

# CHAPTER I

## INTRODUCTION

### 1. Rationale

Badminton is one of the most popular sports due to its simplicity and affordable equipment making it accessible to a wide range of people. Although badminton is a non-contact sport, it requires players to frequently lunge, jump and rapidly change directions during play. If players do not perform with appropriate techniques, related injuries are more likely to occur. Badminton related injuries occur with relative low frequency (4 – 5%) during one year period compared to other sports; however more severity of injury was reported and correlated with a long period of treatment and rehabilitation (1, 2). Higher rate of injuries were reported among Thai recreational and junior badminton players with 42% of recreational (3) and 25.6% of junior players (4) experienced knee injuries. In previous reports for other racket sports, the knee and the ankle were the most frequently injured joints during jumping and landing motion (5, 6). Some types of knee injuries occur more frequently in female such as anterior cruciate ligament (ACL) injury (7-11) and anterior knee pain (12). However, gender effect on knee biomechanics during badminton athletic tasks has not been reported.

Two typical techniques often performed during badminton play include the jump smash and net lift. The forehand overhead jump smash is the most powerful and effective stroke employed to win a point advantage. A deep lunge during net lift shot for return drop shuttle is often used to move the player to the front court. Lunging increases risk of injuries to the lower limbs because body weight is transferred to the

front leg, applying more tibiofemoral shear force and patellofemoral compressive force to a bended knee. Sudden stop movement and/or rapid changes in direction (cutting) after foot contact with the ground is associated with lunging movement. The cutting and landing mechanisms have been reported to be the most common way of incurring non-contact ACL injury or other knee injuries (13).

During competition, the knee muscle strength is essential for rapid footwork and control of the leg while landing from a jump. The quadriceps muscle acts as an antagonist to the ACL and it increases the anterior shear force on the tibia, whereas, the hamstrings muscle acts as an agonist to the ACL and it prevents the excessive anterior translation of the tibia on the femur. The hamstrings/quadriceps ratio (H/Q ratio) is commonly used to indicate balance of the knee muscles, where a low H/Q ratio indicating a higher risk of knee injury (11).

Examining kinematics differences between male and female junior level badminton players are of interest in the present study because this group of young athletes is more prone to injury as proper movement technique and skill development have not been well-developed. The knowledge gained from examining the lower extremity kinematics and knee muscle strength in this group of badminton players may be beneficial to coaches and therapists to prescribe exercise programs for preventing knee and other lower extremity injuries in junior badminton players.

## **2. Purposes of the study**

1. To examine and compare the knee joint angles in 3 directions (flexion/extension, valgus/varus, and external/internal rotation) during the jump smash and net lift tasks between the junior female and male badminton players.
2. To examine and compare the hamstrings and quadriceps muscle strength between the junior female and male badminton players.

## **3. Hypotheses of the study**

1. There would be differences between the junior female and male badminton players in the knee joint kinematics in 3 directions (flexion/extension, valgus/varus, and external/internal rotation) during the jump smash and net lift tasks.
2. There would be differences between the junior female and male badminton players in the hamstrings and quadriceps muscles strength.

## **4. Advantages of the study**

The results of the study may provide useful information about the lower extremity kinematics during performing two badminton techniques: jump smash and net lift, and other factors related to sport performance i.e., knee muscle strength of the junior Thai badminton players. The knowledge gained from present study may be of use by badminton coaches to improve the movement techniques of this players group and to design exercise programs for preventing knee and other lower extremity injuries in the future.