The Effect of Fatigue on ACL injury Risk During Simulated Competition

1. This is a single subject design that will require only one subject for completion. One recreationally active male basketball player will be recruited for this study. This participant will be required to have high school basketball experience, currently playing recreational basketball at least three times a week, and be free from any current lower extremity injury. We chose a trained experienced male basketball player in order to further minimize the already low risk of injury associated with participation in the study. Because the experiment will attempt to recreate the conditions of a basketball game, the subject will not be exposed to any risk that is not present during basketball competition, an activity in which the subject frequently engages.
2. The subject will be recruited verbally from players who typically play basketball at the Texas State University Student Recreation Center. The subject will be asked to sign a consent form that will explain the risks and benefits of the study and discloses all details of the experiment before the initiation of the study.
3. The subject will be required to participate in 3 testing sessions each separated by one week. During these sessions we will measure vertical jump height and three dimensional (3-D) hip and knee angles before and after the administration of a fatigue protocol. Heart rate will also be measured continuously throughout the 3 testing sessions.

On the testing days the subject will be asked to report to the lab and complete a dynamic warm-up followed by the assessment of vertical jump height using the Vertec vertical jump testing device (Sports Imports,Inc., Columbus, OH, USA).. Immediately after vertical jump height is determined the subject will complete 5 successful pre-fatigued unilateral and bilateral landing trials. The trials will consist of jumping and touching a target at 50% of his maximum vertical jump followed by a landing onto a force plate (AMTI force plate; OR6-6-1, AMTI corp., Watertown, MA, USA) positioned 70 cm from the starting position. The type of landing will be governed by a light switch that will be triggered upon take off and randomly signal for either a unilateral or bilateral landing. A successful trial will require the subject to touch the point marked 50% of maximum vertical jump and land onto the force plate performing the correct signaled landing followed by a vertical jump out of the landing postition. After five successful pre-fatigued landing trials are recorded for each landing the fatigue protocol will be administered. The post landing trials will be administered immediately after the completion of the fatigue protocol in an identical fashion as the pre-fatigue landings. During these landing trials the subject will have 3 electromagnetic sensors (Ascension’s Flock of Birds; Ascension Technologies Inc, Burlington, Vt) attached to the sacrum, lateral thigh, and medial shank to measure hip and knee joint angles on the The Motion Monitor for Research (Innovative Sports Training, Inc., Chicago, IL, USA).

The fatigue protocols will consist of : (1) a simulation basketball game that is designed to represent participation in a 40 minute college basketball game, (2) a general fatigue protocol that consists of continuous maximal voluntary concentric contractions of both the hamstrings and quadriceps on a isokinetic dynamometer (Biodex System 4 Pro, Biodex, Inc, Shirley, NY) until fatigue (Thomas et al., 2010), and (3) a functional fatigue protocol that consist of alternating unilateral landings with bilateral squats until squats can no longer be completed (Borotikar et al., 2008; Madigan & Pidcoe, 2003; McLean & Samorezov, 2009).

1. There is minimal risk involved with participation in this study. With the exception of the basketball game these fatigue protocols have been utilized in previous research (Borotikar et al., 2008; Madigan & Pidcoe, 2003; McLean & Samorezov, 2009; Nyland et al., 1999; Thomas et al., 2010) with no reported injury during testing. These submaximal landings the subject will complete are common in sports participation and represent movement that may cause injury during dynamic sports competition. However, since the subject has played basketball multiple times a week for several years with no reported injury, it can be concluded that the risk for injury is minimal.
2. In order to minimize the risk associated with the study we chose a male basketball player with college basketball experience as the study subject. The reported ACL injury rate for a male collegiate basketball player is 1 injury per 25,000 exposures (Agel, Arendt & Bershadsky, 2005) which is defined as participation in a game or practice. Therefore, through utilization of this subject the risk for injury is minimized and is highly unlikely.
3. The results of this study could potentially lead to a greater understanding of the contribution of fatigue to ACL injury risk. This line of research is important in the development of improved ACL injury prevention programs. There is a current lack of knowledge as to how fatigue contributes to ACL injury risk and this study will compare different types of fatigue models to actual competition which no other study in the current literature has done.
4. No compensation will be provided to the subject for participation in the study.
5. The risk of injury to the subject as a result of participation in this experiment is very small and the potential contribution to the body of knowledge on ACL injuries could aid in the prevention of ACL injury in young athletes.
6. The experiment will be performed in the Biomechanics/Sports Medicine Laboratory at Jowers Center at Texas State University with permission from the Department of Health and Human Performance.
7. This experiment is being conducted in order to satisfy my thesis requirement for a masters degree in Physical Education. I am working under the supervision of Dr. Duane Knudson.
8. Attached
9. This study has not been approved/reviewed by another IRB.
10. Since the results of this study could potentially aid in the advancement of knowledge on the effect of fatigue on ACL injury risk the results will be distributed to anyone who is interested. No personal information about the subject will be distributed without prior permission of the subject himself.