Subject: Fwd: R: Status of Scientific paper no. 3428 - J. SPORTS MEDICINE PHYS.FITN.

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To: dranzdaxx@yahoo.com;

Date: Thursday, November 22, 2012 7:25 PM

Begin forwarded message:

From: "Paola Sabini - Edizioni Minerva Medica SpA" <journals6.dept@minervamedica.it>
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Subject: R: Status of Scientific paper no. 3428 - J. SPORTS MEDICINE PHYS.FITN.

Dear Author,

I am pleased to inform you that the revised version of your paper has been accepted for publication.

Once it is edited and typeset, we will send you the proofs for your final checking.

Kind regards,

Paola Sabini

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Dear Sir/ Madam,

I am writing again with reference to the above paper which I have submitted its second revision in July 2012. I would very much appreciate it if you can enlighten me as to whether the evaluation has been completed and what are the feedbacks.

My co-authors and I have been awaiting for final decision for more than a year. We are anxious to expedite the process so that we can concentrate on other matters.

Thank you for your cooperation and understanding.

Best regards,

Goh
Badminton Injuries in Youth Competitive Players

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ABSTRACT

Aim. To survey sports injury pattern and establish cost of injuries in relation to training of 58 competitive badminton players in a Malaysian National Sports School

Methods. This 1 year prospective observational study recruited all the 13-16 year old students after obtaining informed consent from their appointed guardian. All participants were requested to report any injuries, which were pain or disabilities that occur within the study period (1st September 2008 to 31st August 2009) either during training or competition. Injured students were to seek treatment from the researcher(s) who made weekly visits and they were then followed up accordingly until they return to full training. Details and progress of the injuries were documented during each visit.

Results. Sixty three injuries were recorded. Soft tissue sprains/strains were the commonest injury (64%). About one third of the injuries occurred in the lower limb especially the knees and was followed by back injuries. 38% of the injuries did not require training modification, half of these injuries resumed training within 1 week. Upon full training, half of them were still symptomatic. Injury risk was 57%; injury rate was 0.9 injuries/ player/ 1000 training hours.

Conclusion. Badminton injuries mostly involved the lower limb and almost all overuse injuries occurred in the lower limb. However, badminton injuries as a whole were predominantly sprains and strains, and not overuse in nature as widely believed.

Key words: racquet sports, athletic injuries, sports medicine, adolescent, prospective study, epidemiology
Original articles. These should be original contributions to the subject. The text should be 3000-5500 words (8 to 16 typed, double-spaced pages) not including references, tables, figures. No more than 50 references will be accepted. The article must be subdivided into the following sections: introduction, materials and methods, results, discussion, conclusions.

Introduction
Badminton is a popular sport in Asia and understanding the injuries is helpful in suggesting injury prevention methods. However, epidemiologic studies of badminton injuries comprise little more than a few surveys. The aim of this study was to obtain local baseline database to help us identify injuries that hamper our talented national junior badminton players from playing at the highest level and also to determine the cost of injuries in terms of time loss from training.
Badminton is considered as a low risk sports. However injuries are still common as players need to generate enormous power even while in a disadvantaged postural positions. Illustrating the magnitude of force involved in badminton, professional players with the likes of Fu Hai Feng was known to hold a record speed of over 300km/hr in his smashes.

Materials and methods
There were all together 69 badminton youth players at the Bukit Jalil Sports School during 2008-2009 study period. This national school catered mainly for the elite youth athletes in selected sports. Only 58 (34 males, 24 females) of them were eligible for the 1 year prospective study. The other 11 players were excluded as they were no longer actively involved in the training. After a briefing and obtaining the players’ consent, all the eligible players were included in this study, regardless whether they were symptomatic or otherwise. The profile of the participants was as followed with standard deviation and range in parenthesis: age 14.3 years±1.1 (13-16), height 164.2cm ±6.8 (145-179), weight 55.2kg±7.8
(39-79), years of badminton training 6.1 years±2.2 (2-11), competition participated throughout study period 4.6±1.9 (1-10), average weekly training per player 23.8 hours±3.2 (19-28.5).

About 75% of the players were Chinese.

A convenience sample of athletes from the school was selected. These athletes were monitored regularly by the physicians, trainers and school authority. None of the players dropped out from this 1 year study. The school authority as guardian of the players had given consent for the players to participate in this study. Approval had been obtained from the Medical Ethics Committee of University Malaya and the Malaysian Ministry of Education.

For the purpose of this study, a ‘sports injury’ was defined as any injury that appeared to be connected with badminton training or a match and:

i. handicapped player during play², and/or

ii. required special treatment (i.e. special bandaging or medical attention) to play², or

iii. made play impossible², or

iv. affected the availability for selection of a player.

The incidences were defined as new injuries occurring from 1st September 2008- 31 August 2009. The definition of recurrence was that of a previously similar injury, recurring again after the player had successfully returned to play (either full training or match).

The recurrence was treated as a separate case from the preceding injury. However, exacerbation of injury was considered as the same case as the preceding injury. This was done to capture the true number of injuries that warranted medical attention by its own right and to reflect the true injury pattern of the athletes.

Except for back/ spine injury, injury of any paired structure of the body simultaneously, were taken as 2 separate injuries. The classification of injury mechanism was modified from
a review paper by Hagglund which was intended for Union of European Football Association (UEFA) injury studies\(^3\).

i. Traumatic: including sprain, strain, contusion, fracture (except stress fracture), dislocation and other injuries such as concussion and wounds

ii. Overuse: musculoskeletal pain with insidious onset and without any known trauma or disease that might have given previous symptoms.

iii. Indeterminate: when diagnosis can not be made with certainty

To reduce recall bias, a weekly clinic was held by sports doctors so that players with new symptoms can seek consultation or treatment. All injuries sustained by these players were managed just like any other injuries that presented to the clinic where diagnoses were made by clinical assessment and further investigations were only done when indicated. Injuries of players were monitored until they returned to play/ training (RTP).

A sports physician was also available to attend to referrals. In addition to that, monitoring of players by respective coaches and physiotherapist during other times of the week were encouraged to increase the pick up rate of minor injuries. At the conclusion of the study period, medical records of all the students were checked for clinic visits that were done out of the stipulated weekly clinic held by the researchers. Any injuries that qualified, were taken up for analysis.

The odds of injuries was obtained by:

\[
\text{IP} = \frac{\text{Number of injured athletes}}{\text{Number of athletes at risk}}
\]

Injuries incidence reporting was also done with the following additional methods:

i. Incidence proportion (IP) or injury risk used to measure average risk of injury of a player

\[
\text{IP} = \frac{\text{Number of injured athletes}}{\text{Number of athletes at risk}}
\]
ii. Incidence rate (IR) used to measure

\[
\text{IR} = \frac{\text{Number of injuries}}{\text{Total athlete-time at risk}}
\]

iii. Clinical incidence (CLI)

\[
\text{CLI} = \frac{\text{Number of injuries}}{\text{Number of athletes at risk}}
\]

(Clinical incidence \textit{was} calculated mainly for the purpose of estimating number of injuries as a guidance in planning for clinical resources.)

Breakdown of injuries based on body region and pathology \textit{were} given in percentages. Risk of exposure would be calculated as injuries/player/1000 training hour. Mean values ± standard deviation, percentage and ratios were calculated for descriptive analysis using the computerized SPSS system (version 17).

The classification of injury severity used in this study was modelled after the one used by a few papers on football injury\textsuperscript{16}. The severity of injury \textit{was} classified as follows according to real time loss/absence from participation or training (which \textit{was} taken from the point of their first presentation to the clinic):

- mild (RTP within 1 week)
- moderate (RTP after 1 week but within 4 weeks)
- major (RTP after 4 weeks)
Results

A total of 63 injuries involving 33 players (21 males and 12 females) were recorded throughout the 1 year study. Only 1 injury was reported to occur during competition. Odds of injury was 1.32, incidence proportion was 0.57, incidence rate was 0.9 injuries /player/1000 training hours, clinical incidence stood at 1.09. In other words, the odds of injury was 50 out of 90 players; 57% of the athletes had sustained at least 1 injury within a year; and the number of yearly injuries was expected to be 1 injury for each player.

Sprains and strains made up for majority of cases (63%) followed by apophysitis/enthesitis with a distant 10% and tendinopathy at 6%. The remainder proportions included a few cases of stress fracture, pes anserine bursitis, soft tissue contusion and patello-femoral joint pain. (Table 1)

The high incidence of sprains and strains had translated into bigger percentage of acute/traumatic injuries in comparison to overuse injuries. Nearly 75% of the 63 injuries sustained were acute. Only 25% of the incidence cases were due to overuse and these injuries were found to affect the lower limb the most. (Table 1)

Table 1. Breakdown of injury by diagnosis and anatomical site.

The injuries sustained by the athletes were mostly in the region of the lower limb, especially the knees. Knee injuries constituted 40% of the 42 lower limb injuries. The spine/back was the next most common injury prone region after the knees.

It was found that half of the injuries were mild and abled to resume normal training within 1 week. In 12 cases, the players’ RTP time were not reported. About 1/3 of the injured players managed to resume training with no training modifications required. Despite most injuries were considered mild, more than 50% of injured players were still
experiencing residual symptoms upon RTP. There may be other factors that affected time off, such as rest before tournament/competition schedule. However, in this study, the time off was based on the nature of the injury and was determined by the physician.

Figure 1. Incidence of injuries by anatomical region

Figure 2. Time required to return to play (RTP)
Discussion

Sarah B. Knowles et al provided a rather comprehensive description of the 3 terminologies of incidence rate (IR), incidence proportion or risk (IP) and clinical incidence (CI) to facilitate accurate data interpretation and application. Considering the numerous methods and terminologies that were involved in epidemiological reporting, recommendations by Sarah B. Knowles appeared to be practical and applicable to most sports. Thus, it was being adopted by this present study in its injury reporting.

This present study did not include exposure time during competition. Badminton is not a team sport and it is not a game that is played with time limit. A match can last from 20 minutes to an hour and a half. To include the exposure time during competition is overwhelmingly complex and is thus not feasible with the limited resources.

The incidence rate obtained by taking the total athlete exposure time into consideration can be rather inaccurate. This was because not all the players trained continuously for the whole duration during each of the training sessions. Not to be forgotten was that some players would have been laid off due to injuries and they did not train as much as their colleagues. At times, the athletes might also be unable to follow their usual training schedule, especially when they were nearing their school examination period/ holiday or when they were away competing in tournaments.

At this juncture, it would suffice to say that the incidence rate for this group of players shown to be at 0.9 injuries per player per 1000 training hour, was likely to be an underestimation. In fact, incidence measures of any kind were more often than not, underestimated. This was due to over estimation of exposure time which was compounded by under-reporting of injuries. Many injuries commonly went unreported especially when the injuries were thought to be mild or were customarily accepted as the norm for athletes.
Issues frequently associated with epidemiological assessment of badminton injuries or any sports injuries for that matter, were the inconsistent definitions of injury or injury severity and lack of standard in data collection and recording. Illustrating this, outcomes on badminton injuries had been given as 0.85 injuries/player/year\(^2\), 3.1 injuries/player/1000 training hours\(^2\), 3.2\% of badminton players\(^5\), and also 4.1\% of total hospital casualty department registered injuries\(^6\) by various investigators. Even with similar study design and data recording there was still difficulty comparing studies. A prospective study by Jorgensen\(^2\) showed 0.85 injuries/player/year which was lower than the 1.09 injuries/player/year from this study. Thus, implying higher injury risk of Malaysian players. However, if the number of injuries/player/1000 training hours was used for injury description, the Danish players now appeared to be more injury prone (3.1 injuries/player/1000 training hours from Danish study vs 0.9 injuries/player/1000 training hours from this current study).

Study design differences such as self registered incidence reporting versus hospital registry, retrospective versus cross sectional or prospective study, and the variable population selections, are a few of the additional hurdles in epidemiological studies which we will inevitably encounter before we can make a sound comparison.

This prospective study had been designed to capture most if not all, of the injuries regardless of the severity and to complement it with a reliable diagnosis. Questionnaires were not used to avoid the problem of non responders or recall bias. Injury pick up rate was also expected to be higher due to proximity of medical support to the school and familiarity of the players with the researcher.

Injury pattern of the elite youth Malaysian players was observed to be different from few published data. Overuse injuries were widely heralded as the commonest type of injury to afflict badminton players. Jorgensen\(^2\) reported that overuse injuries (74\%) predominated
over sprains and strains (23%). Whereas, this study showed a reversed pattern in which overuse injuries were 3 times less common than sprains and strains instead. There could be under-reporting of overuse injuries from this group of players or it was just due to the discrepancy in musculoskeletal maturity.

Incidence of Achilles tendon and shoulder pain of Malaysian players were also much lower in comparison to those found by Nordic researchers\(^7,8,9\). These researchers were in agreement that Achilles tendon pain was not uncommon in adult elite and recreational badminton players. Thirty two percent of the elite badminton players in Sweden were noted to have disabling painful condition of the Achilles region over a period of 5 years\(^10\).

This study on the contrary, found only 1 out of 58 badminton players (<2%) who had complaint related to the Achilles tendon for the whole duration of this study. Confirmation by ultrasound was done. Postulation in the different rate of Achilles tendon injury between these 2 groups could not be made at this point. They were not comparable with regards to age group, training regimes and level of skills among other things.

Shoulder pain was also reported to be common among adult recreational badminton players in Sweden\(^11\) and in a small Malaysian study of recreational players\(^12\). It was found that 52% of the Swedish players had or were experiencing shoulder pain on their dominant shoulder. In this present study however only 1 case (<2%) of shoulder pain was recorded. The stark difference in the number of injury to the shoulder and Achilles tendon between this study and other foreign study needs to be explored further.

Considering the study design used by the Nordic researcher, it is not surprising that they did not manage to register a high incidence of sprains and strain. Most sprains and strains healed spontaneously without much intervention and may not be worthy of medical attention. Self registry and hospital registry that had been used inevitably failed to detect these injuries as players often neglect to report the commonly encountered sprains and strains. This is
especially so when retrospective data collection is done because players will not even remember the minor incidences of sprains and strains.

This could also explain why back injury made up 25% of cases in this present study as opposed to Kroner’s⁶ figure of 1.8%. Back pain is by and large due to sprains and strains that are usually brushed aside by players once they are asymptomatic. According to the findings from this study, back pain was actually the second commonest site of injury after the knee.

The only similarity found between this study and the Nordic papers in terms of injury pattern was that the lower limb was the commonest site of injuries²,⁶,¹³. However, unlike the Danish players²,⁶, knee injuries in Malaysian players were noted to be comparatively more prevalent than ankle injuries. The higher incident of Osgood-Schlatter disease exacerbation among this group of players could probably account for this observation.

The difference in age, geographical factors, training regimes, musculoskeletal maturity and level of skill can also give rise to the discrepancy in badminton injury pattern of the Malaysian players compared to their Nordic counterparts, bearing in mind the variable implications of study designs or tools used in data collection.

The main limitation encountered in this study was the difficulty getting all injured players to attend the weekly clinic as their training venue differs from group to group, thus few of the injuries outcome were known. Injuries of those players training away from the sports complex could very well be under reported.

Ideally, performance in their sports specific drills should be the milestone before returning a player to play. However, it was difficult for the physician to determine the precise point in time to allow return to play, not without weekly contact with each of the player at the very least. This was especially so when dealing with competitive players who habitually trained a couple of sessions almost daily, the tendency to participate fully without medical clearance
was high. Thus, the players were usually arbitrarily allowed to return to sports when they
denied difficulties in keeping up with the rest of the team during training.

The doctrine of returning an athlete to sports only when pain free, may not be extendable to
all level of players in all settings. Even among the injured Danish elite and recreational
players, 92% of them were playing with their injuries. Dennis Caine et al concurred that
while being a useful measure for gauging the injury severity, RTP time was also determined
by personal motivation, peer influence or coaching staffs’ behaviours. This would explain
why most of the players were symptomatic on RTP.

Despite that half of the injuries were returned to play within 1 week and classified as mild,
it was by no means a reflection of the injury severity in terms of medical diagnosis. A player
with fractured phalanx in the non-dominant hand can easily resume training in a day or two,
whereas a player with severe strain of the quadriceps can only do so after more than a week.
However, gauging injury severity by time needed to return to play is still important in order
to identify injury that is most costly with regards to time loss in training. From this study it
showed that preventive measures for sprains and strains should take precedence over other
interventions in the training of these groups of young badminton players.
Conclusions

In this 1 year prospective study, 58 badminton players were followed up and a total of 63 injuries were recorded. Injury incidence of the youth badminton players was 1.09 injuries/player/year and 0.9 injuries/player/1000 training hours. Lower limb injuries predominated (69.8%) the injury distribution, in which the knee was the most common site. Most injuries were considered mild but half of the players actually returned to play with residual symptoms.

This study had cast doubt on the common belief that overuse injuries were more commonly seen in badminton players. Even though overuse injuries were found almost exclusively in the lower limb and the lower limb was the commonest site of injury, badminton injuries were still predominantly of sprains and strains.

Epidemiological studies of injuries should be best done with the purpose of monitoring injury trends and not merely for comparing injury rates between different sports or populations. Injury epidemiological studies are better suited to serve as a tool in gauging efficacy of preventive interventions or in identifying existing injury risk factors.

- Badminton injury differs from region to region and also from study to study within the same region.
- Design- matched researches are required for the study of sports injuries in order to make comparison.
- Badminton injuries are commonly from sprains and strains.
- Lower limb was the most commonly injured.
- Sports injury incidences are most often being underestimated.
REFERENCES


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Table 1. Breakdown of injury by diagnosis and anatomical site.

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Figure 1. Incidence of injuries by anatomical region

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