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**INDOOR SOCCER INJURIES:
PROBLEMS AND PROSPECTS
FOR SOLVING THEM****Taras PANCHUK¹, Grzegorz GLAB²**¹*Vasyl Stefanyk Precarpathian National University,
Ivano-Frankivsk, Ukraine, e-mail: 24berkyt@rambler.ru,*²*University of Physical Education in Krakow, Krakow, Poland***ТРАВМАТИЗМ У МІНІ-ФУТБОЛІ: ПРОБЛЕМИ ТА ПЕРСПЕКТИВИ ЇХ ВИРІШЕННЯ.** **Тарас ПАНЧУК¹, Гжегож ГЛАБ²** ¹*Прикарпатський національний університет імені Василя Стефаника, Івано-Франківськ, Україна, e-mail: 24berkyt@rambler.ru,* ²*Академія фізичного виховання імені Броніслава Чеха в Кракові, Краків, Польща.*

Анотація На сучасному етапі розвитку світового міні-футболу спостерігається значне зростання тренувальних і змагальних навантажень, що призводить до збільшення кількості спортивних травм, а загальноприйняті методи лікування при цьому не завжди дають бажаний результат. Тому метою роботи було визначити та систематизувати основні чинники ризику отримання спортивних травм та їхньої локалізації для розроблення профілактичних програм. На основі аналізу та узагальнення наукової та методичної літератури встановлено, що схильність гравців до травматизму визначається взаємодією зовнішніх і внутрішніх чинників, а проведення тренувального та змагального процесів вимагає розроблення і впровадження комплексної програми профілактики травматизму, що містить новий метод контролю, заснований на можливості постійного діагностування рівня функціонального стану спортсменів за допомогою трьох видів моніторингу: базового, етапного й поточного, причому відсутність програми профілактики є одним із основних чинників ризику отримання спортивних травм.

Ключові слова: міні-футбол, спортивний травматизм, локалізація, опорно-руховий апарат, профілактика.

Problem statement and analysis of the recent studies and publications. Modern indoor soccer is characterized by an increase in intensity of playing activities that becomes apparent in the competition tension increase in the game episodes, decrease to minimum of passive phases in each player's actions, and increase of anaerobic and aerobic indices of the indoor soccer players [1].

The active phases of a game, diversity of the attack action forms and active defense forms increase to maximum and the number of shoots on the competitors' target also increases. This tendency, conditioned by the indoor soccer specific character itself, every time puts greater requirements for technical and tactical training of the indoor soccer players [2, 3]. The mentioned above factors ultimately lead to an increase of physical load and psychological stress levels that is the reason of a significant growth of injuries in indoor soccer [4].

Athletic injuries according to different sources comprise 10–17% from the general injury rate (everyday, outdoor, industrial, etc.). Its indices depend on both the sports type, and the involvement level of the respondents in sport. Injuries are the most often in soccer which is the closest type of sport to the indoor soccer [5].

According to the modern developments an injury is defined as any damage that is experienced by players during a planned football match or training because of which they have to miss at least one training session or match. The UEFA Medical Committee deems it appropriate to include in this definition the injuries that lead to a player's ceasing of a match or training regardless of his/her further participation in the succeeding matches and trainings and suggests to record such an injury separately [6]. Such a definition, from our own viewpoint, is more objective, less dependent on the frequency of trainings and matches, and applicable for determining of injuries at different indoor soccer professional levels.

Analysis of the literary sources [1, 2, 3, 4, 7, 8] pointed an insufficient number of works regarding the emergence of injuries in indoor soccer and lack of generalized research on this topic in order to develop complex prevention programs, which are becoming increasingly important. Players, coaches and team's medical staff have to understand that it is easier to prevent an injury than to treat it.

Work objective: study of the peculiarities of the injury causes in indoor soccer in order to develop the prevention program.

Study methods: analysis and summarization of scientific and methodological literature.

Presentation of the main materials. Based on the complex analysis of the literary sources, we can conclude that the players' vulnerability to injuries is determined by the interaction of internal and external risk factors [4, 5, 9].

The internal factors in the indoor soccer include the following: previous injury, disease, age and gender of an athlete, experience level, functional state, flexibility, adroitness, muscle strength, joint stability, and biomechanics. The main external factors include such factors as irrational designing of the training process, type and state of the field surface, equipment, usage of special protective means, human factor (unsportsmanlike relationships among partners, opponents, and judges), level of competitions and presence or absence of the prevention program [9, 10].

According to different authors, 4.45 of injuries fall to a player's share during 1000 hours of his/her participation in official indoor soccer matches, 88.24 % of them concern lower limbs: 32.35% of their total amount relate to ankle injuries, 17.65% are knee-joint injuries, and approximately 14.78% are considered to be foot injuries [4, 11, 12].

The significant amount of the knee-joint injuries is caused by the fact that the joint is superficially located and has a complex kinematics of the mutual movement of the constituent parts [13]. The joint functioning requires great power and resources of the whole athlete's organism, and, if any problems arise, the adaptation on the level of the knee-joint can exist for quite a short time. The injury may occur as a result of a direct blow to the knee-joint, thigh or shank. The contact mechanisms include the behind blow under the knee which leads to the shank forward displacement with regard to the thigh and ligament break [14]. The contact mechanisms are inferior to the non-contact ones according to the frequency of the indoor injuries occurrence [4]. The non-contact mechanisms presuppose that the injured joint is not subjected to an external load. The valgus shank displacement with its simultaneous pronation is the most widespread non-contact mechanism. During sudden movements the pivot leg experiences peak loads that form great forces of its adhesion with the field surface as a result of which it is standstill for several milliseconds. Herewith, the torque needed for a step aside or moving direction change is transmitted to the knee joint that may cause its damage [7].

Pathology of the knee joint may be caused by the foot pathology. It has been found out that the knee joint injury is directly dependent on different deformation processes in the foot. The possibility of suffering an injury increases due to irregular position of the foot [15]. Some changes occur in the athlete's locomotor system. The result of this is the emergence of pain in the knee and, moreover, this pain emerges much earlier than the fact of suffering an injury. The athlete gets used to various malfunctions due to the mobilization of some organism resources, which are by far not limitless. Thus, the knee joint "helps" to cope with the malfunctions in the foot. Over time "the helpers" suffer themselves. "A weak link" appears at this stage. A pain syndrome emerges. There is another crucial point. As far as the joint is quite complex according to the biomechanics law and some considerable resources of our organism are employed for its normal functioning, it will not be able "to help" the foot for a long time.

The foot is of great importance for the indoor soccer players' athletic achievements. The study of the foot adaptive capabilities while being engaged in athletics and physical training are also very important for evaluation of its functional and morphological properties. The foot may significantly deform under the influence of physical exercises which often leads to undesirable results both in the dynamics of common walking and in the development of its pathologies [9]. That's why, the detailed and enhanced study of the foot movement capabilities in different conditions of organization of its movement function becomes of great methodological value.

The ways for evaluation of the foot posture were described in numerous scientific works [16, 17, 18, 19]. The interconnection between the foot morphology and suffering sports injuries and, in particular, shank injuries were examined in the work [20]. The clinical diagnostic instrument – foot posture index (FPI), which can be used to determine the foot posture – normal, pronation, or supination – on the basis of six different criteria, was used for this purpose.

Though the mentioned techniques for determination of the foot posture allow the sports medicine physician to classify the athlete's static foot posture, the main restriction for their utilization is that they do not account the foot mobility [20].

The evaluation of the foot posture in the work [21] was conducted with the help of the foot mobility magnitude (FMM). The results of this study show that the measurements, needed to calculate the FMM, have quite a high level of reproducibility and provide the clinician with the method of quantitative evaluation of vertical and medial-and-lateral mobility in the middle part of the foot. We believe it should be noted that utilization of this simple and reliable technique for better understanding of the athlete's foot morphology as one of the main factors of emergence of possible problems and development of preventive measures for the indoor soccer players on its basis can be promising.

To be effective on the field a player must: do a lot of sprints, jumps, quick direction changes, high accuracy performance of techniques throughout a game and shots on goal – the muscle strength is rather important for a player. Numerous studies have found an interconnection of dynamic muscle strength with the speed which athletes can achieve when performing a sprint and force of hitting a ball [22]. For this reason it's necessary to take into account the fact that the evident asymmetry of muscle strength of left and right lower limbs, as well as significant asymmetry of flexors and extensors muscle strength is a factor that may lead to sports injuries [23].

According to the data of the [4] the significant number of injuries is comprised by the muscle disorders and sprains – 26.47%, which include 17.64% of muscle disorders and 14.71% of ligament sprains. The mechanism of the thigh muscle sprain depends on the location. Thus, the anterior rectus muscle sprain usually occurs when kicking a ball, whereas the injury of the posterior surface of thigh or calf muscles happens mostly when speeding up.

The basis for injury prevention of the muscle groups is the enhancement of their flexibility, improvement of proprioception and teaching of the proper technique for making exercises that may be the origin of injury risk. That's why, the indoor soccer player must possess the following physical fitness qualities: muscle strength, speed, flexibility and ability to withstand high loads without getting out of shape when becoming tired.

Thus, the harmony among the strength, speed, muscle flexibility, aerobic and anaerobic endurance is actually accompanied by the body constitution and it also allows the athlete to have better and higher athletic performance efficiency and prevent injuries. The evaluation of the athlete's potential with account of the peculiarities of the indoor soccer as a sports type requires development of the appropriate testing and special complex of exercises. The utilization of the 11+ program for young indoor soccer players aged 17.3 ± 0.7 is examined in the work [24]. It is noticed that this program may be used as efficient training means for improvement of physical fitness and technical characteristics of young indoor soccer players. At the same time, we think that conduction of the studies on the basis of the "11+" program in order to improve the physical conditions of the players of different ages and qualifications may be useful when developing methods for preventing athletic injuries in indoor soccer.

The possibility of suffering an injury in athletics is dependent to a considerable extent on the characteristics of the field covering [25]. The field covering must be smooth and in accordance with the UEFA requirements it must be covered by hardwood or synthetical material. The covering of the indoor soccer fields, on which athletes have trainings and competitions are held, usually differ and have other properties, that's why, change of the covering influences the athletes' muscles state: in such a case there appears a specific tension which may result in injuries. Different coverings have different adhesion with the footwear.

Sports footwear is an important factor of efficient indoor soccer practice. Due to perfect contact with the ball, provided by the footwear for the sports hall, the athlete feels the ball location without visual control that provides him/her with the possibility to concentrate on the general game situation on the field.

According to different sources, the sports footwear nonconformity may cause an injury [5, 26], that's why, it is reasonable to conduct studies for individual selection of footwear for a particular pla-

yer with the account of orthopedics, biomechanics and type of the indoor soccer field surfaces in order to decrease the possibility of suffering an injury with the simultaneous increase of the efficiency of the movements performed by him/her.

When analyzing the problem of injuries in indoor soccer, one should take into account the fact that there is a close relationship between the athletes' health, level of their functional capabilities, and readiness to effective training activities [27]. Sharp increase in loads has recently significantly and fundamentally changed the nature of trainings in indoor soccer. Therefore, only completely healthy people, i. e. the ones in whose health state modern research methods cannot detect any deviations, should be allowed to take sports [28].

The past athletic injuries, even after effective treating and rehabilitation, make the athlete more vulnerable to succeeding injuries [29]. In particular, an injured ligament is usually more sprained than its physiological length that determines the joint instability. Such a ligament can be characterized by proprioceptive hyposensitivity due to injury of mechanoreceptors that decreases control capabilities over the accuracy of movements and may lead to another injury. The athlete's return to a competitive athletic practice must be gradual and in accordance with the established monitoring criteria and functional characteristics for every individual case. That's why, the criteria for returning to the athletic practice after rehabilitation must include the following: normal range of motion, strength, power and endurance of the muscles themselves and cardiovascular system, flexibility, coordination and proprioception [30].

At present the relation between training and competition loads is not sufficiently studied in the sports theory and methodology in general and in indoor soccer in particular [4, 9]. One may find many examples when the exercises, methods and organizational arrangements, used during trainings, are inadequate to the organism state which must be achieved to get the sport result and they may result in an opposite effect, as well as increase the risk of suffering an injury.

To design the training process models there is a need not only to have the information about the level of the athletes' physical preparation but also to know the playing activity requirements for the athlete's organism. It has been determined that the higher level of competitions involves higher rate of injuries [31] and the highest rate of injuries is a characteristic feature of the indoor soccer players of the national teams [32]. The authors associate such a high index among the specialized athletes solely with the high level of sports competition, continuously growing complexity in order to provide the necessary results and long period of sporting activities on the edge of physical and mental possibilities that is also proven by the studies [33], which determined higher level of injuries among the athletes, older than 25 years, than among the players aged 19–24.

At the present stage of the indoor soccer development, when physical abilities of athletes' organisms reach the limit values, analysis and control of the athlete's functional state during the season, which will allow not only to assess the current state but also to predict and prevent the emergence of negative changes, are crucial when planning training processes [34].

The authors of the [35] developed a new control method for grass soccer, which is based on the possibility of continuous diagnostics of the athletes' functional state with the help of such three types of monitoring as base, stage and current ones. The criteria of each study type include hematological monitoring, psychophysiological testing, body composition analysis, determination of the state of the main power supply systems, and cardiovascular screening. The results of these studies must be used to determine the content of the training process – development of flexibility, strengthening of muscles and ligaments, warm-up nature, etc.

Development of methods for permanent functional state control with the account of specific for indoor soccer field and laboratory tests [36, 37, 38, 39, 40] could become one of the key elements of a complex prevention program for this sport.

Warm-up is a constituent part of an athletic training. Warm-up is a complex of exercises that precede the planned training or competition and their aim is not only to prepare the body of an athlete for the upcoming special activities for the given type of sport, but also to prevent injuries [5, 41]. The appropriate warm-up, which provides limbering-up of the muscles and increases their elasticity, helps to improve the technique and general physical preparation of the athletes. The athletes, who conducted a good warm-up before the indoor soccer game, can work better with high concentration.

At the same time, the mechanisms of warm-up influence onto the subsequent competition or training activities are different and at present they are not sufficiently studied, so conduction of the studies to develop complexes of exercises for injury prevention in indoor soccer is topical.

Recovery is an integral part of the training process. Recovery training “cooldown” after training or game is just as important as the warm-up. The gradual reduction of load during cooldown helps to gradually decrease the heart rate and overall rate of metabolism, eliminate the delayed onset muscle soreness (DOMS), and remove various toxic substances, formed during training, out of the muscle fibers.

Cooldown is the first stage of the recovery processes that are important components for achieving the sport results peak. In this context, recovery is considered as a multistage process with the return to the original homeostasis as well as a potential of the higher readiness level to physical activities [42].

A ranking place among recovery means that promote physical efficiency advancement is taken by medical and biological means, which include: sensible nutrition, pharmaceuticals and vitamins, protein medication, sports drinks, oxygen cocktails, physiotherapy and hydrotherapy, different types of massages, balneotherapy, sauna etc. [43, 44, 45, 46].

However, as it can be seen from the analysis of scientific-and-methodological literature and experience of sports practice, the recovery means used for preparation of indoor soccer athletes are not of systemic nature and they do not always take into account training and competition loads [47, 48, 49, 50]. This approach significantly affects the increase of special performance capability, effectiveness of development of special physical qualities, increase in “shortcomings” in the technical and tactical actions of the soccer players, which ultimately make an influence onto the quality and effectiveness of game competitive activities and increase in the number of injuries.

Thus, at present there is an urgent need in presenting training loads and recovery means as two sides of a single complex process [9]. The integration of the training effects and recovery means into a single system is crucial for the management of the functional preparation, physical performance and recovery processes in the training process. The optimum combination of tiredness and recovery processes is the physiological basis for permanent and long-term organism adaptation to physical and athletic loads, and the practical usage of various recovery means in the system of the indoor soccer players' preparation is an important reserve for further enhancement of the training efficiency, achievement of the high preparation level, and decrease in the number of injuries in indoor soccer

Conclusions. The results of this study allow us to make a conclusion that the frequency of injuries in professional indoor soccer is quite high, so, at present, development and implementation of the prevention program to prevent their occurrence are rather urgent tasks. Such a program should be complex, take into account the main risk factors, and provide continuous monitoring of the athlete's functional state on the basis of modern diagnostic technologies.

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ТРАВМАТИЗМ В МИНИ-ФУТБОЛЕ: ПРОБЛЕМЫ И ПЕРСПЕКТИВЫ ИХ РЕШЕНИЯ

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Аннотация. На современном этапе развития мирового мини-футбола наблюдается значительный рост тренировочных и соревновательных нагрузок, что приводит к увеличению спортивных травм, а общепринятые методы лечения при этом не всегда дают желаемый результат. Поэтому целью работы было определение и систематизация основных факторов риска получения спортивных травм, а также их локализации для разработки профилактических программ. На основании анализа и обобщения научно-методической литературы установлено, что склонность игроков к травматизму определяется взаимодействием внешних и внутренних факторов, а проведение тренировочного и соревновательного процесса требует разработки нового метода контроля, основанного на возможности постоянного диагностирования функционального состояния спортсменов при помощи трех видов мониторинга: базового, этапного и поточного, при этом отсутствие программы профилактики является одним из основных факторов риска получения спортивных травм.

Ключевые слова: мини-футбол, спортивный травматизм, локализация, опорно-двигательный аппарат, профилактика.

INDOOR SOCCER INJURIES: PROBLEMS AND PROSPECTS FOR THEIR SOLVING

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Abstract. At the present stage of the world indoor soccer development there is a considerable increase in the training and competition loads that leads to an increase in the number of sports injuries and their conventional treatment methods do not always produce desirable results. Thus, the objective of the work included determination and classification of the main risk factors for sports injuries occurrence and their localization for developing prevention programs. Based on the analysis and generalization of the scientific and methodological literature, it was found out that the vulnerability of players to injuries is determined by the interaction both internal and external factors, and conduction of training and competition processes in indoor soccer requires development and intro-

duction of a complex program for injury prevention that includes a new control method which is based on the possibility of continuous diagnostics of the athletes' functional state with the help of the following three types of monitoring: basic, stage and current ones. Furthermore, absence of the prevention program is one of the main risk factors for sports injuries occurrence.

Keywords: indoor soccer, sports injuries, localization, locomotor system, prevention.

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