# 28 - CHARACTERISTICS OF TRAINING AND INJURIES INCIDENCE IN SPORTIVE SHOOTERS

GUSTAVO RICARDO SCHÜTZ; ALESSANDRO HAUPENTHAL; GABRIEL FERNANDES JACOMEL; CAROLINE RUSCHEL
Aquatic Biomechanics Research Laboratory, Center of Health and Sport Sciences,
Santa Catarina State University - Florianópolis, Santa Catarina, Brazil
gugaschutz@terra.com.br

## INTRODUCTION

In Brazil, shooting has appeared as a sport in the middle of 19th century due to European immigration, mainly German and Italian, who came to live in South region. As a consequence of life habits and of abundance of animals in the region, several Hunting and Fishing clubs were created. Shooting is an Olympic sport since the first edition of modern Olympic Games, in Athens, 1896. The main events are: *shotgun*, which is based on quick reaction to clay targets thrown by a machine in different angles and speeds, using long guns; and *rifle and handgun shooting*, which consists of rapid-fire or long-time target shooting from different distances, using short and long guns.

Shooting is characterized by technical and tactical issues that are performed in order to reach a perfect result, the target. It requires, among other things, good body stability, eye-hand co-ordination and anticipation (NIINIMAA; MACAVOY, 1983; AALTO et al., 1990; MASON; COWAN; GONCZOL, 1990; ERA et al., 1996; VIITASALO et al., 1999). Good stability between body and gun is the focus of most studies related to this modality, affirming this stability is an important issue regarding shooting performance (MASON; COWAN; GONCZOL, 1990; ZATSIORSKY; AKTOV, 1990; KONTTINEN et al., 1998; VIITASALO et al., 1999). Authors affirm that small postural modifications could cause significant changes in final results (ERA et al, 1996; BALL et Al, 2003).

Evaluations of biomechanical, motor learning and mental parameters, among others, are usually carried out with shooters in order to increase performance (AALTO et al., 1990; MASON; COWAN; GONCZOL, 1990; ZATSIORSKY; AKTOV, 1990; KONTTINEN et al., 1998; VIITASALO et al., 1999; DI RUSSO et al., 2005).

However this reality of involvement with modality is different in Brazil, which could be attributed to the lack of evidence of Brazilian shooters in the world setting. Peculiarities of the modality regarding factors as training, time and conditions of practice and injuries incidence, identified through descriptive studies, could be helpful to professionals involved with shooting when acting to develop the sport and planning specific programs for injuries prevention.

Thus this study aimed to identify characteristics related to time and conditions of practice, training and injuries incidence in sportive shooters of 2003 Santa Catarina Open Games.

## METHOD

The study was characterized as descriptive and the sample was composed by 72 shooters (68 male and 4 female), who participated of 2003 Santa Catarina Open Games. Subjects' average age was 38±13 years.

The instrument used was a mixing questionnaire elaborated by the National Center of Sports Excellency, in a partnership with the Government Sports Department in Brazil, for the Project "Champion Profile", which aimed to identify the profile of Brazilian athletes of several modalities in order to improve the public politics of sports in country. The questionnaire is composed by 32 questions regarding some aspects of athletes' sporting life, such as personal data, training and performance information, injuries and others.

This study considered questions related to time and conditions of practice; to financial assistance; to training characteristics (number of daily sessions, average duration of each session, number of sessions per week, complementary training, tests to evaluate physical conditioning and orientation); and to injuries incidence (body region, diagnosis and treatment).

In order to stimulate the sample participants, the questionnaire had a brief explanation about the investigated topics and the importance of the research, including the guarantee of the answers' secrecy.

Data collection was carried out generally before the beginning of each competition, through a previous contact with coaches and athletes. The questionnaire was answered at the moment of the application and the researchers cleared out doubts about the questions. The answers formed a data base. Data were analyzed through the descriptive statistics (mean, standard deviation, simple frequency and percentage).

## RESULTS

The average age athletes started to practice the modality was 24 years-old and they have been practicing it for 13±11 years. Table 1 shows the results related to subjects' opinion regarding the conditions of practice. The evaluated items were personal sporting stuff, auxiliary and needed equipments for training and place of training.

**Table 1: Evaluation of practice conditions.**

| | Personal sporting stuff | | Equipments | | Place of training | |
|---|---|---|---|---|---|---|
| | f | Total % | f | Total % | f | Total % |
| Excellen | 24 | 33,3 | 17 | 23,6 | 20 | 27,8 |
| Very good | 19 | 26,4 | 17 | 23,6 | 13 | 18,1 |
| Good | 19 | 26,4 | 22 | 30,6 | 25 | 34,7 |
| Regular | 6 | 8,3 | 5 | 6,9 | 9 | 12,5 |
| Bad | 0 | 0,0 | 1 | 1,4 | 0 | 0,0 |
| Missing answers | 4 | 5,6 | 10 | 13,9 | 5 | 6,9 |
| **Total** | **72** | **100,0** | **72** | **100,0** | **72** | **100,0** |

**(f = simple frequency; Total % = Percentage related to the total of subjects).**

It was observed that 48 subjects (66,7%) receive any kind of financial assistance to practice the modality. Most of them (68,8%) receive assistance to buy their personal equipment. Other kinds of assistance reported were transportation assistance, food assistance and salary (monthly).

Regarding training characteristics, 30 subjects (83,3% of valid answers) carry out one daily session of training and 6 subjects (16,7% of valid answers) carry out two training sessions per day; 20 subjects (55,5%) carry out the sessions in the evening, 10 (27,8%) in the afternoon and 6 (16,7%) in the morning. The average duration of each session is 2,0 hours.

At most of the time, sessions of specific training are oriented by a coach (86,6% of valid answers). Table 2 presents data related to the number of sessions of specific training (shooting sessions) per week.

**Table 2: Number of sessions of specific training per week.**

| Number of sessions per week | | f | Total % | Valid % |
|---|---|---|---|---|
| Valid | 3 days | 62 | 86,1 | 92,5 |
| | 4 days | 2 | 2,8 | 3,0 |
| | 5 days | 1 | 1,4 | 1,5 |
| | 6 days | 1 | 1,4 | 1,5 |
| | 7 days | 1 | 1,4 | 1,5 |
| | Total | 67 | 93,1 | 100,0 |
| Did not answer | | 5 | 6,9 | |
| **Total** | | **72** | **100,0** | |

**(f = simple frequency; Total % = Percentage related to the total of subjects; % Valid = Percentage related to the total of answers).**

Only 11 subjects (15,3%) carry out sessions of complementary training (lift-weighting), oriented at most of the time (54,4%) by the gym instructor. The average duration of each session is 1,2 hours. Table 3 shows the number of sessions of lift-weighting per week.

**Table 3: Number of complementary training sessions (lift-weighting) per week.**

| Number of sessions per week | f | Total % |
|---|---|---|
| 1 day | 3 | 27,3 |
| 2 days | 4 | 36,4 |
| 3 days | 1 | 9,1 |
| 4 days | 1 | 9,1 |
| 5 days | 2 | 18,2 |
| **Total** | **11** | **100,0** |

**(f = simple frequency; Total % = Percentage related to the total of subjects).**

19 subjects (26,4%) carry out regular tests for the evaluation of physical conditioning in the laboratory (52,2%), in field (21,1%) or in both conditions (26,3%).

Regarding injuries incidence, 5 subjects (6,9%) reported they have already suffered some injury related to the modality. The affected body regions were the elbow (2 occurrences) and the shoulder (3 occurrences). Diagnoses were luxation (1 case), subluxation (1 case), impact syndrome (1 case) and tendonitis (2 cases). The athletes had to carry out physiotherapy sessions and in one of the cases it was necessary to immobilize the segment. Most of the injured athletes (4 of them) had to interrupt training sessions during the treatment. When asked about current injuries (at the moment of the competition), 3 subjects (4,2%) reported cases of tendonitis (2 subjects) and of impact syndrome (1 subject). Affected body regions were the knee, the elbow and the shoulder. Cited kinds of treatment were physiotherapy (1 case) and medicine (2 cases).

## DISCUSSION

Most of athletes evaluated the conditions of practice (personal sporting stuff, equipment and place of training) as excellent, very good or good. Beyond, most of them receive some kind of financial assistance, maybe because shooting is considered a popular sport in the south region of Brazil, especially in Santa Catarina, where data collection was carried out.

Even receiving some kind of financial assistance, athletes don not dedicate full-time to shooting practice, because most of them carry out 3 weekly sessions of specific training. And also, a small number of subjects carry out sessions of complementary training (lift-weighting).

Few shooters use to carry out evaluations of the physical conditioning. And still, the tests they carry out evaluate physical conditioning in a general way through running tasks in treadmills or field tracks. Specific tests for shooters have been used and their benefits to training have been investigated (AALTO et Al, 1990; MASON; COWAN; GONCZOL, 1990; ZATSIORSKY; AKTOV, 1990; KONTTINEN et Al, 1998; VIITASALO et Al, 1999; DI RUSSO et Al, 2005). Thus it is important to mention subjects should look for specific tests when evaluating physical capacities related to shooting.

According to Pera and Brinner (1996) to verify and evaluate the frequency of injuries is the first step to reduce their incidence in athletes. Thus epidemiological studies regarding injuries related to a specific sport provide information that could facilitate the diagnosis, treatment and rehabilitation, promoting prevention programs and decreasing the number of injuries recurrences.

Regarding the frequency of injuries verified in this study, the cases of luxation and subluxation are probably consequence of a bad gun positioning for shooting or it could be due to the use of non-appropriated equipment, which did not provide enough cushioning and discharged the shot energy over the shooter. One suggests special attention should be given to the positioning of the upper limb during shooting practice through a specific program of exercises for muscles necessary to this positioning. In the same way it occurs with keyboarders, tennis players or swimmers, the maintenance or repetition of specific gestures may generate excessive load in the regions responsible for task performance, as shoulder and elbow in this case. Therefore an injury caused by repetitive effort (as the tendonitis) could occur. In order to prevent the occurrence of this and of other kinds of injuries shooters should carry out a program of training that include specific exercises for the muscles that stabilize the shoulder, stretching and flexibility exercises, proprioceptive activities and also exercises for postural correction.

## CONCLUSION

The conditions of personal sporting stuff, equipment and place of training in Santa Catarina are considered adequate to the development of shooting by most of the athletes. Shooting, as a traditional sport in the south region of the country, is assisted by some institutions, public or private, but it does not guarantee to the shooters the required stability for a full-time dedication to training. When compared to other athletes, shooters carry out few weekly sessions of specific and/or complementary training and few athletes carry out evaluations of physical conditioning.

Because shooters use firearms to practice the modality, sportive shooting is sometimes considered dangerous by lots of people. However it was verified few injuries related to this sport and there was no case of injury due to the lack of safeness when

using the guns.

The knowledge about peculiarities of each sportive modality is a helpful tool when planning political actions to improve sports development.

**REFERENCES**

AALTO, H.; PYYKKÖ, I.; ILMARINEN, R.; KÄHKÖNEN, E.; STARCK, J. Postural stability in shooters. **Journal for Otorhinolaryngology and its Related Specialties***,* v. 52, p. 232-238, 1990.

BALL, K. A.; BEST, J. R.; WRIGLEY, T. V. J. Body sway, aim point fluctuation and performance in rifle shooters. **Journal of Sports Sciences**, v. 21, p. 559-566, 2003.

DI RUSSO, F.; PITZALIS, S.; APRILE, T.; SPINELLI, D. Effect of practice on brain activity: an investigation in top-level rifle shooters. **Medicine and Science in Sports and Exercise,** v. 37, n. 9, p. 1586-1593, 2005.

ERA, P.; KONTTINEN, N.; MEHTO, P.; SAARELA, P.; LYYTINEN, H. Postural stability and skilled performance: a study on top-level and naive rifle shooters. **Journal of Biomechanics,** v. 29, n. 3, p. 301-306, 1996.

KONTTINEN, N.; LYYTINEN, H.; VIITASALO, J. Rifle-balancing in precision shooting: behavioral aspects and psychophysiological implication. **Scandinavian Journal of Medicine and Science in Sports,** v. 8, n, 2, p. 78-83, 1998.

MASON, B.R.; COWAN, L.F.; GONCZOL, T. Factors affecting accuracy in pistol shooting. **Excel**, v. 6, n. 4, p. 2-6, 1990.

NIINIMAA, V.; MCAVOY, T. Influence of exercise on body sway in the standing augmented feedback presented in a rifle shooting position. **Canadian Journal of Sport Sciences,** v. 8, p. 30-33, 1983.

PERA, C. E. BRINNER, W. W. Jr. Volleyball Injuries during the 1995 U.S. Olympic Festival. **Medicine Science in Sports and Exercise**, v. 28, n. 5, p. 214-217, 1996.

VIITASALO, J.T.; ERA, P.; MONONEN, H.; MONONEN, K.; NORVAPALO, K.; RINTAKOSKI, E. Posture steadiness of running target shooters of different skill levels. **Kinesiology,** v. 31, n. 1, p. 18-28, 1999.

ZATSIORSKY, V.M.; AKTOV, A. Biomechanics of highly precise movements: the aiming process in air rifle shooting. **Journal of Biomechanics,** v. 23, Suppl. 1, p. 35-41, 1990.

Rua Pascoal Simone, 358 - Florianópolis, SC, CEP 88080-350
Fone: (48) 3321-8647
E-mail: gugaschutz@terra.com.br

**CHARACTERISTICS OF TRAINING AND INJURIES INCIDENCE IN SPORTIVE SHOOTERS**

**ABSTRACT**

It aimed to identify time of practice and characteristics related to training and injuries incidence in sportive shooters. 72 athletes of “Santa Catarina Open Games” participated of this study. A mixing questionnaire elaborated by the National Center of Sports Excellency for the national project “Champion's Profile” was used as instrument. Data were analyzed through descriptive statistics. The average age athletes started to practice was 24 years and practice time was about 13±11 years. Regarding training characteristics most of athletes carry out 3 sessions per week and average duration of each session is 2 hours. Only 11 subjects (15,3%) carry out complementary training sessions (lift weighting) and apparently they are not specific-oriented to modality. 19 subjects (26,4%) are used to carry out regular tests in order to evaluate physical condition. Most of athletes (54,2%) are oriented by coaches during training sessions and 66,7% of them receive any kind of financial assistance (equipment/material assistance was the most related one, with 68,8% of occurrence). Subjects evaluated the quality of personal equipment, accessory equipments and place of training as “good”, “very good” and “excellent”. Five subjects (6,9%) presented injury related to the modality in the past. The injured body regions were elbow and shoulder; reported diagnoses were luxation, subluxation, impact syndrome and tendonitis. 3 subjects (4,2%) reported they were injured at the competition and the affected body regions were the knee, elbow and shoulder; reported diagnoses were tendonitis and impact syndrome.

KEY-WORDS: sport shooting, training, injuries.

**CARACTÉRISTIQUES DE ENTRAINEMENT ET INCIDÉNCE DES LÉSIONS DANS DES PRATICIENS DE TIR DE COMPÉTITION**

**RESUMÉ**

Cette étude a objectivé identifier le temps de pratique et les caractéristiques rapportées à la formation et à l'incidénce des lésion dans des athlètes de tir de compétition. Ont participé de cette étude 72 athlètes participants des 'Jeux Ouverts de Santa Catarina”. Les données ont été analysées à travers de la statistique descriptive. En moyenne les athlètes ont initié la pratique de la modalité avec 24 ans et le temps moyen de pratique a été de 13±11 années. Concernant la formation, la majorité des athlètes réalise 3 sessions par semaine, avec durée moyenne de 2 heures.Seulement 11 sujets (15.3%) réalisent entraînement complémentaire (musculation), apparemment sans orientation spécifique à la modalité. 19 sujets (26.4%) réalisent régulièrement de test pour l'évaluation de la condition physique. La majorité des athlètes est guidée dans les formations par un coach (54.2%) et reçoit quelque forme de assistence financier (66.7%) pour son développement dans la modalité, dans cet condiontion, (68.8%) reçoivent du matériel sportif. Sur la qualité du matériel esportif personnel, des équipements et du lieu d'entraînement ont été classée comme "bonne", "très bonne" et "excellente". Cinq sujets (6,9%) ont lésion rapportée à la modalité, étant attaqués le coude et l'épaule, diagnostiqués comme de cas de luxation, sub-luxation, syndrome d'impact et tendinitis. 3 sujets (4,2%) ont lésion au moment de la compétition, vérifiés deux cas de tendinitis et un cas de syndrome d'impact, localisés dans le genou, le coude et l'épaule.

MOTS CLES: tir de compétition, entraînement, lésion.

**CARACTERÍSTICAS DEL ENTRENAMIENTO Y DE LA INCIDENCIA DE LESIONES EN TIRADORES DEPORTIVOS**

**RESUMEN**

Este trabajo apuntó identificar la época de la práctica, las características relacionadas con el entrenamiento y con la incidencia de lesiones en tiradores deportivos. 72 tiradores de los juegos abiertos de Santa Catarina habían participado de este estudio. Un cuestionario elaboró por el Centro Nacional de la Excelencia Deportiva para el proyecto nacional “perfil del campeón” fue utilizado como instrumento. Los datos habían sido analizados con la estadística descriptiva. En promedio, los atletas habían iniciado el práctico de la modalidad con 24 años y la época media de práctica era de 13±11 años. Con respecto al

entrenamiento, los atletas realizan más 3 sesiones semanales y la duración media es 2 horas cada una. 11 participantes (15.3%) habían dicho solamente llevar con el entrenamiento complementario (entrenamiento con pesas), aparentemente sin la orientación específica dirigida a la modalidad. 19 participantes (26.4%) habían dicho llevar pruebas regulares para la evaluación de la condición física. La mayoría de los atletas (54.2%) un técnico dirigen el entrenamiento y reciben una cierta forma de ayudas financiero (66.7%) para su desarrollo en la modalidad, con el predominio para él asiste al material (68.8%). La calidad del material personal deportivo, equipamientos accesorios y el lugar del entrenamiento fueron clasificados como "buenos", "muy buenos" y "excelente". 5 participantes (6.9%) habían lesión anterior relacionada con la modalidad, siendo acometidos el codo y el hombro, casos fueran relatados como luxación, subluxación, síndrome de impacto y tendinite. 3 participantes (4.2%) habían dicho poseer lesiones en el momento de la competición, verificado dos casos de tendinite y un caso del síndrome de impacto, situado en la rodilla, el codo y el hombro.

PALABRAS-CLAVE: tiro deportivo, entrenamiento, lesiones.

**CARACTERÍSICAS DO TREINAMENTO E INCIDÊNCIA DE LESÕES EM ATLETAS DE TIRO ESPORTIVO**

**RESUMO**

Objetivou-se identificar o tempo de prática e as características relacionadas ao treinamento e à incidência de lesões em atletas de tiro esportivo. Participaram deste estudo 72 atletas participantes dos Jogos Abertos de Santa Catarina. Utilizou-se como instrumento um questionário misto elaborado pelo Centro Nacional de Excelência Esportiva para o Projeto Nacional "Perfil do Campeão". Os dados foram analisados através da estatística descritiva. Em média os atletas iniciaram a prática da modalidade com 24 anos e o tempo médio de prática foi de 13±11 anos. Em relação ao treinamento, a grande maioria dos atletas realiza 3 sessões semanais, com duração média de 2 horas. Somente 11 sujeitos (15,3%) relataram realizar treinamento complementar (musculação como meio utilizado), aparentemente sem orientação específica voltada à modalidade. 19 sujeitos (26,4%) relataram realizar regularmente testes para a avaliação da condição física. A maioria dos atletas é orientada nos treinamentos por um técnico (54,2%) e recebe alguma forma de auxilio financeiro (66,7%) para seu desenvolvimento na modalidade, com predominância para o auxilio material (68,8%). A qualidade do material esportivo pessoal, dos equipamentos auxiliares e do local de treinamento foi classificada como "boa", "muito boa" e "excelente". Cinco sujeitos (6,9%) relataram lesão pregressa relacionada à modalidade, sendo acometidos o cotovelo e o ombro, sendo diagnosticados casos de luxação, subluxação, síndrome de impacto e tendinite. 3 sujeitos (4,2%) relataram possuir lesão no momento da competição, verificados dois casos de tendinite e um caso de síndrome de impacto, localizados no joelho, cotovelo e ombro.

PALAVRAS-CHAVE: tiro esportivo, treinamento, lesões.