

Chiropractic utilization in BMX athletes at the UCI World Championships: a retrospective study

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Objective: *To examine paramedical (chiropractic, physiotherapy and massage therapy) utilization among high-level BMX athletes following sport-related injury at the 2007 UCI World Championships.*

Methods: *Retrospective analysis was conducted on a dataset from international male and female BMX athletes (n = 110) who sustained injury in training and competition at the 2007 BMX World Championships.*

Results: *Fifty percent of individuals aged 8–17 presented to a chiropractor versus 32% to physiotherapists and 18% to massage therapists. There was a significant difference in paramedical practitioner choice when comparing the sample across the different locations of injury. Specifically, the proportion of individuals presenting for treatment to chiropractors (84%) was much higher than to physiotherapists/massage therapists (16%) for spine or torso complaints.*

Conclusion: *Utilization of chiropractors by BMX athletes may be higher than utilization of other paramedical professionals as suggested by this study. Chiropractors appear to be the paramedical practitioner of choice in regards to spine and torso related complaints.*

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KEY WORDS: cycling, BMX, chiropractic, utilization, paramedical

Objectif : *Examiner le recours aux traitements paramédicaux (chiropratique, physiothérapie et massothérapie) par les athlètes BMX de haut niveau suite à une blessure liée à la pratique des sports lors des Championnats mondiaux UCI 2007.*

Méthodes : *L'analyse rétrospective fut menée relativement à un ensemble de données recueillies auprès d'athlètes BMX masculins et féminins (n = 110) ayant subi des blessures à l'entraînement et lors de compétitions dans le cadre des Championnats mondiaux BMX 2007.*

Résultats : *Cinquante pour cent des personnes âgées entre 8 et 17 ans ont consulté un chiropraticien, 32% ont consulté un physiothérapeute, et 18% ont consulté un massothérapeute. La différence dans le choix du professionnel paramédical était grande lorsqu'on comparait l'échantillon au type de blessure. La proportion de gens ayant consulté un chiropraticien (84%) était plus élevée que celle qui ont consulté un physiothérapeute/massothérapeute (16%) pour une douleur à l'épine dorsale ou au torse.*

Conclusion : *Les athlètes BMX ont tendance à faire davantage appel aux services des chiropraticiens qu'à ceux des autres professionnels paramédicaux comme le suggère cette étude. Le chiropraticien semble constituer le praticien de choix en cas de douleur à l'épine dorsale et au torse.*

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MOTS CLÉS : cyclisme, BMX, chiropratique, recours, paramédical

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Introduction

Bicycle motocross (BMX) has its origins in the late 1960s in California in the United States of America. Children and teenagers without the financial means to participate in the popular sport of motorized motocross instead built dirt tracks and raced bicycles around them. The participants also mimicked the motorized competitors by wearing motocross gear and clothing.¹

The official start of BMX as a sport is considered to be in the early 1970s when a sanctioning body for BMX was founded in the United States.¹ By 1978, the sport was introduced on other continents such as Europe.¹

The International BMX Federation was founded in 1981, and the first world championships were held in 1982.¹ BMX rapidly developed as a unique sporting entity, and later adopted codes of competition similar to cycling. In 1993, BMX was fully integrated into the Union Cycliste Internationale (UCI). There are over 75 nationally affiliated federations with official BMX programs recognized by the UCI.¹ BMX made its debut as an Olympic event in Beijing in 2008.

BMX races are held on circuits of around 350 metres, including jumps, banked corners and other obstacles (Figure 1). Eight riders compete in each heat (qualifying rounds, quarter finals, semi-finals, finals) with the top four qualifying for the next round.¹ Riders are divided into classes by age group and sex. The elite riders are divided by sex only.

The 2007 UCI BMX World Championships were held in Victoria, BC, Canada. The 2007 competition was the last World Championships prior to the 2008 Beijing Olympics, placing increased importance on the event. According to the International Cycling Union (UCI) the total number of entries for the 2007 World Championship event was 1954 riders/athletes from 39 countries.¹ This was a substantial increase from 1600+ competitors and 32 countries that UCI reported participated in the 2003 World Championships held in Perth, Australia.¹ The only other BMX event where participant numbers have been reported was authored by Brogger-Jensen et al² following the 1989 European BMX Championships, citing 976 participants.

UCI holds over 70 international BMX events on four continents annually.¹ Despite this, prior to the 2007 World Championships, statistics in regards to the amount or type of injuries seen by paramedical practitioners (chiroprac-

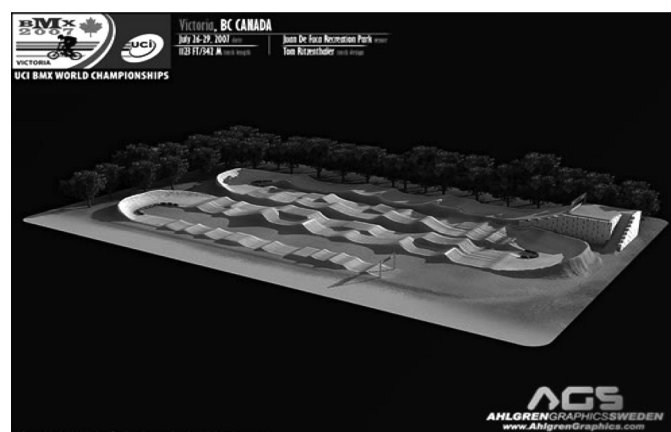


Figure 1 Computerized diagram of the 2007 UCI BMX World Championship track.¹

tic, physiotherapy and massage therapy) or medical practitioners (medical doctors and doctors of osteopathy) at a major BMX event have not been published.

Despite the lack of published data, it is apparent that UCI perceives a need to provide both medical and paramedical services on a consistent basis to its high-level BMX athletes. In 2008, the UCI announced that it would be contracting medical services to Winning Medicine International of California (WMI).¹ WMI's mandate was "to provide comprehensive medical services at all 2008 UCI BMX events."^{1,3} The WMI website⁴ lists four medical practitioners (three medical doctors and one osteopath) and three paramedical practitioners (two chiropractors and one certified athletic trainer) on its medical staff. Despite being given the task of providing treatment and improving the safety of UCI BMX, no injury data is available from the UCI or WMI websites. The requirement for ongoing collection of data to improve safety and quality of treatment available to BMX athletes still needs to be satisfied. Such information would facilitate future medical and paramedical planning for major BMX events that are often held on various continents, with different health practitioners.

The following report was intended to provide information for paramedical services at future events. A separate report⁴ on injuries seen by medical and first-aid at the Victoria 2007 World Championships has also been authored, but is unpublished. This data may be valuable at future

major BMX events. There has been minimal information published regarding the health care utilization of BMX athletes with only one previous study.² The purpose of the present study was to examine the type of paramedical practitioners visited, specifically chiropractic utilization, following a sport-related injury among high-level BMX athletes.

Method

Ethical review approval from Canadian Memorial Chiropractic College (CMCC) was obtained to retrospectively analyze the data on November 25, 2009 (Certificate number: 0911X04).

A single group of subjects were included in this study. The sample population consisted of 110 male and female BMX athletes of all skill levels that presented to the paramedical services tent at the 2007 BMX World Championships following an injury at the event. A total of 110 subjects with an age range of 8 to 44 years, presenting with a total of 131 unique injuries were included in the study. Forty-five females and sixty-five males presented. In addition to a paramedical tent, a medical/first-aid tent was also present. Data from the medical/first-aid tent⁴ is mentioned but was not included in this study.

As mentioned earlier, UCI does not have a standardized method for reporting injury data. However, the Chief Medical Officer at the 2007 World Championships required collection of injury data. Following the event, data were hand scored by the author from encounter forms. Injury tracking forms were adapted from the International Ski Federation (FIS)⁵ to track injuries sustained by competitive level snowboarders. The validity, reliability and transferability of the FIS form to a BMX event have not been tested. The content of the BMX forms was created by consensus between the Chief Medical Officer, the event manager and the author prior to the event.

Both the medical and paramedical treatment tents were located conveniently within the competition venue adjacent to the national teams. All BMX athletes who presented to the paramedical tent had an injury form filled out to provide care for the athletes, consistent with British Columbia law. The forms were filled out by one of eight different paramedical practitioners that provided the treatment: four sports chiropractors (DC), two sports physiotherapists (PT), and two registered massage therapists (RMT). Each practitioner was trained by the author

specifically to collect the following information for each athlete encounter and enter it on the modified FIS form:

- 1) Age
- 2) Sex
- 3) Country
- 4) Date of Injury (Only data for injuries sustained at the event were included).
- 5) Nature of injury/body part injured
- 6) Type of paramedical service provided

The form was discussed in detail with the athletes and written and verbal informed consent was obtained prior to its administration. Although the information was not initially collected for research purposes, participants were informed at the time of registration that data related to their participation in the event was being collected by UCI and may be included in future study. The data form did not include any identifying information and at the end of the event, the data forms were separated from treatment records to preserve confidentiality. The author was the only person who had possession of the injury and data collection forms. Only data for injuries sustained at the current event were included. Although chronic injuries not sustained at the event were also frequently seen and treated, they were not included in the analysis. Athletes seeking treatment from more than one practitioner, either medical or paramedical, were accounted for on the same data form but counted as separate encounters. Follow-up visits to the same type of practitioner for the same problem were counted as a single encounter to avoid artificially increasing the number of encounters.

Descriptive statistics of the anonymous sample were done at CMCC using proportions as well as means and standard deviations. Assessment of paramedical practitioner choice was done across the grouping variables through Chi-square testing. The standard for statistical significance was $p < 0.05$.

Results

The total number of documented paramedical encounters was 110 athletes out of 1954 total participants. Medical and paramedical encounters in total were 229 athletes out of 1954 participants, which represented 12% of all participants requiring medical or paramedical assistance from injuries sustained at the event. There is a high likeli-

Table 1 *Proportion of individuals presenting by age group*

Age Group	Chiropractic (n)	Physiotherapy (n)	Massage (n)	Total (n)
8–17	0.5 (11)	0.32 (7)	0.18 (4)	1.00 (22)
18–26	0.59 (37)	0.19 (12)	0.22 (14)	1.00 (63)
27–44	0.64 (16)	0.16 (4)	0.20 (5)	1.00 (25)
All	0.58 (64)	0.21 (23)	0.21 (23)	1.00 (110)

Table 2 *Proportion of individuals presenting by origin*

Location	Chiropractic (n)	Physiotherapy (n)	Massage (n)	Total (n)
NA	0.64 (41)	0.20 (13)	0.16 (10)	1.00 (64)
Europe	0.63 (5)	0.25 (2)	0.13 (1)	1.00 (8)
SA/CA	0.67 (12)	0.28 (5)	0.06 (1)	1.00 (18)
AUS/NZ	0.45 (9)	0.35 (7)	0.20 (4)	1.00 (20)
Total	0.61 (67)	0.25 (27)	0.15 (16)	1.00 (110)

hood that both medical and paramedical staff saw some athletes for the same injury. Younger athletes sought treatment under the guidance of a parent or guardian. Athletes specified the type of treatment they were seeking i.e.: “chiropractic,” “massage” or “physio,” and this eliminated the need for triage. Although there was some overlap in techniques used, chiropractors primarily utilized manipulation and mobilization, physiotherapists used mostly ultrasound, electrical modalities and stretching and the massage therapists utilized mostly effleurage to the soft tissues.

Fifty eight percent ($n = 64$) of those athletes seeing paramedical staff for treatment of an acute injury presented to a doctor of chiropractic. Twenty one percent of athletes ($n = 23$) presented to a physiotherapist, while 21% ($n = 23$) presented to a massage therapist. Of all initial encounters with paramedical staff, 41% were by female athletes and 59% were by male athletes. Although female athletes represented 41% of encounters, they represented only 20% of total participants, suggesting a much higher rate of injury in female BMX racers. Over three-quarters (76%) of the patients seen by the medical/first-aid staff were male. There was a full range of ages seen by paramedical staff. The youngest patient was 8 years old and the oldest was 44 years old. The median age of all paramedical patients was 21 years of age.

In regards to paramedical treatment, overall (See Table 1), a significantly larger proportion of individuals presented for chiropractic treatment (58%) compared with physiotherapy (21%; $X^2 = 31.96$, $df = 2$, $p < 0.0001$) and massage therapy (21%; $X^2 = 31.96$, $df = 2$, $p < 0.0001$).

Regarding age, the age groupings of 8–17, 18–26 and 27–44 (Table 1) were used. It was found that there was no significant difference in paramedical practitioner choice when comparing the sample across the different age groups (Table 1; $X^2 = 2.19$, $df = 4$, $p = 0.701$).

Fifty percent of individuals aged 8–17 presented to a chiropractor versus 32% to physiotherapists and 18% to massage therapists. This distribution of treatment choice was not significantly different from the age groups of 18–26 and 27–44.

Regarding origin of the athlete, the following groupings were used (Table 2): North America (NA), (Canada, United States of America); Europe (France, Germany, Netherlands); Central/South America (SA/CA), (Aruba, Brazil, Columbia, Ecuador, Venezuela) and Australia/New Zealand (AUS/NZ). It was found that there was no significant difference in paramedical practitioner choice when comparing the sample across the different locations of athlete origin (Table 2; $X^2 = 3.96$, $df = 6$, $p = 0.683$).

Sixty three – sixty seven percent of individuals from North America, South America and Europe presented to

Table 3 Proportion of individuals presenting by location of injury

Location of Injury	Chiropractic (n)	Physiotherapy/Massage (n)	Total (n)
Lower Limb	0.54 (15)	0.46 (13)	1.00 (28)
Spine / Torso	0.84 (47)	0.16 (9)	1.00 (56)
Upper Limb	0.53 (25)	0.47 (22)	1.00 (47)
All	0.66 (87)	0.34 (44)	1.00 (131)

a chiropractor for their injuries versus 45% of individuals from Australia and New Zealand. 20–35% of all athletes presented to physiotherapists and 6–20% of all athletes presented to massage therapists. Some countries provided their own medical services exclusively to their team members and their numbers are not included. American athletes accounted for 26% of all paramedical encounters (29/110), compared with Australian and Canadian athletes who accounted for 14% (15/110) and 32% (35/110), respectively.

Due to the small number of total presentations to a massage therapist by location of injury, the massage therapy and physiotherapy groups were combined into one group for the analysis.

Regarding location of injury, we used the following groupings (Table 3): Lower Limb (ankle, hip, knee, lower leg, thigh); Spine/Torso (back, lumbar, pelvis, ribs, neck); Upper Limb (clavicle, hands/fingers/thumb, shoulder, wrist). It was found that there was a significant difference in paramedical practitioner choice when comparing the sample across the different locations of injury (Table 3; $X^2 = 13.46$, $df = 2$, $p = 0.001$). This difference is seen when looking specifically at the proportion of individuals presenting for treatment for spine and torso related complaints. Eighty-four percent of individuals with spine or torso related complaints presented to chiropractors compared to 16% who presented to physiotherapists/massage therapists ($X^2 = 51.57$, $df = 1$, $p < 0.0001$). The comparisons between chiropractors and physiotherapists/massage therapists for proportions of individuals presenting with lower limb or upper limb complaints were not found to be significantly different (Table 3).

In the current study injuries to the torso and spine accounted for close to half the injuries seen by paramedical staff (43%). Upper limb injuries accounted for 36% of the injuries and lower extremity injuries accounted for 21% of injuries. On average, each athlete had 1.19 complaints.

Some athletes also saw more than one provider per encounter and these athletes were recorded as seeing each provider as separate encounters. Only initial visits with each type of provider were recorded and total number of repeat visits was not studied. The majority of injuries were of a musculoskeletal nature, but almost all injuries also required First-aid (provided by both the paramedical practitioners and the medical staff) and wound care prior to assessment and treatment.

Discussion

This study is the first to investigate patterns of paramedical utilization of athletes at a large-scale BMX event. An electronic literature search using Pubmed and Biomed Central using cycling and BMX as keywords resulted in one relevant paper describing the 1989 European Championships.² The data collected covers a single World Championship in 2007. Given the high number of event registrants, and subsequent presentations at the paramedical tent, hopefully this study presents a clearer picture of paramedical utilization by BMX athletes in high-level competition.

The total number of documented medical/nursing/First-aid encounters during the 2007 World Championships was 119 athletes out of a total 1954 participants representing 6.2% of all athletes. This is similar to the 6.3% of BMX athletes sustaining injury at the 1989 European Championships.² When the 2007 medical and paramedical encounters are combined, 12% of participants were seen. This is much higher than the 6.3% of participants that were reported as injured at the 1989 European Championships, but without paramedical services provided in 1989, direct comparison is not possible.

Kazemi⁶ has suggested that athletes desire a rapid recovery and may seek treatment from more than one practitioner to speed up the healing process. This insight may explain why multiple health professionals were consulted

at the 2007 BMX Worlds. Other studies^{7,8} suggest that athletes often use paramedical services in conjunction with medical services and observations from this study support this.

In regards to country of origin, Australia, Canada and the United States of America brought the largest number of athletes and therefore may have also resulted in the largest number of paramedical encounters. As well, athletes from these countries are also the most likely to be accustomed to using paramedical services at home, and may have been more comfortable requesting treatment as they did not have to overcome any language barriers to receive treatment as English was the primary language.

With their training and expertise in the area of musculoskeletal injuries, chiropractors and sports chiropractors in particular are well positioned to treat athletic injuries. Even so, little research has been conducted to examine the prevalence of chiropractic use in the treatment of sport-related injuries. Prior to this study, the relationships between age, location of injury, country of origin and choice of practitioner has not been adequately investigated. This study suggests that the utilization of doctors of chiropractic was twice that of other paramedical practitioners at the 2007 BMX Worlds. This difference might be explained by the presence of twice as many chiropractors (two) treating athletes compared to the other paramedical practitioners (one massage therapist and one physiotherapist) on one of the five days of competition. This is less likely because BMX athletes were freely given the ability to request any type of practitioner and athletes were not aware of the relative or absolute number of the different practitioners. On the other four days of competition, there was one chiropractor, one physiotherapist and one massage therapist present.

The ability to see paramedical providers free of charge may also result in an over reporting of injuries by athletes. Athletes may be more likely to seek treatment if services are provided free of charge. Paramedical visits accounting for 48% of the first injury encounters agrees with a study of paramedical usage by athletes in an American college where a rate of 56% was noted.⁹

There are limitations in the present study that should be addressed. The study could be strengthened with the use of a previously validated questionnaire or survey tool that could be peer-reviewed initially, and then subjected to testing at various events via a pilot study. The new ques-

tionnaire should be developed to take into account athlete use of multiple practitioners yet preserve confidentiality – perhaps using numbers off of the athlete's accreditation. There is no prior research regarding treatment preferences among BMX athletes, and this could be answered via a direct survey. Although the data collection of this study could have been strengthened, results from this study are a starting point to enhance future studies in this sport.

Retrospective surveys can be affected by poor recall and perception bias, but analysis of written data in this case may have controlled for this. Another study should be done regarding the demographic characteristics of high-level BMX competition participants to see if this study could be generalized to future BMX events of similar caliber. It is unknown if the population sampled here was similar in characteristics to that seen in other large-scale BMX events. Participants could also be surveyed in regards to the frequency and type of treatments they typically receive pre-mid-post competition.

The objective of this retrospective investigation was to identify trends in the paramedical utilization among BMX athletes. Paramedical practitioners with extensive BMX athlete contact should endeavor to further conduct utilization studies. There is a lack of information surrounding chiropractic utilization in the majority of sports. The results of this study are primarily descriptive. It provides some insight into paramedical utilization patterns among BMX athletes. Future studies should focus on developing a standardized form that can be tested. This paper was written with the intent of generating a database for decision-making or hypotheses for future study. Until now, the demographic tendencies of BMX athletes that use paramedical services have not been recorded.

Conclusions

This study suggests that at the 2007 BMX World Championships, paramedical utilization (n = 119) was almost equal to medical utilization (n = 110) among participants who sought treatment for injuries sustained at the event. With regards to the type of paramedical care utilized, chiropractors were used more than half the time for injuries to the upper limb, lower limb and up to 84% of the time for injuries to the spine or torso. There was no significant difference in paramedical practitioner choice due to the athlete's age or country or origin. The apparent popularity of chiropractic as treatment for injuries sustained at this

event, suggests that its inclusion should continue at future high-level BMX competitions. This is especially true for treatment of spine and torso related complaints.

The data collected by this study encompasses BMX athletes of all ages and skill levels and thus it is believed that it represents the range of presentations that can be expected at a World Championship BMX event. However, comparing numbers of athletes participating at the BMX world championships in both 2007 and 2003 suggests an increase in riders participating in the sport at a high level.¹ Similar as is found in other sports, as the sport becomes increasingly popular and increasingly competitive, the potential for injuries may increase.¹⁰ Without any attempt to determine the types of injuries seen, trends cannot be recognized. Analysis of injury trends may be used in education and injury prevention. The ongoing collection of standardized injury statistics of BMX athletes at competition is a worthy goal. Determining the validity, reliability and transferability of the FIS form for this purpose is also appropriate. This article could be used to better enable event planners to determine the type of injury care that ought to be provided for these kinds of events, by anticipating the preference of BMX athletes who are injured and the type of injuries they are most likely to sustain.

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