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Cooper, Kathy

From: IRRC
Subject: FW: COMMENTS ON PROPOSED MMA REGULATION CHANGE

From: FCP [mailto:mick@fightclubpittsburgh.com]
Sent: Wednesday, March 06, 2013 11:59 AM
To: Schalles, Scott R.
Subject: COMMENTS ON PROPOSED MMA REGULATION CHANGE

RECEIVED
IRRC
2013 MAR - 7 AM 9:30

Fight Club Pittsburgh MMA, Inc.
4573 Campbells Run Road
Pittsburgh, PA 15205

The Independent Regulatory Review Commission
333 Market Street, 14th Floor
Harrisburg, PA 17101

March 6, 2013

Dear IRRC Commissioners:

My name is Michael Morrow from Fight Club Pittsburgh MMA. I have read many of the comments that have been sent to you and I am in agreement with most of them. I find myself in total agreement with Evolve MMA gym owner Mr. John Cook. We also have seventeen professional fighters and over twenty amateur fighters. Although we find ourselves in opposing corners on occasion, Mr. Cook's comments about this proposed rules change are 100% accurate. The fact that he is actually a business owner from Ohio and he sees the damage the current rules in Pennsylvania have done to the development of Mixed Martial Arts in Pennsylvania as well as what a disadvantage they are to our current fighters should speak volumes.

I must say that I most respectfully disagree with the letter written by Mr. Thomas H. DeWall, CAE, the Executive Director of the Pennsylvania Psychological Association. I noticed that Mr. DeWall wrote the letter on a letterhead from the American Psychological Association. Since his opinion expresses what he feels are the dangers of these proposed rules changes, I feel it is fair to question his medical qualifications to do so. Mr. DeWall has a CAE certification beside his name. I am not sure what CAE stands for, but my best guess is that is **Certified Association Executive**. CAE is a professional certification sponsored by the American Society of Association Executives (ASAE) and the Canadian Society of Association Executives (CSAE). Association management professionals must meet certain educational and experience requirements and pass an examination before the designation is awarded.

I am sure that a CAE designation is an honorable salutation, but he is not a medical Doctor.

In reviewing the Pennsylvania Psychological Association website, the site states the following as the group's goals and objectives:

"The purpose of PPA is to advance psychology in Pennsylvania as a means of promoting human welfare. We carry out this charge through activities that advocate vigorously for public access to psychological services that educate and support the professional development of our members, that educate the public through disseminating and applying psychological knowledge, and that maintain and build organizational strength."

I am sure the Pennsylvania Psychological Association is a fantastic organization that does great work for its members. However, by writing his comment letter on the organization's letterhead Mr. DeWall would give the impression that he is speaking for his organization with his comments. That may in fact be the case, but if so, I might point out that the organization's goals would not seem to have any involvement with medical studies or particularly medical studies on the sport of MMA.

Mr. DeWall quotes, "According to a recent article published in the journal of Neuropathology and Experimental Neurology", the symptoms of Chronic Traumatic Encephalopathy are insidious, meaning that the initial symptoms may be subtle and hard to identify as related to brain injury. Eventually the symptoms become more severe and include disorientation, confusion, mood changes, depression (including suicidal thoughts) and increased the risks of early dementia."

He also quotes, "Data suggests that CTE is more prevalent than once believed and it is no longer confined to boxers. A recent survey of retired NFL players showed a 19-fold increase in memory-related disorders, such as Alzheimer's, in the 35 to 49 age group and a 5-fold increase in ages 50 or older, when compared to National Standards."

I saw no specific studies in Mr. DeWall's letter; only the above reference to it. Furthermore, he relates the studies to football and boxing. Mixed Martial Arts is not football or boxing. It is a completely different sport with its own dynamic and completely different set of rules.

Mr. DeWall stated that your decision needs to be informed by the recent medical literature on the subject but quotes (nor includes) no specific studies on the sport of MMA.

I completely respect Mr. DeWall's concern for the safety of our young MMA athletes but Mr. DeWalls complete lack of knowledge on the sport of MMA or how the ground and pound rule even works in MMA would not allow Mr. DeWall to offer an educated opinion as to the safety aspects of this proposed rules change.

As many of the comments have said, I also believe that the end result of the rules change will create more safety for our young MMA athletes.

In response to Mr. DeWall's call for more literature on the subject, I have compiled a list of articles that also includes a study specifically about Injuries in Mixed Martial Arts Competitions. The study was done by John Hopkins University School of Medicine and is entitled, "Incidence of Injury in Professional Mixed Martial Arts Competitions." It was done 2006 by one of our nation's leading medical research facilities specifically to evaluate the dangers of MMA that included ground and pound as it is proposed in this new rules change. The study was the most comprehensive ever done on the subject and was completed in 2006. Since 2006, the

sport of MMA has become even safer due to improvements in training, as well as the increases in safety and efficiency over time from all of the State Athletic Commissions, referees, judges, and ringside Doctors in addition to the widespread adoption of the Unified Rules of Mixed Martial Arts that include ground and pound.

The term ground and pound is somewhat dangerous sounding to those uneducated on the rules of MMA, but as the following collection of articles and the John Hopkins Study will indicate, MMA with ground and pound is more safe than boxing or football and our local athletes should be able to fight locally under the new rules for all of the reasons these many people have stated.

Thank you for your consideration.

Most Respectfully,

Michael Morrow
Fight Club Pittsburgh MMA, Inc.

It Only Looks Dangerous - Op Ed from NY Times on MMA

Mixed martial arts is one of the fastest-growing sports in America. Yet for years the New York State Legislature has refused to sanction M.M.A. — making New York one of the last states holding out against the sport's expansion. (Connecticut is a holdout, too.) After helping to block a clause in last year's budget that would have legalized M.M.A., Bob Reilly, a state assemblyman, called it "a violent sport not worthy of our society."

As the editor in chief of Men's Health, I'd been a de facto supporter of New York's ban by refusing to put a mixed-martial artist on the magazine's cover — despite the entreaties of several editors and even my own brother, Eric, who trained in M.M.A. I edit a health magazine, after all, and this is a sport in which men use nearly every means available to beat one another into submission, from jujitsu to kickboxing to simply slugging one another in the face with nothing but lightly padded gloves on their hands

But I've come to believe that, in fact, the New York Legislature is wrong. Mr. Reilly is wrong. And more to the point, I was wrong (an admission my brother will hold over my head as long as I live). Mixed martial arts may be a violent sport, but it is much safer than other, supposedly more civilized competitions, and New York and its fellow holdouts should finally sanction it.

We think of more traditional violent sports like boxing and football as safer in part because of the helmets and padded gloves their athletes wear, and that supposedly protect them from harm. These are, in fact, more like the equivalent of poorly designed sunscreen — "protection" that allows athletes to submit to even greater levels of punishment.

For instance, studies show that up to 40 percent of former boxers have symptoms of chronic brain injury, the result of repeated, if padded, blows to the head. And recent studies have demonstrated that most professional boxers, including the majority who show no outward signs of impairment, have some degree of brain damage.

In comparison, a 2006 Johns Hopkins study noted "a reduced risk of traumatic brain injury in M.M.A. competitions when compared to other events involving striking." The reason is simple: Boxing's "protective" padding, coupled with its 12-round bouts and rest periods, means the boxer is subject to dozens of brain-jostling head blows in each fight. In M.M.A., most bouts end in a wrestling match, with one opponent forcing the other into submission; only 28 percent of all M.M.A. bouts are decided by a blow to the head, according to a study published in *The British Journal of Sports Medicine*.

As a result, M.M.A. fighters have not only a lower risk of cognitive impairment, but of death. There have been only three fatalities in the 17-year history of American M.M.A. But we average almost that many in a single year in boxing: 129 fighters have died in American rings since 1960.

Some might argue that such statistics only make the case that boxing, too, should be banned. But what about hockey or football? Men's Health has proudly and without controversy featured Drew Brees, Tom Brady and other N.F.L. stars on our cover — despite the fact that football and hockey combined sent 55,000 Americans to the emergency room for head injuries in 2009 alone.

Hall of Famers like Harry Carson, a former linebacker for the Giants, and Pat LaFontaine, who played center for the Islanders and the Rangers, have talked publicly, even courageously, about the physical and emotional toll of their multiple concussions. And watching 41-year-old Brett Favre dragging his swollen body onto the field week after week last season was an exercise in spectator-sport sadism. Compare that to the Ultimate Fighting Championship, the premier M.M.A. league, where 23-year-old Jon Jones recently won the light heavyweight championship but injured his hand in the process; as a result, he is barred from competition until doctors say he has healed. In fact, fighters who suffer knockouts are suspended and barred even from sparring for three months; in the N.F.L. and N.H.L., we cheer when a player leaves the game on a stretcher and returns the next week — and even louder if he comes back the next period.

The New York State Assembly and Senate both have bills in committee that would allow M.M.A. into the state, and it only makes sense to push them through. In the meantime, I've changed my policy: This month Men's Health features the U.F.C.'s reigning welterweight titleholder, Georges St-Pierre,

on its cover. Sometimes the more raw and visceral a sport appears, the more humane it may actually be.

Mixed Martial Arts – How safe is MMA?

Posted on [April 18, 2011](#) by [Impact MMA](#)

Abbott's vicious right hands slammed on the head of the fallen Matua. Immediately the unconscious Matua's body contorted in frightening convulsions. This was in UFC 6, in modern MMA's early days. MMA has come a very very long way...

So is MMA a "safe sport"?

No doubt, MMA is a combat sport. It certainly has risks. The question is, how does MMA compare with other combat sports like boxing, Muay Thai etc.

Visually, MMA does look very dangerous. In particular, the "Ground & Pound" aspect of the game looks uniquely violent. The science however, suggests otherwise.

MMA is probably one of the safest full contact sports out there today. MMA is much safer than even boxing in terms of the risk of serious injury.

MMA trainer Rudy Lindsey, himself a father explains:

"A lot of people are worried about the kids safety. Mixed martial arts are safer than football or baseball. There is less severe injuries in mixed martial arts fighting than most contact sports."^[1]

MMA champions last pretty long, many of the best have held belts well into their 30's and even 40's. (Randy Couture, Chuck Lidell, Anderson Silva, Matt Sera, Sean Sherk, Fedor, Dan Henderson, Takanori Gomi, Antônio Rodrigo Nogueira, Lyoto Machida, Matt Hughes etc...)

I think the following factors explain MMA's surprisingly good safety record:

1. MMA allows for tapping-out or submitting, and this is a very common method of ending matches.

The submission, using locks and chokes, is central to MMA. In a submission, a losing fighter can concede by “tapping out” to stop the match before he gets hurt. In boxing, a fighter must inevitably get hurt before the match can be stopped early.

“There is zero shame in tapping out. In American culture it’s, ‘I quit,’ but in Japan and Brazilian jujitsu, it’s not quitting. You were bested and will live to fight another day.”

(creativeloafing.com [article](#), 21 February 2007[3])

And from Dana White:

“And the difference with the tap out is that if I get you into a submission and you’re in a bad place – you can tap out with honour. It’s acceptable in this sport. In the Roberto Duran v Sugar Ray Leonard boxing fight, when Duran said ‘no mas’- he was ridiculed for the rest of his career...”

(Guardian Unlimited, 25 April 2007)

2. MMA referees will stop matches, the moment one party is unable to put up a reasonable defence or once one party is so dominant that the other is at risk of injury.

In a boxing or kickboxing match, if a fighter takes a hit and gets knocked down and is unable to defend himself, the fighter gets 8-10 seconds to recover and try to resume fighting.

In MMA, once a fighter is unable to defend himself, the match is stopped immediately. No further hits will be sustained.

Barry Jordan, a neurologist and ringside physician, said, *“If a boxer is sustaining enough punishment to have to count to eight to assess his condition, then he’s probably suffered enough punishment to stop the fight.”*[2]

3. Strikes in MMA are directed at all parts of the body. In boxing, strikes are largely directed at the head.

“At first, MMA looks more dangerous than boxing. Kicks, chokes, elbows, knees, those little gloves? When a fighter knocks his opponent down, he doesn’t go to a neutral corner, he attacks. But ...With boxing, the goal in mind is to punch your opponent in the head as much as possible,”... “The accumulation of those blows is devastating. With MMA, you can win in a plethora of ways, and fighters don’t take a fraction of the blows to the head. You might go through a whole MMA fight without getting hit one time.”-Ross Kellin, gym owner

(creativeloafing.com [article](#), 21 February 2007)

“In the UFC you and I can fight, and I can beat you and win, and never punch you in the head once. We can go right to the ground, start grappling, and pull off a submission. It’s not 25, 30 minutes of blows to the head non-stop. The misconception is, God look at these guys can kick, knee, punch, elbow, slam to the ground, this has to be more violent and dangerous. It’s not true.”

(Dana White, Guardian Unlimited, 25 April 2007)

The medical report “A neurologist’s reflections on boxing” by Unterharnscheidt F identified the number of blows received as one of 3 factors affecting the extent of brain damage suffered by boxers.

Boxers take up to 500 hits to the head per 12 bout fight (42 per round). By comparison, an MMA fighter was estimated to take less than 20 hits to the head per round. That is 22 less head strikes per round (almost a 50% reduction)!

And from a 2005 [Time Magazine](#) article:

“It’s probably safer than boxing in terms of the chances of injury,” says David Holland of Virginia’s Professional Boxing and Wrestling Program, reflecting the UFC’s argument that the sport’s blows are more evenly distributed, whereas boxing focuses on debilitating punches to the head.”

Fatalities?

In a 12 March 2007 [article](#) by Scrippsnews.com, it was pointed out that since 1997, at least 12 boxers have died in the U.S. from boxing related injuries and opined that boxing was deadlier than MMA, it adds:

“...Reno, Nev. brain surgeon Dr. Joe Walker says that while injuries of all kinds from mixed martial arts fights are about three times that of boxing, knockout rates are half. Based on his knowledge of the physiology of brain injury, Walker guesses the relative safety might arise from mixed martial arts being about more than simply hitting an opponent’s melon over and over.”They’re able to hit other things, there are fewer rounds, and it’s not all about hitting...”

Boxing has a relatively low fatality rate, estimated at 76 deaths per million. Since 1998 there have been over 70 boxing related deaths worldwide. In sanctioned MMA events, there have only been **2!**

Safer than American Football?

Herschel Walker, who won a Heisman Trophy (a prestigious trophy for the most outstanding collegiate player) and ran for more than 13,000 yards in 15 years in professional football said in a USA Today [article](#):

“People shy away from it because they think it’s a brutal, brutal sport, and I’ve said, ‘Guys, MMA is safer than football and boxing,... And people tell me they don’t believe it. Am I not the most credible person to give you the answer to that?’“

David Zinczenko, editor in chief of Men’s Health and editorial director of Women’s Health explained in a [NY Times opinion piece](#):

“... In fact, fighters who suffer knockouts are suspended and barred even from sparring for three months; in the N.F.L. and N.H.L., we cheer when a player leaves the game on a stretcher and returns the next week — and even louder if he comes back the next period.”

What do the experts say?

We already quoted Dr. Joe Walker above.

Nick Lembo of the New Jersey State Athletic Control Board which sanctions both boxing and MMA matches, says:

“In MMA, you’re going to see there’s more violence in their advertising and marketing, and to the casual observer it does seem more primitive and more violent...But in terms of serious injuries, it seems safer than boxing.”

A study by Bledsloe et al, ” *Incidence of Injury in Professional Mixed Martial Arts Competitions*”, published in 2006 by the prestigious Johns Hopkins physicians concluded:

“The injury rate in MMA competitions is compatible with other combat sports involving striking. The lower knockout rates in MMA compared to boxing may help prevent brain injury in MMA events.“

Another Johns Hopkins study 2 years later by Ngai et al, “*Injury trends in sanctioned mixed martial arts competition: a 5-year review from 2002 to 2007*” concluded:

“Injury rates in regulated professional MMA competition are similar to other combat sports; the overall risk of critical sports-related injury seems to be low. “

The studies both found that relatively minor injuries like cuts, sprains and strains are common, but the critical injuries were not.

I leave this argument, quoting from AOL Sports Journalist Michael David Smith’s blog(after he concludes that MMA is safer than boxing):

“Both sports can be brutal, but in terms of safety, if a father is going to encourage his son to get involved in either boxing or mixed martial arts, he’d be much better off choosing the latter.”

Combat Sports Special Issue

Research article

INCIDENCE OF INJURY IN PROFESSIONAL MIXED MARTIAL ARTS COMPETITIONS

Gregory H. Bledsoe · , Edbert B. Hsu, Jurek George Grabowski, Justin D. Brill and Guohua Li

Johns Hopkins University School of Medicine, Department of Emergency Medicine, Baltimore, Maryland, USA

Published (online): 01 July 2006

ABSTRACT

Mixed Martial Arts (MMA) competitions were introduced in the United States with the first Ultimate Fighting Championship (UFC) in 1993. In 2001, Nevada and New Jersey sanctioned MMA events after requiring a series of rule changes. The purpose of this study was to determine the incidence of injury in professional MMA fighters. Data from all professional MMA events that took place between September 2001 and December 2004 in the state of Nevada were obtained from the Nevada Athletic Commission. Medical and outcome data from events were analyzed based on a pair-matched case-control design. Both conditional and unconditional logistic regression models were used to assess risk factors for injury. A total of 171 MMA matches involving 220 different fighters occurred during the study period. There were a total of 96 injuries to 78 fighters. Of the 171 matches fought, 69 (40.3%) ended with at least one injured fighter. The overall injury rate was 28.6 injuries per 100 fight participations or 12.5 injuries per 100 competitor rounds. Facial laceration was the most common injury accounting for 47.9% of all injuries, followed by hand injury (13.5%), nose injury (10.4%), and eye injury (8.3%). With adjustment for weight and match outcome, older age was associated with significantly increased risk of injury. The most common conclusion to a MMA fight was a technical knockout (TKO) followed by a tap out. The injury rate in MMA competitions is compatible with other combat sports involving striking. The lower knockout rates in MMA compared to boxing may help prevent brain injury in MMA events.

KEY WORDS: Brain injury, ultimate, boxing, jiu jitsu.

INTRODUCTION

Mixed Martial Arts (MMA) competitions were introduced in the United States with the first Ultimate Fighting Championship (UFC) in 1993 (Krauss and Aita, 2002). Styled after the popular *Vale Tudo* (Portugese for “anything goes”) matches in Brazil (Peligro, 2003), these first UFC matches were marketed as brutal, no-holds-barred tournaments with no time limits, no weight classes, and few rules (Hamilton, 1995).

Politicians such as Senator John McCain of Arizona led the charge to ban these competitions from cable television, describing the events as “human cock fighting” (Krauss, 2004). When their cable contracts were terminated in 1997, MMA events survived underground through internet and word of mouth promotions until their organizers agreed to a change of rules that allowed the Nevada State Athletic Commission and the New Jersey State Athletic Control Board to sanction the competitions

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Table 1. Frequencies and rates of mixed martial arts injuries to professional competitors, September 2001 through December 2004, Nevada.*

Injury site Number (%) Injury Rate per 100

Competitors

Facial Laceration 46 (47.9) 13.45

Eye 8 (8.3) 2.34

Ear 1 (1.0) .29

Nose 10 (10.4) 2.92

Mouth 0 (0.0) .00

Jaw 1 (1.0) .29

Neck 1 (1.0) .29

Shoulder 5 (5.2) 1.46

Arm 1 (1.0) .29

Elbow 2 (2.1) .58

Hand 13 (13.5) 3.80

Chest 0 (0.0) .00

Abdomen 0 (0.0) .00

Back 2 (2.1) .58

Knee 3 (3.1) .88

Ankle 2 (2.1) .58

Foot 1 (1.0) .29

*Up to four injuries recorded per competitor per match.
in 2001 (Krauss, 2004).

This study is the first report of the incidence of injury in MMA competitions. No study has previously documented injuries in MMA events either before or after the tightening of regulations. Fight results and injury incidence from professional MMA bouts since their sanctioning in 2001 in Nevada are compared to boxing data from the same state. A discussion of MMA events and combat sports injuries is also included.

METHODS

Mixed Martial Art (MMA) data from all professional MMA matches in the state of Nevada from September 2001 until December 2004 (n = 171 matches) was obtained from the Nevada State Athletic Commission. All professional MMA matches occurring in the state during the study period were included. Data obtained included gender, date of the match, date of birth, weight, rounds scheduled, rounds fought, whether the fighter won or lost, how the match ended (knockout, technical knockout, decision, draw, disqualification, no decision, tap out, or choke) and the injuries that occurred in the match and the type of injuries sustained. Up to four injuries per fighter were recorded per competition. These data are in the public domain and accessible on the website of the Nevada State Athletic Commission (<http://boxing.nv.gov>, last accessed January 2005). Medical and outcome data for all professional MMA matches were analyzed based on a pairmatched

case-control design. Cases were fighters who sustained an injury during the matches. Fighters who were not injured served as controls. Matches in which both competitors were injured or both were uninjured were excluded from the conditional logistic regression. Both conditional and unconditional logistic regression models were used to assess risk factors for injury.

Injuries were recorded based on the clinical report of the physician at ringside. No follow-up study was done to confirm the accuracy of the reported injury based on radiography or other diagnostic testing. Injuries were divided into seventeen broad classifications: eye injuries, facial lacerations, ear injuries, nose injuries, mouth injuries, jaw injuries, hand injuries, shoulder injuries, elbow injuries, ankle injuries, foot injuries, chest injuries, abdominal injuries, knee injuries, back injuries, neck injuries, and arm injuries. Lacerations to the eyelid and nose were counted as facial lacerations. Only those injuries documented other than lacerations—such as possible orbit fractures or a nose deformity—were listed as eye or nose injuries respectively.

The Johns Hopkins University School of Medicine's Institutional Review Board approved the study protocol via exemption.

RESULTS

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A total of 171 MMA matches involving 220 different fighters occurred during the study period. All participants were male with an average age of 28.5 years (SD = 4.7, range from 19 to 44 years old). The average weight was 87.6 kg (SD= 16.3 kg, range from 60.4 to 166.4 kg). A total of 1,130 rounds were scheduled, of which 624 (55%) were actually fought. These rounds were each 5 minutes for a total of 3120 minutes of fighting. A total of 67 fighters fought in more than one fight during the study period. The average number of competitions for these 67 repeat fighters was 2.8 (SD = 1) with a range of 2 to 6 fights each.

There were a total of 96 injuries to 78 fighters. Of the 171 matches fought, 69 (40.3%) ended with at least one injured fighter. The overall injury rate was 28.6 injuries per 100 fight participations, 12.5 injuries per 100 competitor rounds, or 3.08 injuries per 100 fight minutes. The majority of recorded injuries were injuries to the facial region with facial lacerations being the most common. Hand injuries

were the second most common injury, accounting for 13.5% of all injuries, followed by injuries to the nose (10.4%) and eye (8.3%, Table 1).

Older fighters were at greater risk of injury as were those who lost a match by knockout or technical knockout (Tables 2 and 3). Those who lost their match under any circumstance—whether knockout, technical knockout, decision, tap out, choke, or disqualification—were significantly more likely to suffer an injury during the course of the competition than those who won ($p < 0.001$). Also, the incidence of injury increased with the length of the fight with matches lasting 4 or 5 rounds being more likely to include a fighter who suffered an injury (Tables 2 and 3). The most common conclusion to a MMA fight was a technical knockout (TKO) followed by a tap out (Table 4). The proportion of fighters suffering a knockout during the competition was 6.4% ($n = 11$).

Table 2. Incidence rates of injury in mixed martial arts matches by competition characteristics, September 2001 through December 2004, Nevada.

Competitors

#(%)

Injured

Competitors

#(%)

Injury Rate

per 100

Competitors

Rounds

fought

#(%)

Injury Rate

per 100

Fought

Rounds

Age Groups (years)*

<25	76 (22.3)	13 (16.9)	17.1	132 (21.2)	9.8
25-29	144 (41.5)	29 (37.7)	20.6	260 (41.8)	11.2
30+	124 (36.4)	35 (45.5)	28.2	230 (37.0)	15.2

$\chi^2=3.9,$

$p=0.14$

$\chi^2=2.2,$

$p=0.33$

Weight Class

Fly, bantam, feather, or light	32 (9.4)	5 (6.4)	15.23	53 (8.5)	9.4
Welter or Middle	150 (43.8)	35 (44.9)	23.33	300 (48.1)	11.7
Light heavy, heavy, or super heavy	160 (46.8)	38 (48.7)	23.75	271 (43.4)	14.0

$\chi^2=1.04,$

$p=0.59$

$\chi^2=0.95,$

p=0.62

Match Outcome

Win 169 (49.4) 27 (34.6) 16.0 306 (49.0) 8.8

Loss 169 (49.4) 51 (65.4) 30.2 306 (49.0) 16.7

Draw 4 (1.2) 0 (0) 0.0 12 (1.9) 0.0

$\chi^2=9.6,$

p<0.001

$\chi^2=8.2,$

p=0.02 †

Type of Outcome

TKO or KO 158 (46.2) 42 (54.0) 26.6 240 (38.5) 17.5

Other 184 (53.8) 36 (46.2) 19.6 384 (61.5) 9.4

$\chi^2=2.38,$

p=0.12

$\chi^2=6.8,$

p=0.009

Rounds fought

1 176 (51.5) 32 (41.0) 18.2 176 (28.2) 18.2

2 76 (22.2) 19 (24.4) 25.0 152 (24.4) 12.5

3 - 5 90 (26.3) 27 (34.7) 30.0 296 (47.4) 9.12

$\chi^2=5,$

p=0.08

$\chi^2=6.3,$

p=0.04

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Table 3. Odds Ratios (OR) and 95% Confidence Intervals (CIs) of injury in mixed martial arts matches from multivariate logistic regression models, September 2001 through December 2004, Nevada.

Model Variables OR 95%CI

Unconditional logistic regression

Age *† 1.29 0.73-2.26

Weight *† 1.03 0.95-1.11

Lost match 2.32 1.36-3.98

KO or TKO 1.71 0.97-3.01

Rounds fought † 1.44 1.11-1.87

1:1 matched conditional logistic regression

Age *† 3.11 1.11-8.59

Weight difference *† 1.10 0.90-1.34

Lost match 2.69 1.44-5.0

*Odds Ratio for a ten-unit change in age and weight.

† A continuous variable.

DISCUSSION

Though initially promoted as brutal, no-holds-barred contests, Mixed Martial Arts competitions in the United States have changed dramatically and now have improved regulations to minimize injury. A total of 13 states now sanction MMA events, the first two being Nevada and New Jersey in 2001. Since the sanctioning, MMA competitions have followed much stricter regulations. Fighters are now

forbidden to headbutt, stomp or knee an opponent on the ground, strike the throat, spine or back of the head, must fight within a predetermined weight class, and are allowed only one fight per night—all important changes that were implemented with sanctioning.

Table 4. Results of Mixed Martial Arts Competitions in Nevada, September 2001 through December 2004.

Result Number (%)

Technical Knockout 68 (39.8)

Tap Out 52 (30.4)

Decision 31 (18.1)

Knockout 11 (6.4)

Choke 4 (2.3)

Disqualification 3 (1.8)

Draw 2 (1.2)

Total 171

The mandatory “grappling” gloves now used in MMA events weigh between 4 to 8 ounces, thinner than the 8 to 10 ounce gloves worn by professional boxers, and are designed with the fingers exposed so a fighter can grasp his opponent. Fighters must pass the same physical exam used to screen professional boxers including a cerebral MRI, before being licensed. Referees and ringside physicians are required to be present and have the authority to stop the match at any time.

Fighters train in both the striking and grappling arts (Amtmann, 2004) and become proficient in a number of means of “submitting” or defeating their opponents (Figures 1 and 2). Fights can be ended not only by the traditional knock out, technical knock out, and decision of boxing, but also by “tap out”—where an opponent either taps the mat or his opponent to signal his desire to stop the match or verbally indicates to the referee his desire to stop—and “choke”—where an opponent refuses to tap even though caught in a choke hold and passes out.

Figure 1. Fighter A (in blue) applies a traditional jiu jitsu choke to Fighter B (in white). MMA events should be differentiated from the infamous “Toughman” competitions held around the country. Toughman competitions feature amateur fighters who often have little or no training
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experience, wear “one-size-fits-all” protective gear, do not need a thorough physical exam to compete, and often feature inexperienced referees and ringside

physicians (Branch, 2003). While there have been no deaths in the United States in MMA competitions, at least 12 participants have died during Toughman events—two of whom were being supervised by ringside physicians who were chiropractors (Branch, 2003). Incidentally, both Nevada and New Jersey—the first two states to sanction MMA competitions—are “among 10 states that have banned or attempted to ban [Toughman] events.” (Branch, 2003).

Figure 2. Fighter A (in blue) applies a traditional jiu jitsu armbar to Fighter B (in white).

The relatively high incidence of injuries in combat sports has been well documented. The giving and receiving of high velocity blows seems to be the best correlation of whether a sport will have an increased risk of injury. Styles that include striking—such as boxing (Bledsoe et al., 2005; Zazryn et al., 2003a), kickboxing (Gartland et al., 2001; Zazryn et al., 2003b), karate (Zetaruk et al., 2005), and taekwondo (Kazemi and Pieter, 2004)—have been shown to have a higher incidence of injury than styles that involve grappling alone, such as collegiate wrestling (Jarret et al., 1998). Strikes from elite athletes, particularly professional boxers, can generate a significant amount of force (Walilko et al., 2005)—equivalent to “a padded wooden mallet with a mass of 6 kg (13 lbs) if swung at 20 mph” (Atha et al., 1985) according to one study. This seems to explain why many injuries in the striking arts are prevalent not only in the target areas of the face and torso, but also the extremities used for striking such as the hands for boxing and the upper and lower extremities in kickboxing and karate.

While no prior articles document the incidence of injury in MMA, injury rates from boxing have been reported. In 2003, Zazryn and colleagues (2003a) reported an overall injury rate to professional boxers in Victoria, Australia of 25 injuries per 100 fight participations. A recent look at the injury rates of professional boxers in Nevada showed 17.1 injuries per 100 fight participations (Bledsoe et al., 2005). With an overall injury rate of 28.6 injuries per 100 fight participations, MMA competitions demonstrate a high rate of overall injury, but a rate in keeping with other combat sports involving striking. By contrast, sports involving grappling have demonstrated much lower rates of injury. For example, collegiate wrestling has been documented to have rates as low as 1 injury per 100 participations when analyzed for participants in both practice and competition (Jarret et al., 1998).

As opposed to professional boxing, MMA competitions have a mechanism that enables the participant to stop the competition at any time. The “tap out” is the second most common means of ending a MMA competition (Table 4) This unique characteristic, combined with more options of attack when competing, is thought to help explain a knockout proportion in MMA competitions that is almost half of the reported 11.3% of professional boxing matches in Nevada (Bledsoe et al., 2005). With the growing concern over repetitive head injuries and the risk of *dementia pugilistica* among career boxers, decreasing the number of head blows a fighter receives during a match has been promoted as an important intervention (Mendez, 1995; Unterharnscheidt, 1995). With MMA competitions, the opportunity to attack the extremities with arm bars and leg locks and the possibility of extended periods of grappling could serve to lessen the risk of traumatic brain injury. When TKOs are compared, proportions between professional boxing (38%) and MMA are similar (Bledsoe et al., 2005).

There are several limitations to this study. First, the injuries reported were based on the physical exams performed at ringside by the ringside physician. No labs or radiologic studies were ordered and no diagnoses were confirmed. The incidence of injury in these fighters may have been higher than reported. Second, although the study included all MMA fights throughout a 40 month period, the total number of matches was relatively small. Third, the fights included in this study were all held in Nevada, the premiere site for MMA events. How injury rates would change for events held under different conditions with less supervision is a matter of concern. Finally, for the purpose of discussion, knockouts and technical knockouts were not defined as injuries although many would argue that these represent the most serious of all boxing injuries. Due to the sometimes subtle nature of traumatic brain injury—and since there was no radiographic imaging available to verify whether an injury had occurred—KOs and TKOs were discussed as separate entities and not included in the Injury in mixed martial arts competitions

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overall injury data. Further research is needed to determine the true nature of these injuries and their cumulative effects upon the individual fighters.

CONCLUSION

Mixed Martial Arts competitions have changed

dramatically since the first Ultimate Fighting Championship in 1993. The overall injury rate in MMA competitions is now similar to other combat sports, including boxing. Knockout rates are lower in MMA competitions than in boxing. This suggests a reduced risk of TBI in MMA competitions when compared to other events involving striking. MMA events must continue to be properly supervised by trained referees and ringside physicians, and the rules implemented by state sanctioning—including weight classes, limited rounds per match, proper safety gear, and banning of the most devastating attacks—must be strictly enforced. Further research is necessary to continue to improve safety in this developing new sport.

ACKNOWLEDGEMENTS

The authors would like to express their appreciation to Michael Johnson and Steve Lord for permission to use their photographs to demonstrate the jiu jitsu techniques.

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KEY POINTS

- Mixed martial arts (MMA) has changed since the first MMA matches in the United States and now has increased safety regulations and sanctioning.
- MMA competitions have an overall high rate of injury.
- There have been no MMA deaths in the United States.
- The knockout (KO) rate in MMA appears to be lower than the KO rate of boxing matches.
- MMA must continue to be supervised by properly trained medical professionals and referees to ensure fighter safety in the future.

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