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Thesis for doctoral degree (Ph.D.)
2014

Psychological Injury Prevention and Cost Analysis in Elite Floorball

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Stockholm 2014

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Printed by Universitetsservice US-AB
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ISBN 978-91-7549-748-8

PSYCHOLOGICAL INJURY PREVENTION AND COST ANALYSIS IN ELITE FLOORBALL

THESIS FOR DOCTORAL DEGREE (Ph.D.)

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To my Parents and Ruska

ABSTRACT

Floorball is a growing indoor team sport. Like many sports with fast turns and stops, the likelihood to sustain injuries is evident. The epidemiology of sport injures is well documented and prevention strategies have been suggested. Elite players are probably experiencing stress due to high demands in their sport paralleling with studies or work. The relation between stress and risk for injury has been reported in earlier research. Consequently, a psychological injury prevention programme at team level is of interest. The injuries can be divided into either traumatic or overuse injuries. So far, the research has not been able to find possible psychological factors that may explain the onset of overuse injuries. Most individuals with sport-related injuries need some kind of rehabilitation. Examinations and rehabilitations of sport injuries are most likely afflicted to costs. The documentation of costs of floorball injuries is sparse.

The primary objective with this project was to evaluate a psychological skills training programme in terms of injury prevention in Swedish elite floorball during the season that the intervention was implemented and also during the consecutive season. The project had two additionally objectives; to investigate possible psychological risk factors to overuse injuries and to estimate the cost of floorball injuries at elite level.

For this purpose, 23 elite floorball teams were included in this project. The teams were allocated to an intervention group or a control group. The intervention group consisted of 11 teams (males n=94 and females n=99). The remaining 12 teams were included in the control group (males n=109 and females n= 99). The occurrence of injuries was prospectively recorded in both groups during two seasons. All injuries that occurred were registered according to time loss definition. The teams in the intervention group participated in a group-based psychological skills training consisting of six sessions during the season 2010/2011. The control group did not receive any intervention. During the consecutive season, 2011/2012, injury recordings continued without any intervening. The injuries that occurred during the second season, 2011/2012, were followed up with a questionnaire regarding cost related to each injury. Eleven floorball players, who were diagnosed with overuse injuries, were interviewed regarding possible psychological factors that may have contributed to overuse injuries.

In total, the first season, 142 players (35%) out of the 401 players sustained 197 injuries, 0.45/injuries per player in the intervention group and 0.53 injury/player in the control group. The second season resulted in 93 (27%) injured players out of the 346 participating players during the game season, 0.31/injuries per player in the intervention group and 0.41 injury/player in the control group. None of the analyses showed statistical significant group differences. The effect size Cohen's d was considered as small 0.02. The estimated means of cost of injuries in floorball showed that mean costs per mild injuries (<7 days absence from floorball) was 332 euro (SD 451), the cost per moderate injury (7-30 days) was 987 euro (SD 2868), and the mean cost per severe injury (> 30 days off) was 2358 euro (SD 2122). Knee

injuries were the most costly ones as well as the traumatic injuries in female players. The interviews resulted in five core themes with possible influencing factors that contributed to overuse injuries: history of stressors, person factors, psycho-physiological factors, psychosocial factors and ineffective coping.

The conclusion of this project was that no statistical significant differences were shown after the intervention. The value, however, with fewer injuries in both the intervention group and the control group should be considered to be of clinical importance. The cost of floorball injuries increases with the level of severity. Those injuries are possible risk factors to new injuries or future complaints. Therefore, it is important to evaluate preventions strategies also from a health economic perspective. To minimise risk factors to sport injuries, also psychological factors must be considered when prevention strategies are planned.

LIST OF SCIENTIFIC PAPERS

I. **Tranaeus U**, Johnson U, Engström B, Skillgate E, Werner S.
A psychological injury prevention group intervention in Swedish floorball.
Knee Surgery, Sports Traumatology, Arthroscopy. 2014Jun 17 [Epub ahead of print]

II. **Tranaeus U**, Johnson U, Ivarsson A, Engström B, Skillgate E, Werner S.
Sports injury prevention in Swedish elite floorball players: evaluation of two consecutive floorball seasons.
Knee Surgery, Sports Traumatology, Arthroscopy. 2014 Oct [Epub ahead of print]

III. **Tranaeus U**, Heintz E, Johnson U, Forssblad M, Werner S.
Injuries in Swedish floorball: a cost analysis.
Manuscript

IV. **Tranaeus U,** Johnson U, Engström B, Skillgate E, Werner S.
Psychological antecedents of overuse injuries in Swedish elite floorball players.
Athletic Insight 6(2):155–172

CONTENTS

LIST OF ABBREVIATIONS

ACSI-28	The Athletic Coping Scales Inventory-28
CI	Confidence Intervals
ICD-10	International Classification of Diseases-10
IFF	International Floorball Federation
LESCA	The Life Events Surevey for Colligate Athletes
M	Mean
Md	Median
N	Number
SAS	The Sport Anxiety Scale
SD	Standard Deviation
SSP	The Swedish universities Scales of Personality
TRIPP	Translating research into injury prevention practise

1 INTRODUCTION

During the years when I was working as naprapath, quite often with elite athletes, the focus was to prevent injuries. An experience when working with highly motivated athletes and high achievers from the business world was a need for someone taking care of a soared back but also a soared mind or a curious mind, when the patient wanted to discuss injury related issues and not only undergo rehabilitation. In the fall 2005, I started my bachelor studies in sport psychology at Halmstad University. I would never ever have guessed then that I would defend a thesis 10 years later. This thesis is an attempt to merge different angles of injury prevention. So far, most of the research has examined details of the human body and its joints and muscles to understand the injury mechanisms. To my knowledge, all athletes and people I have met, also have emotions and thoughts leading to behaviours, which in some cases prevent injuries and in other cases might contribute to the occurrence of injuries. Consequently, it is time to include psychology when working with sport injuries. Regardless of profession; coach, team doctor, physiotherapist or naprapath, when one is involved in sports many parts of the work is related to psychology: e.g. arousal regulation, communication, motivation, goal setting and group cohesion. However, some of this issues are solved unconscious or automatically, others are not. This may differ from time to time or between different persons. To make the psychological approach evidence based, conscious, and systematic it is important to raise this matter more often and include the topic in education for the people involved in sport.

2 BACKGROUND

2.1 FLOORBALL

Floorball is a team sport played on an indoor rink with 5 players on the field and one goalkeeper on each team. The games are played over 3 x 20 minutes with two, 10 minutes intermissions. From the very beginning, the stick was a stiff plastic shaft and a plastic blade. The equipment has developed over the years and simpler sticks are still available. The most advanced sticks consist of a composite shaft and adjustable blades that can be tailored to fit the individual player. No other special equipment is needed, however, eye protection/shades are recommended for children and adolescents to protect the eyes. The goalkeeper wears protective pants with kneepads and a helmet with face protection. Floorball is a sport that does not need expensive equipment and facilities. This results not only in organised leagues and games, but also recreational floorball in schools and corporate games, as well as, warm-up training in other sports, and by policemen/women and firemen/women. No physical contact, tackling, is allowed between the players. Potential injury risk factors may, however, exist in such sports with quick stops, turns, and changes of directions.

Floorball began to be played in Sweden in the late 1960s. In the 1980s, the sport developed and had their first national championship in Sweden. By the beginning of the 1990s the Swedish Floorball Federation included more than 1,000 member clubs. In 2013, the Swedish Floorball Federation had 1,030 clubs and almost 120,000 licensed players. The first world championships were played in 1996 in Stockholm, Sweden. Thereafter, the World championships are held every even year for men, and every odd year for women, with teams representing the top sixteen countries. In 2002, the first World University Championship was held and teams from eight countries participated. In July 2011, The International Floorball Federation received full recognition by the International Olympic Committee (IOC). In 2013, nearly 300,000 people were licensed players (competing) in 55 member countries of the IFF. The number of recreational players is estimated to be 400,000 in Sweden and 1,256,000 in all the member countries of the IFF, in 2013.

2.2 SPORTS-RELATED INJURIES

The epidemiology of injuries in sport has been documented in different sports [1-3]. The previous research showed that 41 % of female soccer players sustained injuries during one season; the overall injury incidence rate was 6.8 per 1,000 hours exposure to games and training. Traumatic injuries were most common at 34 % in this study [1]. The corresponding numbers in team handball showed that 23 % of the players were diagnosed with a time-loss injury during one season, of which 79 % were traumatic injuries between both genders [3]. Long-term injury surveillance in collegiate athletes showed an injury incidence in soccer and basketball of 18.8 and 7.7, respectively, per 1,000 game hours, and 5.2 and 4.0 per 1,000 training hours [2].

2.3 INJURY DEFINITIONS

The definition and methodology varies in injury epidemiological research and that results in difficulties when comparing studies [4-8]. Consensus statements have been suggested in team sports such as rugby [9], soccer [10], individual sports such as tennis [11], and multisport events [12]. The injury definition in rugby and soccer include any physical complaint that was associated to training or match in the sport. An additional distinction is if the injury needs medical attention or results in a player being unable to take full part in ordinary training or matches; "medical-attention or "time-loss" definitions [9, 10]. Depending on the research question it might also be important to determine whether the injury is new or recurrent [13, 14] due to the increased risk of new injuries [15]. The definitions used in previous floorball studies were new time-loss injuries [16, 17] and complaint that caused the athlete to modify the activity [18].

2.3.1 Injury classification

Injuries need to be classified related to their body localisation and the damaged structure or tissue. There are several classifications systems: International Classification of Diseases (ICD), The Orchard sports injury classifications system (OSICS) [19], and the Sports medicine diagnostic coding system (SMDCS) [20] wherein the two latter are adjusted to sports medicine context. The ICD-10 codes the injuries with at least four characters. The first letter indicates the kind of injury, the following three-digit number identifies the body localisation and injury category, and in some cases, a fourth digit specifies the localisation further. OSICS-10 is a four-character code system wherein the first letter identifies the body localisation, the second to forth characters identify the pathology of the injury. SMDCS is a six-character system with the first two letters identifying the body localisation, the next pair of digits identifies the structure and the last pair of digits is a diagnosis code.

2.3.2 Injury causation

The causation of injuries is separated into traumatic and overuse injuries. The traumatic injury has a sudden onset at an identified and specific event while the overuse injury is caused by repeated micro trauma without any identifiable event and most often has a gradual onset [21-24]. The separation between the two types of injuries is important since they have different injury causation and thus need different prevention strategies [25]. The inciting events for overuse injuries may be distant from the actual injury occurrence [26].

2.4 INJURY RISK FACTORS

The aetiology of risk factors for injuries is described in two categories: internal (personal) and external (environmental) [23, 27-29]. Risk factors have been identified over many years and are discussed in the literature as influencing the injury occurrence directly or indirectly via mediating/moderating variables [27, 30]. Some models have been presented to explain the injury mechanisms using the internal and external factors [26, 31, 32]. In 1994, *a Model of multifactorial aetiology in athletic injury* was presented [32]. The model was revised in 2007

to the *Dynamic, recursive of aetiology in sport injury* [31] and also took into consideration the discussion of the *Comprehensive model for injury causation* [26]. The *Comprehensive model for injury causation* is a model that starts with the bases from the previous suggestions in the literature. This model includes the internal risk factors that are suggested to predispose an athlete to be at risk. Moreover, when an athlete is exposed to external risk factors, the athlete's susceptibility to injury may increase. The risk for injury is also influenced by the inciting event, which may consist of the nature of the sport in terms of the playing situation, player/opponent behaviour and biomechanical descriptions (Figure 1).

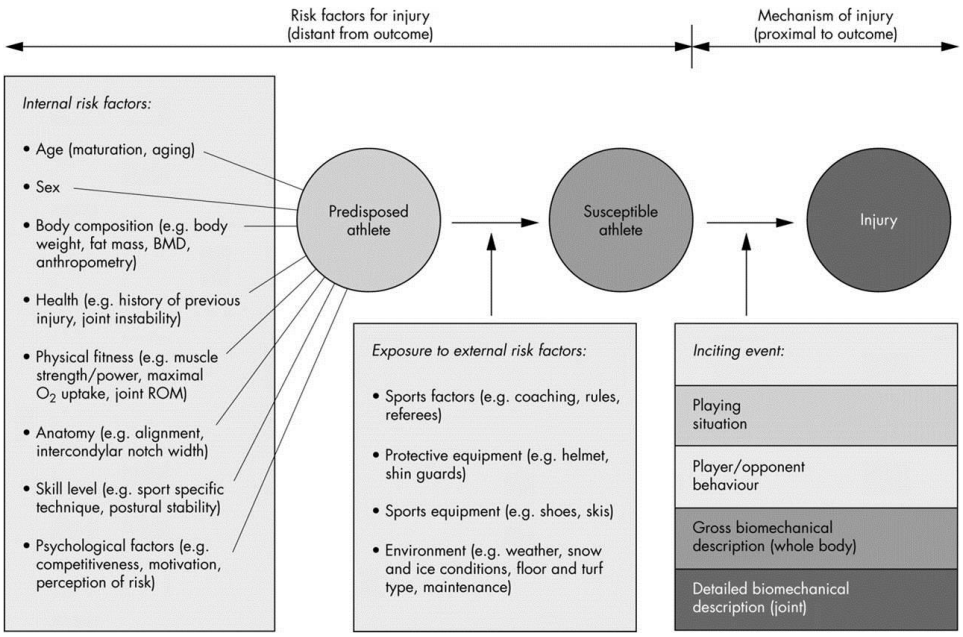

Figure 1. The Comprehensive model for injury causation [26]. Reprinted with permission

The latest published model, the *Dynamic, recursive of aetiology in sport injury* [31], includes the same components as previous versions. The new component in this model is the no injury part that implies that the athlete can continue to play. The intrinsic factors might, however, have changed and modified the athlete's predisposition as well as the susceptibility to injuries. If repeating the same kind of event, there is either an increased susceptibility to injury due to fatigue, or the opposite, a decreased susceptibility of injury occurrence due to better neuromuscular control (Figure 2). The risk factors are also assumed to interact within the main groups and the risk is probably higher when more factors are involved. The risk factors in floorball are sparsely discussed, therefore, the following results from the literature are collected from studies that are probably able to be generalised to floorball.

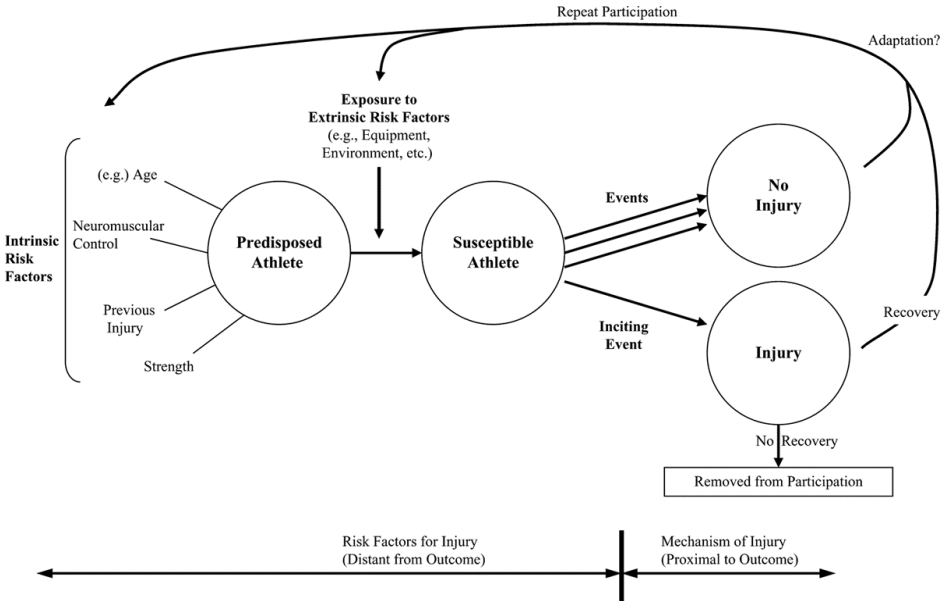

Figure 2. The dynamic, recursive of aetiology in sport injury [31]. Reprinted with permission,

2.4.1 Extrinsic risk factors

The extrinsic or external factors are suggested to include sports related factors (type of sport, exposure, match or training, opponents, and team mates) sports facilities (floor/ground, indoor/outdoor, light, permanent objects), and equipment (sport related: e.g. stick or racket, protective gear, rules and referees) [26, 31, 32].

2.4.2 Intrinsic risk factors

The intrinsic or internal factors have been a focus in previous research. Among the intrinsic factors age, gender, body composition, previous injury, physical fitness, anatomy, skill level, and psychological factors are included [23, 26, 27, 29]. The psychological factors are probably the least investigated part in this model. Some research in the area has, however, been published. The following part of this thesis will focus on the psychological factors as risk to athletic injuries.

2.4.2.1 Psychological risk factors

Previous research has emphasised a variation of psychological factors as predictors to, or contributors of, the risk to sports injuries. Some of these factors have been used as a basis for the construction of theoretical models aiming to explain/explore the relationship/influence of psychological factors to the occurrence of sport injuries [25, 33-35].

Andersen and Williams presented a model of stress and athletic injury based on previous research in psychological factors and athletic injuries [33]. This model included three variables, personality, history of stressors, and coping resources that were suggested to

influence the stress response, which in turn may influence the risk for an athletic injury. The early studies in the 1960s are derived from clinical or coaching experiences. Since then, some research in personality and athletic injury has been conducted, and a large number of the studies found a relationship between life stress and athletic injury [33]. One of the early studies that detected the relationship between stress and sports injuries was Holmes, who in 1970, found that football players who rated high on life stress were more injury-prone than players that rated low on life stress (for details see [33]). This research, among others, was the foundation of the first version of the *Stress and injury model* [33]. Other underlying studies in the model showed the relationship between injuries/illness and minor stressors. Personality variables like the relationship between psychological hardiness and locus of control were also included. Under the heading "coping resources" in the model, studies regarding coping behaviours, as well as, coping resources were included. Coping resources include social support and the use of stress management techniques and drugs. The variables personality, history of stressors, and coping resources are suggested to influence the core in the model, the stress response that consists of cognitive appraisal and somatic reactions. When an athlete encounter figures a potentially stressful event, he/she appraises the demands, his/her resources, and the consequences, and from these actions a stress response may occur. The cognitive appraisal will probably not occur without a somatic response. The responses discussed in relation to risk for injuries are muscle tension and attentional changes. Consequently, since these influencing factors may cause or contribute to an injury, these factors are suggested to be a focus for prevention intervention leading to athletes experiencing fewer stressful situations, decrease the stress response, and may also change the psychological intrinsic factor as a risk for injury occurrence. The study does provide suggestions for interventions for both the cognitive and somatic stress response. Suggestions to change or influence the cognitive appraisal were cognitive reconstructing, thought stopping, confidence training, and improved team cohesiveness. Interventions aimed at lowering arousal and enhancing concentration were suggested to influence somatic reactions [33].

In 1998, Williams and Andersen published a revised version of their model based on later research fitting into the model [25] (Figure 3). The revision consisted of bidirectional links between the following factors: personality, history of stressors, and coping strategies, as well as, relationships between the components in the stress response. Their review of studies conducted since the first version gave additional support for the relationship between history of stressors, such as life events, daily hassles, and injury occurrence. The personality variable in the model was supported by findings of locus of control, competitive trait anxiety, aggression, anger, less positive states of mind, but some of the studies had contradictive results. The coping resources were noted in eating and sleeping behaviours, social support, and coping skills. Also, studies that evaluated these factors' influences on stress response and prediction of injury occurrence found contradictive results [25]. An intervention study that evaluated relaxation and imagery showed a 52 % reduction in injuries compared to the previous season [36]. A stress management study in a small population did not reduce the

injuries statistical significantly. The effect size, however, showed Cohens *d* = .67 [37]. In a later review, Williams and Andersen [38] were able to identify some intervention studies related to their model that showed promising results when using stress management programs [39, 40] and cognitive behavioural components [41, 42].

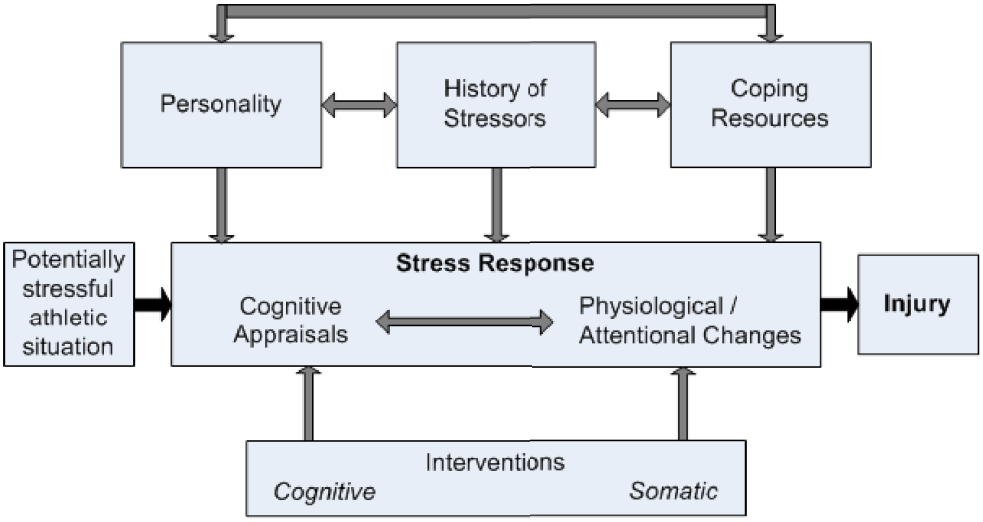

Figure 3. The stress and injury model [25]. Re-printed with permission.

Junge [34] reviewed the literature regarding studies in psychological factors influencing the occurrence of sports injuries. She included 29 articles including one Spanish article that was not discussed in the previous review by Williams and Andersen [25]. In the discussion of the review, Junge proposed a model of the influence of psychological factors on sports injury. The differences in this model from the stress injury model [25] are that this model suggests that interventions should be directed to influence an athlete's coping resources and emotional states to change the reaction to the risk situation [34].

A conceptual model discussed the sports injury from an action-theory based approach. This is a theoretical model with the assumption that the intentions influence the (re-) actions leading to injury occurrence [35]. Briefly, it suggests the personality affects the emotional and motivational state. The risk motivation or risk acceptance is central in the theory as well as situational aims like the athlete's estimation of his/her physical or ability to perform. The actions proposed in the model are motor behaviour, cognitive processes and emotional reactions.

By far, the most cited and evaluated of these models is the stress injury model [33], revised in 1998 [25]. Since the revision of the model, some updates of studies in the area have been performed and have been discussed previously in the literature [38, 43]. In a recently published paper by Johnson, Tranæus and Ivarsson [44] an update of newer studies are discussed. This update and other relevant studies will be presented in the following sections.

2.4.2.2 Stress in sport

Stress is a research field in itself and will, therefore, be only briefly explained with some definitions given.

Selye suggested in 1974 that there are two kinds of stress: distress and eustress. Distress was described to have negative effects such as destructive anger and aggression while eustress was related to positive effects like striving [45]. The response to stress in sport was most often categorised as anxiety. Shortly thereafter, Lazarus and co-workers suggested two different kinds of psychological stress: threat and challenge, where the threat might overwhelm and harm the athlete and challenge might be experienced as fun and joy. Threats and challenges are suggested to be related to both positive (e.g. relief, happiness) and negative emotions (e.g. anger, anxiety) [45]. This implies that stress does not necessarily need to be negative in sports. Some stress and arousal can help an athlete to focus on the task as long as the stress is controllable.

Both qualitative and quantitative researches have shown the presence of stress in sport. Since the early research in the beginning of 1970s, over 40 studies have investigated the relationship of life stress to sport injury risk; approximately 85 % of these studies showed a existent relationship between life stress and athletic injury [38]. A life-stress sport injury study in college football players showed that when the players' experience of life stress was categorised into groups of low, medium or high, the injuries followed the groups. Thirty percent, 50 % and 73 % of the players in the groups, respectively, sustained injuries [46]. The factors that athletes perceive as stressors can consist of a broad variety of variables including: lack of adequate physical, technical, and mental preparation prior to performance; fear of injury; high external and internal expectations; team atmosphere; and communication; as well as selection, finances and carer development [47-50].

2.4.2.3 Personality

The personality as a predictor for athletic injuries has been evaluated and discussed previously in the literature [25, 33, 38, 43]. An update showed that ten studies have been published since then [44]. Eight of these studies evaluated, among other variables, anxiety [51-58] and six of them detected a statistical significant association to injury and anxiety [51, 53-57]. The two remaining studies found that aggression, fear, inhibitory control, and hardiness were associated with an increased injury risk [59, 60]. Additional studies showed an association between injury risk and neuroticism and global self-esteem [61], low ability to control emotions [62], aggression [63], low athletic identity [64, 65] high susceptibility to boredom and sensation seeking, [66] and finally depression symptoms [67] (Table 1).

2.4.2.4 History of stressors

In the recent review of studies of stressors' influence on injury risk, 12 studies were identified [44]. The majority of these studies focused on life stress, negative life event stress, and daily hassles [53, 54, 57, 58, 60, 68-71]. Ten of the studies found statistical significant associations

between the studied stress variables and risk of injury [52, 54, 57, 58, 60, 68, 69, 71-73]. An additional study showed that major and negative life events increased the injury risk [74] (Table 1).

2.4.2.5 Coping strategies

Coping strategies for stress within sport are suggested to consist of two dimensions including two strategies each: problem- and emotion-focused coping [75] or approach- and avoidance coping [76, 77]. Even though it has been discussed whether athletes' coping style is a trait or a process, most studies show that athletes probably use different strategies to cope with situations depending on the actual appraisal [75]. Seven studies of coping strategies have been conducted since previous reviews in 2007 [52-54, 57, 58, 69, 70]. The results of these studies are contradictive; two studies showed statistically significant differences in the use of coping skills or strategies in injured athletes compared to uninjured athletes [52, 53]. A qualitative study described that ineffective coping was identified as a risk factor to injuries [65] (Table 1).

2.4.2.6 Stress response

Stress might also contribute to a stress response that consists of several parts such as affective (e.g., emotions, mood), cognitive (e.g., interference with thought and information processing), behavioural (e.g., change in self-care routines like sleeping and eating habits), and physiological (e.g., activation of the autonomic nervous system, fatigue) [78]. The research in this area is sparse, partly due to the complexity of studying the stress response. Two studies have been conducted, however, and peripheral vision narrowing and increased muscle tension was reported to influence the injury risk [79, 80]. The physiological stress response might influence the immune system and, consequently, the risk of (viral) illness [78].

2.4.2.7 Psychological interventions

It is suggested that athletes who come across situations that they experience as stressful sustain a cognitive or somatic stress response that may influence their vulnerability to injury. Consequently, interventions aimed to minimise the stress response to prevent injuries have been evaluated [38, 43]. One study that is cited quite often is a randomised controlled study by Johnson, Ekengren and Andersen [41]. They included 235 soccer players representing 12 teams. After screening for at-risk players (i.e., experiencing life events, high anxiety and low coping resources), 32 players were left in the study. The players were randomly assigned to a control or intervention group. The intervention group took part in an individual intervention comprising six sessions during a 20-week period and resulted in 0.22 injuries per player, while the control group received 1.31 injuries per players. Later on, four studies evaluated prevention intervention [81-85]. The content in the intervention is mostly based on psychological skills training [81, 83, 84] but education is also included [82] and mindfulness [85]. The most striking aspects in these studies are the small groups of athletes (range 13-35) and the rather young age of the athletes (range 17-22) (Table 1).

Table 1. Studies that evaluate psychological factors related to sport injuries published 2006-2014

Study	Population (mean age)	Study design	Variable	Results
Alizadeh et al, 2012 [51]	Male junior soccer players n= 81 (18)	Retrospective study	State anxiety	Positive relationships between injury occurrence and cognitive and somatic anxiety, not to self-confidence
Brink et al, 2010 [72]	Elite soccer players, n= 53 (17)	Prospective longitudinal cohort design	Stress, recovery	No significant relation to injuries
Deroche et al, 2007 [61]	Male rugby players, n= 235 (23)	Cohort study	Global self-esteem, perceived susceptibility, neuroticism, previous injury	A positive relation between previous injury and perceived susceptibility to injury, neuroticism and global self esteem
Devantier, 2011[52]	Elite male Soccer players n= 87 (25)	Prospective study, 3 months	Coping/history of stressors/ personality	Previous injury and coping with adversity predicts new injury
Edvardssson, et al, 2012 [81]	Youth soccer players, males , females, n=29, (17)	RCT, nine week psychological intervention	Intervention	No statistical significant differences between the groups. The effect size Cohen's *d*= 0.89
Fuhrman, 2010 [82]	Female dancers n= 13 (22)	Intervention study, no control group	Education	No effect
Ivarsson & Johnson, 2010 [53]	Soccer player, males, n= 48 (22)	Prospective study, four months	Psychological factors	Somatic trait anxiety, psychic trait anxiety, stress susceptibility and trait irritability predicted injury
Ivarsson et al, submitted [85]	Male and female soccer players, n=41 (17)	Intervention group and control group	Mindfulness	Fewer injuries, fewer injured players and less days injured in the intervention group, Cohen*s *d* 0.59
Ivarsson, Johnson Podlog, 2013 [69]	Elite male and female soccer players, n=56 (25)	Prospective cohort, 14 weeks	history of stressors/ personality	Trait anxiety, negative life event stress, daily hassles explained 24 % of variance in injuries
Ivarsson, Johnson, Lindwall et al 2014 [68]	Elite junior soccer players, males and females, n=101 (17)	Prospective cohort study, 10 weeks	Psychosocial stress	Higher levels of hassles, lower levels of uplift increased injury risk
Johnson & Ivarsson 2011 [54]	Junior soccer players, males and females, n= 108 (18)	Prospective design, seven months	Psychological factors	Somatic trait anxiety, mistrust, negative life events stress and negative coping predicted injury
Johnson, 2011 [65]	Competitive athletes n=20 (23)	Qualitative study	Psychosocial factors	History of stressors, person factors, fatigue, ineffective coping were described as antecedents to acute injuries
Kalkhoran et al, 2013 [62]	Wrestlers n=90 (19)	Prospective cohort study	Personality	Low ability of emotion control predicted injury risk
Keller et al, 2013 [63]	Youth elite tennis player, males females, n= 60, (15)	Retrospective study	Personality	Aggression was the only factor (of 15) that influenced injury
Kleinert, 2007 [55]	Soccer players, Study 1, males and females: n= 293 (21) Study 2 females: 1021 (16)	Prospective cohort	Emotional, physiological and motivational states	Low levels of perceived physical health and high sociability predicted injury occurrence in

				both studies.
Mc Dermott, 2013 [70]	Male basketball players, n= 24 (19)	Prospective cohort	Life event stress	No statistical differences between injured and non-injured players
McKay, et al., 2013 [64]	Youth elite ice hockey players, male, n= 316, (Md 15)	Prospective cohort study	Personality, Injury	Low scores on athletic identity increased the risk for injury
Noh et al, 2007 [83]	Female ballet dancers n= 35 (17)	Intervention study, three groups	Autogenic training, broad based coping skills	Athletes in the broad based coping skills group spent less time injured
Osborn et al, 2009 [66]	Male ice hockey players n=18 (28)	Prospective cohort study	Personality	Players scoring high on boredom susceptibility and total sensation seeking experienced more total injuries.
Schwebel et al, 2007 [59]	Youth soccer player, male, n=60, (12)	Prospective study, an 8-week season	Personality,	Less-experienced and more-skilled players had a greater risk for injury.
Shrier & Halle, 2011 [73]	Circus artists, males and females, n =47, (NA)	Retrospective cohort study 14 weeks	Psychological factors	Low self-efficacy, high levels of fatigue, emotional exhaustion and injury increased the risk for injury.
Sibold et al, 2011 [56]	Male and female collegiate athletes n= 177 (20)	Prospective cohort design	Anxiety, life stress	Somatic anxiety, negative and positive life stress predicted days missed due to injury
Sibold & Zizzi, 2012 [71]	Team and individual athletes, males and females, n=177 (20)	Prospective study	History of stressors, psychosocial factors	Number of injuries, worry and negative life events predicted the days to first injury,
Steffen, Pensgaard, Bahr, 2009 [57]	Female soccer players, n=1430 (15)	Prospective cohort study	Coping/ history of stressors/ personality	Perceived mastery climate and high level of life events were risk factors for new injuries.
Tranaeus 2006 [84]	Male ice hockey players, n= 22 (23)	Intervention group and control group	Psychological skills training	Significantly fewer acute injuries
Vassos, 2009 [58]	Male and female athletes n=41 (30)	Prospective cohort study	Coping/ history of stressors/ personality	Injured athletes scored significant higher in negative life event stress
Wadey et al, 2012 [60]	University student athletes, male and females, n= 104, (19)	A two year longitudinal design	Hardiness, history of stressors, injury	High level of negative life events increased the risk for injury, hardiness decreased the risk
Wadey et al, 2013 [74]	University student athletes, male and females, n= 694,(19)	A two year longitudinal design	History of stressors, optimism, injury	Scoring low in optimism, high level of major and negative life events and previous injuries increased the risk for new injuries
Yang, Jingzhen; Cheng, Gang; Zhang, Ying; et al., 2014 [67]	American football players, n=330 (N.A)	An open cohort two year prospective study	Psychological factors	Depression symptoms increased likelihood of injury, Anxiety decreased likelihood of injury

2.5 INJURIES IN FLOORBALL

The previous research aimed at exploring the epidemiology of injuries in floorball is not large. Four retrospective studies have been conducted that studied recreational floorball players such as firemen/women, policemen/women and patient in all ages who sought

emergency care at a University hospital during 1990-1991 [86-89]. Four prospective studies were conducted to study the injuries in competitive players from division five to elite leagues [16-18, 90]. The oldest study investigated floorball injuries during the season 1993/1994 and found that 11 % of the players sustained injuries [17]. The majority (76%) of these injuries were traumatic. Ankle sprain was the most common injury. In the season of 1997/1998, 295 floorball players were observed regarding injuries [18]. Thirty-four percent of the players sustained injuries. The most common injury in the male players was traumatic sprains (24%) and the most frequent injury in the female players was tissue overuse injuries (31%). The lower extremities were the most common sites (62%), with ankle (21%) and knee (24%) injuries being most prevalent in the male players, while the female players sustained injuries in ankles (19%) and head/neck/clavicle (18%). During one season in 2004/2005 347 female floorball players were followed of which 164 were elite players [16]. Thirty-six percent of the total players sustained injuries, and 38 % of those were elite players. Both overuse (27%) and traumatic injuries (28%) were common in the knees. More recently, in 2010//2011 238 elite players were followed, with 43% of the male players and 57% of the female suffering from injuries. Traumatic injuries to the ankle (15%) and knee (11%) were common in the female players and overuse injuries in the back (6%) and thigh (4%) were common in the male players [90] (Table 2).

Table 2. Prospective studies in floorball

Study	Study period	Population	Participants (*n*)	Injury definition	Injury classification	Severity level	Injuries *n* (%)	Severity of injuries (%)	Injury incidence males	Injury incidence females
Snellman et al. 2001 [18]	Prospectively over one floorball year	Males and females, in premiere leagues to fifth division	Males *n* = 199, females *n*= 96	New injury that caused a significant compliant	Trauma and overuse	Level I-IV, where level I is not affecting the activity and Level IV is affecting activity and/or daily life	100 (83 %) trauma, 20 (17 %) overuse	Males: Level I: 13%, Level II: 38 %, Level III: 26%, Level IV: 24%. Females: Level I: 12%, Level II: 44 %, Level III: 22%, Level IV: 22%.	1.0/1000 training hours, 23.7/ 1000 game hours	1.0/1000 training hours, 15.9/ 1000 game hours
Tranaeus et al., submitted [90]	Prospective over one floorball year	Males and females in the premiere leagues	Males *n* =122, females *n* =116	Time loss	Trauma and overuse	Time-loss: Minor <7 days, moderate and sever > 30 days	112 (60%) trauma, 74 (40%) overuse	Males Minor: 17%, Moderate: 16 %, Major: 10%, Females: Minor: 32%, Moderate:	2.6/ 1000 hours exposure to floorball	3.9/1000 hours exposure to floorball

								13 %, Major: 12%		
Pasanen et al. 2008 [16]	Prospectively, one season	Females, premiere league to second division	Females, *n* = 374 (164 elite players)	Time-loss, 24 hours	Trauma and overuse	Time-loss: Minor <7 days, moderate and sever > 28 days	121 (70 %) trauma, 51 (30 %) overuse, (85 injuries in elite players)	Minor: 59%, Moderate: 23%, Major: 18%		1.8/ 1000 practice hours, 40.3/1000 game hours (34.3/ 1000 game hours in the elite players)
Wikström et al. 1997 [17]	Prospective, one season	Males, female, second to fifth divisions	Males *n*= 303, females *n* = 154	Time-loss, 24 hours	Trauma and overuse	Time-loss: Minor <7 days, moderate and sever > 30 days	Males , 28 (48 %) trauma, 13 (22 %) overuse, females: 16 (28 %) trauma, 1 (2 %) overuse	Minor: 36%, Moderate: 29 %, Major: 35%	2.6/ 1000 playing hours	2.5/ 1000 playing hours

2.5.1 Injury incidence in elite floorball

Collection of the frequency of injuries is important in data surveillance; however the number of injuries must be presented in proportion to the participants (number of injuries during a specific period of time divided by the total number of athletes). The most common way to express injury incidence is the number of injuries per 1000 playing hours of exposure to the studied phenomenon. The exposure to the sport can be separated into training hours or match hours or in total number of exposure hours [10]. Another line of injury incidence is to calculate the injuries per 1000 athletes or sport sessions as one unit regardless from exposure hours. The previous floorball studies showed the incidence 1.0/1000 in practice hours [18], 23.7/1000 game hours [16] and 2.6/1000 playing hours in male players [17]. The female players had an incidence of 1.0 [18] and 1.8 per 1000 training hours [16], 15.9 [18] and 34.3 per 1000 game hours [16], in which the latter is in the elite players. The injury incidence in elite male players during one year were 2.6/1000 hours exposure to floorball and 3.9/1000 hours exposure to floorball in elite female players [90]. One of the studies also presented the injury rate as 442/1000 male players and 333/1000 female players [18].

2.5.2 Injury severity in elite floorball

The severity level of the injury is related to injury definition and is mainly evaluated from the days' absence from ordinary training or match [27, 91] described the severity levels on the bases of the nature of the injury, duration of the treatment, time-loss from sport and/or work, permanent complaints and cost. Studies in other sports than floorball have used the "National Athletic Injury Reporting System", NAIRS, and classified the level of severity in time loss to sport, minor (1-7 days absence) moderate (8-21 days) and severe (more than 21 days) [5, 92, 93]. Other studies have used the classification suggested by Lysens et al. [29, 54]. This definition also includes the groups minor, moderate and severe, with the difference in number of days in moderate classification that stretches from eight days to a month and the severe injuries consequently being over a month absence from sport. The consensus statement for injury-severity definition in soccer is modified from previous definitions and contains two additional groups: slight (0 days) and minimal (1-3 days), followed by mild (4-7 days) [10]. Three of the previous floorball studies used minor, moderate and severe categories, with a difference of days in the severe category: over 28 days [16] and over 30 days [17, 90]. One of the studies used the degree of complaints in a four-level scale as severity definition [18].

2.6 INJURY PREVENTION

In 1992, a model suggested four steps to evaluate prevention strategies [27]. These steps were: first, to describe the problem and its magnitude; second, to describe the mechanisms behind the problem; third, to implement an intervention; and finally, to evaluate the magnitude of how the problem has changed. This has been used as the leading theoretical framework in many studies. To take the prevention research a step further, an extended framework was publicised in 2006 [94]. The model *Translating research into injury prevention practice*, TRIPP, begins with the first three steps in van Mechelen's model [27].

The fourth step, which evaluates the prevention, is called “scientific evaluation” in ideal conditions. The fifth step suggests understanding the context in which an intervention will be implemented. This includes understanding the motivators and barriers before an intervention can be implemented in a real-world context to change behaviours. The sixth and final step is to implement the intervention and evaluate the same in a real-world context (Figure 4).

Sports injury prevention may be implemented with different interventions depending on which of the injury mechanisms are in focus [26]. A recently published review analysed injury prevention articles since 1938 [95]. The authors included nearly 12,000 articles, of which 5,274 publications were original research and classified the articles in three groups according to the stages in the two models: 1) Observational: injury surveillance, establishing the extent of the problem (n=1354), and aetiology, establishing risk factors and mechanisms of the injury (n=2558); 2) Prevention programs in ideal conditions: preventive measures, introducing a preventions program (n=708), and efficacy, assessing prevention programs under ideal conditions (n=460); 3) Prevention programs in real-world conditions: implementation, describing intervention context to inform strategies (n=162), and effectiveness, assessing prevention programs in a real-world context (n=32). The articles were also categorised into three main areas: training, equipment, and rules and regulation. The training studies consisted of a total of 551 studies. Psychological training interventions were included in this group. These were distributed in 321 prevention programs, 211 efficacy studies, 16 implementation studies and three effectiveness studies. The number of prevention programmes and efficacy studies in this category increased in the late 1990s and early 2000s. The numbers of psychological prevention intervention studies are, however, rare [38, 44].

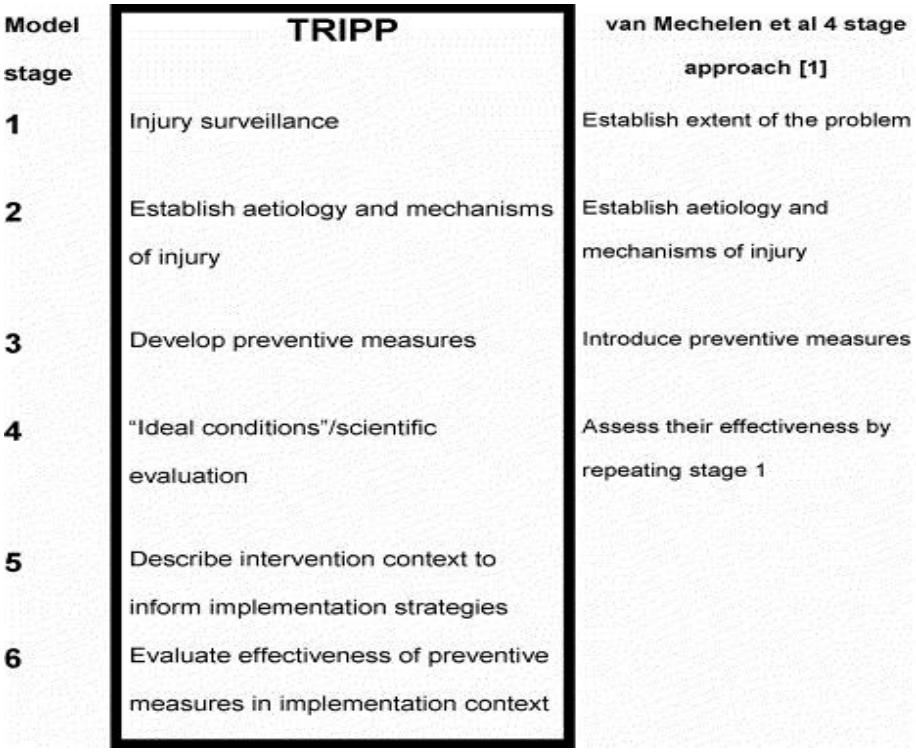

Figure 4. The model translating research into injury prevention practice, TRIPP [94]. Re-printed with permission.

The studies in prevention of floorball injuries are modest. The only published study evaluated the effect of a neuromuscular training programme in terms of non-contact acute leg injuries in female elite floorball players [96]. The experimental group consisted of 256 (mean age 24 years) players and the control group of 201 players (mean age 23 years). The experimental group took part in an intervention that consisted of exercises designed to enhance the players' motor skills and body control according to the specific demands in floorball. The programme reduced the risk of leg injuries by 66 % with an incident rate ratio 0.34, 95% CI 0.20 to 0.57.

2.7 COST OF INJURIES

Costs related to sports injuries can be seen from several perspectives depending on the payer or the bearer of the costs. The most common perspectives related to costs for sports injuries are societal, insurance companies, sports organisations and the athletes. In general, the societal perspective is recommended [97]. A societal perspective implies that all relevant costs, direct and indirect, are included. For example, the direct costs are may be the actual cost for a treatment and the indirect cost can consist of time lost from productivity for the injured person, but also, for family members helping out with care taking or transportation to

physiotherapy. These costs can be used to estimate the cost of illness, (e.g., sport injuries) [98]. The cost of illness studies are often criticised to only estimate the cost for a specific illness and nothing else such as regarding effectiveness or suggestions for prevention [99]. If an evaluation of a prevention intervention includes the costs per athlete or per injury, however, these costs can be used as an input in a cost-effectiveness analysis of the intervention [100, 101]. Additional use of cost of injury analyses is to define the magnitude of the injuries in monetary terms, and warrant preventive interventions [102, 103]. A common method to estimate the costs of a specific injury is to use the prevalence data on epidemiology and the medical consumption and use a "bottom-up" calculation [104, 105]. The "bottom-up" method implies that the costs in a specific cohort are aggregated and presented as the total of all costs or a mean of the costs. In the long run of injury prevention, the funders and decision makers are interested to know if an implementation of a prevention program, then a cost outcome such as return on investments is suggested [106]. Hitherto, only one study has presented the cost of floorball injuries in competitive athletes [18]. This study, performed 1997/98, showed that 88 % of the injured players reported a direct cost less than 150 USD. When including eight severe injuries to knees and eyes in the cost calculation, however, the mean cost per injury was up to 500 US$. The mean costs for knee surgery related to athletes in Stockholm Sweden during 1997 were estimated at 108 SEK per player [107]. This study included floorball players as well as players in European team handball, ice hockey, soccer, with the mean cost per player for knee surgery in floorball being SEK 87,in team handball SEK 220, ice hockey SEK 72, and in soccer SEK 115 (Table 3).

Table 3. Health economic studies regarding sport injuries.

Study	Sport	Journal	Population	Study design	Analysis	Outcome	Result
Collard et al., 2011 [108]	Physical activity	Br J Sports Med	996 Dutch school children, 10-12	Prospective injury record, cost diary	Mean total indirect and direct costs, CI bootstrapping	Cost/child	Total cost € 188 ±329
Cumps et al., 2008 [109]	Sports federations	Br J Sports Med	Flemish sports federations, n=72	Retrospective cohort study, insurance statistics		Direct and indirect cost	Total cost € 4 228 970, Direct cost €180 and indirect cost €1338 / injured athlete
De Loes et al., 2000 [110]	Athletes	Scand J Med Sci Sports	Athletes in six individual and six team sports, 14-20	Retrospective cohort study, insurance statistics	CI, mean costs/injury/sport	Cost/knee injury	Males: mean cost USD 1097, females: mean cost USD 1131
Forssblad et al., 2005 [107]	Team sports: football, floorball, handball, ice hockey	Scand J Med Sci Sports	Three databases regarding: registered athletes, knee surgery performed at one hospital, all surgery performed in the capital of Sweden	Register study, questionnaires to all patients who had undergone knee surgery		Costs/diagnosis related group; costs/sport	The mean cost/player: SEK 108 (range 72-220), floorball: SEK 87/ player
Hupperets et al., 2010 [111]	Athletes	The Am J Sports Med	522 male and female athletes	Cohort study, RCT	Incremental cost-effectiveness ratio ICER	Cost/ athlete, cost/injured athlete in a intervention and control group respectively mean (95% CI)	Cost/athlete: Intervention € 80.8 (134.2) control € 149.4 (835.8), cost/ injured athlete: Intervention € 114.1 (324.8) control € 446.5 (1403.4)
Janssen et al., 2012 [112]	Athletes	Scand J Med Sci Sports	Athletes with knee injuries	Register study of knee surgeries	Direct costs	Cost/ACL	The mean annual hospital and surgery costs associated with ACL reconstructions was over A$75 million (EU 45 million)
Knowles et al., 2007 [113]	Athletes	Inj Prev	72 varsity athletes from 12 sports	Prospective cohort study, two-stage cluster sampling	Revised Injury Cost Model (RICM) methodology estimating costs	Three types of costs were estimated: medical, human capital (medical costs plus loss of future	The annual state wide estimates were $9.9 million in medical costs, $44.7 million in human capital costs, and $144.6 million in comprehensive costs. The mean medical

					using mean costs	earnings), and comprehensive (human capital costs plus lost quality of life)	cost was $709 per injury (95% CI $542 to $927), $2223 per injury (95% CI $1709 to $2893) in human capital costs, and $10 432 per injury (95% CI $8062 to $13 449) in comprehensive costs. Sport and competition division were significant predictors of injury costs
Snellman et al., 2001 [18]	Floorball	Int J Sports Med	Male and female floorball players in Finland n= 295	Prospective cohort study	Cost of injury	Cost/injury	Total cost/ injury 500 USD
Verhagen et al., 2005 [114]	Volleyball	Br J Sports Med	116 male and female Dutch volleyball teams, 2 + 3 division	Prospective controlled trial	Intention to treat, CI bootstrapping, Number needed to treat	Injury and intervention cost/player,	Total cost/player mean (SD) Intervention group: € 36.99 (93.87) control group € 18.94 (147.09)

2.8 RATIONALE

The support for contribution of psychological factors regarding sport injuries has been demonstrated earlier [25, 38, 43, 44]. The evaluations of interventions focusing on injury prevention from a psychological point of view, however, have by far not reached the same magnitude [38, 44]. Those publications have used rather small cohorts and their evaluations have been performed relatively soon after the interventions were finished and primary based on individual level (athlete and sport psychology consultant). Hence, it is warranted to evaluate psychological injury prevention intervention in a larger cohort and during a longer period of time and on group level. Floorball is a sport that continues to grow in popularity. Unfortunately, floorball also leads to injuries [16, 18, 90]. These earlier studies in floorball have shown that overuse injuries account for 17-40 % of the total amount of injuries. Despite this fact, much of injury research in sport psychological domain is focussed on traumatic injuries or injuries in general. Most of the injured athletes require examinations and treatments to help athletes during the rehabilitation process before they are ready to return to sport. This is afflicted with costs that are seldom estimated.

Consequently, it is of interest to evaluate if a psychological skills training programme can lead to a reduction of injuries not only after the implementation, but also, during the consecutive season. An investigation of psychological antecedents to overuse injuries and an estimation of cost of injuries may support future injury prevention strategies in floorball players.

3 AIMS

The general aims of this thesis are described as follows:

Paper I: The primary aim was to evaluate whether a psychological skills training intervention programme at group level could prevent sports-related injuries in male and female elite floorball players in Sweden. The underlying aim was to evaluate possible differences of traumatic injuries and overuse injuries between the intervention group and the control group.

Paper II: The primary aim was to evaluate injury prevention using a psychological skills training group-based intervention programme, the season after the implementation, (i.e., at the end of the second season) in elite floorball teams for males and females). The secondary aim was to evaluate the effect of the intervention over two consecutive floorball seasons.

Paper III: The aim was to present estimates of injury costs in Swedish floorball players at elite level.

Paper IV: The aim was to identify possible psychological factors preceding overuse injuries among elite floorball players.

4 MATERIALS AND METHODS

The present thesis consists of four papers comprising the same study population, male and female elite floorball players in Sweden. The prospective data collection was performed during two years; at the preseason and game season 2010/2011 and 2011/2012. The Swedish floorball federation was informed about the study and gave their approval. Prior to the start of the study they also gave the opportunity to present the project to people involved in Swedish elite floorball. The Swedish floorball federation provided contact information for the teams and during the spring 2010 they were invited to participate in the study.

The premier leagues for male and female floorball players consist of 14 teams each. All teams were asked about participation in the study. Five teams did not choose to participate and gave the following reasons: too stressful, too many injuries, no problem with injuries (and thereby no need for prevention), and no reasons given (Figure 5). The inclusion criterion was to understand the Swedish language and thereby understand and answer a number of psychometric instruments and questionnaires as well as to take part in the intervention programme. The proceedings of the methods are presented in Figure 6.

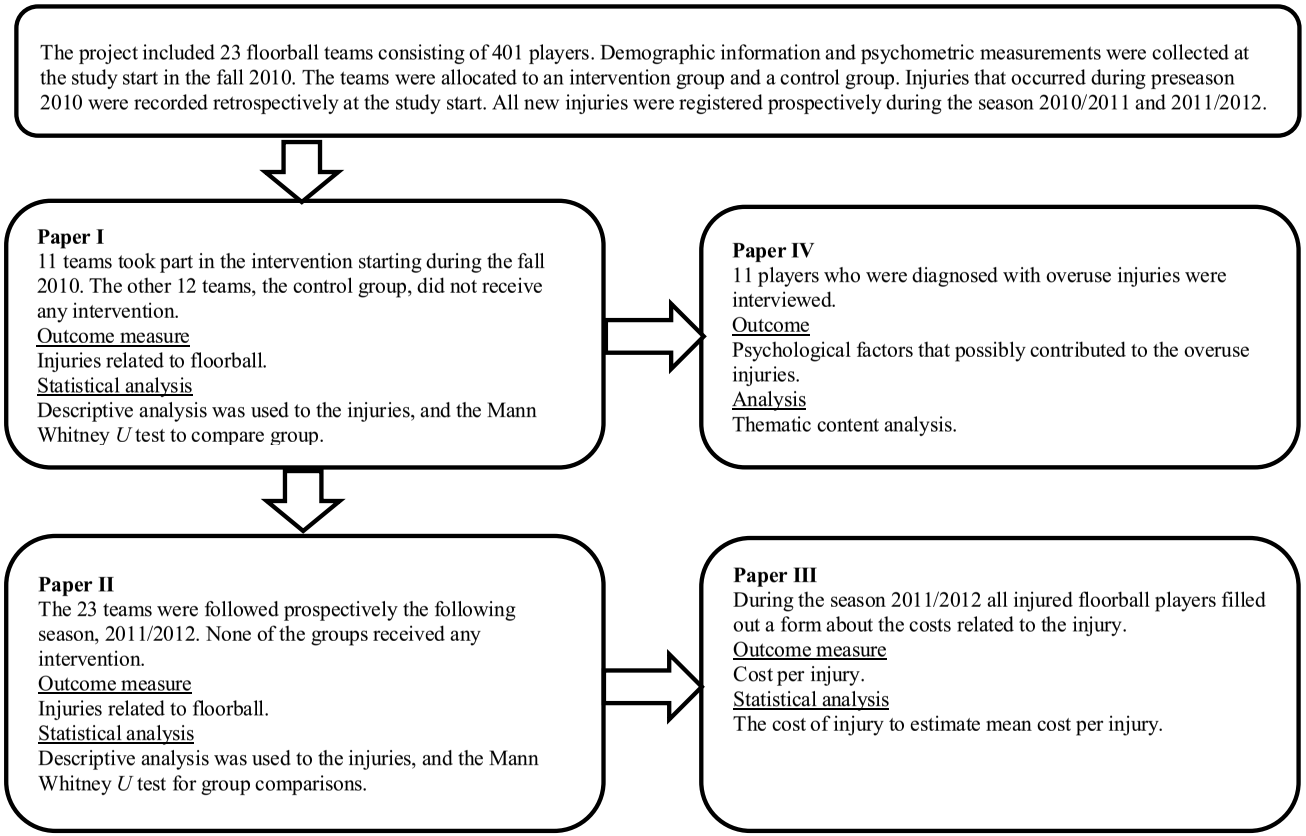

Figure 5. This flow chart shows the participants, outcome measures and the statistical analysis of the four papers included in this project.

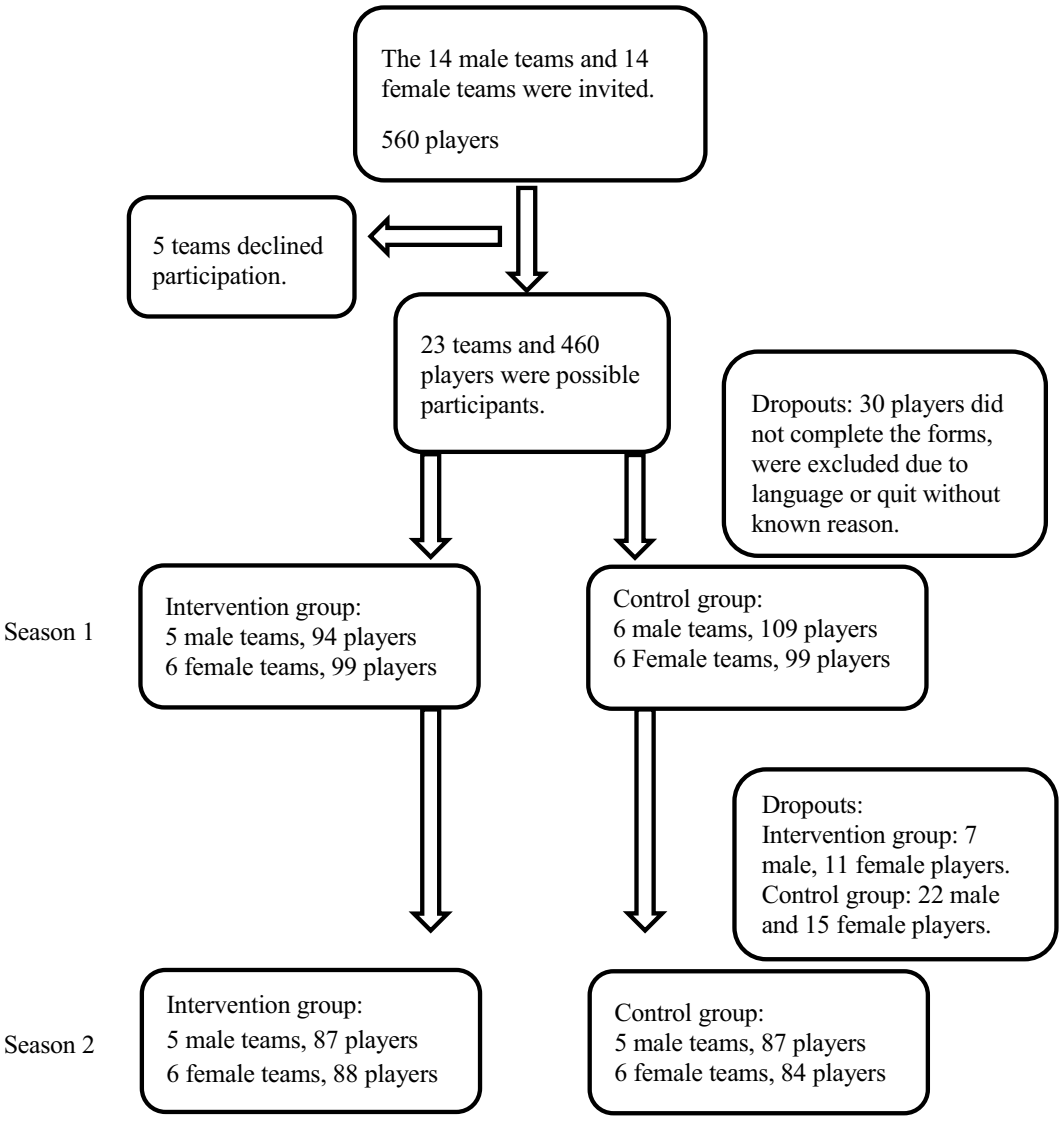

Figure 6. The flow chart describes the participants of the intervention group and the control group.

4.1 PAPER I

4.1.1 Population

The 23 teams that accepted participation included approximately 460 players. Out of these players were excluded due to lack of knowledge of the Swedish language. Other reasons not to participate were: players were not permanent players of their team, and some players gave their written consent to participate but did not complete the forms in an adequate way. Finally, 401 players were included in the study.

4.1.2 Data collection

The teams were consecutively allocated to an intervention group and a control group, respectively until the numbers of participating teams were equal in both groups. The teams were visited after appointments with the coaches. The players were informed, both verbally and by a written hand out, about the study and its aims. Then the players who agreed to join the study gave their written consent and filled out questionnaires and psychometric instruments (See below). The baseline questionnaires included contact information along with demographic information regarding age, number of years in floorball and history of severe injuries during the past 12 months (Appendix 1). The intervention group took part in an intervention aimed at reducing stress and, thereby, the number of injuries. The control group continued with regular floorball activities without receiving any intervention.

4.1.2.1 Psychometric instruments

Psychometric instruments were used to capture some of the psychological factors included in the stress injury model [25].
At baseline the Life Events Survey for Collegiate Athletes (LESCA), [115], was used to measure the history of stressors in a player's life. The test consists of 69 items. The players were asked to indicate which life events had occurred during the last 12 months, as well as for each event to rate the impact of his/her life events on an 8-point Likert scale, with the anchoring set at -4 (extremely negative) to +4 (extremely positive). Based on the results, the score was divided into three categories: negative life event stress, positive life event stress and total life event stress. LESCA has a test–retest reliability ranging from 0.76 to 0.84 [115].

At baseline the Swedish universities Scales of Personality (SSP) [116] was used to measure personality factors. SSP has been used in other studies in sport context [54]. The test consists of 91 items, classified into 13 categories. These are somatic trait anxiety, cognitive trait anxiety, mistrust, stress susceptibility, submission, impulsiveness, adventure-loving,

interpersonal distance, social conformity, bitterness, annoyance tendency, verbal trait aggression and physical trait aggression [116]. The questions were answered on a 4-point Likert scale, ranging from 1 (not at all) to 4 (very much so). The Cronbach's alpha coefficients ranged from 0.59 to 0.84 [116].

The Sport Anxiety Scale (SAS), [117], was used to measure anxiety level at the beginning as well as at the end of the two seasons. The test consists of 20 items, classified into three categories. These are somatic anxiety, worry and concentration disrupters. The questions were answered on a 4-point Likert scale, ranging from 1 (not at all) to 4 (very much so). SAS has a test–retest reliability of 0.85 [117].

The Athletic Coping Skills Inventory-28 (ACSI-28) [118] was used to measure the player's general coping skills at the beginning and at end of the two seasons. The test consists of 28 items, classified in seven categories. These are coping with adversity, peaking under pressure, goal setting, concentration, freedom from worry, confidence and achievement motivation, coach ability. The questions were answered on a 4-point Likert scale, ranging from 0 (not at all) to 3 (very much so). The ACSI -28 has a test–retest reliability of 0.87 and an internal consistency coefficient of 0.86 [118].

4.1.2.2 Injury surveillance

All teams were asked to keep records and register all injuries that occurred during these two seasons. At the beginning of the study the athletes were asked about possible severe injuries during the last 12 months. Injuries that occurred during the preseason were registered as well as on-going injuries when the study started.
All teams were given access to the Swedish national injury registry, by the Swedish floorball federation. This registry is an online web-based injury surveillance system adjusted to floorball. Some teams preferred to regularly report their injuries manually via e-mail or telephone.
The injuries were reported according to specific guidelines given to the responsible person of each team, primarily a naprapath or a physiotherapist. The reported information was the date of injury, type of injury, injury localisation and date of returning to full participation in floorball.

4.1.2.3 Injury definitions

The injuries were classified according to the time-loss definition. The injuries were further categorised into levels of severity depending on the number of days without regular floorball training or games, 1-7 days, 8-30 days, and more than 30 days [29]. The injuries were also

classified into traumatic or overuse injuries [10].

4.1.3 Psychological intervention

The intervention was developed to reduce the stress-response according to Williams and Andersen's stress and injury model [25]. The intervention included somatic and cognitive content based on psychological skills training to fit the different parts of the stress injury model in the context of floorball. The intervention was developed as a group-based education including all team members (players and staff) at the same time. The intervention consisted of six meetings, lasting one hour each, and included theoretical parts, workshops and questions for discussion according to a written manuscript for each session.
The six different subjects were 1) goal setting skills, 2) somatic and cognitive relaxation (three different kinds of relaxation programmes were made available for download to the players' own mobile devices, 3) stress management according to stress inoculation training, 4) self-confidence training, 5) concentration skills, and 6) emotions in sport [41, 119].

Goal setting included performance, process and outcome goals, there were also short-and long-term goals. The need for individual goals as well as team goals was also discussed [120]. The somatic and cognitive relaxation consisted of three different kinds of relaxation programmes that were available for downloading to the players' own mobile devices. The relaxation consisted of breathing exercises and muscle tonus regulation [121, 122]. Stress management were discussed according to stress inoculation training [123]. The stress inoculation training consists of several steps, briefly identifying stressors, finding coping strategies and using this coping strategies in real-life contexts. The training of self-confidence included evaluation of goals, motivation and attribution, i.e. education of differences in explanations about the outcomes of events [124]. The concentration skills included education and workshops regarding focus and re-focus as well as the different kinds of attentional focus [125]. The final part in the intervention programme was emotions, control of emotions and the relation to performance [119]. All six subjects in the intervention, in different combinations of the subjects, have previously been used successfully in several studies (see Table 1).

4.1.4 Statistical analysis

The descriptive analysis showed a positively skewed distribution of data (2.28). A non-parametric analysis, the Mann Whitney U test, was used to investigate possible group differences. For the effect size the Cohen's d was used. Significance was accepted at $p < .05$.

4.2 PAPER II

This paper was a continuation of Paper I. The study was based on the same group-based psychological skills training intervention and prospectively followed the intervention group and control group throughout the consecutive season, 2011/2012.

4.2.1 Population

From the included 401 players, 55 people dropped out after the first season. This group of players consisted of people who either stopped playing floorball or belonged to teams with insufficient injury documentation.

4.2.2 Data collection

The recordings of injuries continued throughout the second preseason and the game season 2011/2012. None of the groups received any intervention during this season.

4.2.3 Statistical analysis

Descriptive analysis was used to investigate the injuries. A non-parametric analysis, the Mann Whitney U test, was used to investigate possible group differences due to a positive skewed distribution of data. For the effect size the Cohen's d was used. Significance was accepted at $p < .05$.

4.3 PAPER III

4.3.1 Population

All injured players during the second season, 2011/2012, were included in this study.

4.3.2 Data collection

The second season, all players who sustained an injury were contacted and asked to fill out a questionnaire regarding the costs related to the injury (Appendix 2). This questionnaire was aimed at collecting data regarding direct and indirect costs for the athletes. Pricelists from several different part of Sweden were collected to estimate mean costs for the included recourses.

4.3.3 Statistical analysis

The data were analysed descriptively; mean values, standard deviation, and frequency.

4.4 PAPER IV

During the first study season, 2010/2011, medical staff in the participating teams asked players with an overuse injury to volunteer for this study. Having a present or recently experienced overuse injury was set as the inclusion criterion for this study. There was no time frame set to how recently but they must have the period and possible risk factors prior to the injury fresh in mind.

4.4.1 Population

The study included 11 floorball players representing five teams in the Swedish premiere leagues. These players, nine males and two females (median age 25 years), had an ongoing overuse injury diagnosed by the team´s medical staff, or had very recently, returned to play after an overuse injury. The number of years playing floorball was 11-20 (Median = 15), out of which 1-10 years (Median = 6.5) was at elite level.

4.4.2 Data collection

The players were interviewed face-to-face using a semi-structured interview guide. The interview guide consisted of open-ended questions regarding the overuse injury and life events before the injury. The first part of the interview was focused on the injury itself as well as on previous injuries. The second part was focused on the situation and circumstances inside and outside floorball prior to the injury. The interview started by informing the player about the aim of the study, the voluntary nature and confidentiality, and lasted about 45 minutes (Appendix 3).

4.4.3 Analysis

The results of this study using a qualitative design was analysed interpretively according to thematic content data analysis [126]. The analysis was performed deductively and inductively in several steps, resulting in meaning units, condensed units, sub-themes, themes, and core themes.

4.5 ETHICAL APPROVAL

The study was approved by the Regional ethical board at Karolinska Institutet, Stockholm, Sweden, Dnr 2009/2001- 31.

5 RESULTS

The present project included 401 players during the first season (Table 4). Prior to the second season 55 players dropped out due to quitting floorball or were playing in teams without reliable injury reporting.

Table 4. Gender-specific characteristics of the study participants at baseline.

	Intervention group (n=193)		**Control group (n=208)**	
Gender	Male (n=94)	Female (n=99)	Male (n=109)	Female (n=99)
Age [a]	23.5 ± 4.2	21.1 ± 3.2	23.7 ± 4.6	21.4 ± 4.3
Floorball experience [a]	13.4 ± 3.4	11.3 ± 3.1	12.7 ± 4.6	10.9 ± 3.2
Previous Injuries [b]	29 (31 %)	23 (23 %)	29 (23 %)	19 (19 %)
Exposure hours to floorball per week [c]	6.1 ± 0.6	6.1 ± 1.0	6.2 ± 0.9	6.7 ± 0.7
Somatic worry [d]	1.5 ± 0.4	1.6 ± 0.4	1.5 ± 0.4	1.6 ± 0.5
Cognitive worry [d]	2.0 ± 0.6	2.1 ± 0.5	2.0 ± 0.5	2.1 ± 0.6
Concentration difficulties [d]	1.3 ± 0.3	1.4 ± 0.4	1.3 ± 0.3	1.5 ± 0.5
Coping when frustrated[e]	2.6 ± 0.5	2.5 ± 0.5	2.4 ± 0.6	2.5 ± 0.6
Max performance while stressed [e]	3.0 ± 0.6	2.9 ± 0.7	2.9 ± 0.7	2.8 ± 0.7
Aim [e]	2.0 ± 0.6	1.9 ± 0.7	2.1 ± 0.5	2.1 ± 0.6
Concentration [e]	3.0 ± 0.6	3.0 ± 0.5	2.8 ± 0.5	2.9 ± 0.6
Lack of worry [e]	1.7 ± 0.5	2.1 ± 0.7	1.9 ± 0.6	2.0 ± 0.8
Self-confidence and competing motivation [e]	2.9 ± 0.5	2.8 ± 0.5	2.9 ± 0.5	2.9 ± 0.5
Confidence for trainer [e]	2.1 ± 0.3	2.3 ± 0.3	2.2 ± 0.4	2.3 ± 0.3
Positive life events [f]	18.6 ± 34.0	31.2 ± 47.4	16.6 ± 29.1	23.4 ± 38.9
Negative life events [f]	13.2 ± 11.0	19.8 ± 14.0	15.1 ± 14.0	18.1 ± 14.0
Total life events [f]	31.8 ± 35.8	51.0 ± 55.0	31.7 ± 35.3	41.6 ± 44.5
Somatic Trait Anxiety [g]	1.7 ± 0.4	2.1 ± 0.5	1.9 ± 0.5	2.0 ± 0.5
Psychic Trait Anxiety [g]	1.8 ± 0.5	2.2 ± 0.6	1.8 ± 0.5	2.1 ± 0.6
Stress Susceptibility [g]	2.0 ± 0.4	2.1 ± 0.5	2.0 ± 0.4	2.2 ± 0.5

[a] Mean years, standard deviation. [b] Injuries n (percentage). [c] Mean hours/week during game season and standard deviation., [d] SAS, [e] ACSI -28, [f] Life Events in LESCA, [g] SSP.

5.1 PAPER I

Out of the 401 players (intervention group and control group) 142 players (35%) sustained totally 197 injuries. The intervention group sustained 0.45 ± 0.7 injuries/player, 95% CI 0.35 to 0.55, and the control group 0.53 ± 0.9 injuries/player, CI 0.41 to 0.55. In the intervention group 19 % of the injuries were traumatic injuries and five % were due to overuse in male players. The corresponding figure in female players was 12 % and 8 %, respectively. In the control group male players sustained 11 % traumatic injuries and 15 % overuse injuries, and female players 20 % traumatic injuries and 10 % overuse injuries. Overall, the mild injuries

were the most common. However, in the control group the moderate traumatic injuries were found to be more common in male players. When comparing the groups, the Mann Whitney *U* test did not show any statistical significant group differences. The effect size of a possible influence of the intervention was small when it comes to overuse injuries, Cohen's d 0.2. The injury incidence in the intervention group was 2.9 (95% CI 2.2-3.8) for male players and 2.6 (95% CI 1.9-3.6) for female players. The corresponding figures in the control group were 2.8 (95% CI 2.1-3.7) for male players and 3.9 (95% CI 3.0-5.0) for female players. A comparison, the Fisher´s exact test, between females in intervention and control groups was 0.7 (95% CI 0.4- 1.0).

5.2 PAPER II

During the second season (the season following the intervention season), 27 % of the players were injured during the game season. Sixty-nine injuries occurred during preseason and 119 injuries occurred during the game season. When dividing the injuries into the two groups, the intervention group sustained 0.31 injuries/player (95% CI 0.22-0.39) and the control group 0.41 injuries/player (95% CI 0.29-0.53). The distribution of injuries across the whole study period is presented in Table 5. There was no statistical difference between the groups and the effect size, Cohen's d was 0.1. When comparing the two seasons no statistical significant group differences were found. The effect size was considered to be small, Cohen's d = 0.2 or below.

Table 5 Distribution of injuries divided in levels of severity and traumatic injuries and overuse injuries during season 1, preseason 2 and season 2

	Intervention			**group**				**Control**		**group**			**Total**
	male	(n=87)		female	(n=88)		male	(n=87)		female	(n=84)		
	trauma	overuse	total	trauma	overuse	total	trauma	overuse	total	trauma	overuse	total	
Mild	25	12	37	21	16	37	12	25	37	46	33	79	190
Moderate	22	9	31	9	15	24	17	13	30	12	9	21	106
Severe	15	13	28	13	4	17	19	8	27	18	8	26	98
Total	62(16)	34 (9)	96	43 (11)	35 (9)	78	48(12)	46 (12)	94	76(19)	50 (12)	126	394

5.3 PAPER III

The costs of the 188 injuries that occurred during preseason and season 2011/2012 were distributed in several categories: kind of injury, gender, and level of severity. Both traumatic injuries and overuse injuries of the knees used most resources (e.g. medical specialists visits, n= 59 and physiotherapy n= 576). The cost per injury showed that overuse injuries in the female players who were absent from floorball between 7-30 days were most costly, 2483

euro SD 5741. The total cost per injury showed that overuse injuries in severity level 1 (mild) and 2 (moderate) were more costly than the traumatic injuries, 434 (SD 533) and 1490 (SD 4277). In severity level 3 the traumatic injuries were afflicted with most costs 2730 (SD 2284). These costs were related to the traumatic injuries of the knees and shoulders that in 19 cases underwent surgery.

5.4 PAPER IV

The interviews indicated several psychological factors that might contribute to overuse injuries. These factors evolved into five core themes: history of stressors, person factors, psycho-physiological factors, psychosocial factors, and ineffective coping. The core themes were determined from a number of contributing factors clustered from 18 themes: previous injuries, stress in life, stress in sport, carelessness with body, excessive destructive training, motivation, passion, rivalry, self-efficacy, athletic identity, lack of recovery, pain, staleness, culture, lack of communication, fear of re-injury, lack of mental skills, and lack of social support.

6 DISCUSSION

6.1 MAIN FINDINGS

6.1.1 Paper I and II

The first and second Papers evaluated the prevention intervention after the season when the intervention was implemented and the following season. The intervention group sustained 0.45 (95% CI 0.35-0.55) injury per player the first season and 0.31 (95% CI 0.22-0.39) injury per player the second season. The control group sustained 0.53 (95% CI 0.41-0.55) injury per player the first season and 0.41 (95% CI 0.29-0.53) the second season. These results did not reach statistical significant differences between the groups. Earlier psychological injury intervention studies showed a reduction of injuries, [36, 41, 127], acute injuries, [84] reduced time-loss due to injuries [42, 83] fewer injured players [85]. Two additional studies are published [37, 81], their (lack of statistical significant) results were discussed based on methodological and statistical matters and the meaning of effect sizes [128, 129]. The effect sizes of the influence of the psychological skills training in the Paper I and II in this thesis were considered as small, Cohen's *d* 0.2. The Cohen's *d* effect sizes are suggested as small 0.2, medium 0.5 and large effect above 0.8 [130]. The clinical relevance of a small effect size corresponds to eight % of the injuries outside the overlapping CI in the intervention and control groups [131].
None of the earlier studies used large numbers of participants. These studies can be presumed to have evaluated the intervention in a controlled research design suggested as "ideal conditions" in the TRIPP model [94]. This project was purposely including all elite floorball teams aiming to evaluate such an intervention closer to a real-world or "on the field" context. Injury prevention studies in floorball are not common; the only to be found is a neuromuscular training programme aiming to reduce acute noncontact leg injuries in female floorball players [96]. The reduction was 66 % in the intervention group compared to the control group. That result is promising but might raise a discussion how physical prepared the female floorball players were to perform at that level and the intensity. To play and perform in a sport with a history of many injuries may influence the stress level. The psychological skills training programme is suggested to decrease such stress response to avoid unintentional contact and thereby the risk for injuries regardless of body location.

6.1.1.1 Gender

The incidences of injuries per 1000 hours of exposure o floorball across these two seasons were different in male and female players. The females in the intervention group showed a decrease of injuries to a larger extant then the male players. Previous research has showed that male floorball players suffered from more injuries [17, 18]. A recently conducted study [90] showed that the male players sustained fewer injuries than the female players which also

were the case in Paper I and II with one exception: the male players in the intervention group after the first season. It has been discussed that there is no statistical significant gender differences of the frequency of injuries in elite athletes [132, 133] or in the acceptance of pain [134]. From a psychological perspective, females are suggested to be more sensitive to stress but still have the ability to use a variety of active coping (e.g. problem-solving and information seeking) as compared to avoidance-focused coping strategies [135, 136]. It is possible that female athletes are more susceptible to such a psychological skills training programme.

6.1.1.2 Overuse and traumatic injuries

The distribution of traumatic and overuse injuries in earlier floorball studies, the traumatic injuries ranged from 60 % to 83 % [16-18, 90]. Table 5 showed that the traumatic injuries stood for 24 % of all injuries both in the intervention group and as well as in the control group. The proportion of overuse injuries out of all injuries were 20 % in the intervention group were and 32 % in the control group. This implies that the proportion of overuse injuries was larger in this project than in earlier studies. Many of the overuse injuries occurred during the preseason. This is in line with other research that has reported seasonal distribution of injuries [137]. Williams and Andersen have discussed that the stress response in the stress-injury model probably can explain the relation to traumatic injuries more accurately than overuse injuries [25, 38]. The extrinsic and intrinsic injury mechanisms explain how traumatic and overuse injuries occurs but not why. Researchers have discussed different behavioural theories that may contribute to the understanding of why the overuse injuries occur [138-141]. The behaviour explains what the players are doing to sustain overuse injuries. The psychological (risk) factors that may contribute to why overuse injuries occur are still under-explored [44, 142]. Overuse injuries might not always cause many days' of time-loss from sport [21]. The complaints overuse injuries cause may use resources in terms of a large amount of physical treatments and rehabilitation. Altogether, also overuse injuries need to be prevented.

6.1.1.3 Levels of severity

The intervention group 19 %, were mild injuries and the control group 29 %, were mild injuries of the total injuries over the study period. Many of these mild injuries are probably minor in the sense that they caused less than four days absence from floorball. It is possible that some injuries are recurrent injuries in this category. The complaints of injuries may cause a couple of rest days and the players return to sport early and are playing before next period of rest due to complaints. During the whole study period the proportions of the moderate injuries were equal distributed in intervention group, 14 %, and control group, 13 %. The proportion of severe injuries was 11 % in the intervention group and 14 % in the control

group (Table 5). The second season separately showed that a proportion of injuries moved from moderate (8 %) to mild (35 %) in the control group. The proportion of severe injuries in the intervention group was 8 % while the control group were still 14 % (see Table 3 in Paper II). One of the earlier studies reported that 25 % of the injuries caused at least one days of missed training [18]. Other studies reported that the proportion of mild injuries were 36 % [17], 49 % [90] and 59 % [16] respectively. The proportion of severe injuries were 35 % [17], 22 % [84] and 18 % [16] which showed that the proportion of severe injuries were lower in the intervention group in these papers after the evaluation of a psychological skills training intervention. It is probably not possible to state a "vision zero" in sports injuries. However, the players need shorter breaks to recover from activities. Using the time-loss definition such breaks will be categorised as mild injuries, unless the mild category is not separated into new two new categories: less than four days and four days and more. The moderate and severe injuries are the ones that should be in focus when discussing injury prevention strategies. Recurrent and subsequent moderate injuries might contribute to periods of absence from floorball. Injuries have a clearly negative influence on the individual player [143, 144] and the team performance [145]. Severe injuries have the same influence on players and team, in additions, this category of injures are most often the ones that cause the player to quit his or her sport [146] and may cause future complaints e.g. osteoarthritis [147] or psychological factors [148].

6.1.2 Paper III

The costs related to the 188 injuries that occurred the second season was estimated. The total cost per injury in severity level 1, mild, and 2, moderate, in the overuse injuries kind were most costly. Even though these injuries did not cause many days away from regular floorball activities, overuse injuries may need many treatments and long periods of rehabilitation. Very few of the floorball players earn their living from floorball. During the injury period it is possible that the athletes may spend more time at work without the time reduction due to away game that otherwise are scheduled. Earlier studies in floorball showed that an average time loss of work was 4 (SD 14) days and floorball 12 days (SD 22) [18] and work 5 days (SD 15) and floorball 23 days (SD 42) [16] due to injury.

This paper showed that the mean cost of traumatic knee injuries in female players was 2762 euro (SD 2633). Previous studies have reported the cost of ankle sprain in athletes as 570 euro (SD 1789). This paper estimated the cost of feet and ankle injuries to 575 euro (SD 964). The average cost per injury in Finnish floorball was estimated to 692 euro including players who underwent surgery. The cost of injuries in the Swedish floorball population showed a ranged from 332 euro (SD 451) to 2358 euro (SD 2122). This may depend on more expensive health care cost over time or differences between countries.

This study included injuries from a study which evaluated an intervention using an intervention group and a control group. When evaluating a sports injury prevention intervention, a cost effectiveness analysis can parallel a randomised control study [111]. This study estimated the mean cost of injuries and did not compare the cost in the two groups.

6.1.3 Paper IV

This paper was aiming to illuminate possible psychological reasons to why overuse injuries occur. The interviews revealed that all of the participating athletes were able to discuss psychological factors related to their overuse injuries. Some of the factors are probably close related to elite athlete in general, such as e.g. stress inside and outside sport, motivation and the acceptance of pain. Fear of re-injury has been described earlier [149], and some of the players were afraid to get injured again, despite the fear, they practised floorball instead of rehabilitation. Some other factors that occurred were of an intra-personal character but can probably be stated by many other athletes, e.g. the staleness, lack of social support and excessive destructive training. The almost obsessive passion to floorball and the strong athletic identity were reasons to why some players experienced themselves to play no matter what. The reasons to that players forced themselves to practice with pain and sustain overuse injuries early in the season was the internal rivalry, the players were eager to keep or take a position in the team roster. The most puzzling themes were the culture in the clubs and the poor communication. This included the appraisal of overuse injuries not to be as important as traumatic injuries and thereby neglected by the players and the teams' physiotherapists and naprapaths. The poor communication consisted e.g. of lack of information regarding the complaints and also low acceptance of complaining. The latter was discussed from internal perspective but also from external view such as team mates, and coaches. This is in line with a study that described the athletes and coaches perception of overuse injuries [142]. Some of the interviewed players described the time prior to the injury as the last part of *the dynamic, recursive model of aetiology in sport injury* in the sense of repeating the participation in floorball [31]. To provide psychological help to players with traumatic injuries or injuries in general have been in focus previously [150], however, overuse injured players must not be minimised or neglected. To develop prevention strategies the findings in this paper provides possible risk factors and suggests a working model (Figure 7). The factors in the model are suggested to influence the athlete's behaviour and risk to sustain an injury depending on the athletes coping resources.

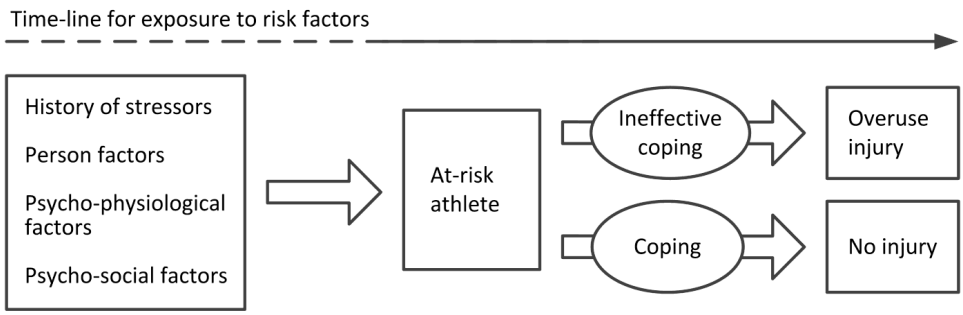

Figure 7. A working model of psychological risk factors for overuse injuries.

6.2 METHODOLOGICAL CONSIDERATION

The methodological issues, including limitations and strengths of this study will be discussed below.

A power calculation prior to study start based on previous studies showed that the study needed 38 participants in each group to detect the estimated effect. With a dropout rate of 20%, 46 participants were to be included in each study group. The power calculation was estimated on standard deviation of 1.0, significant level set to alpha 0.05, and statistical power 0.80. After the first season a new power calculation was performed based on both previous study results and the context, specified Cohen´s *d* effect size at 0.5 (a moderate effect size). The result showed that a minimum of 64 participants, in each group, was needed to reach sufficient power, 80 %. This project included at start of the study at least 94 players in each group and at least 84 players in each group after dropouts the second season.

This study included 23 teams, 82 %, out of 28 eligible teams. The teams were consecutively allocated to intervention group or control group. This procedure was not blinded and must be considered as a quasi-experimental design rather than a randomised controlled trial. The team as a cluster were allocated to one of the two groups and not the individual players. This method was chosen to avoid the risk of contamination between the players in a team if they were included in different groups [151]. A test of the heterogeneity between the groups showed no statistical significant differences of the baseline information (e.g. age, years in floorball, previous injuries).

The injury definition that was used in this project was time loss. Floorball teams do not necessary have the access to medical care during all practise hours. In addition, for the purpose of the study, to reduce injuries using a psychological intervention, the time loss definition was more suitable [152]. A player who is hit by a stick and need a stich or two and may continue to play were not included in this injury survey, however, such injuries might be impossible to prevent with medical or psychological intervention.

The time loss definition does probably not include all overuse injuries [21] which must be considered as a limitation in this study. It is suggested that problems of pain can be registered as an alternative. However, many athletes state that pain is a part of the game [153]. This situation makes it probably difficult for the athlete as well for the medical team (or researcher) to decide if the pain is a result of the game or an overuse injury. Moreover, some athletes are not willing to admit that they are suffering from pain due to e.g. fear of losing one's position in the team [142, 154].

Sports injuries are often followed by subsequent injuries [31, 155]. The first injury should, consequently, be avoided. In this project the aim was to evaluate if the intervention reduced the number of injuries not the amount of injured athletes. There was no definition or evaluation whether an injury was recurrent, a re-injury or an exacerbated injury. The risk of misclassification of injuries was expected to be reduced with using traumatic and overuse as the only classification. This was also a choice to get useful data from the teams but also not to

ask for too much work. The risk of too complicated injury survey may cause a risk of non-compliance or dropouts from a study. The rational was to keep the extra work as simple and easy as possible for the persons who reported the injuries.

The hours of exposure to floorball was registered at team level. This meant that all regular and mandatory practice and games were registered but not at individual level. This limited the study by not being able to separate exposure to practise hours or games hours when calculating the injury incidence.

A significant confounder in such an injury prevention project, which may influence the outcome, is other parallel prevention strategies in the team e.g. different kinds of neuromuscular training programmes. Floorball is a sport with a history of many severe knee injuries and therefore extended physical training has been recommended. No registration of which teams that eventually had implemented such training was done.

The intervention, the psychological skills training, has been evaluated in other sports, soccer and ice hockey, and in face-to-face meetings previously [41, 84]. This study design with group-based sessions for sport teams is not very common in the literature [156], however, with a growing number of sport psychology consultants the group-based meetings per se is common. Group-based meeting is a challenge for the consultant due to the group climate and how an intervention would be received; some players are curious and others are negative to sport psychology. There were no evaluations of whether the players considered the intervention effective or not, nor if they found the interveners appropriate for the task. Out of the eight sport psychology consultants, three were already involved in their teams. None of the consultants were otherwise involved in the research project.

The strength with this prospective study was that 70 % of the eligible players were included and the dropout rate was less than 14 %. So far, no other project has evaluated a psychological skills training programme in group-based sessions and over two seasons.

6.3 CLINICAL IMPORTANCE

Injury mechanisms consist of several intrinsic and extrinsic factors. One of the intrinsic factors is the psychological factor with its underlying variables such as personality and anxiety. When planning injury prevention strategies a bio-psycho-social perspective is important. The players who are experiencing stressful events do probably need help to cope with stress to avoid injuries.

The awareness of possible psychological risk factors to overuse injuries may contribute to the development of prevention strategies. To prevent from overuse injuries psychological factors are suggested to be included

Few educations in sports medicine include sports psychology competence, including individual and situational factors and sports injury.

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7 CONCLUSIONS

The following conclusions were drawn in this project:

- The evaluation of the intervention after the first season showed that fewer injuries occurred in the female players in the intervention group. Overuse injuries decreased to larger extent then traumatic injuries. The effect size of the psychological skills training influence in overuse injuries was small, Cohen's d 0.2.
- To evaluate the sustainable effect of an intervention, a longer period of time must go. This group-based training showed small effect size Cohen's d 0.2 after the second year resulting in fewer injuries in total. There were fewer severe injuries in the intervention group compared to the control group.
- The downside with injuries is not only the absence from the sport, it is also the cost. The cost of floorball injuries is mostly a cost from the societal perspective. Some of the injuries were not afflicted to any costs while some were using more resources. Knee injuries were one of the most costly.
- A quite amount of overuse injuries have occurred in this project. Little is known about why they occur and based on the empirical findings, a working model is proposed, aimed at integrating psychological findings from Paper IV with previous research, such as the pioneering work of Andersen and Williams [33]. The model suggest that the history of stressors, person factors, psycho-physiological factors, psychosocial factors and an athlete's coping resources influence injury rates over time. Effective coping suggests decreasing the proneness to overuse injuries, while ineffective coping makes the athlete vulnerable to overuse injuries. The outcome of the model is either an injury or no injury, with an assumption that effective coping results in less overuse injuries.

8 FUTURE RESEARCH

The psychological skills training has not been evaluated using stress, anxiety and coping variables as outcome measures. To evaluate the intervention after the first season but also after a consecutive season to explore whether the players' experiences of these variables change over time are valuable.

Thirty-five percent of the players were injured during the first season and 27 % the second season. This means that a majority of the players remained uninjured during this study. Previous research has focused and suggested psychological risk factors to injuries. Consequently, it is of importance to investigate if the uninjured players use particular coping strategies or psychological resources to avoid injuries.

The cost of floorball injuries is described, a continuation of that would be to perform a cost-effectiveness analysis to evaluate the cost in an intervention group compared to a control group.

The injury mechanisms how overuse injuries occur are described but it is still not clear why they occur. The suggested psychological factors are possible risk factors that need to be further investigated and also the need to develop and evaluate prevention strategies.

9 ACKNOWLEDGEMENTS

The present thesis was made possible thanks to grants and support from Halmstad University; Center of research on Welfare, Health and Sport, Sophiahemmet Foundation, the Swedish Floorball Federation, the Swedish Naprapathic Association, and Swedish National Centre for research in Sports.

I am greatful to many former colleagues, athletes and friends that have supported and helped me during these study years. This thesis was not possible to complete without your help. In particular, I would like to thank:

My main supervisor, Professor *Suzanne Werner*, for your never failing support and enthusiasm, and for your stimulating guidance in my scientific work. You are an expert of seeing the broad picture of a thesis and coming up with brilliant ideas as well as to identify every mistake in spelling. Thank you, for sharing you experience and knowledge in science and sports medicine.

My co-supervisor Professor *Urban Johnson*, for your support and always fast response to my e-mails wherever you have been. You made me interested in research when I was your Master student and all together it has been a pleasure to be your student during almost ten years. Thank you, for bringing me to international conferences and introducing me to your international network in sports psychology.

My co-supervisor and former colleague Assistant Professor *Eva Skillgate*, for supporting me and sharing your knowledge. Before the start of my thesis we used to visit the opera and other cultural events, which I appreciated very much. I look forward to do this again in the future.

My co-supervisor Associate Professor *Björn Engström*, for sharing your expertise in orthopaedics. You have been taking care of a lot of things during these years: from my knees to teaching me about ICD-10 codes. I am impressed and thankful.

My mentor *Tönu Saartok*, PhD, MD, for your source of inspiration and support, always being calm and wise. I still have those words in my mind: “keep it simple”!

My co-author and new friend *Emilie Heintz*, PhD, for sharing your knowledge about health economy. You have taught me a lot and it has been a pleasure to discuss both life and health economy.

My co-author Associate Professor *Magnus Forssblad,* for your collaboration through the years. I am grateful to you for giving me access to the research facilities at Capio Artro Clinic.

All *colleagues* at *Capio Artro Clinic*, for sharing coffee, lunches and discussions during these years.

Former and *present members of the research group at Stockholm Sports Trauma Research Center,* for fruitful and important scientific discussions during these years.

Colleagues at *Halmstad University*, for always good discussions and laughs. It has been a pleasure to be a part of your group during these years.

Anna Pappas, Andreas Ivarsson and *Mia Westin*, for very good friendship since day one. I hope to continue our discussions, meals, (Andreas, I still owe you one) and ski runs (Mia, looking forward to your "kappa writing", maybe in Tänndalen). I could not have done this without your stimulating support.

All the participating *players* in the floorball teams, the *coaches*, and the *medical staff*, for supporting my work. This thesis could not have been possible without your collaboration, thanks a lot!

Emil Risberg, Mattias Hjelmberg, Lasse Granqvist and *Lars G Karlsson,* for your belief in this project and for helping me with contacts within the floorball group and also for other valuable parts of this thesis before and during these years of research.

Anders, Göran, Johan, Johan, Malin, Malin, and *Mikael*, for challenging yourself by helping me with the psychological skills training intervention - the core in this project. You made a great job, thanks a lot!

Dan Friberg, Tomas Tranæus, Andrea Hjelmåker, and *Annika Borgström*, for your help with different, valuable things in this project. You have done an excellent work - most often with short notice. Thank you, so much!

Mark Andersen and *Jeffrey Armstrong*, for all the help that you have put into my project and my education as a PhD-student, and not the least for being a part of your Swedish friends.

Birre Espeling, Cecilia Ålander, Inger Tobell, Peder Lindberg and *Tommy* Eriksson, my old friends for your sources of inspiration during many years.

My other old friends in different groups, *Kickan, Maria* and *Sanna, Berit, Katharina* and *Lena, Mia* and *Pia, Carina* and the oldest one*, Marie*, for having been patient with me and waited for me -now it is time to catch up!

Last but not least, my dear family, *Hans* and *Anders, Catharina, Helena*, for being there days and nights, in good times and in sad times. I love you and I am so pleased to be a part of this large and fantastic family.

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Appendix 1

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Kodnummer (ifylls inte) ☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Bakgrundsinformation

A1. Vilken skolutbildning har du?, välj den högsta

☐ Grundskola ☐ Gymnasium ☐ Högskola/Universitet

A2. Har du någon utbildning inom idrott?

☐ Idrottshögskola (Bosön, Lillsved eller motsvarande)
☐ SISU utbildning
☐ GIH
☐ Tränarutbildning inom förbundet
☐ Ingen
☐ Annat, vad? ☐

A3. Vad är din huvudsakliga sysselsättning?

☐ Arbete, heltid
☐ Arbete, deltid
☐ Utbildning, heltid
☐ Utbildning, halvtid
☐ Innebandy, heltid
☐ Innebandy, halvtid

A4. Beräknad årsinkomst nuvarande kalenderår:

☐ 0-100'
☐ 101'-150'
☐ 151'-200'
☐ 201'-250'
☐ 251'-300'
☐ 301'-350'
☐ 351'-400'
☐ 401'-

A5. Kommer inkomsten i huvudsak från: ☐ Arbete ☐ Studielån ☐ Innebandy

A6a. Har Du tidigare erfarenhet av idrottspsykologi? ☐ Ja ☐ Nej

b. Om Ja, på vilket sätt?

☐ Enstaka föredrag
☐ Kurs (t ex helgkurs)
☐ Utbildning
☐ Idrottspsykoligisk utbildning, mental träning
☐ Annat, vad? ☐

A7. Använder du någon medicin? ☐ Ja ☐ Nej

Om Ja, ange vilken/vilka.

För vilken diagnos eller orsak äter du i så fall medicinen?

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A8. Röker du? ☐ Ja ☐ Nej

A9. Snusar du? ☐ Ja ☐ Nej

A10. Hur många år har du spelat innebandy? ☐☐

A11. Har du utövat någon annan idrott än innebandy? ☐ Ja ☐ Nej

Om **Ja**, ange vilken/vilka.

Ange även hur länge du utövat idrotten/idrotterna.

A12. På vilken nivå? ☐ Motion, kul ☐ Motion, tävling ☐ Tävling, elit

A13. Har du varit skadad och borta från träning längre än 30 dagar i sträck under förra säsongen? ☐ Ja ☐ Nej

Om **Ja**, ange vilken typ av skada?

Besvara nedanstående påståenden utifrån dina tidigare erfarenheter

A14. Jag blir stressad i samband med innebandyn.
☐ Alltid ☐ Ofta ☐ Ibland ☐ Sällan ☐ Aldrig

A15. Jag blir stressad av livet utanför idrotten.
☐ Alltid ☐ Ofta ☐ Ibland ☐ Sällan ☐ Aldrig

A16. Jag har svårt att somna.
☐ Alltid ☐ Ofta ☐ Ibland ☐ Sällan ☐ Aldrig

A17. Jag har svårt att sova de timmar jag skulle önska.
☐ Alltid ☐ Ofta ☐ Ibland ☐ Sällan ☐ Aldrig

A18. Jag kan vara dyster och ledsen under säsongen
☐ Alltid ☐ Ofta ☐ Ibland ☐ Sällan ☐ Aldrig

A19. Jag är glad och motiverad under säsongen.
☐ Alltid ☐ Ofta ☐ Ibland ☐ Sällan ☐ Aldrig

A20. Jag brukar känna mig lugn och harmonisk under säsongen.
☐ Alltid ☐ Ofta ☐ Ibland ☐ Sällan ☐ Aldrig

A21. Jag kan bli trött och sliten under säsongen.
☐ Alltid ☐ Ofta ☐ Ibland ☐ Sällan ☐ Aldrig

A22. Mina lagkamrater betyder mycket för mig.
☐ Alltid ☐ Ofta ☐ Ibland ☐ Sällan ☐ Aldrig

A23. Innebandyn är det viktigaste för mig.
☐ Alltid ☐ Ofta ☐ Ibland ☐ Sällan ☐ Aldrig

A24. Jag återhämtar mig genom:

☐ Sömn	☐ TV/DVD
☐ Vila	☐ Yoga/Qi Gong
☐ Avslappning	☐ Massage
☐ Kompisar	☐ Alkohol
☐ Familj	☐ Kosttillskott/Läkemedel
☐ Dataspel	☐ Annat, vad

Tack för din medverkan!!

Appendix 2

Undersökningar och kostnader i samband med innebandyskador under säsongen 2011-2012, Premis-studien.

Jag vore tacksam om du kan fylla i nedanstående uppgifter. Syftet med uppgifterna är att kartlägga vad skador inom innebandyn kostar spelaren, klubben och samhället.
Efter att dina uppgifter har registrerats kommer namnet att tas bort och ersättas med en kod.
Alla insamlade papper och data kommer att hanteras konfidentiellt och anonymt.
Resultatet kommer att rapporteras på gruppnivå (det innebär att dina svara slås ihop med övriga spelares svar) i tidskrifter och på nationella samt internationella kongresser.

Namn/Spelare:_____

Klubb:_____

Skadedatum:_____

Datum för återgång till skada:_____

Typ av skada (olycksfall/överbelastning):_____

Lokalisering (på kroppen):_____

Dessa frågor gäller dig som spelare:

Har du blivit undersökt av **ditt lags** fysio? Ja ☐ Nej ☐
Har du blivit undersökt av **motståndarlagets** läkare eller fysio? Ja ☐ Nej ☐
Hur många behandlingar du har fått för skadan av ditt lags fysio i hallen: _____
Har du fått behandlingar på fysions klinik? Ja ☐ Nej ☐
Om ja, hur många gånger?_____
Har **du** betalat för behandlingarna? Ja ☐ Nej ☐
Om ja, hur mycket har det kostat dig?_____

Har du varit på undersökning av **landstingsfinansierad** vårdgivare (vårdcentral, akutmottagning, tandläkare)? Ja ☐ Nej ☐
Om ja, hur många gånger?_____
Vilken/vilka undersökningar?_____

_____
Har du gått på behandling hos landstingsfinansierad sjukgymnast? Ja ☐ Nej ☐
Om ja, hur många besök?_____

Har du blivit röntgad? Ja ☐ Nej ☐
Har du gjort MR undersökning? Ja ☐ Nej ☐
Åkte du ambulans i samband med skadan? Ja ☐ Nej ☐
Har du fått sjuktransport (t ex taxi) till/från arbete/skola? Ja ☐ Nej ☐
Har du fått någon övrig sjuktransport? Ja ☐ Nej ☐
Om ja, kan du beskriva den (antal, sträcka)?_____

_____

Har du köpt mediciner? Ja ☐ Nej ☐

Har du fått hjälpmedel (kryckor, ortoser, skydd, bettskena)? Ja ☐ Nej ☐
Om ja, vad?_____

Har du blivit sjukskriven, haft sjukfrånvaro med inkomstbortfall? Ja ☐ Nej ☐
Om ja, hur lång tid?_____

Har du blivit sjukskriven, haft sjukfrånvaro från skola? Ja ☐ Nej ☐
Om ja, hur lång tid?_____

Har du varit borta från arbete/skola (pga läkarbesök, rehab etc)? Ja ☐ Nej ☐
Om ja, hur många gånger/timmar?_____

Har någon anhörig varit ledig från arbetet för att hjälpa dig i samband med skadan, exv följt med på läkarbesök, skjutsat eller varit hemma för din skull? Ja ☐ Nej ☐
Om ja, hur många gånger/timmar?_____

Har du varit borta från träning/match? Ja ☐ Nej ☐
Om ja, hur många gånger?_____

Har du haft kostnader i samband med skadan? Ja ☐ Nej ☐
Exv. för läkarbesök, skydd, mediciner etc.

Om ja, hur mycket och för vad?_____

_____

Har du fått frikort till vård? Ja ☐ Nej ☐

Har du blivit undersökt av **försäkringsfinansierad** vårdgivare (privatläkare, tandläkare)?
Ja ☐ Nej ☐
Om ja, vilken/vilka undersökningar?_____

_____

Har du blivit behandlad av försäkringsfinansierad sjukgymnast? Ja ☐ Nej ☐
Om ja, hur många besök?_____

Har **klubben** stått för kostnader i samband med skadan? Ja ☐ Nej ☐
Exv. för läkarbesök, skydd, mediciner, taxi, röntgen etc.

Om ja, hur mycket och för vad?_____

_____

Har din/klubbens **försäkring** stått för kostnader i samband med skadan? Ja ☐ Nej ☐
Exv. för läkarbesök, skydd, mediciner, taxi, röntgen etc.

Om ja, hur mycket och för vad?_____

_____

Har du haft utlägg i samband med skadan som du kommer att få tillbaka från klubb eller försäkringsbolag? Ja ☐ Nej ☐
Exv. för läkarbesök, skydd, mediciner etc.

Om ja, hur mycket och för vad?_____

_____

<u>Dessa frågor gäller klubben/föreningen:</u>

Hur stora kostnader har klubben för spelarnas försäkringar (avseende skador)?

_____

Hur stora kostnader har klubben för spelarnas löner inkl soc. avgifter?

_____

Betalas lön ut även vid skada eller sjukskrivs spelaren? Ja ☐ Nej ☐

Klubbens kostnader för arvode/lön till fysio, läkare, tandläkare?

_____

Har klubben kostnader för transporter (taxi), skydd (ortoser), självrisker etc? Ja ☐ Nej ☐
Om ja, hur stora kostnader och för vad?_____

Har personer från klubben varit involverade på sin ”civila” arbetstid i samband med spelares skada (medföljande till sjukhus)? Ja ☐ Nej ☐

Om ja, i vilken omfattning (tid/antal gånger)?_____

Har klubben haft direkta kostnader i samband med spelares skada? Ja ☐ Nej ☐
Om ja, beskriv kostnader och omfattning_____

Har klubben använt försäkringsbolag i samband med skada? Ja ☐ Nej ☐
Om ja, för vad?_____

Har klubben använt landstingsfinansierad vårdgivare (exv. akutsjukhus, vårdcentral, sjukgymnastik) i samband med spelares skada? Ja ☐ Nej ☐

Om ja, för vad?_____

Appendix 3

Bilaga 5

Intervjuguide överbelastningsskador

Syftet med intervjuerna är att undersöka om det förekommer gemensamma psykologiska mönster vid uppkomsten/ i samband med överbelastningsskadorna hos de intervjuade idrottarna.

För att kunna skicka en kopia på utskriften för godkännande behövs namn och adress. Dessa uppgifter kommer inte att finnas kvar under databearbetningen eller vid senare redovisning

Dessa uppgifter är konfidentiella och kommer att redovisas anonymt i grupp.
Det är helt frivilligt att delta och då kan när som helst avbryta eller avstå från att besvara frågorna.

Namn:
E-post:
Telefonnummer:

Bakgrund
Hur länge har du spelat innebandy?

Hur länge har du spelat på denna nivå?

Hur ofta tränar du?

Tränar du något utanför den schemalagda innebandyträningen?

Vad har du för typ av skada nu?

Hur länge har du haft den?

När under säsongen började besvären?

Vad har du gjort åt den/låtit göra?

Vad är prognosen?

Vad tror du själv att skadan beror på?

Har du varit skadad tidigare?

Om ja, berätta lite om dina tidigare skador

Om ja, när då?

Vilken typ av skada var det?
Fokus på överbelastningsskador

Berätta om hur den skadan började

Hur länge varade den skadan?

Var du helt bra innan du började spela för fullt igen?
Om nej, vad fick dig att börja spela?

Beskriv hur det gick till när det bestämdes att du skulle börja spela fullt ut igen.

Fysiologiska faktorer och stressorer
Hur började besvären i samband med den skada du har nu?

Fick du någon varningssignal innan besvären började?

Om ja, beskriv vad för slags signaler det kan handla om

Lyssnar du på din kropps (varnings)signaler?

Psykosociala faktorer och Stressorer
Har det varit något speciellt i livet som hände innan du började få ont?

Berätta om det.

Betyder innebandyn mycket för dig?

Vad är det som är betydelsefullt (fysiska aktiviteten, vinna, laget)?

Vad motiverar dig att spela innebandy på denna nivå?

Berätta vad som är positivt med att spela på denna nivå.

Vad skulle du göra om du inte spelade på denna nivå?

Beskriv om det finns negativa aspekter med att spela på denna nivå.
Eventuella följdfrågor på negativa faktorer

Finns det stressande faktorer i samband med innebandyn?

Finns det stressande faktorer utanför innebandyn?

Berätta hur du hanterar sena kvällar efter bortamatcher.

Berätta hur du reagerar på förluster eller egen dålig prestation.

Hur gör du för att komma till ro och somna?

Berätta om ditt sätt att återhämta dig.

Känner du dig sliten ibland under säsongen?

Beskriv hur du märker det?

Hur hanterar du trötthet/slitenhet under säsongen?

Upplevde du att du var sliten eller trött när du började få besvär?

Hur var din motivation till innebandyn när du började få besvär?

Hur är din motivation generellt?

Har du ett bra socialt stöd?
- Social factors (family, relationships, financial, work, coach, team, …)

Beskriv vad ett bra stöd betyder för dig

Berätta om vilka som ger dig stöd.

Hur är din position/status i laget?

Förändras den för att du är skadad?

Hur är din relation till tränarna?

Hur är din relation till de andra spelarna?

Vem avgör när du kan börja träna fullt och spela igen?

Hur beskriver du dig själv?(envis, vinnarskalle, trygg, motiverad, brinner för…)

Hur är ditt självförtroende?

Beskriv om ditt självförtroende är likadant när du är skadad.

Hur sätter du mål under rehabiliteringen?

Hur sätter du mål under säsongen?

Hur utvärderar du om du når dina mål?

Vad tror du skulle hjälpa bäst för att bli av med skadan?

Hur tror du är bästa sättet för att inte få tillbaka en liknande skada?

Vad tror du är det bästa sättet att undvika en sådan här skada från början?

Vill du berätta något mer som har samband med din överbelastningsskada?

Något övrigt du vill tillägga?

Tack så hemskt mycket för att du ställde upp med din berättelse och tid!

Vill du läsa igenom utskriften för att godkänna texten?