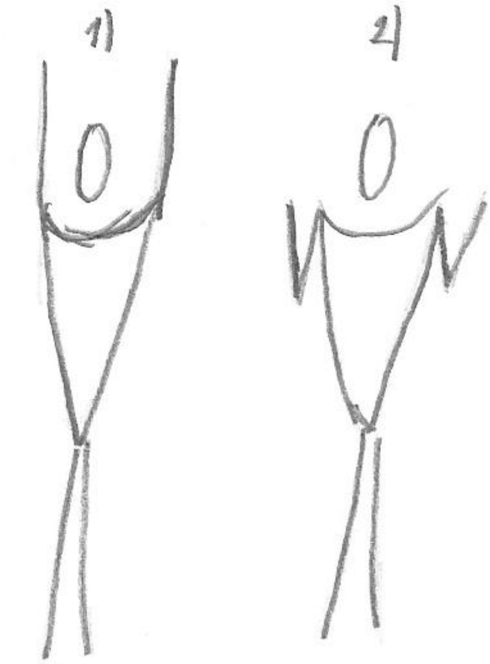


IMAGE 8. The swimming movement.

C. Strengthening m. serratus anterior

The starting position is like in a normal pushup except that keep your hands more down and palms pointing inwards at 45° degrees. Keep your legs extended and hips off the ground throughout the movement. Bring your body down towards ground by bending the elbows and back up by extending them.

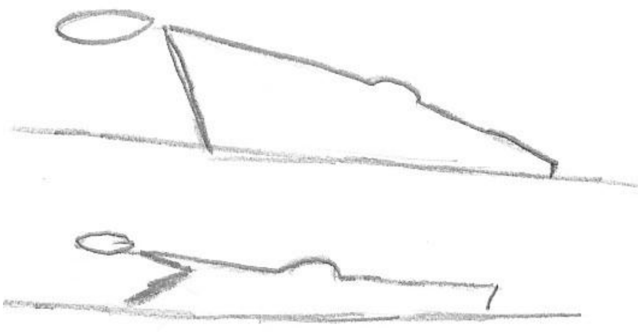


IMAGE 9. Serratus anterior pushup.

D. Stabilisation of scapula and shoulder

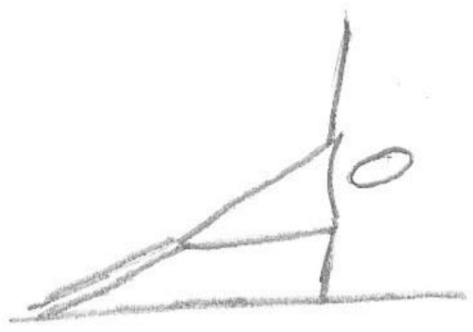


IMAGE 10. Trunk rotation on the side.

Place yourself sideways with the base arm in elbow flexion so that the weight is on your forearm. The weight on the other end of the body will be on toes. Lift up the pelvis and try to keep a straight line from head to toes. Realise the trunk rotation with the free arm leading the movement from above the body ending up bending upwards and over the starting line. Follow the movement with your eyes. At the beginning do the movement without any weights to learn to stabilise the scapula. When progressing add a weight on your free hand or a theraband so that you stretch the band when ending the movement with the opening rotation. You can make the exercise harder by leaning your forearm on a BOSU (half-ball-shaped balance equipment).

E. Stabilisation of scapula

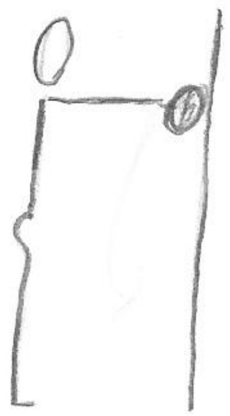


IMAGE 11. Ball circles.

Position yourself close to a wall, remain the good standing posture and lift your extended hands to the wall. You should have a floorball in both hands. The aim is to move the balls to different directions and/or make circles clockwise and anti-clockwise at the same time. Remember not to lift your shoulders. You can increase the challenge by standing on a balance board or a BOSU.

9.4 Exercises for ankle and knee instability

As stated before, ankles and knees are under big load in floorball and cover up most of the floorball injuries. Wrong ankle and knee position are related to their instability as a reason or a cause, which means that exercising stability is an effective mean of injury prevention. Ankle sprains, especially when recurrent, lead to further ligamentous damage as well as damage to mechanoreceptors and reduction in proprioceptive awareness. Alerting was to find how common slackening of posterior cruciate knee ligaments is, since the slackening may affect the knee stability. Thus, strengthening the knee structures and thigh muscle coordination is essential in order to prevent knee injuries. Hendrickson (2009, 367) writes that also hamstring weakness increases the instability of the knee.

Athletes who gain an ankle sprain are very likely to reinjure the same ankle and ankle instability occurs in 20–50% of these cases (Verhagen, van der Beek, Twisk, Bouter, Bahr & van Mechelen 2004, 1385). Mechanical and functional instability can coexist following an ankle sprain although they may not be related. Mechanical instability is understood as laxity and excessive joint motion in some of the ankle joints and it results from structural damage to supporting ligamentous tissues. Whereas, functionally instable ankle may not exceed the physiological range of motion, being often described as joint motion occurring beyond voluntary control or as subjective feeling of ”giving away”. When the joint position sense works flawlessly, the proprioceptive information is received from the mechanoreceptors upon detection of joint displacement and the response in order to maintain postural stability is through increase in muscle stiffness. In case of ankle sprain, the proprioceptive function of the joint is reduced (Verhagen et al. 2004, 1391). The correlation between impaired proprioception and functional instability explains how problems in joint position sense result in improper positioning of the foot at heel strike and that possible kinaesthetic deficits delay the neuromuscular response time, thus increasing the risk of reinjury. (Hughes & Rochester 2008, 136–137.)

Proprioceptive balance boards are widely in use in prevention and rehabilitation of ankle sprains to strengthen the muscles and ligaments and restore the proprioception of damaged structures. In their research, Verhagen et al. (2004, 1391) noticed significantly reduced risk of ankle sprains in players with a history of sprains after proprioceptive balance board training. However, when strengthening the structures around the ankle joint, it must be kept in mind, that this can result into shifting the weakest link of injury chain up to the knee joint. When the ankle has been exercised to withstand external forces resulting to injury, the knee joint will be stressed abnormally and may result injured instead. Therefore, it is important not to forget strengthening the structures of the knee. (Verhagen et al. 2004, 1391–1392.)

Primary function of posterior cruciate ligament (PCL) complex is to restrict posterior tibial translation and act as a secondary restraint to tibial varus, valgus and external rotation. In comparison with the anterior cruciate ligament (ACL), the posterior has slightly higher stiffness. Mechanism of PCL injury in athletes is most commonly fall on flexed knee or hyperextension of the knee. According to Wind, Bergfeld and Parker (2004, 1768) findings of genu varus thrust in gait are more common in patients with chronic PCL deficiency. Hertel, Porfman and Braham (2004, 220) reported that foot overpronation, leg length discrepancy and pelvic tilt were significant predictors for knee injury in athletic population. (Wind et al. 2004, 1766.)

The aim in prevention of PCL injuries is to strengthen the surrounding musculature to provide dynamic stabilisation. Most important muscle is m. quadriceps femoris, since it pulls the tibia in anterior direction and thus counteracts the backwards sag of tibia seen when PCL is torn. Paterno, Myer, Ford and Hewett (2004, 305) highlighted the role of balance training in prevention of ACL injuries and also reported, that the preventive programs improved lower extremity biomechanics and muscle cocontraction during athletic tasks, thus increasing stability and athletic performance. In their research Paterno et al. (2004, 306) found that the ankle disc training group experienced 79% fewer lower extremity injuries – specifically for knee injuries the decrease was 72%. Wind et al. (2004, 1769) reported that in non-surgery treatment of PCL injuries, most important thing in rehabilitation is to regain quadriceps muscle strength. The preferred rehabilitative exercises included the likes of straigth leg rises, eccentric quadriceps contractions and open kinetic chain exercises with progressive resistance and theraband leg presses (Wind et al. 2004, 1773).

9.4.1 Exercise examples

A. Ankle and knee stability, strengthening thigh muscles, balance

IMAGE 12. Lunge.

To perform a lunge, stand with feet shoulder-width apart and step forward landing on the ball of toes. The weight should be on this part in both legs. Change the angle of the step to affect on different muscles. The front knee should be at 90° degrees and not furt- her than the toes. The back knee should nearly touch the ground at an angle close to 90°. Remember to keep the pelvic position and straight back. Dynamic lunges can later be done with weights or done harder having to land the front leg or leaving the back leg on a BOSU.

The lunge can be done in more of a static kind of way as well. When reaching the lunge position, move your weight more to the front leg while counting to ten. Hold the position for 10 seconds and return to the starting position again counting slowly to ten. This horizontal movement can be done to backward direction also or be performed in vertical direction counting to ten when lowering the position. Using BOSU under one or both feet makes the exercise harder.

B. Ankle and knee stability, balance, muscle coordination

The variations of lunges involving more sport-specific charasteristics include miming the trunk rotation in shooting and combining balance exercise and actual passing.

Once in a lunge position you can take a medicinball to extended arms and make the rotational trunk movement happening during a shoot. It is also possible to make trunk rotation moving the ball in horizontal plane. Another variation is to take a floorball stick and a ball and pass fore- and backhand passes with a friend or to the wall while in the lunge position. If you have a friend with you, hold a static lunge position and try to reach to a floorball your friend holds almost unreachable in different directions and distances. All of the exercises can be performed with front leg on a BOSU to create an unstable base.

IMAGE 13. Trunk rotation with medicineball in a lunge.

C. Ankle and knee stability, balance, leg muscle explosivity

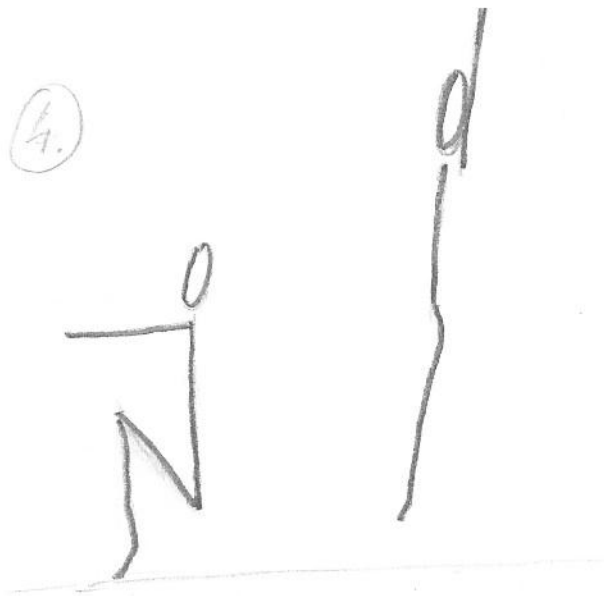


IMAGE 14. Squat jump.

Set your feet in a squatting base with hands extended infront of you. Jump up straightening legs and hands above head and land softly on balls of toes. Remember to keep the linings in knees and ankles. You can make the exercise harder by jumping from a BOSU or having one under each foot.

IMAGE 15. Skating jump.

D. Ankle and knee stability, balance, leg muscle explosivity

Jump from side to side, while controlling upper body in slightly downwards flexed position as you would be skating. Jump through straightening the leg and lead the other flexed leg behind the base leg when on the other side. Try to land on balls of toes. Swing arms from side to side. You can make the exercise more challenging by jumping from BOSU to BOSU.

10 DISCUSSION

The aim of the thesis was to find out the most common functional anatomical problems in floorball juniors (A-category) and create and present sport-specific, injury-preventive and compensatory exercises to target these problems. The thesis was meant to extense the knowledge of both the participated coaches and the junior players themselves and create information from which others can benefit later on. The thesis was realised in cooperation with a Czech Nicneboli.cz –project, where the student did her clinical practice during an exchange year in Prague, the Czech Republic. The used examination method (kinesiological analysis) is a monitoring pattern of the project. The thesis benefitted the project thanks to them receiving an academical research based on their examination patterns and also offered them a view to Finnish floorball.

The research results were presented in quantified and classified way in order to show the floorball players, coaches and physiotherapists where the biggest problems are and what should be taken into account in training and rehabilitation. The therapeutical exercises included in the thesis are based on student's own experiences of clinical practices and knowledge on floorball. They wished to show physiotherapists how to combine therapeutical and sport-specific characters when planning exercises for floorball players.

10.1 Research - Kinesiological analyses

Validity and reliability are tricky concerning the qualitative research. Validity means that correct things from the point of view of research question are being researched. The aim of the research was to find the most common functional anatomical problems, thus it was valid choice to use kinesiological analysis as an examination pattern, since it concentrates on examining and pointing out the individual problems. Validity is divided yet into internal and external validity, where internally valid research requires that its analysing and conclusions are done without mistakes. The student did the research examinations alone and had previous experiences of using the same examination patterns, thus the examining came routinely and the logic of conclusions was consistent.

The external validity of research, also known as transferability or generalisation, means the ability to transfer the results for same kind of other situations, which in this research must be handled carefully. Even though the results did confirm the already known silent information, the research group was relatively small and limited (41 players in A-junior category) compared to the amount of under 19-year-old male players in Finland – 19 500 according to IFF (2011). The examined players were only from the oldest age category, so the results are not straightly transferable to all categories. It is not competent to jump into conclusions concerning the whole floorball playing youth, but the guidelines and general characteristics are certain and same. Taking into account the qualitative research method, the amount of players can be considered big enough for the purpose of the thesis.

External validity and generalisation is closely related to the saturation of the research group. The group is defined saturated when the informants (here: the examined players) do not bring any new findings to the research (Tuomi & Sarajärvi 2002, 89). It is slightly problematic to speak about saturation when it comes to qualitative research, but all the same, at some point it happens that the results start to repeat themselves. However, when creating a new empirically-based theory the repetitions in results are needed.

The reliability of research describes the ability for someone to repeat it and how logical the results are. For a research to be reliable, the process should be possible to be repeated with the help of carefully documented materials. However, the examination pattern of the thesis being based on Czech methods, it is not completely possible for someone without understanding and knowledge of the Czech physiotherapeutical way of thinking to repeat the examinations in the same manners. This is because the Czech physiotherapy is for the most part based on kinesiology, which is not taught in Finland. Also a bit of knowledge and experience of postural analysis is required for the findings to be competent, since seeing the problems in the posture and their correctness depends on the quality of observation the examiner does.

Using an already established examination pattern excluded the possibility to change any parts of it. All the methods are valid and generally known physiotherapeutical examinations in Czech. Still it would be recommended to include also closer examination of cervical muscles, since it is known that m. sternocleidomastoideus and mm. scaleni are either overstressed or weakened in forwarded posture of the head, which is common in floorball players. To give deeper information about muscle imbalances and strength, it would be reasonable to include more precise muscle strength measurement concerning also muscles of the extremities.

10.2 Therapeutical exercises

Planning the therapeutical exercises was simple thanks to the previous experiences. It remains to be seen how the coaches and players took the exercises in and whether they sustain and get integrated into the training routines. All the received feedback from the coaches and the players was positive and further cooperation with both teams is going on and planning to develop further. Thus the thesis may be considered successful in getting the coaches to understand what they and their players can benefit from a physiotherapeutic point of view.

The coaches of both participated teams were actively involved after the data collection, when they and the players received the results. Their activity was appreciated since the aim of the thesis was to provide them and the players with physiotherapeutic knowhow and give them tools to the off-rink training routines. Due to the coach-oriented approach, the demonstration and teaching of the exercises were carried out before or after sport-specific trainings, since coaches from both teams asked for this possibility. In order to keep the thesis within the limits of a bachelor’s degree, the exercise demonstrations were left out of the thesis report.

In general all coaches have different readiness and knowhow to the coaching, which can be seen in the trainings on and off the rink. Some clubs may work on a more professional base than others, which will affect the kind of coaches junior teams have (so called qualified coaches vs. ex-players, older juniors or parents). This affects also the training routines and their quality, since without any sport education or background, it is almost impossible to take into account all the necessary things in training junior players including for example amount of compensatory exercises, right technique in stretching and injury prevention.

10.3 Thesis process and professional growth

Lack of previous research concerning the subject area and cooperation with the Czech project gave their own guidelines to the thesis process. Even though the practical realisation of the thesis was familiar to the student, the most difficult part was to write down and present the process and explain used methodology. The results from kinesiological analysis confirmed the silent information from clinical practices and own floorball experiences, excluding the frequency of posterior cruciate ligament slackening. Also the aims of the thesis were reached and feedback from the cooperative project and the participated players and coaches was positive, so the process can be considered successful and having met its aims.

Concerning one’s professional growth the aim was to further develop self-reliant clinical reasoning and combine own specialised knowledge from clinical practices and theoretical studies. The thesis also gave an opportunity to direct the professional growth, future career planning and employment to the field of sports physiotherapy. Clinical practice and the thesis opened employment possibility to the cooperative project. It was important for the student to be able to deepen and specialise professional knowhow in the subject area and see the need and benefit for the thesis in practice. The benefits from the thesis to the professional field are certain and actual, which convinced the student about its importance.

10.4 Future research

Further research is needed to be able to generalise the results for a wider group of floorball players starting from the youngest players to the adults. The problems resulting from spending many years in the playing posture can be seen already in the older youth categories, but it is to be noted that children have totally different body composition and training routines than A-juniors, thus these results cannot be directly transferred to the younger players. There might also be some differencies between girls and boys due to different body compositions and training routines, which should be examined.

The aim of the cooperative project is to provide the athletes with an individual exercise patterns to target everyone’s individual problems, which also guided the out-product of the thesis. There are several general guidebooks and guidelines concerning injury prevention and compensatory exercising in sport-specific ways for other sports like football, but for now there is none for floorball.

In order to research the effectiveness of the therapeutical exercises in injury prevention there should be testing before and after a period of exercising for example a season and preferably also a control group. Another important subject for research would be to form a progressive training program to cover the whole season and/or off-season. This because the players and coaches participating in the research in this thesis only received exercise examples and the rest was left to their own activity, readiness and willingness to take the exercises and ideas into the training routines.

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APPENDICES

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st.:1: **L:** stoj v prstcích, hra šlach, úklon, záklon, rotace _________ / **P:** prstce, hra šlach, úklon, záklon, rotace ___________

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st.:3: **L:** prstce, hra #lach, úklon, záklon, rotace_________ , padá / **P:** prstce, hra #lach, úklon, záklon, rotace ________, padá
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<u>LOPATKY</u>: L: OK, L níž / výš o _________cm // - lopatky odstáté – nepracují fixátory – oslab. mezilopat. svaly

<u>RAMENO</u>: L: OK, protrakce , omezená VR/ZR // P: OK, protrakce, omezená VR/ZR // pozn.:_______________
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hlava v protrakci také ANO / NE

Poznámka: Tento dotazník je majetkem pojektu www.nicneboli.cz a jeho kopírování či zneužití mimo tento projekt je zakázáno.

Appendix 1a. Examination form from Nicneboli.cz –project.

© FYZIO dotazník 1 ® www.nicneboli.cz /**2. část dot./:** JMÉNO:________________klub:___________dat.vyš.:_____

PALPACE : dolní končetiny, zadek, záda, krk, ramena, horní končetiny aj. - zadní pohled: BOLÍ NEBO JE CITLIVÉ:

achill. šlacha L / P, **lýtko** (triceps) L / P, **zadní stehno**(hamstringy) L / P, **gluteus medius** L / P, **gluteus maximus** L / P je / není oslabený, **iliopsoas** L / P, **piriformis** L / P, **tensor** L / P, **fibula** – hlavička L / P, **přitahovač stehna** L / P, **paravertebrální val** (PV) L / P, **quadratus lumborum** (QL) L / P, **trapéz** L / P, **šíje** obecně, **scaleni** L / P + jiné svalové skupiny - jaké ? poznámka: ____

PALPACE : pokračování + **přední pohled: bolí nebo je citlivé:**
vazy kotníku L / P, **holeň** L / P, **kvadriceps** L / P – vasty: ____________**přitahovač** L / P, třísla, **piriformis** L / P, **břicho** A / N, **přímý břišní sval** A / N, **šikmý břišní sval** L / P, **žebra** – kde – jaké _______ L / P, **prsní sval -major** L / P, **-minor** L / P, **rameno** L / P, **podezření na zánět rotátor. manžety** L / P ano, **klíční kost** L / P, **klíček** L / P, **SCM** L / P – **biceps** paže L / P, **triceps** L / P, **předloktí** L / P, **hlavička radia** L / P jiné: ____
BŘICHO: oslabené ANO / NE, **diastáza** ANO / NE, ________cm, **fenomén rozevřených nůžek** ANO / NE, pozn.:________
KYČLE: L: OK, omezená VR, omezená ZR / P: OK, omezená VR, omezená ZR / poznámky:_____________________

Patrick sign.: L / P:__________________________________ poznámka: ______________________________________

KOLENA: úrazy, problémy: ____
VAZY KOLEN: OK, L: PZK, ZZK, POS. VNĚJŠÍ / VNITŘNÍ povolené**/ P: PZK, ZZK, POS. VNĚJŠÍ / VNITŘNÍ** povolené
čéška L / P problém – jaký: ____
patella tažena: L / P : ___________________________**lig. patellae: L / P** ______________________________

KYČLE:
L: VR/ZR/OK ________________/ **P: VR/ZR/OK** _______________ **poznámka:** __________________________
rectus femoris L/P:______________ **ostatní svalové skupiny:** _______________________________________

PÁTEŘ poznámky - doplnění:L – bederní _____________________________Th – hrudní________________________
C – krční ____ pozn.:____

test záda – postupně zapojuje**:** ___________**-**___________**-**___________**, to je: správně, špatně /**_______________
BŘICHO:
test na transversus abdominis „miminko" :______________________ ostatní testy:_______________________________
dýchání hrudní / do břicha:_________________________ pozn.:____

LOKET: hypermobilita **ANO – NE** , **poznámka:**______________________ ___________________________________

ZÁPĚSTÍ A PRSTY ruky**:** poznámka:____

Poznámka:____

Závěrečná zpráva fyzioterapeuta je přiložena k dotazníku včetně doporučení a návrhu řešení zjištěných zkušeností.
Za důvěru vám děkuje tým projektu www.nicneboli.cz, jmenovitě:
Mgr. Jindřich Douda, autor a manažer projektu **– 603 264 762, douda@cmail.cz**
Karel Pelikán, DiS, hlavní fyzioterapeut projektu **– 603 167 811, pelikkar@gmail.com**

Erna Jirásková, fyzioterapeutka **– 603 194 581,**
Kaisa Lind, stážistka, studentka fyzioterapie **(FTVS Praha a Universita v Helsinkách)**
Jiří Trenkwitz (fyzio a masér **SK Slavia Praha A tým fotbal**), garant projektu **– 603 433 997**

doporučujeme následná vyšetření – kde:____
doporučená kompenzační cvičení: - bude řešeno formou seminářů po dohodě s trenéry a rodiči.

dne:_______________________fyzioterapeut / kontakt:___________________________________

TENTO **ROZBOR JE POUZE ZÁKLADNÍM VYŠETŘENÍM**, V PŘÍPADĚ JAKÝCHKOLI DOTAZŮ NEBO POŽADAVKŮ NA DALŠÍ VYŠETŘENÍ KONTAKTUJTE PROSÍM NAŠEHO FYZIOTERAPEUTA. VŠECHNY INFORMACE UVEDENÉ V DOTAZNÍKU POVAŽUJEME **ZA DŮVĚRNÉ** A TYTO NEBUDOU NIKDE ŠÍŘENY BEZ SOUHLASU ZÁKONNÝCH ZÁSTUPCŮ NEBO ZLETILÉHO KLIENTA.

UPOZORNĚNÍ PRO RODIČE: U NÁSLEDNÉ PÉČE MÁ ÚČASTNÍK NAŠEHO PROJEKTU SLEVU 15% NA VŠECHNY NAŠE SLUŽBY (SAUNA, MASÁŽE, FYZIOTERAPIE, PORADENSTVÍ)
– sídlo: hala TJ Tatran Střešovice, Sibeliova 368, Praha 6 – Střešovice (zastávka tram 1 a 18 – Ořechovka).

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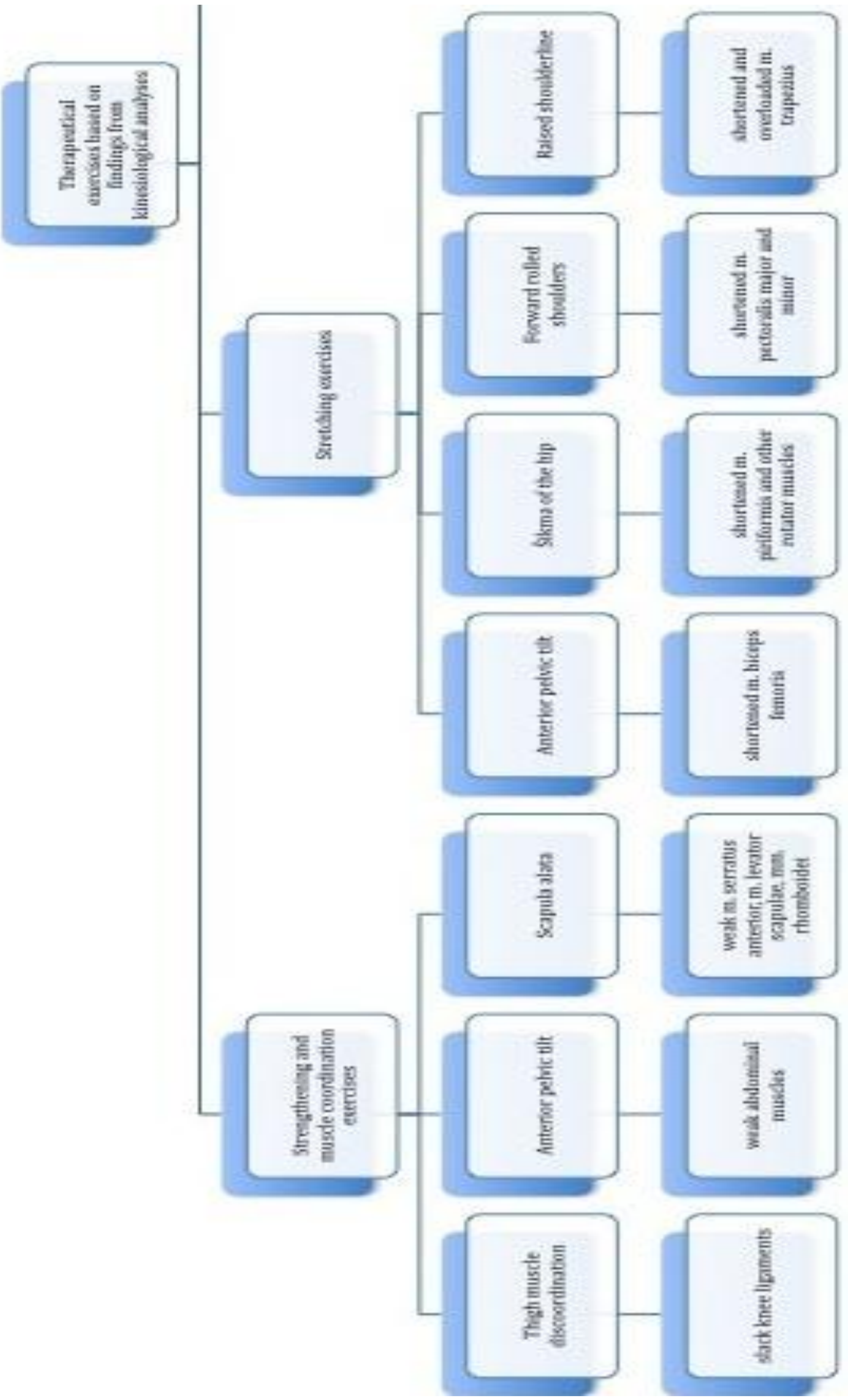
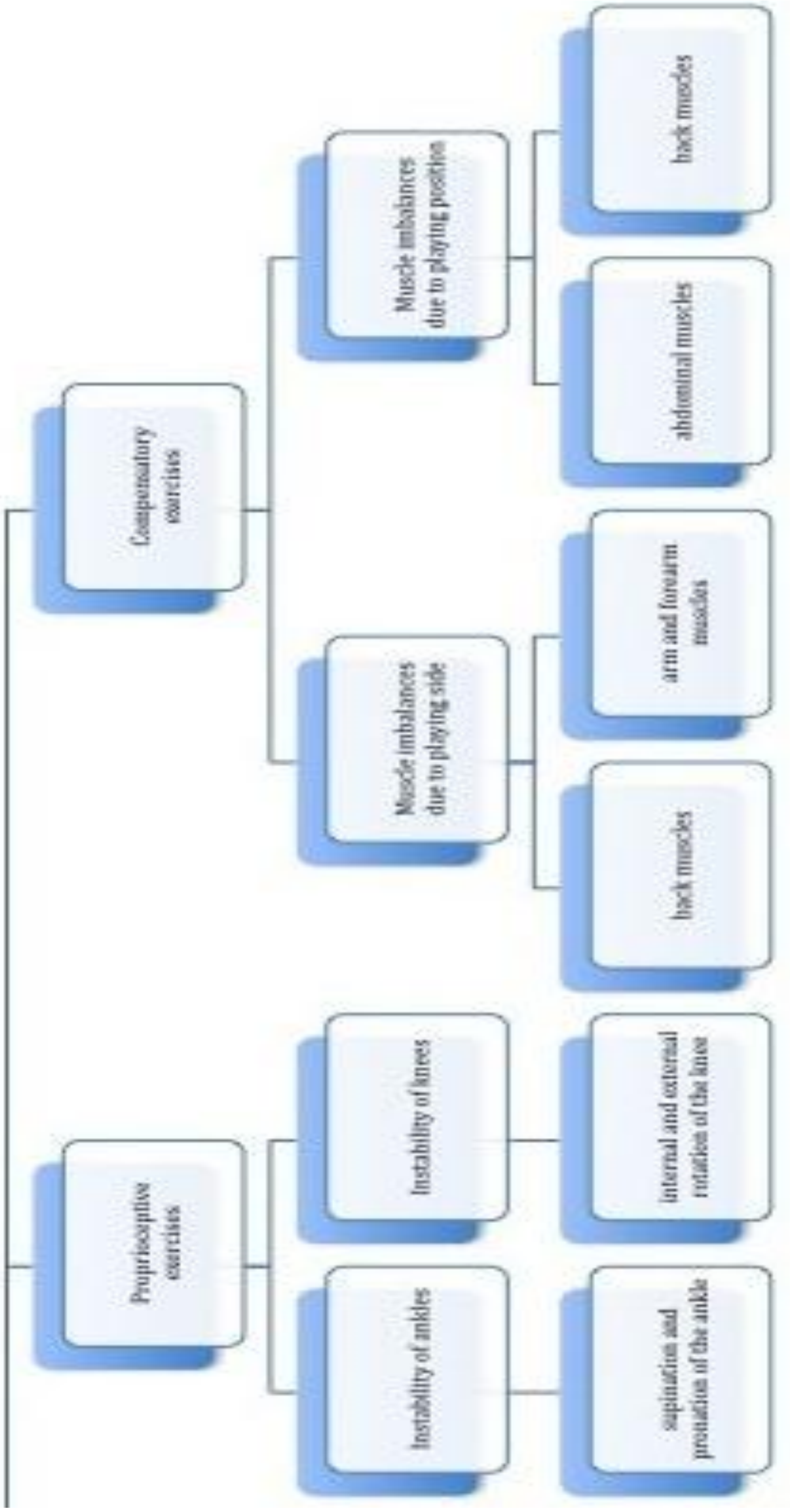
Appendix 1b. Examination form from Nicneboli.cz –project.



Appendix 2a. Sorting of codes from content analysis.

Appendix 2b. Sorting of codes from content analysis.



Appendix 2b. Sorting of codes from content analysis.