



Prevalence of Musculoskeletal Injuries among Adolescent Recreational Netballers in Kwa-Zulu Natal, South Africa

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Authors' contributions

This work was carried out in collaboration between all authors. Authors TJE, HJVH and PDR designed the study, while authors KTS, LTNZ and TJE wrote the protocol. Author TJE drafted the manuscript. Authors TJE, KTS and LTNZ managed the literature searches. Authors KTS and LTNZ collected the data. Analyses of the study were performed by authors HJVH and TJE. All authors read and approved the final manuscript.

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ABSTRACT

Background: Netball injuries remain an area of concern for professional and recreational South African players. This study profiled the prevalence of acute musculoskeletal injuries among female adolescent non-elite recreational netball players in Kwa-Zulu Natal, South Africa.

Materials and Methods: Data were collected from 413 high school players who participated in the Kwa-Zulu Natal Netball School league. Players completed a self-reporting questionnaire for demographic information, acute musculoskeletal injuries and training history, mechanism of injury, types and nature of symptom, and severity of pain during the previous 12 months.

Results: Two hundred and fifty-eight (62.0%) players sustained acute musculoskeletal injuries, with the knee (31%) and ankle (23.7%) injuries being the most prevalent. The mechanisms producing

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the musculoskeletal injuries were poor landing (37.8%), being pushed by an opponent (22.7%), colliding with a team mate (20.8%) and rapid rotational movement (18.5%). The injured netballers have played netball for longer period of years than uninjured players ($p < 0.05$).

Conclusion: Netballers have a high prevalence of acute musculoskeletal injuries, which are predominant in the knee and ankle.

Keywords: Netball; musculoskeletal injury; adolescents.

1. INTRODUCTION

Netball is a popular female sport in South African, New Zealand and Australia [1,2]. Australia and South Africa have 455 000 and 500 000 female netball players respectively who participate in their country's annual netball leagues [1,3]. Netball is a dynamic and physically demanding sport that requires players to perform jumping, breaking/stopping, lunging and leaping movements, which can predispose players to lower limb injuries [4]. Epidemiological studies, among netballers have identified the ankle and knee as vulnerable anatomical sites, with the ankle being more commonly injured [5-8]. Gianotti et al. [9] reported that next to basketball, netball produces the highest number of knee injuries among females. In addition, the number of injuries sustained from netball is greater than those contracted from touch rugby and hockey [3,9].

Both intrinsic and extrinsic factors contribute to injuries in netballers. The intrinsic factors include increased body mass, stature, body mass index and percentage body fat while the extrinsic factors include poor landing techniques, colliding with players, struck with ball and rapid, changing of direction [2,5,10]. McManus et al. [3] and Delextrat and Gross-Sampson [11] reported that failure to adequately warm-up and practice for a netball game increases the risk of injury, while training for more than four hours per week and being injury free in a preceding season (previous 12 months) serves as protective mechanisms against injuries.

To date, majority of netball epidemiological research has focused on elite players and the conclusions may not be applicable to non-elite recreational players. This is because elite netballers have more years of experience and proficiency with better netball motor skills, have access to better playing surfaces, have expert coaches and receive better medical and rehabilitative care compared with non-elite counterparts. This study, therefore, seeks to determine the prevalence of musculoskeletal

injuries among a cross-section of adolescent non-elite netballers in Kwa-Zulu Natal, South Africa. This knowledge will help players, coaches and parents to improve their training regimes and prevent injuries.

2. METHODOLOGY

School netball players between the ages of 13-17 years participated in a retrospective musculoskeletal injury survey. Participation in this study was entirely voluntary and based on personal and parental informed consent. Ethical approval was obtained from the School of Health Science Research Committee, University of Kwa-Zulu Natal (SHSEC 008/12). The Kwa-Zulu Natal Netball School League extends from the urban eThekweni schools to the rural schools of the Umgungundlovu Districts, and comprised 80 schools with 560 players. All the 80 schools in the school netball league were invited to participate in the study via telephonic and electronic correspondence. Fifty-nine schools voluntarily accepted and identified specific dates for participation. In all, 413 players participated in the study. Inclusion criteria were as follows: being a female netball player, age between 13-17 years, and parental and personal consent. Each participant was accessed by using structured questionnaires. Two well-trained research assistants who were fluent in English, Afrikaans and IsiZulu languages were available to assist the participants.

The data collected included demographic details (age and race), body mass and stature, and training and netball injury histories. The players' history of netball-related musculoskeletal injuries was obtained by using a self-reporting musculoskeletal injury questionnaire adapted from Van Heerden [12], and, was divided into the following parts: training history (frequency, duration and intensity of practise and game participation) and acute netball injury.

Acute musculoskeletal injury was defined as distress or pain as a result of playing netball that prevented one from physical activity for a

minimum period of 24 hours during the previous 12 months. The anatomical site of the injury, types of symptom experienced when injured (dull aching, discomfort, sharp, pins and needles, numbness, burning and radiating), the severity of the pain and the predisposing mechanism of injury were recorded. Severity of pain was measured by the Kee and Seo [13] pain rating scale, which ranged from 1-5. A score of 1, 2, 3, 4 and 5 indicated no pain, mild, moderate, severe and the worst pain ever experienced respectively [13].

Players were requested to indicate only those musculoskeletal injuries sustained while playing netball during the previous 12 months, and not those contracted from other sport and/or recreational activities. Non-injured player was defined as a player who did not sustain netball related musculoskeletal injury within the previous 12 months.

Continuous data were presented as mean±standard deviation while discontinuous data were presented as frequencies and percentages. Continuous data were compared using two-tailed T-tests adjusted for equal variance; the Levene's test was used to assess the homogeneity variance. Discontinuous data were compared using chi-square tests (X^2). The probability level for all statistical analyses was set at $p \leq 0.05$. The software used for the analysis was Microsoft Excel2010.lnk.

3. RESULTS

The results are presented in the following sequence; demographic details, and training history (Table 1), anatomical site of acute musculoskeletal injuries, severity of associated pain, type of acute injury symptoms, mechanism of musculoskeletal injury. The mechanism of musculoskeletal injury was divided into poor landing, collision with another player, rapid

rotational movement and being pushed by an opponent (Table 2).

The majority of the players were of African (64.18%) descent, followed by White (23.97%), Colored (8.95%) and Indian (2.9%). The injured and non-injured players' age, body mass, stature and body mass index were not significantly different (Table 1). The number of years of playing netball was significantly higher for the injured players than non-injured players ($p < 0.05$) (Table 1). The training history of the injured and non-injured players in regards to the number of months they played netball, number of sessions per week and duration of sessions were similar (Table 1).

Table 2 indicates the prevalence of musculoskeletal injuries and the mechanisms of injury in different anatomical sites. Sixty-two percent of the netballers ($n=258$) sustained injury within the last 12 months. Injuries to the knee and ankle were most susceptible, followed by the lumbar hip complex, elbow/forearm, foot, and shoulder injuries, with neck injuries being least affected. The injury mechanisms that contributed to the prevalence of the various musculoskeletal injuries are poor landing, colliding with a team mate, rapid rotational movements and being pushed by opponents (Table 2).

Analysis of the severity of musculoskeletal pain (as measured by Kee and Seo scale) showed that moderate pain was the most prevalent (32.9%), followed by no pain (27.3%), mild pain (27.0%), and severe pain (11.3%), with the worst pain ever experienced (1.2%) being the least prevalent. The most common acute musculoskeletal injury symptoms reported by the players were discomfort (19.4%), followed by swelling (18.3%), pins and needles (14.4%), numbness (13.2%), burning (12.3%), dull aching (11.1%), sharp (7.5%) and radiating pain (3.3%).

Table 1. The demographic and training details of the non-injured and injured players

Demographics	Non-injured (n=155)	Injured (n=258)	(t-test)
Age (years)	15.5±1.4	15.5±1.3	0.7
Body mass (kg)	60.0±12.3	61.0±12.6	0.5
Stature (m)	1.34±0.06	1.27±0.06	0.2
Body Mass Index (kg/m ²)	23.2±4.9	23.2±5.2	0.9
No. of years playing netball (years)	4.6±2.5	5.3±2.7	0.008*
No. of months playing netball	5.4±3.2	5.5±3.4	0.9
No. of sessions/week	2.6±1.0	2.7±1.1	0.1
Duration of session (min.)	96.0±40.6	99.6±38.2	0.3

* $p < 0.05$

Table 2. The prevalence of musculoskeletal injuries and their mechanisms in different anatomical sites

Anatomical site	Musculoskeletal injury 258(62)	Colliding with a team mate n(20.8)	Poor landing n(37.8)	Rapid rotational movements n(18.5)	Being pushed by opponents n(22.7)
Neck	36(4.8)	15	9	7	7
Shoulder	52(6.9)	10	14	6	8
Elbow/forearm	85(11.3)	16	22	11	20
Lumbar-hip complex	103(13.8)	68	133	59	78
Knee joint	232(31.0)	68	133	59	78
Ankle	177(23.7)	57	112	54	62
Foot	61(8.1)	11	21	5	16

Data are presented as frequencies (outside parenthesis) and percentages (in parenthesis)

4. DISCUSSION

The results will be discussed as follows; acute musculoskeletal injuries and training history. Acute musculoskeletal injuries will incorporate the mechanism of injury.

4.1 Musculoskeletal Injury

The players' lower extremities experienced the most injury, which confers with previous literature that indicated problems in the lumbar hip complex, knee joint, ankle and foot [2,5,6]. The most vulnerable anatomical site of acute injury in the present study was the knee, which differs from the previous studies, which indicated the ankle joint as the most common injured site [8,9]. Most players who sustained acute knee injuries cited poor landing as the primary mechanism of injury. This finding corresponds with Stuelcken et al. [2]. Single leg landing, which is common in netball, produces a large valgus force on the knee in the frontal plane, facilitating medial deviation of the tibia away from the femur [2], which can tear the medial collateral ligament and medial meniscus [9]. It is recommended that netball players be taught Saunders et al. therapeutic intervention programme, which emphasizes proper landing technique that has been reported to cause significant reduction in the incidence of ankle and knee injuries among adolescence netballers after the implementation [5].

The ankle was the second most prominent injury site, and this finding confers with Saunders et al. [5] and De Klerk [6]. The netballers who sustained ankle injuries also cited poor landing as the main cause of the injuries. The pathomechanics of ankle sprains begins when

the ankle joint moves from dorsi to maximum plantar flexion and inversion, which places the mortise in the vulnerable position susceptible to injury because the anterior talofibular ligament and calcaneofibular ligament are maximally stretched [2]. Delayed concentric contraction, of the fibularis muscles, to rapidly evert the foot, results in an inversion sprain [2]. It is recommended that neuromuscular exercises be prescribed to increase nerve activation of the fibularis muscles, to rapidly evert the foot upon landing, and thereby preventing an inversion sprain [14].

4.2 Training History

Comparison of the training histories between the non-injured and injured players revealed no statistical significance, indicating that training history was not associated with injury. However, the number of years of playing netball differed significantly between the two groups, with injured group having played netball for a longer period of time. The number of years of playing netball and its relation to injury is controversial. McManus et al. [3] and Delextrat and Gross-Sampson [11] reported that increased number of years of playing netball translated into improved motor skills, which reduces the occurrence of musculoskeletal injury. Dick et al. [15] proposed that the more often sport is played, the greater the incidence of micro-tearing of ligaments and muscle tissue around joints, which destabilizes the musculoskeletal integrity. It was proposed that continuous exercising for prolonged periods, reduces the healing time needed by the sprained ligaments and strained muscles to recover which increased the severity of the injury [15]. Physical therapists, athletic trainers and biokineticists suggest that periodization of sport and training is

therefore essential to eliminate injuries [14]. Further research should be conducted to resolve the controversy surrounding this issue.

5. CONCLUSION

Netball players experienced a high prevalence of acute knee and ankle musculoskeletal injuries. The limitation of this cross sectional study is its retrospective nature. It is recommended that future prospective cross sectional studies be conducted to determine the nature and mechanism of netball injuries among non-elite adolescent females.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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