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**Risk Management for the Martial Arts**

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*Presented to:*

Dr. John C. Nash

*Submitted by:*

Rob Peaker  
ID. 1611385

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## **Background**

The origins of the oriental martial arts are shrouded in mystery, with each different martial art school claiming lineage and ancestry over the others. Therefore, a clear picture of the starting point for the various different schools and styles is unrealistic. However, given the disagreement and debate, the following is the most widely accepted view of the origins of the oriental martial arts:

Ta-Mo (Sanskrit – Bodhidharma), an Indian Dhyana (Chinese – Ch’an, Japanese – Zen) master, arrived at the famous Shao-Lin Buddhist temple in Ho-Nan, a northern province of China, in 527 A.D. After lecturing there for a number of years, Ta-Mo found many of the monks weak, unhealthy, and prone to fall asleep during sermons and meditation. Accordingly, Ta-Mo developed several systems of exercise including “the changing of tendons”, “marrow washing” and “Eighteen Hands of Buddha” to encourage the monks to be more physically active, and thus more attentive during their religious observances. Over time, the monks refined and expanded upon these exercises, developing unique a martial arts system commonly referred to as Shao-Lin Chuan (or Shao-Lin Boxing).

The monks often traveled to other parts of China and Japan, spreading the martial arts initially developed in northern China throughout the Asian region. Like seeds scattered in the wind, the initial Shao-Lin Chuan style grew and developed in different regions to give us the many different styles of modern martial arts including Karate, Tae Kwon Do, Kung Fu, Aikido and Jiu-Jitsu.

Today, the oriental martial arts are practiced in many nations and have become extremely popular in western countries. With the popularity of action cinema stars such as Bruce Lee, Chuck Norris, Jackie Chan and Jean-Claude Van Damme, the martial arts are now more popular than ever before, with many martial arts schools, organizations and societies taking part in martial arts training, demonstration and competition.

## **Stakeholders**

### *Student Practitioners*

Students comprise the largest group of stakeholders and are also the most affected by the various hazards and benefits of practicing the martial arts. The student's primary hazards are physical injuries resulting from the combative nature of the martial arts. These injuries range from minor aches and inconveniences to serious physical trauma resulting in substantial lifestyle changes.

A typical martial arts club contains from 20-50 students. The Ottawa yellow pages contains 60 different martial arts clubs listings with an estimated additional 20 clubs located in community centres, colleges and universities. Thus, the total estimated number of martial arts students in the Ottawa area:

$$80 \text{ clubs} * (35 \text{ students/club average}) = 2,800 \text{ students.}$$

The average age of male participants is about 21 years and about 19 years for females. 83% of participants are males and 17% female, with the gap widening in competitions. (Estwanik 1996)

### *Master Practitioners and Teachers*

The second largest group of stakeholders are the master practitioners and teachers.

Typically, the master practitioner is the main teacher and owner of the martial arts club.

This individual will receive payment from the students for instructional services rendered. The reputation of the instructor directly impacts the success of the martial arts club and is closely related to the personal testimony of the students in the club.

Liability is a prime concern of the master. If a student is injured during a class, the teacher may be liable for the injury sustained to the student, especially if the instructor is found to be negligent. Negligence has been defined as '*breach of one's duty of care that causes harm to another individual*' (Anderson and Hall 1997). For an individual to be liable the injured must prove:

- There was a legal duty of care
- There was a breach of that duty
- There was harm caused by that breach
- The harm was a direct cause of the breach of duty

(Source: Anderson and Hall 1997)

Clearly, minimizing the risk of injury to students is important for the master practitioner/teacher.

### *Martial Arts Tournament Officials*

The interests of the tournament officials and organizers are similar to those of the master practitioners and teachers. The tournament organizers charge a substantial entry fee to the competitors. The number of participants entering the competition is directly related to the reputation of the tournament, which is a reflection on the ability of the tournament

officials to provide a competitive yet safe environment for competition. Tournament officials are also concerned with the liability from potential injury that may occur during the event.

### *Martial Arts Organizations*

The largest and most popular martial arts (eg. Karate and Tae Kwon Do) have central organizations (eg. World Tae Kwon Do Federation) for the promotion and integration of the martial art across national boundaries. These organizations often recommend safety standards for teaching and training of their individual martial arts.

### *Sports Medicine Professionals*

Sports medicine professionals specialize in the treatment of sports related injuries. Clearly, martial arts related injuries represent a business opportunity for these individuals. However, the research done by these individuals and associations benefits the injured martial arts practitioner by shortening the recovery time and reducing the severity of permanent disability due to serious injury.

### *Insurance Companies*

To limit the liability of martial arts club owners and tournament organizers, insurance companies offer liability insurance. The revenues from the insurance premiums are offset by the payouts due to insurance claims. A reduction in injuries is in the financial interest of the insurance company, due to the reduction in payout claims.

### *Sports Equipment Manufacturers*

Manufacturers of sporting equipment benefit from the martial arts in two ways: sale of martial arts training equipment and sale of protective and injury preventing equipment. The larger the numbers of martial arts practitioners, the larger the potential market for the sporting equipment manufacturers.

### **Hazards of Martial Arts**

The primary hazard involved with practicing a form of martial art is threat of physical injury. *Appendix A: Martial Arts Injury Statistics* presents the results from a comprehensive study performed by Birrer and Birrer (1981). Several important points need to be made with respect to the data from this study:

1. The results are a compendium of all the injuries from 26 different martial arts styles participating in the study. The study does not provide a comparison of injuries from the different styles.
2. The results are statistically significant. ie. They are a very good predictor of typical injuries observed in an average martial arts club or tournament.

The study provides the following information on the nature of physical injuries sustained while practicing martial arts:

1. The most severe injuries occur to the head and the mildest to the groin (Table 4).
2. The most commonly injured areas are the hands, feet and legs. The least commonly injured area is the neck (Tables 2 and 3).

3. Fractures are the most severe type of injury, bruises are the least severe (Table 4).
4. Serious injuries are rare, accounting for less than 0.2% of all injuries (Table 5).
5. Tournaments account for 59% of all injuries, reflecting the amount of sparring and physical contact (Table 1).
6. Sparring accounts for the majority of injuries (Table 6).
7. During a typical martial arts year, a practitioner is likely to be injured 2.5 times.  
This falls to ~1 time if the practitioner does not participate in any tournaments.

The severity and rate of injury is directly proportional to the level of contact for the activity and the level of experience of the participants (Estwanik 1996). Inexperienced or immature participants have a higher risk of trauma (Estwanik 1996). 70% of the injured recuperate quickly without training interruption, however 30% suffer significant measurable disability (Estwanik 1996). Males experience more injuries of higher severity than females (Estwanik 1996).

In comparison with other sports, martial arts have an injury rate 1/20<sup>th</sup> that of football and are statistically safer than golf or general exercise (Estwanik 1996).

### **Benefits of Martial Arts**

The benefits to the student from the study and practice of the martial arts are varied, depending on the focus and intent of the student and teacher. One of the most basic is the benefit of regular physical exercise. Practice of the martial arts can result in an increased level of general health due to the following physical training attributes: increased level of

cardio-pulmonary activity, increased level of flexibility and a general increase in physical strength.

A second direct benefit from the martial arts is an increased level of self-defense capability in the student. Typically, this is accompanied by an increased level of 'situational awareness' and self-awareness. Most martial arts schools will stress the teaching of incident avoidance and the use of force as a technique of last resort. The martial aspects of the training will help the student to minimize potential for bodily injury when threatened by an attacker. However, it should be noted that the martial arts student is not invincible, and should employ the technique of incident avoidance if at all possible.

The secondary benefits from the martial arts include mental and spiritual training aspects. The developing martial artist may experience an increased ability to concentrate and focus their energies on a given problem or situation. Over time, this benefit can extend into a practitioner's working life. Advanced students may also explore spiritual training and the associated life style benefits. For example, practitioners of the internal martial art, Tai Chi Chuan, often claim that the daily practice of their martial art can increase their longevity and quality of life (Jou 1991).

## **Risk Assessment**

To assess the risk of martial arts for the student practitioner, an assessment of the author's martial arts participation is given:

Martial Arts years to date: 5.5  
Estimated Martial Arts years in lifetime: 25

Non-tournament injury rate: 9948 injuries/9800 martial arts years  
= 1.015 injuries/martial arts year  
(the author does not participate in martial arts tournaments)

**Expected total injuries:**

*to date:*  
5.5 years \* 1.015 injuries/ year  
= 5.58 injuries

*lifetime:*  
25 years \* 1.015 injuries  
= 25.38 injuries

**Expected serious injuries:**

*to date:*  
5.58 injuries \* (fracture + dislocation %)  
= 5.58 \* 13.8%  
= 0.77 injuries

*lifetime:*  
25.38 \* (fracture + dislocation %)  
= 25.38 \* 13.8%  
= 3.5 injuries

**Expected work threatening injuries:**

(based on ability to type at computer keyboard)

*to date:*  
0.77 injuries \* (hand/wrist %)  
= 0.77 \* 40.7%  
= 0.31 injuries

*lifetime:*  
3.5 injuries \* (hand/wrist %)  
= 3.5 \* 40.7%  
= 1.42 injuries

**Expected life threatening injuries:**

*to date:*  
5.58 injuries \* 0.2%  
= 0.011 injuries

*lifetime:*  
25.38 injuries \* 0.2%  
= 0.05 injuries

The rates of expected injuries to date can be calibrated with the author's personal experience. The total injury rate of 5.58 injuries exceeds the author's recollection of personal injuries sustained. The author estimates that he has sustained a total of 3 injuries during the 5.5 martial arts year period. This may be attributed to the fact that the author is no longer an inexperienced martial artist. During the last 2 years of training, the author has not sustained any injuries while performing martial arts training. In addition, the

author participates in full contact sparring extremely rarely, thus avoid the largest cause of martial arts related injury.

To date the author has sustained 1 serious injury: a hyperextension of the right elbow. This roughly corresponds to the expected value of 0.77 injuries. It is interesting to note that this injury was sustained during the first 2 martial arts years of experience, while training with a similarly inexperienced student. This experience tends to calibrate the finding that most injuries occur with inexperienced or immature athletes. In fact, the average statistics may be heavily weighted by injury rates among inexperienced or immature athletes. It is estimated that 80% of all martial arts participants are junior level practitioners. As the student progresses and gains more experience, the numbers of students at a similar level decreases rapidly, with less dedicated practitioners abandoning the activity. Thus, the injury rate for intermediate or advanced practitioners is expected to be substantially lower.

During his experience of martial arts training, the author has never witnessed a life threatening injury. While this does not calibrate the expected 0.011 life threatening injuries, it does reflect the extremely low rate of life threatening injury.

Of particular interest to the author is the expected number of lifetime work threatening injuries: 1.42. A work threatening injury for the author is defined as a fracture or dislocation of the hand/wrist/fingers, which would affect his ability to operate a computer keyboard. There are two important factors to consider when assessing the relevance of

this number: the author's participation in sparring activity and the author's level of experience. As noted earlier, the author rarely participates in full contact sparring activity, thus the author's rate of injury should be 26% (Appendix A, Table 6) of the expected rate. I.e.:  $1.42 * 26\% = 0.37$  injuries. In addition, over the 25 martial arts years, the author is expected to achieve a high level of experience and proficiency in the martial arts. As previously hypothesized, the injury rate for experienced practitioners is expected to be substantially lower than the average rate. Thus the author's expected rate of work threatening injury is quite low.

### **Risk Management**

Based on the identified hazards and risk assessment, the following risk management strategies are recommended:

#### *Student*

##### **1. Avoid informal high contact sparring activity**

The majority of injuries (74%) are sustained while participating in the sparring activity. The rate of injury is directly related to the level of contact. By avoiding informal high contact sparring activity, the student will eliminate the majority of injury situations. The student must carefully evaluate the training benefit of sparring with the potential for injury.

##### **2. Use protective gear when sparring**

The use of proper protective gear can substantially reduce the level of injury sustained during the sparring activity.

### **3. Avoid participation in martial arts tournaments**

59% of all martial arts injuries occur during martial arts tournaments. Compared with the overall benefits of martial arts training, the martial arts tournament provides only minimal additional benefit (ie. skill validation and comparison).

### **4. Be especially careful during first 2 martial arts years**

A large proportion of injuries occur with inexperienced or immature martial artists. The prudent martial artist should use the first 2 years to learn the basics and develop a general proficiency in the art, before attempting higher risk activities. In addition, the martial artist should avoid high-risk activities with inexperienced training partners.

### **5. Train with an established instructor who is trained in medical first aid**

Properly applied medical first aid can help to reduce the impact and severity of injury. Seek an established instructor with medical first aid training and experience to minimize the chance and severity of injury.

#### *Instructor*

#### **1. Become qualified in medical first aid**

As noted above, properly applied medical first aid can reduce the impact and severity of injury.

## **2. Insist on the usage of protective gear while sparring**

As above, the usage of proper protective gear can reduce the level of injury sustained.

## **3. Limit inexperienced student's sparring activity**

The majority of injury occurs during sparring activity and with inexperienced or immature students. Traditional martial arts teachers often did not allow sparring activity or advanced training until the student had demonstrated proficiency with the basic techniques. Traditionally, this was so that the student would develop proper technique and not learn 'short cuts'. However, this strategy can also help substantially reduce student injury rates.

## **Open Questions**

The risk assessment and hazard identification provide a clear picture of the injury and risk profile for an average martial arts student performing average martial arts activities. However, as has been previously noted, students progress through a series of proficiency stages within their martial arts career. In addition, the prospective student has a wide variety of martial arts schools and styles to choose from. This leads to the following unanswered questions:

1. How does a student's injury and risk profile change as the student matures and becomes more proficient in the martial arts?

2. How do the various martial arts styles compare to one another? Are some martial arts riskier than others? Can this knowledge be used to help new students choose an appropriate martial art to suit their needs? Can this knowledge be used by the instructors to mitigate injury-causing behaviour specific to their particular martial art style?

### **References and Further Readings**

Anderson, Marcia K. and Hall, Susan J. (1997) *Fundamentals of Sports Injury Management*: Baltimore MA, Williams & Wilkins.

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(Source of front cover image)

## Appendix A: Martial Arts Injury Statistics

Source: (Birrer and Birrer, 1981)

*Table 1: Summary of Data*

Total Injuries:	24112
Tournament Injuries:	14164 (59%)
Non-Tournament Injuries:	9948 (41%)
Total Martial Arts Years*:	9800
Total Number of Athletes:	6347

\* Martial Arts Years = Total sum of the years practiced for all athletes.

**Note:** Sparring is associated with the majority of injuries per activity. As the amount of contact increases, the amount and severity of injuries (particularly of the head) increases.

*Table 2: Non-Tournament Injuries – Number (Percentage)*

<i>Location</i>	<i>Type</i>	<i>Cut</i>	<i>Bruise</i>	<i>Sprain Strain</i>	<i>Fracture</i>	<i>Dislocation</i>	<i>Total</i>
<b>Head</b>		178 (13.8)	321 (7.1)		28 (3.2)		<b>528 (5.6)</b>
<b>Neck</b>		31 (2.4)	97 (2.1)	99 (3.6)	9 (1.0)	2 (0.4)	<b>238 (2.4)</b>
<b>Shoulder</b>		56 (4.3)	258 (5.7)	176 (6.4)	54 (6.2)	104 (20.3)	<b>648 (6.5)</b>
<b>Elbow</b>		79 (6.1)	311 (6.9)	48 (1.7)	17 (2.0)	37 (7.2)	<b>492 (4.9)</b>
<b>Arm/Forearm</b>		155 (11.9)	429 (9.5)	155 (5.6)	41 (3.8)	7 (1.4)	<b>787 (7.9)</b>
<b>Wrist</b>		44 (3.4)	295 (6.5)	212 (7.7)	61 (7.1)	7 (1.4)	<b>619 (6.2)</b>
<b>Hand/Fingers</b>		121 (9.3)	333 (7.4)	143 (5.2)	211 (24.4)	281 (54.9)	<b>1089 (10.9)</b>
<b>Trunk</b>		87 (6.7)	395 (8.7)	334 (12.2)	104 (12.0)	4 (0.8)	<b>924 (9.3)</b>
<b>Groin</b>		13 (1.0)	139 (3.1)	286 (10.4)	12 (1.4)		<b>450 (4.5)</b>
<b>Hip</b>		62 (4.8)	347 (7.7)	213 (7.8)	11 (1.4)	2 (0.4)	<b>635 (6.4)</b>
<b>Knee</b>		78 (6.0)	22 (4.9)	292 (10.6)	13 (1.4)	6 (1.2)	<b>611 (6.1)</b>
<b>Thigh/Leg</b>		167 (12.8)	486 (10.7)	354 (12.9)	36 (4.2)	4 (0.8)	<b>1047 (10.5)</b>
<b>Ankle</b>		81 (6.2)	467 (10.3)	313 (11.4)	71 (8.2)	7 (1.4)	<b>939 (9.4)</b>
<b>Foot/Toes</b>		147 (11.3)	425 (9.4)	121 (4.4)	197 (22.8)	51 (10.0)	<b>941 (9.5)</b>
<b>Total</b>		<b>1300 (13.1)</b>	<b>4525 (45.5)</b>	<b>2746 (27.6)</b>	<b>865 (8.7)</b>	<b>512 (5.1)</b>	<b>9948 (100.0)</b>

Table 3: Tournament Injuries: Number (Percentage)

<i>Location</i>	<i>Type</i>	<i>Cut</i>	<i>Bruise</i>	<i>Sprain Strain</i>	<i>Fracture</i>	<i>Dislocation</i>	<i>Total</i>
<b>Head</b>		331 (16.8)	409 (6.5)		59 (4.6)		<b>799 (5.6)</b>
<b>Neck</b>		59 (2.9)	151 (2.4)	169 (4.3)	13 (1.0)	2 (0.3)	<b>238 (2.8)</b>
<b>Shoulder</b>		97 (4.8)	498 (8.0)	243 (6.1)	87 (6.8)	97 (15.2)	<b>1022 (7.2)</b>
<b>Elbow</b>		122 (6.1)	501 (8.0)	75 (1.9)	29 (2.3)	22 (3.4)	<b>749 (5.3)</b>
<b>Arm/Forearm</b>		302 (15.0)	607 (9.7)	219 (5.5)	49 (3.8)	12 (1.9)	<b>1189 (8.4)</b>
<b>Wrist</b>		60 (3.0)	398 (6.4)	287 (7.2)	73 (5.7)	9 (1.4)	<b>827 (5.8)</b>
<b>Hand/Fingers</b>		197 (9.8)	418 (6.7)	201 (5.1)	325 (25.4)	387 (60.6)	<b>1528 (10.8)</b>
<b>Trunk</b>		131 (6.5)	455 (7.3)	499 (12.6)	125 (9.8)	8 (1.3)	<b>1218 (8.6)</b>
<b>Groin</b>		45 (2.2)	196 (3.1)	401 (10.1)	14 (1.1)		<b>656 (4.6)</b>
<b>Hip</b>		111 (5.5)	521 (8.3)	293 (7.4)	16 (1.2)	2 (0.3)	<b>943 (6.7)</b>
<b>Knee</b>		105 (5.2)	306 (4.9)	413 (10.4)	19 (1.5)	10 (1.6)	<b>853 (6.0)</b>
<b>Thigh/Leg</b>		181 (9.0)	659 (10.5)	544 (13.7)	51 (4.0)	10 (1.6)	<b>1445 (10.2)</b>
<b>Ankle</b>		107 (5.3)	543 (8.7)	417 (10.5)	101 (7.9)	6 (0.9)	<b>1174 (8.3)</b>
<b>Foot/Toes</b>		161 (8.0)	597 (9.5)	214 (5.4)	321 (25.0)	74 (11.6)	<b>1367 (9.7)</b>
<b>Total</b>		<b>2009 (14.2)</b>	<b>6259 (44.2)</b>	<b>3975 (28.1)</b>	<b>1282 (9.1)</b>	<b>639 (4.5)</b>	<b>14164 (100.0)</b>

Table 4: Degrees of Injury by Body Area represented by weighted averages

<i>Location</i>	<i>Type</i>	<i>Cut</i>	<i>Bruise</i>	<i>Sprain Strain</i>	<i>Fracture</i>	<i>Dislocation</i>	<i>Total</i>
<b>Head</b>		3.4	2.9		4.2		<b>3.5</b>
<b>Neck</b>		2.3	2.5	2.3	4.4	4.4	<b>3.2</b>
<b>Shoulder</b>		2.1	3.1	2.4	4.1	4.1	<b>3.2</b>
<b>Elbow</b>		2.6	2.7	2.1	4.0	4.0	<b>3.1</b>
<b>Arm/Forearm</b>		3.2	2.7	2.2	4.0	3.9	<b>3.2</b>
<b>Wrist</b>		2.2	2.0	2.6	4.0	4.0	<b>3.0</b>
<b>Hand/Fingers</b>		3.1	2.4	2.4	3.9	3.3	<b>3.0</b>
<b>Trunk</b>		2.2	2.7	2.2	4.1	4.0	<b>3.0</b>
<b>Groin</b>		2.1	2.0	2.5	4.1		<b>2.7</b>
<b>Hip</b>		2.0	2.2	2.2	4.2	4.1	<b>2.9</b>
<b>Knee</b>		2.4	2.9	2.9	4.0	3.8	<b>3.2</b>
<b>Thigh/Leg</b>		2.9	2.8	2.7	4.2	4.2	<b>3.4</b>
<b>Ankle</b>		2.8	2.9	2.9	4.1	4.0	<b>3.3</b>
<b>Foot/Toes</b>		2.9	2.3	2.2	3.5	3.1	<b>2.8</b>
<b>Total</b>		<b>2.64</b>	<b>2.61</b>	<b>2.62</b>	<b>4.1</b>	<b>3.9</b>	<b>2.66</b>

Mild Injury = 1, Moderate Injury = 3, Severe Injury = 5

*Table 5: Serious Rare Injuries*

Pneumothorax	4
Lung Contusion	2
Contusion of Liver/Spleen	1
Bladder Rupture	3
Diaphragm Rupture	1
Cerebral Hematoma	2
Cerebral Contusion	2
Spontaneous Abortion	1
Testicular Torsion	3
Renal Contusion	8
Renal Laceration	1
Circo-thyroid Fracture	1
Cardiac Contusion	1
Pericardial Hematoma	1
Lens dislocation/Hyphema	5
Globe Contusion	7
Retinal Detachment	<u>1</u>
Total	47

*Table 6: Injuries by Activity*  
(Source: Estwanik 1996)

<i>Activity</i>	<i>Percent</i>
<b>Sparring/Fighting</b>	74
<b>Forms</b>	5
<b>Weapons</b>	2
<b>Basics</b>	14
<b>Miscellaneous</b>	<u>5</u>
<b>Total</b>	100