Relation between medical clinical monitoring and the incidence of sports injuries in young athletes of São Paulo

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ABSTRACT

The objective of this study was to evaluate the relation between medical clinical monitoring and the incidence of the main sports injuries found in young athletes in sports modalities such basketball, indoor soccer and volleyball from 20 clubs located in São Paulo (Brazil). To obtain those data, a questionnaire was applied to 323 athletes and surveys were performed among eight physicians. The results of the study showed a total of 343 injuries or 1,7 injury/athlete/year. In basketball, there was not statistic relation between rates of injury and clinical monitoring in the club. In indoor soccer and volleyball, the rate of injury was bigger with clinical monitoring, because the injuries of less gravity do not are detected in clubs without physician. This study suggest specialized clinical care for young in sports clubs.

Keywords: Sports medicine. Clubs. Adolescents.

INTRODUCTION

Sports practice in childhood and adolescence is stimulated within the State of São Paulo. Initiation as well as training in different sports is promoted by private clubs and municipal sports boards. In collective indoor modalities, such as basketball, futsal and volleyball, specific training begins at around 10 years of age, and it intensifies from 12-13 years of age when some clubs participate in lower categories competitions, which are organized by the respective federations from São Paulo. The child who starts in the sport at around 10 years of age, and remains competing for several years in the lower categories, is exposed to an extended training time (in years) and consequently sports injuries are inevitable.

In the literature, studies on the main sports injuries in youngsters of different sports indicated certain types of predominant injuries. Powell and Barber-Foss[1] observed a higher occurrence of sprains and muscular injuries. For Taylor and Attia[2], the most common injuries are sprains and strains (32%), fractures (29.4%) and contusions (19.3%). In Brazil, Carazzato *et al.*[3], in a study on young athletes injuries, confirmed that the most common kinds of injuries are ankle sprains, lumbalgia and knee sprains. In basketball, Gutgesell[4] has identified in youngsters the prevalence of contusions (35.9%), sprains (28.2%) and apophysary injuries (12.3%). In volleyball, Carazzato *et al.*[5] have identified the predominance of knee (26.74%), ankle (19.52%), back (13.44%), hand (13.3%) and shoulder injuries (7.9%). Ribeiro *et al.*[6] have verified in a study with youngsters in futsal, that the most committed segment was the ankle (45.2%), followed by the knee (19%); sprains (21.4%) and fractures/strains (26.2%) were the most common injuries.

The incidence of certain sports injuries in young individuals may vary as consequence of a set of factors, such as the kind of sport practiced, the time of sports practice, and the level of competition of the athlete (state, national and international). The occurrence of typical sports injuries is common in all sports training program. The combination of different factors such as the sports organization, the technical training, the competition system and the lack of suitable medical structure may favor health risks of the involved youngsters[7].

Questioning whether there is a suitable and efficient medical structure for the athletes from lower categories, as well as if the training programs for children and adolescents organized by clubs have available supervisors and specialized physicians, as happens in the high level competition system have appeared. In the last years, the number of young individuals who practice different sports in entities has been increasing, once the high performance sport for adult athletes is becoming financially impossible for the clubs.

This issue is a reality in other countries. Gutgesell[4] has observed low organization in the sports medicine field in basketball sports programs for adolescents. Pfeifer *et al.*[8] verified that in the majority of less severe injuries in adolescents, such as ankle and finger sprains, the athletes did not look for medical assistance. Solgard *et al.*[9] have evidenced the need for a larger number of prophylactic measures in sports medicine in training situations.

Due to the lack of Brazilian investigations on sports injuries with young athletes as well as the need of sport professionals to obtain further information not only on adolescents' health and needs, but also on suitable medical orientation on sports matters, the need for this research on a possible relationship between the medical assistance structure and the number of sports injuries is justified.

The aim of this study was to verify the medical assistance structure in different clubs from São Paulo and to relate the presence or absence of a specialized physician in the training site with the number of sports injuries occurred in a competition season of young basketball, futsal and volleyball athletes.

METHODS

The sample consisted of 323 male athletes between 16 and 19 years (± 17.5 years of age) from youth categories of basketball, futsal and volleyball, semifinalists (28 teams) from the State Championship from São Paulo, 2002 organized by the federations. The athletes have been selected out of 20 sport clubs, and only eight out of them have local specialized medical assistance. Therefore, eight physicians were interviewed.

In the sport clubs which have a medical assistance system for the training and sports competition medical situations, a structured interview was applied (intensive direct observation[10]). The questions script had the purpose to verify medical assistance structure aspects concerning pre-participation examinations, periodic clinical evaluation, diagnosis examinations and rehabilitation (questions script attached).

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The number of sports injuries occurred in a training and competition season for each modality was identified by a closed questionnaire, an extensive direct observation prospective method[10] about sports injuries, adapted by Carazzato *et al.*[11], and applied in all athletes. The athletes were told to report only the injuries occurred in that year and which had received medical assistance (diagnosis).

Frequency and percentage descriptive analysis (%) of the number of injuries, and comparative analysis with the Qui-square test with respective significance level (p = probability) were applied with the obtained data.

All athletes and physicians have signed the consent form established by the Ethics Committee from the Medicine School of São Paulo. They have all been informed about the research's aims.

RESULTS

Number of sports injuries

Out of 323 athletes, 197 athletes presented some kind of injury and 126 did not present sports injuries in the season. 343 sports injuries occurred in 197 athletes have been identified, that is, 1.7 injury/athlete/year. In table 1, the number of athletes with and without sports injury in basketball, futsal and volleyball is presented.

TABLE 1
Number of athletes with and without sports injuries in 2002

Injury in 2002	Basketball	%	Futsal	%	Volleyball	%	Total
With injury	79	59	57	53	*61	75	197
Without injury	55	41	50	47	*21	25	126
Total	134	100	107	100	82	100	323

* p = 0,004

For table 1 data, the Qui-square test was used with the purpose to verify a statistically significant association between the total of sports injuries and the kind of sport. When basketball and futsal were compared with volleyball, it was observed that volleyball proportionally presented a higher number of injuries in the year of 2002 (p = 0.004).

In table 2, the situation in which the sports injuries occurred is presented (training and competition) in basketball, futsal and volleyball.

TABLE 2
Situation in which the sports injuries occurred

Situation in which the injury occurred	Basketball	%	Futsal	%	Volleyball	%	Total
Training	97	66	55	58	90	90	242
Competition	50	34	41	38	10	10	101
Total	147	100	96	100	100	100	343

* p < 0.001

Through the use of the qui-square test, a statistically significant association was found between the situation in which the injury occurred and the kind of sport when training was compared with competition (p < 0.001). The distribution of the situation in which the injury occurred is different in the three sports.

Medical structure monitoring

The medical structure offered was evaluated through an interview with the physician in charge of the department for the young athletes. From the 28 evaluated teams, which respectively belong to 20 clubs or sports entities, only eight places have a physician responsible for the diagnosis and treatment of the sports injuries of the athletes.

The interviewed physicians who work inside the club at least once a week are specialists in sports medicine. They work in shifts, which vary from one to three weekly shifts in the clubs. Would any medical emergency occur outside the working day, these athletes can be seen in the physicians' private office or in a hospital with coverage for emergencies. The medical departments in those places share the space with the physiotherapy department.

Concerning the pre-participation medical-clinical examinations, it was verified that seven physicians performed initial orthopedic evaluations. The evaluations are performed from one to two times a year or whenever a new athlete joins the club. In the clubs, the physical aptitude evaluation, such as strength and endurance, is performed only by the physical educators. None of the physicians performs biological maturation evaluation.

In all the eight clubs (physicians) interviewed, when complementary examinations for diagnosis, such as laboratory, radiological, ultra-sounds and resonance exams are needed, different partnerships occur. These complementary examinations are reimbursed to the clinics or hospitals with a partnership with the club.

The treatments applied are followed by the physicians when they are on duty. The physiotherapy departments from all participant clubs, according to the interviewed physicians' opinion, are suitably equipped and have skilled physiotherapy professional follow-up.

From the 20 sports entities evaluated, four clubs which do not offer specialized medical assistance for sports injuries inside the institution have been identified. However, they pay for a health insurance or even offer insurance with any specialized clinic for medical assistance of their athletes.

Eight clubs which do not offer any specialized medical structure in the place have been identified. They do not even offer health insurance to their athletes. In that case, when the athletes need medical assistance, they look for public hospitals or have private health insurance of their own. There are not physicians specialized in sports medicine in those places. From that total of clubs (8), only four have an internal medicine physician for emergencies with a physiotherapy department for rehabilitation.

In the study, the number of athletes who presented sports injury occurred in the season in the three modalities according to the presence or absence of the specialized physician inside the club can be related. The number of athletes who presented or not sports injury with the presence or absence of the physician is presented in tables 3 and 4.

The statistical association of this relationship between the presence of the physician and the occurrence of injury is presented in basketball (table 5), futsal (table 6) and volleyball (table 7).

TABLE 3
Number of athletes who presented sports injuries in the presence of the physician inside the club

# of athletes with and without injuries	With	Without	Total
Basketball	13	7	20
Futsal	42	25	67
Volleyball	46	15	51
Total	101	47	148

TABLE 4
Number of athletes who presented sports injuries in the absence of the physician inside the club

# of athletes with and without injury	With	Without	Total
Basketball	65	49	114
Futsal	14	26	40
Volleyball	11	10	21
Total	90	85	175

TABLE 5
Statistical association between the occurrence and absence of sports injury (yes and no – injury) with and without the presence of the physician (yes and no – physician) in 2002 in basketball

Physician	Injury		
	Yes	No	Total
Yes	13	7	20
No	65	49	114
Total	78	56	134

* p = 0.504

In table 5, when the Qui-square test was used, association between the presence or absence of injuries with the presence or absence of the physician was not found, that is, the number of injuries was not affected by the presence of the physician inside the club in basketball (p = 0.504).

TABLE 6
Statistical analysis between the occurrence and not of sports injury (yes and no – injury) with and without the presence of the physician (yes and no – physician) in 2002 in indoor soccer

Physician	Injury		
	Yes	No	Total
Yes	42	25	67
No	14	26	40
Total	56	51	107

* p = 0.006

In table 6, when the Qui-square test was used we found an association between the presence or absence of injuries with the presence or absence of the physician, that is, the number of injuries was higher with the presence of the physician inside the club in futsal (p = 0.006).

TABLE 7
Statistical analysis between the occurrence and not of sports injury (yes and no – injury) with and without the presence of the physician (yes and no – physician) in 2002 in volleyball

Physician	Injury		
	Yes	No	Total
Yes	46	15	61
No	11	10	21
Total	57	25	82

* p = 0.048

In table 7, when the Qui-square test was used, an association between the presence or absence of injuries with the presence or absence of the physician was found, that is, the number of injuries was higher with the presence of the physician inside the club in volleyball (p = 0.048).

DISCUSSION

The occurrence of sports injuries is common in any training program, and their incidence may be associated with different risk factors. There are the risk factors which are congenital intrinsic, many times uncontrollable, and those which are resultant from extrinsic factors derived from environmental aspects, such as training situations and medical structure assistance.

A factor related to the organization in sports for the young should be considered, the medical department assistance which is offered by the sports entities. It was not possible to find in the national literature any study which reported the follow-up medical structure of young athletes in Brazilian clubs. Therefore, this research was original as well as relevant since it has selected young athletes from 28 semi-finalist teams from the State Championship of São Paulo, 2002 (basketball, futsal and volleyball) and investigated the sports medicine structure from the 20 entities (clubs and counties) which promote training programs for these teams. In this study, we hoped to contact the physician(s) from each entity (20); however, it was only possible to interview eight physicians who take shifts in sports medicine or even orthopedics and traumatology at the site.

Through suitable statistical tests, the existence of association or lack of it between the presence or absence of the physician in the club (two variables) with its occurrence being sports-related on not (two variables). In this analysis, it was observed that out of the three sports involved, basketball did not present association (p = 0.504) between among these four variables observed (table 5) showing that despite the high number of injuries presented, it was not affected by the presence of the physician inside the club. For futsal (table 6) and volleyball (table 7), it was observed that there is an association (p = 0.006 and p = 0.048 respectively) among the four variables observed, showing that the number of injuries was higher with the presence of the physician inside the club. This statistical outcome becomes interesting, as the inverse situation would be the most coherent, that is, with the constant presence of the physician in the club, there should be a lower number of injuries due to prevention measurements and medical follow-up.

When the athletes filled out the questionnaire on sports injuries, they received information to report only the injuries which had been evaluated by a physician. The athletes, whose clubs did not have local medical assistance have mentioned that they rarely saw a specialized physician, except when together with the physiotherapist from the club, their injury was considered serious. The teams which did not have medical assistance inside the club presented a lower number of injuries. Such fact occurred once the less severe injuries have not been identified, once from the 20 clubs, only eight had a sports medicine specialist.

The injuries occurrence have been identified through reports from the athletes themselves, through a questionnaire on sports injuries, while the most precise situation for data collection would be the observation of the young athlete's history at an organized and efficient medical department, unfortunately still not viable for many sports entities in São Paulo. This fact has generated the first limitation of this study; the data collection technique had to be modified to a questionnaire with multiple choice closed questions[11]. In the literature, some investigations on the incidence of sports injuries have used this same technique[12-15]. In Brazil, there are few studies on sports injuries in basketball, futsal and volleyball[5,16-18]. In the national literature, there is a need for investigations on injuries in children and adolescents who participate in regular sports training[3,6].

Another limitation occurred when the physicians were interviewed. From the eight interviewed physicians, only four keep track of the records resulting from the clinical evaluations of the athletes, making the answer to some of the interview script questions impossible and hence the qualitative analysis of some questioned variables difficult. Sports training programs when applied to young individuals in development, with not much control on the load and with few prevention measures for injuries, may lead in the long run, the youngster to typical sports injuries, which initially may be mild, but when they are recurrent in the same body region, may lead to severe injuries which compromise the athletic future of these individuals.

The risks decrease of young athletes to suffer musculo-skeletal injuries begins with medical supervision which should include: a) pre-participation medical examinations with general and musculo-

skeletal evaluations including a history of the sports injuries occurred as well as the medical and physiotherapeutic treatments used; b) suitable assistance of medical specialists and support teams due to the risks imposed on the immature structures of the joint cartilage, apophyses and growth plaque, postural deviations and congenital defects[15,19-21].

Carazzato *et al.*[3] and Bischoff and Perrin[22] highlighted the importance of initial medical evaluation of the young athlete to determine the ideal age to begin a specific and regular sports training as well. A complete musculo-skeletal evaluation of an athlete previously injured and a complete prevention and rehabilitation planning may be the most effective way to diagnose and control sports injuries in young athletes[23-24]. In the United States, there are some active systems of surveillance of sports injuries. The most mentioned ones are the *National Safety Council, the Annual Survey Football Injury Research, the National Electronic Injury Surveillance System (NEISS), the NCAA Injury Surveillance System, the National Center for Catastrophic Sports Injury Research and the National High School Sports Injuries Registry*[25].

CONCLUSIONS AND SUGGESTIONS

From the 28 basketball, futsal and volleyball semifinalist teams of the São Paulo State Championship in 2002, participants of sports training programs in 20 sports entities, only eight clubs have been identified as having suitable medical structure, with physicians who give assistance (shifts) in sports medicine or even orthopedics and traumatology at the site.

An ideal system with epidemiological approach which studies the relationship between several factors which influence the frequency and distribution of injuries which occur in sports should be adopted, especially with young athletes. It is necessary that both the intrinsic and the extrinsic risk factors natural from young individuals are studied from the data obtained from the athletes' individual data. Such fact shows the need to introduce a pre-participation examination specific to young athletes inside Brazilian clubs and sports centers, involving the main aspects: anamnesis, physical examination, evaluation of the biological maturation and orthopedic evaluation.

Concerning the statistical relationship between the presence of the association or not between the presence or absence of the physician in the club with the occurrence of sports injury it was verified that from the three sports involved, basketball did not present association ($p = 0.504$), that is, the number of injuries was not affected by the presence or not of the physician since the majority of the injuries evaluated has been conducted outside the training site. In futsal and volleyball, statistical association has been observed ($p = 0.006$ and $p = 0.048$ respectively), that is, the number of injuries was higher with the presence of the physician in the club, since the majority of the injuries has been evaluated at the training site. In the sports entities which did not have a physician, the less serious injuries have not been evaluated, leading to a lower number of injuries.

This medical strategy, which includes pre-participation in sports examinations for all athletes of lower categories, within the sports institution itself, could act coordinated with the training technical segment, aiding as well as informing all involved individuals on the relevant preventive measures, many times simple and of low cost, which can be adopted at the training daily routine, besides the preparation of traditional exercises applied in order to increase performance.

Therefore, this study suggests that concomitantly with this ideal system of epidemiological approach of sports injuries in young athletes, there should be professionals who act in the sports field (physical educators coaches, physiotherapists, psychologists, nutritionists or physicians) in their field, considering the multidisciplinary aspects involved in a sports longevity. Taking care of this young athlete's 'today' is not enough. He should be followed in detail within the sports clubs. A sports talent is not simply born, it is developed. In order to really see a so much expected Brazilian sports renovation happening in different sports modalities, it is necessary that different entities which promote the sports development in Brazil reflect about the real conditions of the offered training conditions and whether they really fulfill the main purpose of the sport: health and well-being promotion of the individuals involved.

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APPENDIX
Interview with the physicians (interview script)

Identification

1. What are the physician's name, medical specialty and working load at the place?
2. Is there a sports medicine doctor or orthopedic for assistance in the Club? If so, is he/she present at training and/or game situations?

Assistance procedures of the medical department (for sports injuries)

1. Which are the main emergency procedures concerning sports injuries?
2. Which are the instruments and/or medical resources available for assistance?

Medical examinations for risk factors prevention

1. Which are the existing pre-participation medical examinations?
2. What is the frequency of the medical examinations of the general status evaluation of the athletes?
3. Are there evaluation examinations for the maturational level for young athletes (what kind)?
4. Are there evaluation examinations for physical aptitude for young athletes? Are they performed by a physician or a teacher?

Infra-structure for diagnosis

1. Which medical examinations are possible to be made at the club premises?
2. Which examinations are offered outside the assistance site in order to complement the diagnosis?
3. Which are the existing health insurance for medical assistance (if necessary) and complementary examinations?

Ways of treatment used for the sports injuries

1. Which are the main used treatments for the injuries recovery?
2. Is there a specific place for physiotherapy within the sports entity?
3. What is the structure (equipments and professionals) of the physiotherapy department?
4. Is there any insurance for complementary treatments? If so, what kind?