THE RELATIONSHIP OF PHYSICAL ACTIVITY, INJURY, AND SUCCESS OF RODEO ATHLETES

By

AMANDA J. SINCLAIR

Bachelor of Arts
Adams State College
Alamosa, Colorado
1994

Master of Arts
San Jose State University
San Jose, California
1997

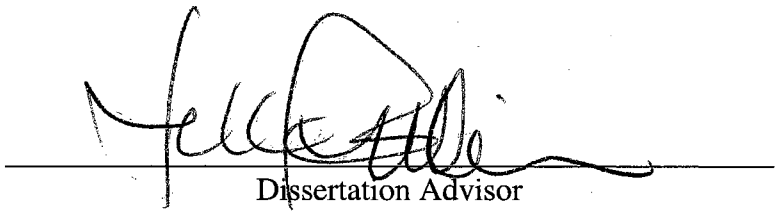
Submitted to the Faculty of the
Graduate College of
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
DOCTOR OF EDUCATION
December, 2001

THE RELATIONSHIP OF PHYSICAL ACTIVITY,

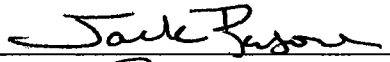
INJURY, AND SUCCESS OF

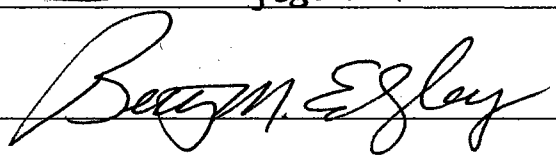
RODEO ATHLETES

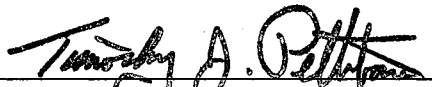
Dissertation Approved:



Dissertation Advisor







Dean of the Graduate College

ACKNOWLEDGEMENTS

I give much gratitude to my entire family whose love and encouragement continues to be irreplaceable. I would like to thank Don Andrews and Rick Foster of the Justin Sportsmedicine Team for their incredible support throughout this study. Big thanks go to the other Team members, Ted Bryant, Bill Chambers, J. Pat Evans, Lisa Herring, and Bill Zeigler, without whom I would still be searching for volunteers. Of course, Chad Smidt I am your biggest fan--thanks for your words of wisdom and help. Chrissy Lacy deserves my many words of gratitude as well for her help. Connie Ransone thanks for keeping my spirits up—again! To my cowboy volunteers, I greatly appreciate the time you spent making this study possible.

Last but not least, there would not have been a study without the help of my doctoral committee. Dr. Betty Edgely, you are one in a million and I appreciate your shoulders—even on Sunday morning! Dr. Frank Kulling your plug theory will continue to offer me many hours of comic relief—thanks for your time and patience with our venture into the world of rodeo research. Dr. Janice Miller, I appreciate your excitement and support of my topic. Dr. Jack Ransone, I guess your coat tails are finally free—even though bumpy at times, you will never know just how much I appreciate the ride.

TABLE OF CONTENTS

Chapter Page

LIST OF TABLES

LIST OF FIGURES

Chapter 1

Introduction

Professional rodeo is the only sport in the modern era that finds its roots in a way of life—ranching (Professional Rodeo Cowboys Association [PRCA], 2000). Ranching skills were first introduced to the public through wild-west shows, such as those presented by Buffalo Bill Cody (Rosa & May, 1989). Organized rodeo sporting events as recognized today are thought to have originated in 1864 in Deer Trail, CO. (Harvey, Foster, Koehler, Smidt, 1995; PRCA). It wasn't until the early 1900's that the sport gained recognition and rodeos began taking place in the west. The rodeo athletes, or cowboys as they are more commonly called, formed their first formal organization in 1929 when the Rodeo Association of America was founded. In 1937, the Cowboys Turtle Association formed, then changed its name to the Rodeo Cowboys Association in 1945, and finally decided on its current name, the Professional Rodeo Cowboys Association (PRCA), in 1975. Today, in the United States, the PRCA, the Women's Professional Rodeo Association (WPRA), and the International Professional Rodeo Association (IPRA) are the largest professional rodeo organizations (Harvey, Foster, Koehler, Smidt; PRCA).

The rodeo athletes compete for a portion of the prize money in long-go (elimination) and short-go (final) rounds of competition. Their earnings in sanctioned (sponsored) events are tracked by the organization to determine their ranking in their event and to ultimately qualify them for their national final event. This final event for the PRCA is the National Finals Rodeo (NFR) held annually during the beginning of December in Las Vegas, NV (PRCA, 2000). Rough stock athletes are allowed to qualify

(add up) earnings from up to 125 rodeos per year, while timed event athletes can qualify from up to 100 rodeos per year. The rodeo season for the PRCA runs from the beginning of November until the beginning of the following November, which is the earnings qualifying period followed by the championship rodeo, the NFR during the beginning of December (PRCA).

Since 1990, the popularity of rodeo has increased tremendously. Exposure to rodeo has increased primarily due to the broadcasting of events on television. In 1990 ESPN/espn2 developed a Summer Season Series of rodeos that broadcast during the prime season of rodeo. In 2000, ESPN/espn2 also began a Winter Series for broadcasting. Begun in 2000, the Wrangler Pro Rodeo Tour is a set of eight rodeos broadcast exclusively on TNN. In 1999, approximately nine million viewers watched the NFR on ESPN/espn2 and approximately 17 million viewed other PRCA rodeos on television (PRCA, 2000).

Although the cowboy way of life appears to be glamorous, the athletes have a great demand on their time and body due to traveling, trying to make it from rodeo to rodeo to increase their earnings. The athletes drive solo, in pairs or groups, and sometimes fly. It is not unheard of for an athlete to compete in two to three different rodeos in a weekend, and at times, if necessary, will make it to four rodeos (Evans and Freeman, 1995). The athlete's standing near the end of the season dictates whether or not he must attend more rodeos in order to make it to the top ten in earnings to qualify for the NFR.

The amount of time spent traveling thousands of miles during a season places a heavy burden on the physical and mental well-being of the athlete—keeping them cooped

up in vehicles or airplanes for long periods of time, sleeping in hotels and trailers, and eating on the road. This burden challenges their ability to stay healthy and conditioned for their sport, unlike traditional athletes that typically have regularly scheduled practices and only three to four events per week (Evans & Freeman, 1995).

Although there are several descriptive publications on rodeo injury types and frequencies (Evans & Freeman, 1995; Griffin, Peterson, & Halseth 1983; Griffin, Peterson, Halseth & Reynolds, 1987; Harvey, Foster, Koehler, & Smidt, 1995; Hilscher, 1999; Meyers, 1990; Meyers, Elledge, Sterling, & Tolson, 1990; Nebergall, 1996), the physiological demand of rodeo events on the athletes is not well documented. There is even less documentation of physical conditioning patterns of rodeo athletes or recommended exercise protocols (Copley, 1987; Meyers, Elledge, Sterling and Tolson,1990; Raether, Sanders, & Antonio, 2000; Tuza, 1985). Although some veterans of the sport have recognized the value of conditioning, anecdotal evidence does not show conditioning to be well accepted by rodeo athletes. During the ninth round of the 2000 NFR broadcast, seven-time World Champion All-Around Cowboy Ty Murray announced

> " ...I think that [working out] is so important in this sport. In this sport you don't have [personal] trainers and coaches that are having you go to practice and making you stay in shape—you know you gotta do it yourself. Not only does it make you a better athlete and make you stronger and cut down on injuries, but that 2 hours a day that you are working out, you're thinking about getting better at your sport" (Winnercomm, 2000).

Participating in physical activity can help to develop the strength, speed, agility and proprioception of an athlete (American College of Sports Medicine, 2000; Fleck & Falkel, 1986;Kraemer, Duncan & Volek, 1998; Stone, 1990). The more conditioned the athlete is in these types of skills, the better they will perform and the more successful they will be. Being physically fit by working out can also assist in injury prevention or decreasing the severity of an injury if it occurs (Arnheim & Prentice, 1999; Fleck & Falkel; Griffin, Peterson, Halseth, & Reynolds, 1987; Stone, 1990). Conditioning and strength training may be the key to improving performance and reducing the risk of injury in spite of the travel and lifestyle demands of competing as a rodeo athlete. By presenting information regarding the relationship between physical condition, injury and success, rodeo athletes may be more inclined to participate in a regular conditioning program.

Statement of the Problem

The purpose of this study was to determine the physical activity levels for male rodeo athletes competing in six rodeo events and to assess the relation of this activity to their rate of injury and success in competition. A second purpose was to determine if there was a difference in physical activity level between groups.

Delimitations

Certain delimitations set by the investigator may have affected the results and conclusion drawn from this study. The investigator acknowledged the following delimitations:

1. Volunteer male PRCA member rodeo athletes served as subjects due to their availability at events located near the investigator.

2. A modified version of the Canada Fitness Survey (Canadian Fitness and Lifestyle Institute, Ottawa, Ontario, Canada, 1983) was used to address necessary changes to meet the lifestyle indications of the selected population.
3. In order to improve the accuracy and increase the activity choices, the metabolic rates for the selected activities were taken from the most recent published compendium by Ainsworth et al (2000) rather than the 1997 activity list supplied with the Canada Fitness survey. Only activities with published metabolic rates were included in the calculations.
4. Surveys were administered at five rodeo events sanctioned by the PRCA and located near the principle investigator.
5. Subjects were grouped into six categories, two of which were multiple event groups. Calf ropers, team ropers, and those ropers who competed in either another roping event and/or steer wrestling were placed in the timed event group. This grouping was made as it represents the population more adequately since a large proportion of the timed event athletes compete in at least two of the timed events rather than a single roping event (D. Andrews, personal communication, June 6, 2001). The rough stock group consisted of rodeo athletes who participated in two or more of the rough stock events (saddle bronc riding, bareback riding, and bullriding).

Limitations

The limitations set in this study reflect the effect the delimiting factors may have had on the collection of data and the ability to infer beyond the sample population included in this study.

1. Inferences are unable to be made beyond the tested population. Generalizations cannot be made to adolescent, geriatric, women, amateur, other organizations, other sports, and other inactive, active, and athletic populations.
2. No inferences can be made as to the exact level of physiological fitness because there is not conclusive evidence as to the exact relationship between this self-reported physical assessment and physiological measurements. Several of the metabolic measurements have not been directly calculated, but have been derived from similar activities, again indicating the inability to determine exact level of fitness (Ainsworth et al, 2000).
3. Inferences made from this study related to earnings as a measure of success in rodeo competition cannot be made outside the 2001 season, as the total available earnings change per PRCA season (PRCA, 2000).
4. Exact validity of the Canada Fitness Survey was not available; however, the instrument has been used in nationwide physical activity epidemiological studies in Canada (Canadian Fitness and Lifestyle in Canada, Fitness and Lifestyle in Canada, 1983, Canadian Fitness and Lifestyle Research Institute, Ottawa, Ontario, Canada; Stephens, et al., 1986a; Stephens, et al., 1986b).

Assumptions

The following statements were assumed to be true in order to analyze the data of this study:

1. The subjects answered the survey questions with their best, honest effort. The subjects were able to select the appropriate activity for the survey questions.
2. The investigator's attitude and assistance were not biased toward a particular subject or physical activity selection.
3. The subjects represented a normal distribution of the sample population.
4. MET values used were representative of the way the athlete performed the activity, as actual energy expenditure can vary between individuals doing the same activity (Kriska & Casperson, 1997).

Hypotheses

1. There will not be a significant interrelationship among physical activity level (MET calculation), injury rate and success rate (as represented by season earnings) of rodeo athletes.
2. There will not be a significant difference in physical activity level (MET calculation) between timed event athletes, steer wrestlers, saddle bronc riders, bareback riders, bull riders, or multiple event rough stock athletes.

Significance of the Study

Rodeo competition has increased in popularity over the past fifteen years with an increase in participation, number of sanctioned rodeos, and medical care. With the formation of the traveling rodeo sports medicine trailers, care for the PRCA rodeo athlete has dramatically improved, however, the baseline body of knowledge relating specifically

to rodeo sports medicine is limited and provides limited evidence for the medical team to use other than practical experience (Evans, & Freeman, 1995; Gauthier, 1986). Providing baseline evidence relating to rodeo athlete physical activity level and its relationship to injury and success rate may give evidence of the need for developing accurate and beneficial workout protocols for the athlete as well as providing a means for encouraging the use of the protocols by the rodeo athletes. Understanding the physical activities of the various events will also aid in workout protocol development for each group.

Definition of Terms

Box—corner of the space on both sides of the chute for a calf and steer. Marked off by two 3' high wooden walls as the starting place for ropers and steer wrestlers.

Bronc—a semi-wild horse.

Bull rope—a braided rope with a woven-in handle wrapped around the girth of the bull and the hand of the bull rider to provide a handle for the bull rider. The wider and tighter woven ropes resist twisting help to prevent the bull rider from getting "hung up" (Harvey, Foster, Koehler, & Smidt, 1995).

Dally—the process of looping the rope around the saddle horn in order to secure the rope after catching a calf or steer (S. Honeycutt, personal communication, March 22, 2001).

Earnings—prize money won at PRCA sanctioned events that is used as the deciding factor for qualifying for the NFR. The amount of money at each rodeo varies, depending on entry fees, sponsor donations, and other donations to the total purse. The earnings of each rodeo athlete is reported to the PRCA headquarters where their total earnings are kept track of to determine who is ranked in which place (PRCA, 2001).

Flank—when a calf roper lifts a calf by the rear of the shoulder and the front of the hip and lays it on its side (S. Honeycutt, personal communication, March 22, 2001).

Go-round—an individual segment of a rodeo, similar to bracket phases of a tournament.

Halter—a leather strap placed around the head of a horse that the reins are attached to (Boyer, et al., 1983).

Hazer—a partner of the steer wrestler responsible for leaving the box with the steer in order to keep ("haze") the steer moving in a straight line (PRCA, 2000).

Header—the first roper in the team roping competition. The header is responsible for roping the horns of the steer and turning the steer for his partner (Professional Rodeo Cowboys Association, 2000).

Heeler—the second roper in the team roping competition. The heeler is responsible for roping the hind legs of the steer and lifting them off the ground to complete the maneuver (PRCA, 2000).

Long-go—The initial bracket of a rodeo that includes each of the participants. The top ranked athletes in the long-go move on to the short-go.

Metabolic calculation—based on a MET which represents the resting metabolic rate of an individual. One MET is equal to 3.5ml of oxygen per kilogram of body mass per minute (1kcal/kg/h) (Kriska, & Casperson, 1997).

Permit member—an entry year member of the PRCA only allowed to enter into designated rodeos until he/she has earned $2,500.00. Once this earnings level is reached, they are eligible to become a card-carrying member of the PRCA (S. Honeycutt, personal communication, March 22, 2001; PRCA, 2000).

Pigging string—7/16" x 3' nylon rope used by calf ropers to tie the legs of the calf (S. Honeycutt, personal communication, March 22, 2001).

Rigging—broad leather and rawhide handhold with a firm handle coated with rosin. The rigging is strapped around the horse's girth for the bareback rider to hold on to during a ride (Harvey, Foster, Koehler, & Smidt, 1995).

Rough stock events—rodeo events that include saddle bronc riding, bareback riding, and bull riding. They are considered rough stock due to the animals bucking, kicking, turning and twisting during the event (PRCA, 2000).

Sanctioned event—A rodeo run by a rodeo committee that is a member of the PRCA. Each of the contracted personnel at this event are members of the PRCA. Money earned at a sanctioned event counts towards qualifying for the NFR (PRCA, 2000).

Short-go—The final bracket of a rodeo with only the top athletes from the long-go competing. This is considered to be the championship go-round for the rodeo.

Spurring—when the cowboy runs dull spurs on his heels along the neck of the horse.

Timed events—rodeo events that include the common male events of calf roping, team roping (heading and heeling), and steer wrestling. The time it takes the athlete to complete the maneuver is considered the athlete's score (PRCA, 2000).

Withers—highest point of the back of a horse between the shoulder blades, near the end of the mane (Boyer, et al., 1983).

Chapter 2

Review of Literature

With an increase in the popularity and membership in the PRCA, the rodeo athlete has more competition for reaching the pinnacle of rodeo—the NFR. Improving performance and in turn improving earnings will assist the athlete in reaching this pinnacle. However, with the risks of injury associated with rodeo, physical conditioning can also play a major role in the athlete being successful. The following literature review will present information pertaining to the reported injury rates for rodeo athletes, physical activity participation of rodeo athletes, indicators for physical activity as an injury prevention tool, the use of physical activity questionnaires, and the activity of the general population as reported by physical activity questionnaires.

Membership/Eligibility

Membership for the PRCA has seen a dramatic increase from 5,693 members in 1990 to 7,403 in 1999. PRCA sanctioned events have also increased since 1985 from 617 to 700 in 1999. Four Canadian provinces have sanctioned events with the PRCA since 1983 making the PRCA an international organization (PRCA, 2000). Once a rodeo athlete reaches the age of eighteen, he or she may apply to become a permit member of the PRCA. Once he/she earns $2,500.00, he/she is eligible to become a card-carrying member. Currently, in the PRCA the age range of the athletes is 18 years to approximately 50 years (PRCA, 2000). College students who compete in the National Intercollegiate Rodeo Association (NIRA) are also eligible to compete in the PRCA.

Events

An organized rodeo includes seven main events: barrel racing, calf roping, team roping, steer wrestling (bull dogging), saddle bronc, bareback riding, and bull riding. Barrel racing is reserved as the only women's event in the PRCA and IPRA. Calf roping, team roping (including heading and heeling), and steer wrestling are timed events, where the outcome of the event is solely based on their time for completing the maneuver. Steer roping is also included in several rodeos, but is not a mandatory event. Saddle bronc, bareback riding, and bull riding are considered rough stock events where the athlete is awarded a score for a qualified eight-second ride. This score is given on a 100 point scale, 50 points for the athlete's actions and 50 points for the animal's (PRCA, 2000).

Calf roping. During this event extending from ranch work, the cowboy and his horse work together to catch and tie a calf. The calf is given a head start out of the chute marked by a rope barrier, while the cowboy is backed into the box just behind the chute. The horse chases the calf and the cowboy ropes the calf around the neck. The cowboy quickly dismounts and runs to the calf as the horse begins to stop and back up. Next, the cowboy must flank the calf, meaning to grab the calf at the shoulder and groin and lift it over on its side. The calf must be standing in order to be flanked. The cowboy then uses a pigging string, which he has been carrying in his teeth, to tie together any three of the calf's legs. Once the legs are tied, the cowboy throws both arms in the air to indicate that he is finished and his time is stopped. The calf must remain tied for 6 seconds or no time is given. If the barrier is broken, the cowboy has false-started and is given a 10 second penalty. The PRCA record for calf roping is 5.7 seconds, with more common times in the low 7-second range (PRCA, 2001).

Team roping. This event is a team event with a header and a heeler. Both cowboys are backed into a box behind the chute holding a steer—the header on the left and the heeler on the right side of the chute. The steer is given a head start with the rope barrier in front of the header. The header and his horse chase the steer with the heeler following shortly behind. It is the header's job to rope the steer, dally his rope around the saddle horn, and turn the steer towards the left exposing the steer's hind legs towards the heeler. As soon as the header dallies, the heeler then ropes both hind legs and dallies his rope. Time stops as soon as the slack in both ropes is taken up. Disqualification occurs if the heeler ropes before the steer is turned, or either member fails to catch. A 6 second penalty is given if the heeler catches only one leg, and a 10 second penalty is given if the header breaks the barrier. The PRCA record time is 3.7 seconds, with more common times averaging in the 5-second range (PRCA, 2001).

Steer wrestling. Also known as bulldogging, steer wrestling is an event requiring a strong cowboy, a good horse and a good hazer. The steer wrestler and his horse are placed in the box on the left side of the chute holding an approximately 750 pound steer (Smith, 1976). The rope barrier is also used in this event. The hazer is placed on the right side of the chute and is expected to leave with the steer to keep the steer running in a straight direction down the arena (PRCA, 2001). Once the steer has a head start, the steer wrestler can leave the box and chase the steer at speeds near 30-40 mph (Harvey, Foster, Koehler, & Smidt, 1995; Smith, 1976). Once his horse is next to the steer, he leans over the right side of the horse and reaches for the steer's horns and dismounts his horse. If done properly, his right arm is hooked under the steer's right horn and his left arm is hooked around the head. He then digs his heels into the dirt trying to bring the

steer to a stop or change it's direction and then begin to throw the steer. The steer is then brought to the ground with all four legs on one side by lifting the right horn and pushing down the left horn. As soon as the steer is on its side, the time stops. Common times range in the 3 to 5 second range, while the PRCA record is 2.4 seconds (PRCA, 2001).

Bareback riding. Bareback riders make their 8 second ride holding onto a rigging with one hand in the palm-up position. The cowboy mounts the horse while it is held in a chute. He wears a tight leather glove covered with rosin and tied onto the wrist with a thin leather strap. The gloved hand is wedged into the handhold of the rigging for a snug fit (Harvey, Foster, Koehler, & Smidt, 1995). As soon as his hand is positioned, the cowboy places his feet above the horse's shoulders. He must hold this position until the horse lands on his first jump out of the chute, which is known as the "mark out." When the cowboy feels that he is in proper position, he nods his head and the chute opens to begin the time. After the mark out, the cowboy must begin spurring the horse by running his spurs (toes pointed out) from the front of the neck towards the withers (near the end of the mane) close to the rigging. Generally, he is in a laid back position on the horse. A disqualification occurs if the cowboy touches the animal, his equipment, or himself during the eight seconds with the free hand or fails to mark out of the chute. The rider is given a score of up to 50 points based on his spurring technique and control. The quality of the horse is also scored for up to 50 points. The scores are combined for the ride total. The PRCA record is a 93-point ride (PRCA, 2001).

Saddle bronc riding. The event developed from trying to break wild broncs, saddle bronc riding became a contest of who could look the best while doing so. The cowboy mounts the horse while in the chute and sits on a modified saddle (smaller and no

saddle horn) and holds onto a rope attached to the horse's halter. The saddle bronc rider sits in an upright position and spurs by running his spurs from the front of the horse's shoulder near the neck to the back of the saddle. The cowboy must also mark out of the chute. Disqualification occurs for the same reasons as in bareback. Scores are awarded as they are in bareback. Two 95-point rides hold the PRCA record for saddle bronc (PRCA, 2001).

Bull riding. The third and most violent rough stock event, bull riding pits man against an approximately 1,800 pound bull. The cowboy mounts the bull while in the chute. He holds on to the handle of a tightly woven bull rope covered in rosin. The cowboy wears a tight leather glove covered with rosin and tied around the wrist with a thin leather strap. His hand is placed in the bull rope and the free end of the rope is wrapped around his hand then back through his palm for a stronger grip (Harvey, Foster, Koehler, & Smidt, 1995). Once he has his hand positioned, the rider sits as far forward as possible. When ready, the nod of his head will indicate that the chute is to be opened and the eight-second ride can begin. The cowboy is not expected to spur, but it can help his score. He is scored half for control in his ride and half for the bull's performance. The bull rider will be disqualified if he touches the bull, the rope or himself with his free hand during his ride. A perfect 100 is the PRCA record (PRCA, 2001).

Physical Demands

In the calf roping event, the physical demands involve quick reaction time for starting, eye-hand coordination for roping the calf, speed and agility for dismounting the horse and moving toward the calf over rough dirt, strength for flanking the calf which weighs between 225 and 280 lbs., and quick hands for tying the pigging string (S.

Honeycutt, personal communication, March 22, 2001). The physical demands for team ropers are quick reaction time on the start, eye-hand coordination for roping the steer, and fast, accurate hands to dally the rope before the steer can react and without catching hands or fingers in the rope. Steer wrestlers tend to be the biggest athletes at the rodeo as they rely on their body mass and strength to tip over a steer weighing between 425 and 650lbs. (S. Honeycutt, personal communication, March 22, 2001; Wilkinson & Meyers, 1983). The steer wrestler also relies on upper and lower extremity strength and flexibility to hold on to the saddle while leaning over the right side until releasing the saddle to wrestle the steer.

Rough stock riders require strength in their adductor muscles of the hip and leg to help hold on to the bucking animal. The riding arm, which holds the handle or rope, must be strong to support the elbow and shoulder from the forces applied by the animal. Strength in the free arm (non-contact arm) is also important in preventing excessive whipping action of the arm during the ride. Of course, a good sense of proprioception also assists in all three rough stock events by maintaining the rider's position over the animal. It is often thought that being able to land on one's feet is the best way to prevent injury in the rough stock events (S. Honeycutt, personal communication, March 22, 2001).

Rodeo Earnings Rate

The rodeo cowboy measures success by the amount of money earned at each event and cumulatively over the course of the rodeo season. The top ten cowboys as measured by their cumulative earnings for the season are invited to participate in the NFR. During the time of this study, top earnings for the 2001 season reached $70,272 for

saddle bronc and the lowest earnings for the 50th rank were in bareback riding at $5,006. Across events, the average earnings for the number one rank was $52,352, for twenty-fifth rank was $15,566, and for fiftieth rank was $6,204. At the conclusion of the 2000 NFR, the top earnings ranged between $225,396 for the all-around cowboy to $139,000 for the bull riding (PRCA, 2001).

Rodeo Injury Rate

In 1983, Griffin, Peterson and Halseth detailed the rodeo injuries occurring at the Montana Pro Rodeo Championship Finals rodeo. The authors tracked treatment and injury records for 67 cowboys. During the event, 22 cowboys received treatment. Bull riders had the most reported injuries with seven, while the remaining two rough stock events, saddle bronc and bareback, reported the second most number of injuries with five. Calf ropers reported three injuries and steer wrestlers reported two. Team ropers reported the least number of injuries with only one report. All reported injuries were acute. Sprains and contusions were the most common injuries and occurred during or after landing. Strains, primarily to the adductors, were the next most common injury type. The remaining injuries varied from a fracture to lacerations. The cowboys reported having come to the rodeo with chronic conditions due to neglect of previous injuries or returning to participation before complete rehabilitation. Griffin et al. (1983) concluded that the cowboys need medical and rehabilitation supervision to eliminate the issues of chronic injuries.

Griffin, Peterson, Halseth and Reynolds (1987) conducted a follow-up study on rodeo injuries to the Griffin et al, 1983 study. They reported the treatment records for the cowboys at the Montana Pro Rodeo Championship Finals rodeo for the four-year period

following the 1983 (Griffin et al, 1983) study. Of the 270 cowboys, they reported treating 55 participants for 61 injuries. Again, the bull riders reported the greatest number of injuries, 20, with those injuries occurring on and dismounting the bull. Saddle bronc and bareback riders each reported 13 injuries, all due to the dismount. Five steer wrestlers reported injuries as well as five calf ropers. Team ropers only had one injury reported. Contusions, sprains, and strains were the most frequent injuries. Fractures, lacerations, abrasions, concussions and dislocations all occurred, but less frequently. Two bareback riders sustained hand fractures during their ride.

Griffin et al. (1987) reported the elbow as the most frequently injured body part. They suggested that elbow injuries were due to overloading and hyperextension during the rough stock events. The mechanism of injury for rotator cuff strains was reported as hang-ups in the bull rope or rigging. Interestingly, there were no reports of ankle injuries in this study, which the authors attributed to cowboy boot support. Many of the injuries that occurred were attributed to the animal stepping on, kicking, or hooking (hitting with a horn) the cowboy. Four of the reported injuries were caused by the animal throwing or running the cowboy into the gate, chute, or fence panels. Griffin et al. (1987) suggested that physical conditioning could be a preventative treatment for some rodeo injuries. Specifically, sprains and strains could decrease with flexibility, strength and cardiovascular conditioning.

Meyers, Elledge, Sterling, and Tolson (1990) reported a result of 79.7% of all reported injuries occurring to rough stock riders in their study of 156 male and female rodeo athletes. Bareback riders and bull riders had similar rates of injuries (36 versus 39%, respectively), however, bareback riders sustained more extremity injuries while bull

riders sustained more axial injuries. Saddle bronc riders sustained 44% of their injuries to the lower leg. Unlike both studies by Griffin et al. (1993, 1997), eight ankle injuries were seen during this study period. Meyers et al. found that 23% of the reported injuries occurred during the ride, 18% during the dismount, 9% from being hung up, and 29% due to contact with the animal during or after the dismount. Twenty-three percent of the injuries were due to chutes, gates, ropes or other equipment interactions. The injury exposure ratio found in this study was 24:1 overall, and 19:1 for steer wrestlers, but rose dramatically to 6:1 for rough stock events. A ratio for the timed events was not reported.

Examining documents from six International Finals Rodeos (N=738 male and female athletes), Nebergall, Bauer and Eimen (1992) presented the injury type and frequencies collected by the sponsoring sports medicine team. Similar to other reports, Nebergall et al. found an 8.1% injury exposure for bull riders, followed by bareback riders at 6.3% and saddle bronc riders at 3.1%. The authors reported injury exposure for the timed events at less than 1.0%. Nebergall et al. concluded that their findings were lower than expected and that the injury rate may have been affected by the six events being a finals situation rather than regular season rodeos.

Through a review of literature and unpublished data, Nebergall (1996) also reported injury exposure percentages for various events. He reported bull riders at 8.1%, bareback riders at 6.3%, saddle bronc riders at 3.1% and steer wrestlers at 0.9% chance of injury per exposure. Nebergall also reported that the elbow and the shoulder are the most commonly injured parts of the upper extremity while groin injuries were most prevalent in the lower extremity. Injury prevention techniques reported by Nebergall, were the same as those presented by former studies in this section.

Harvey, Foster, Koehler, & Smidt (1995) reported more recent rodeo injury statistics. Their data was gathered by the members of the Justin Sportsmedicine Program over a period of several years and included only PRCA cowboys. This report revealed similar injury rates as previous studies. Bull riding accounted for 37% of all injuries, with bareback riding, 23%, and saddle bronc riding, 16%, falling in place next. Steer wrestlers accounted for 9% of the reported injuries, calf roper accounted for 4% and team ropers accounted for 1%. Harvey et al. indicated that collegiate injury rates previously reported were twice that of football players. The authors' report on injury by body region showed that spine injuries made up 21% of all injuries, accounting for the largest number of injuries. Following the spine, they reported statistics for the arm (18%), knee (15%), shoulder (11%), other injuries (11%), groin (10%), ankle (8%), lower leg (4%), and head (2%). Stretching and strengthening was recommended to help prevent groin injuries. Harvey et al. also indicate that the ropers have chronic shoulder problems due to long periods of practice throwing the rope. Rotator cuff tendonitis appears to be prevalent in the roping athlete, and the authors recommend stretching and strengthening for prevention.

Injury data from 22% of the 1994 Canadian Professional Rodeo Association season rodeos was presented by Butterwick, Nelson, LaFave and Meeuwisse (1996). Sprains, contusions, strains, and fractures were the most frequent injuries sustained at the participating rodeos. Bareback riders sustained the highest injury rate of 4.6%, while bull riders had an injury rate of 3.6%. Saddle bronc riders and steer wrestlers had the 3rd and 4th highest injury rates of 1.4 and 0.9%, respectively. Overall, the injury rate, 2.4%, was lower than the 4.3% reported by Meyers, Elledge, Sterling and Tolson (1990) and the

19.7% reported by Griffin, Peterson, Halseth and Reynolds (1987). Butterwick et al. indicated that the injury rate for all rodeo athletes decreased during the course of the season until the Canadian Finals Rodeo. Rodeo athletes sought treatment for knee and ankle injuries most often during this study. Butterwick et al. suggest that data collected over longer time frame would alleviate the discrepancies in the pattern of injuries and frequencies.

Treatment frequencies of each event for the Turquoise Rodeo Circuit (New Mexico and Arizona) were reported by Aspegren and Keller (1995). Their report was based on the number of treatments conducted by the Wrangler Sports Chiropractic Program at thirteen rodeos during the 1994 season. Specific injury types were not reported. In concert with related literature, bull riders received the most number of treatments (23.6%), however, saddle bronc riders received more treatments than bareback riders (14.0 vs. 12.4%, respectively) in this study. The remaining events each received less than 7% of the treatments. Aspegren and Keller concluded that timed event participants are in less need of chiropractic care at rodeos than their rough stock riding peers.

With the mix of injury data from both collegiate and professional rodeo, the inexperience of the athlete has been questioned for increasing risk of injury. Butterwick and Meeuwisse (2001) reported their five-year study at 63 Canadian rodeos indicates that injury rates are similar for inexperienced and experienced rough stock athletes. Subjects in the professional group were at least 18 years old, while the inexperienced group subjects were 16 to 21 years old in bareback and saddle bronc events, and 11 to 14 years

old in steer riding (novice version of bull riding) event. The results showed injury frequency and risk level to be similar between the professional and inexperienced groups.

Table 1

Summary of Rodeo Injury Literature

	Griffin, Peterson, & Halseth (1983)	Griffin, Peterson, Halseth, & Reynolds (1987)	Meyers, Elledge, Sterling, & Tolson (1990)	Nebergall, Bauer, & Eimen (1992)	Harvey, Foster, Koehler, & Smidt (1995)	Butterwick, Nelson, LaFave, & Meeuwisse (1996)
Level of participation	P	P	C	P	P	P
# of subjects	67	278	156	738	*	*
Gender of subjects	M	M, F	M, F	M, F	M	M
Total # of Injuries	25	61	138	90	*	94
% Injuries						
Bullriding	28.0	32.8	*	40.0	37.0	31.9
Bareback	20.0	21.3	*	31.0	23.0	31.9
Saddlebronc	20.0	21.3	*	15.5	16.0	11.7
Steer wrestling	8.0	8.2	*	4.4	9.0	9.5
Calf roping	12.0	8.2	*	2.2	4.0	4.2
Team roping	4.0	1.6	*	0.0	1.0	*
# of injuries						
Sprains	28.0	19.6	10.9	*	*	44.6
Strains	16.0	19.6	15.9	*	*	13.8
Contusions	28.0	36.0	42.0	*	*	80.8
Fractures	4.0	6.5	3.6	*	*	7.4
Lacerations	8.0	6.5	3.6	*	*	2.1
# of injuries to body part						(% of treatments)
Upper Extremity	48.0	44.0	29.7	*	29.0	30.0
Lower Extremity	36.0	31.1	34.0	*	37.0	53.2
Torso	16.0	24.6	36.0	*	34.0	16.6

P=professional, C=collegiate; *=information not provided
All numbers were converted to percentages if not reported in that form in the literature.

Physical Activity and Physiological Status of Rodeo Athletes

Meyers (1990) reported that in a group of fifteen collegiate rodeo athletes, only 56% of the athletes reported any type of conditioning/exercise participation. Of those participating, 27% took part in general exercise, 24% took part in weight training, and only 5% ran. Both injured and un-injured individuals reported in this study. Meyers also reported that the distribution even across all events.

After a season-long study of collegiate rodeo athletes, Meyers, Elledge, Sterling and Tolson (1990) concluded that participation in regular physical activity might decrease, or at least lessen, the severity of sprains and strains suffered by the athlete. They indicated that sprains and strains are related to insufficient muscle function, endurance, strength and flexibility. Forty-three percent of the athletes surveyed (N=15) in this study, no matter which event, did not participate in any type of regular conditioning program.

Meyers et al. (1992) collected physiological data on 20 male and 10 female collegiate rodeo athletes. Measurements of anthropometric data, body composition, cardiovascular endurance, resting blood screens, post-exercise blood lactate, and visual reaction and movement time were gathered. The authors reported that the steer wrestlers were heavier, had more lean muscle mass, and greater body fat percentage than the rough stock and roping event competitors. Rodeo athletes had body fat lower than football and hockey athletes but higher than baseball, basketball, soccer and rugby athletes. Meyers et al. suggested that steer wrestlers might require the larger mass to gain an advantage in their event. The male rodeo athletes demonstrated above average aerobic capacity which they may have received through their sport. According to Meyers et al., the aerobic level

of the rodeo athlete is similar to that of other short-burst activities athletes. Reaction and movement times (253-275msec and 123-157msec) for this group of rodeo athletes were within the normal range of collegiate athletes. Meyers et al. suggest that whole-body aerobic capacity and strength training become the focus of future research.

In a study of fifteen rough stock riders, Copley (1987) examined hand grip strength in relationship to body weight of the athletes. Unlike previous research relating body weight and hand grip strength, Copley found no significant relationship between grip strength and body weight in the rodeo athlete sample. Relatively small differences were seen between hands. Suggested explanations for this result were that the grip strength is developed in the non-dominant hand as this hand is often used (60% of those in the study) as the riding hand. Copley also reported that the athletes spent 5.3 ± 3.4 hrs/wk on strength and flexibility, while only 47% of the sample followed a conditioning program.

Wilkinson and Meyers (1993) assessed hand grip-strength and isokinetic knee extension and flexion strength of thirty male and female rodeo athletes. Although not significant, the steer wrestlers had greater hand grip strength than the rough stock riders and the calf and team ropers. No significant differences in the isokinetic tests were seen except for the steer wrestlers' hamstring peak torque at 30°/s. The quadriceps to hamstring relationship was elevated for the male athletes at 72.4 to 79.5% as opposed to the average 60%. The authors suggested that this could be due to the spurring action of the events. When comparing the rodeo athletes to other athletic populations, they compared to baseball, football and hockey athletes in body composition, yet in strength the rodeo athletes were similar to endurance runners. Wilkinson and Meyers suggested

that off-season and pre-season strength training might help prevent injury and improve performance of the rodeo athlete.

In 1985, Tuza presented a subjective general exercise prescription for rodeo athletes based on a general strength training program utilizing low repetitions with high loads. The focus of the general training is on the leg and pelvic girdle. The shoulder girdle and remaining upper body are trained as accessory muscle groups. Tuza also presents specific exercises for each event. Specific flexibility routines for each event are explained. Tuza concludes his article with general conditioning recommendations on endurance, agility, and speed work.

Raether (2000) presents another subjective exercise prescription plan for calf ropers. He reports that the phosphagen energy system is the primary system used in calf roping, yet agility, body composition, nutrition and rest must also be considered. Raether suggests that sprint and power training be incorporated into the workout to improve the dismount and calf approach portion of the event. Plyometrics and interval training are exercises recommended to work on explosiveness. For strength training, Raether suggests the traditional multiple-joint lifts, such as squats, for the whole body and a rotator cuff resistance program for the shoulder. Beyond stressing the phosphagen system, Raether reports that aerobic training is not necessary for the calf roper as prolonged endurance exercise may decrease strength and power improvements.

Physical Activity and Injury Prevention

Hershman (1984) described a method for injury prevention through sport profiling. He explained that determining the type of risk present for a given sport allows the practitioner to focus on the type of preventative techniques for that type of risk. The

profiling should contain the demands of the sport, risk factors for injury, and detailed individualized musculoskeletal examinations. Hershman recognized that some injuries are not preventable such as those created by a high force collision situation. Outside of these situations, Hershman explained that implementing the profiling system will assist in decreasing the total number of injuries incurred.

Physical activity has been linked to musculoskeletal adaptations. In a review of literature, Stone (1988) examined the changes that occur to connective tissues as a result of physical activity. With endurance exercise, aerobic enzyme activity and collagen synthesis in the tendons is increased. The increase in collagen content increases the strength of the tissue. Similar changes in collagen of the muscle connective tissues also are seen as a result of physical activity. Tendons and ligaments will recover more quickly from an injury with physical activity. General weight training and long distance running were speculated to create the largest increases in connective tissue. Stone reports that bone mineral density and mass are increased with physical activity. Elite athletes had the greatest bone density followed by average athletes and then the untrained control group. Evidence suggested that the type of activity dictates the bone density changes, therefore, activity with greater forces produce the greatest bone densities. The amount of activity also dictates what changes occur to the bone composition. Some indications that hormonal changes caused by physical activity may be involved in the connective tissue and bone density adaptations.

In his 1990 literature review, Stone concurred with his previous review that endurance training increases the size and tensile strength of tendon and ligament tissues. He also reported that sprint training increases the weight/length ratio of ligaments,

indicating greater amounts of collagen. When examining the literature, Stone reports that studies on preseason and year-round strengthening programs demonstrated decreased numbers of injuries in both male and female athletes. Stone states that by increasing the strength of the muscle and connective tissues, a sound conditioning program can not only reduce injuries, it can improve the performance of an athlete.

Kraemer, Duncan and Volek (1998) agree that resistance training can enhance performance and decrease the incidence of injury in their review of literature. These benefits are accomplished as the strength, power and endurance of the musculature is increased. As maximal force production is increased with training, performance is enhanced as a result. The enhancement of neural involvement is also a result of resistance training. The recruitment of the motor unit is improved as well as its efficiency. The adaptations to the muscular and the neural system will help to diminish injuries and recovery time from an injury. Kraemer, et al. (1998) also report that hormonal responses to physical activity adjust according to the type of physical activity, and also affect the performance of the athlete. The authors concluded that resistance training alone will not improve performance--it also requires training that is adjusted to simulate sport specific skills.

Kraemer, Deschenes and Fleck (1988) describe an increase in high-energy phosphate and enzyme levels as a result of strength training. They suggest that these changes may lead to improvements in activities utilizing multiple near maximum muscle contractions. Kraemer, et al. (1988) indicate that improvements in motor unit recruitment and neural stimulation are the cause of increased strength at certain periods in the training program. In turn, the strength training will also assist in decreasing the inhibition of

proprioceptive antagonists allowing for a greater force production by the involved muscle. Strength training may also increase the amount of neurotransmitters creating a greater force production by the motor unit. Through training, the motor units of the muscle become more efficient in their transmission and gain synchrony with other motor units in muscle function. This synchrony will increase the length of time that a muscle can sustain maximal force output. The authors report that to gain these advantages the strength training program must include a variable amount of velocities and angles.

Through their review of literature, Fleck and Falkel (1986) also found that studies concur that increases in strength may decrease the risk of injury. They indicated that several studies showed decreased pain from tennis elbow and shoulder pain from tennis and swimming after resistance training. Their review also showed that tendons and ligaments adapt to physical activity by increasing metabolism, thickness, weight and strength of the tissue. In animal studies, bone-ligament junction strength increased with endurance activity. The nutrition of cartilage was improved by an increased pumping action of synovial fluid into the tissues as a result of participation in physical activity. Fleck and Falkel agreed that the connective tissue of muscle showed an increased collagen content after resistance training and hypertrophy and that bone density increases as intensity of activity increases. When Fleck and Falkel evaluated longitudinal studies, they found that moderate to intense consistent activity was the best for increases in bone density and full range of motion activity was most effective for tendon and ligament strength.

Feiring and Derscheid (1989) explain that a proper stretching program assists in preparing the muscle for maximal performance as well as decreasing the risk of injury.

Effective stretching allows accommodation for the additional amounts of stress placed on the connective tissues and the muscle during activity. Feiring and Derscheid describe the various methods of stretching and report that static stretching should precede ballistic stretching to help avoid injury and to improve flexibility. They also report that off-season conditioning programs might aid in reducing non-contact injuries. Consistent with Kraemer et al. (1998), Feiring and Derscheid express that the conditioning program must be specific to the activity to enhance performance and prevent injuries.

Physical Activity Questionnaire

Ainsworth, et al. (2000) presented an updated compendium of physical activities to include activities that have been presented in the research during the 1990's. They were also able to assign measured MET values for some activities that had previously been estimated. A five-digit coding scheme is also represented in the compendium to enable easier data entry. Added to the original version of the compendium were 129 new activities that are included in the 605 total specific activities. The compendium lists the activities and their associated MET value as a ratio between the associated metabolic rate divided by a standard resting metabolic rate. All MET values in the original and current compendium are based on those published in the literature. Ainsworth et al. recommend that the compendium be used to classify activity and retain standardized MET values for physical activity questionnaires rather than attempting to assess precise energy expenditures. They also acknowledge that the compendium has limitations by making underestimates for heavier individuals and overestimates for thinner individuals during weight-bearing activities. They suggest that correction may improve the use of the compendium, but no correction exists. Despite the limitations, Ainsworth, et al. defend

the use of the compendium for use with physical activity questionnaires probing wide activity ranges and intensity levels.

Physical activity, as reported by Kriska and Casperson (1997), is a variable component of energy expenditure. The components of physical activity are daily living activities, sports, leisure activities, and occupational activities. Measurement of physical activity is often gathered through caloric expenditure, aerobic intensity, weight bearing, flexibility, and strength. Physiological assessment is the most accurate way to gather precise data on these traits, however, Kriska and Casperson explain that questionnaires are used for four reasons: 1) non-reactiveness, 2) practicality, 3) applicability, and 4) accuracy. They also reveal that the use of questionnaires is easier to accomplish on a larger population. The use of the questionnaire for shorter time frames are less likely to be affected by recall bias and are more practical for validation according to Kriska and Casperson. When the questionnaire focuses on leisure, sport, and occupational activities, the validity is most likely secure with younger, healthy populations. The final statements Kriska and Casperson make regarding reliability and validity of physical activity questionnaires is that they can be affected by interviewer and subject bias, time frame surveyed, and questionnaire sequence in the overall procedures.

Patterson (2000) recommends that reliability of a physical activity questionnaire be tested through test-retest sessions that occur within three days and no more than one week. She also recommends that the recall period be the exact same designated period in both sessions. The use of a 95% confidence interval is also suggested as well as reporting reliability for all groups. Patterson reports that the validity in physical activity questionnaires must be accepted as a dynamic process as the results of the questionnaire

can be used for a variety of reasons such as classification, energy expenditure measures and disease risk prediction. The instrument should estimate measures according to public health guidelines and be able measure different types of physical activity according to Patterson.

In order to address the variance seen in reliability and validity measures of physical activity questionnaires, Jacobs, Ainsworth, Hartman, and Leon (1992) evaluated eleven instruments and compared them with direct and indirect methods of validation. They responded that there are several dimensions of physical activity that do not overlap, and that they also did not overlap in validation. This led them to a classification system for physical activity including sleep, light intensity leisure activity, moderate intensity leisure activity, heavy intensity leisure activity, household chores, and occupational activity. The authors also indicated that questions should address both recent and habitual activity, as they do not reflect each other if asked separately. Another result of their study was that the length or detail of the questionnaire did not affect validity—it seemed to be the logic of item construction that was most important. Jacobs et al. suggested that the instrument should target the physical activity dimensions and be written using the language the subjects use for that activity. The authors concluded that physical activity questionnaires can provide beneficial information and the more common instruments tend to be reliable means for gathering the data.

The Canada Fitness Survey is based on the Minnesota Leisure-Time Physical Activity Questionnaire (Taylor, et al., 1978) and has been used in a nationwide epidemiological study in Canada (Pereira, 1997). Validity for the Canada Fitness Survey has not been reported, but the validity of the Minnesota Leisure-Time Physical Activity

Questionnaire has reported validity between r = .45 and .34 ($p < .05$) by Taylor et al. (as cited by Pereira). Peak ventilation of oxygen (VO_2peak) and body fat percentage were validated (r = .47 and -.24, respectively; $p < .05$) by Richardson, et al. (as cited by Pereira).

Weller and Corey examined test-retest reliability of the Canada Fitness Survey in 1998 for 146 male and female subjects. Subjects completed the questionnaire on two occasions one-month apart and selected subjects performed the Canadian Aerobic Fitness Test on both visits. They found that there was variation in the reliability with the different physical activities reported. Overall, they found moderate measures of intraclass reliability of r = .38 to .65 for the physical activity measures of the weekly and monthly sections for males. For the daily activity section, the intraclass reliability measure was r = .98. The greatest variation observed by Weller and Corey was between males and females.

Physical Activity Participation—General Population

Martin, Morrow, Jackson and Dunn (2000) suggest that a limit of some physical activity studies is that they don't measure the physical activity according to the Center for Disease Control & Prevention/American College of Sports Medicine (CDC/ACSM) guidelines. This indicates individuals are not exercising to gain benefits. Reports were presented that lack of physical activity is often determined by personal characteristics such as medical history, psychological traits, and physical activity history. The activity level is also determined by environmental factors such as facility access and time. Their results demonstrated that household income, age, education level, and ethnicity were not necessarily associated with meeting the CDC/ACSM recommended physical activity

levels. This is in contrast to the report by Kriska (2000). Martin et al. concluded that some individuals perceive physical activity as a health risk, and that participation in physical activity is most dependent upon how important the individual feels it is.

Kriska (2000) reported that cultural and ethnic issues might impact the measurements of physical activity, especially those examining occupational activity. However, it was also reported that measurement error might have been part of the cause for the results in the studies that were reviewed. This review also reported that the socioeconomic level and environmental factors could have played a bigger part by representing a larger number of minority ethnic groups. Physical inactivity was also reported greater in lower income and lower educated populations. In contrast, low level leisure activity decreased as income increased. This also contradicts the findings by Martin et al. (2000).

Summary

The sport of rodeo will only continue to grow in popularity and membership as long as the media exposure continues. With this growth comes a growing concern of the sportsmedicine providers for managing the health and injury prevention of the rodeo athletes. However, the variety of physical demands necessary for the six different events rodeo athletes compete in provide a challenge when trying to determine the needs of each athlete. The nomadic lifestyle required for participation also adds to the challenge of ensuring proper physical activity.

As expected by the name, rough stock riders account for the largest number of injuries reported in rodeo. Bull riders are decidedly the most frequently injured rodeo athletes. Bareback riders and saddle bronc riders generally exchange positions for second

and third on the injury rankings. Steer wrestlers often fall in fourth place for injury rankings with calf ropers in fifth place. Team ropers generally take last place in injury rankings with a report of an average of one injury per rodeo in the literature (Butterwick, et al., 1994; Griffin, et al. 1983; Griffin, et al. 1987; Harvey, et al., 1995; Meyers, et al., 1990; Nebergall, et al., 1992). Whether examining injury rates from professional or amateur rodeo athletes, the incidence of injury remains the same (Butterwick, & Meeuwisse, 2001).

The rodeo athlete generally utilizes his whole body during competition. Although the specific number of injuries varies per rodeo, the particular event determines which body part is most frequently injured. Bull riders most often suffer from groin strains or traumatic injuries due to their dismount or contact with the animal. Both bareback and saddle bronc riders most frequently sustain injuries to their extremities, particularly the groin from gripping the animal. Steer wrestlers often suffer injuries to their groins during their dismount from the horse or knee injuries during their attempt to stop the steer. Calf ropers reported shoulder and lower extremity injuries most frequently. The most common injury to team ropers is an injury to the hand occurring during the dallying phase of the event (Butterwick, et al., 1994; Griffin, et al., 1983; Griffin, et al., 1987; Harvey, et al., 1995; Meyers, et al., 1990; Nebergall, et al., 1992). Several studies suggest injury frequencies, however, longitudinal studies provide the best depiction of injuries and frequencies to the rodeo athlete (Butterwick, et al., 2001; Griffin, et al., 1987; Harvey, et al., 1995).

Rodeo athletes must produce great amounts of strength in short bouts of time, yet less than 50% seem to recognize that regular strength and conditioning practices could

enhance their performance and reduce their risk of injury (Copley, 1987; Meyers, 1990; Meyers, et al., 1990). When compared to other athletic events, rodeo athletes fit power sports such as football and hockey in body composition, yet their strength is more similar to that of an endurance athlete rather than a power athlete (Copley, 1987; Meyers, et al., 1992; Wilkinson & Meyers, 1993). Martin et al. (2000) suggest that individuals not meeting the recommended levels of physical activity may be due to the lack of availability of facilities and time. When examining rodeo athletes, the lack of facilities and time may be the largest factor for the small number of athletes participating in a strength or conditioning program.

Although many of the collision created injuries in rodeo are unable to be prevented by conditioning, the common strains and sprains can (Hershman, 1984). By increasing the number and intensity of workouts the athlete participates in, the athlete would be increasing bone density and connective tissue strength (Kraemer, et al., 1988; Fleck & Falkel, 1986; Kraemer, et al., 1998; Stone, 1988; Stone, 1990). These tissue changes would improve the athlete's ability to prevent musculoskeletal injury or at least reduce the severity of the injury. As discussed by Stone (1990) and Kraemer, et al., once injured, an athlete will recover more quickly if involved in a physical activity program.

Kriska and Casperson (1997), Patterson (2000) and Jacobs, et al. (1992) concurred that physical activity can be adequately estimated by the use of self-reported physical activity questionnaires. By detailing areas of leisure time, sport, occupational, and daily living activities in the questionnaire, metabolic calculations can be calculated with good validity. The updated compendium of metabolic calculations for numerous

activities presented by Ainsworth, et al. (2000) will improve the estimations of fitness drawn from new physical activity questionnaires.

Chapter 3

Methods

Physical activity assessment is a common method used in epidemiological studies to determine the physical activity level of a select population. Although physiological measures provide a stronger representation of the physical fitness of an individual, it is also important to determine baseline activity habits of the population. Regular participation in moderate physical activity can help to decrease the risk of injury while increasing the level of performance (Arnheim & Prentice, 2000). The purpose of this study was to determine the physical activity levels for male rodeo athletes competing in six rodeo events and to assess the relationship of this activity level with the athlete's rate of injury and success in competition.

Pilot Study

Phase 1. During the initial portion of the pilot study, a specialist in the field of rodeo sportsmedicine was provided with the survey and asked to provide feedback. The feedback that was given was that the initially selected physical activity survey was too lengthy and appeared too busy for the selected population. The recommendation was to shorten the survey and modify the formatting of the questions. The reviewer also requested that descriptive information regarding the number of performances and the years of workout be gathered to increase the breadth of information (L. Herring, personal communication, March 10, 2001).

Phase 2. During the second phase of the pilot study, the modified survey was distributed among three rodeo sportsmedicine specialists for their feedback, to verify the length and simplicity of the modifications. Minor adjustments were suggested, for

example to list the common activities such as driving, feeding, saddling and grooming animals, rather than housework on the survey. A suggestion was also made to create injury type categories related to the types of doctor's releases that rodeo athletes can use to be excused from participation so that the athlete is familiar with the category (D. Andrews, personal communication, March 12, 2001; R. Foster, personal communication, March 25, 2001; C. Smidt, personal communication, March 23, 2001; Jacobs, Ainsworth, Hartman, & Leon, 1992).

Subjects

Seventy-two (12 per group) volunteer male rodeo athletes participated in this study forming a convenience sample. All subjects were current card/permit holding members of the PRCA and competed in at least one of the following events: calf roping, team roping (header and heeler), steer wrestling, bull riding, saddle bronc riding, or bareback riding. The subjects were at least age 18 with no maximum age limit to assist in the assurance that the population was adequately represented. The subjects participated at one of five PRCA sanctioned rodeos in the Midwest.

The subjects were grouped into 6 categories: timed events (calf or team roping and/or any combination of timed events), steer wrestling, saddle bronc riding, bareback riding, bull riding, and multiple rough stock events (any combination of two or more rough stock events). Calf ropers and team ropers as well as those ropers who also steer wrestle were combined into the multiple timed events groups as they represented the population more accurately. A large proportion of the timed event athletes compete in at least two of the timed events rather than a single roping event (D. Andrews, personal communication, June 6, 2001).

Permission to conduct the study was granted by the Institutional Review Board at Oklahoma State University (Appendix A). Prior to testing, subjects signed an informed consent form advising them of the risks and benefits involved in the study (Appendix B). Each subject was assigned an identification number for confidentiality purposes. The investigator kept all forms in a locked file box until they were transferred to a locked file cabinet in the office of the investigator. Subjects were screened to ensure that they were current PRCA card/permit holders in the PRCA. Subjects provided information on demographic data of age, height and weight. Descriptive data reporting their event(s), earnings, membership length, injury frequency, injury type, and workout information was also gathered on the demographic form (Appendix C).

Data Collection Locations

The investigator administered the surveys at five PRCA sanctioned events in Oklahoma, Texas and Colorado where the Justin Sportsmedicine Team was present. The Justin Sportsmedicine Team is the contracting sportsmedicine team of athletic trainers, physical therapists and physicians that provide nationwide coverage at 150 of the 700 PRCA sanctioned rodeos. The Justin Sportsmedicine Team provides injury prevention measures, treatment, and rehabilitation for the rodeo athletes. A major focus of the Justin Sportsmedicine Team is education of the athlete on conditioning, taping techniques and stretching, to enable the athlete to manage their injuries when assistance is not available (Mobile Sports Medicine Systems, 2001). An agreement for using the Justin Sportsmedicine Team name in support of this investigation is found in Appendix D. The rodeo committee for each of the selected rodeos was contacted by telephone to receive

permission to gather data at their event and to ensure they were notified that this study would be conducted at their site in conjunction with the Justin Sportsmedicine Team.

Physical Activity Instrument

The study was quantitative in nature using self-reported data to determine the energy expenditure (MET calculation), injury rate and earnings for male rodeo athletes. Based on the pilot study, a modified version of the Canada Fitness Survey (Canadian Fitness and Lifestyle Research Institute, Ottawa, Ontario, Canada, 1983) was used and is located in Appendix E. The modifications eliminated the yearly activity section since activity that only occurs beyond monthly would not significantly add to the present physical fitness of the athlete. This modification also shortened the length of the survey meeting the recommendations of reviewers in the pilot study. Minor modifications were made in the format of the frequency selection from days/month to days/week in the weekly section. This adjustment was made to represent a more defined activity period.

The survey provided information of frequency duration and intensity for determining metabolic (MET) calculation totals for each activity reported by the subjects. Data was collected by daily, weekly and monthly physical activity self-report of household chores, leisure, sporting and occupational activity to incorporate manual labor type activity involved in ranching and farming often seen in the rodeo athlete population. Activities in the daily category of the survey represent typical daily activities such as sitting and walking. Weekly activities were those that the athlete does on a weekly basis, not including the daily activities, representing the seven days immediately prior to completion of the survey. Monthly activities were reported for all physical activity in the

month immediately prior to the completion of the survey, not including the daily and weekly activities.

MET calculations were based on the MET value list published by Ainsworth, et al. (2000). This list was used as it represented more recent research and included more physical activities related to the lifestyle of a rodeo athlete. The MET values were used in the equation provided with the Canada Fitness Survey with conversions made to represent the modifications in the questionnaire. The activities list was presented to the rodeo athletes on an easy to read guide sheet. The investigator verified the activity codes for the activities selected by the athletes.

Procedures

Attempts were made to ensure that the subjects were not influenced in their responses. Each subject was provided a clipboard with the forms attached and a pencil. Subjects read printed instructions for completing the physical activity questionnaire (Appendix F). A printed list of physical activities (Ainsworth, et al, 2000) was provided in an easy to read format without the activity codes (Appendix G). The investigator only answered questions regarding the instructions and clarified activity selections to assist in maintaining internal validity. Once the subject completed the survey, the investigator assessed the survey to ensure that all questions were answered thoroughly and that the activities listed were clarified so that they could be coded correctly.

Once the surveys were completed, the investigator assigned the appropriate activity code to the survey. At this point, the investigator computed the MET calculations according to the equations: [(Occasions in the last wk x hours per occasion x MET) ÷ 7 d/wk] and [(Occasions in the last mo x hours per occasion x MET) ÷ 31 d/mo]

from the Canada Fitness Survey (Canadian Fitness and Lifestyle Research Institute, Ottawa, Ontario, Canada, 1983). MET calculations in (kcal/kg/d) were collated for each subject through the use of a computerized database. To measure success, the investigator determined an earnings ratio for each subject by dividing the self-reported amount of 2001 season earnings by the number of 2001 season rodeos the athlete reported he had competed in at the time of the survey. An injury ratio was calculated by dividing the number of self-reported 2001 season injuries by the number of 2001 season rodeos competed in.

Statistical Analyses

The investigator computed the statistical analyses using the Statistical Package for the Social Sciences (SPSSX) version 10 (Statistical Package for the Social Sciences, Inc., Chicago, IL). Frequency distributions, means, and standard deviations for the demographic data were determined. To determine the inter-relationship among activity level, injury rate and success rate, a correlation matrix between variables was developed. The values in the matrix consist of Pearson bi-variate correlation coefficients. A one-way between subjects ANOVA was run to determine if differences in activity level existed between the six groups. All differences were assessed for both statistical and practical significance. Appropriate follow-up analyses were conducted based on the findings of the study. All analyses reaching $p \leq .05$ were considered statistically significant.

Summary

The intent of this study was to determine the physical activity levels for male rodeo athletes competing in six rodeo events and to assess the relationship of this activity level with their rate of injury and success in competition. A secondary analysis was

intended to determine if differences existed in MET level between the groups. The results present baseline information to develop conditioning protocols for the rodeo athletes. MET calculations based on self-reported activity data, injury rate, and earnings rate (a measure of performance success) served as the variables for the statistical analyses.

Chapter 4

Results

This study investigated the relationship of the physical activity level of rodeo athletes, their injury rate and their success rate. Descriptive statistics for the sample follow as well as descriptive statistics for each of the six groups. Descriptive details of the workout of rodeo athletes are also presented. To determine the relationship, Pearson bivariate correlation coefficients were calculated between MET level, injury rate, and earnings rate, and a one-way between subjects ANOVA was run to examine differences between the six groups.

Descriptive Statistics

Descriptions of Central Tendency of the Sample. Seventy-two volunteer male rodeo athletes between the ages of 18 to 49 participated in this study. Descriptions of central tendency are presented in Table 2 for the sample. Subjects reported that they were permit or card carrying members of the PRCA for a mean of 7.25 ± 5.23 years with a range of 1 to 25 years. The subjects had participated in rodeo for a mean of 12.25 ± 6.43 years with a range of 3 to 34 years. Mass (kg) was converted from pounds.

Table 2

Descriptions of Central Tendency for the Whole Sample

Variable	Range	Mean	SD
Age (yrs)	18-49	27.81	6.39
Height (in)	64-76	69.94	2.65
Mass (kg)	58.82-119.91	77.64	16.04
2001 Earnings ($)	0-66,000	7,025.86	10,114.06
Avg. Rodeos per Year	15-130	76.67	27.30
2001 Rodeos Attended	2-46	22.07	11.63

Descriptive Statistics and Frequencies by Group. Subjects were divided into six groups (n =12) by event: timed events, steer wrestling, saddle bronc riding, bareback riding, bull riding, and multiple rough stock events. Table 3 presents the descriptive statistics for each of the six groups' self-reported demographic data. The timed event group included 3 team ropers, 2 calf ropers, 2 calf/team ropers, 1 calf roper/steer wrestler, 2 team roper/steer wrestlers, and 2 calf/team roper/steer wrestlers. The multiple event rough stock group included 5 saddle bronc/bareback riders, 3 saddle bronc/bull riders, 2 bareback/bull riders, and 2 saddle bronc/bareback/bull riders.

Stretching Activity Prior to Competition. Data from the sample population indicate that 40 (55.6%) of the 72 rodeo athletes spend 6 or more minutes stretching prior to competition. Fourteen (19.4%) athletes reported stretching for 4 to less than 6 minutes stretching and 7 (9.7%) athletes indicated that they stretched 2 to less than 4 minutes. Of this sample, 11 (15.3%) athletes reported minimal stretching of less than 2 minutes prior to competition.

Self-Reported Injury Statistics. Figure 1 illustrates the self-reported 130 total injuries occurring to 17 subjects of the whole sample in this study during the 2001 season. The athletes reported an average of 1.81 injuries during the 2001 season with a range of 0 to 15 injuries. Forty percent of the athletes reported no injuries. Muscle strains, bruises, and sprains, respectively, were the most frequently reported injuries. As a result of their injuries, the athletes reported a mean of 7.33 ± 20.85 days off with a range of 1 to 110 days. Table 4 presents injury rate by group as self-reported by the subjects.

Table 3

Descriptions of Central Tendency of Groups

	Timed Events			Steer Wrestling			Saddle Bronc		
Variable	Range	Mean	SD	Range	Mean	SD	Range	Mean	SD
Age (yrs)	22-45	31.75	7.45	20-49	31.08	7.89	20-35	28.42	4.56
Height (cm)	9-67	71.92	2.31	69-75	72.25	1.86	68-72	70.27	1.35
Mass (kg)	31.7-74.7	89.22	10.10	81.5-119.9	96.72	12.17	63.4-83.7	67.98	22.25
2001 Earnings ($)	0-25,000	6,341.67	6,677.57	0-15,000	2,531.25	5,437.53	0-15,200	4,350.00	4,512.10
Avg. Rodeos/Year	25-105	63	25	35-120	65	26	15-130	85	43
2001 Rodeos	2-30	16	8	5-35	16	11	12-45	24	10

	Bareback			Bull Riding			Rough Stock		
Variable	Range	Mean	SD	Range	Mean	SD	Range	Mean	SD
Age (yrs)	18-39	27.08	6.40	21-28	24.00	2.30	19-31	24.50	4.58
Height (cm)	66-72	68.04	2.22	67-72	69.38	2.08	64-71	67.83	2.41
Mass (kg)	63.4-79.2	69.98	5.84	58.8-83.7	71.60	7.38	61.1-79.2	70.32	4.57
2001 Earnings ($)	0-35,000	8,850.00	10,450.00	0-23,000	8,498.92	7,730.45	0-66,000	11,583.00	18,375.91
Avg. Rodeos/Year	50-100	74	17	40-130	85	23	70-120	88	13
2001 Rodeos	7-28	19	6	5-46	29	13	5-45	28	14

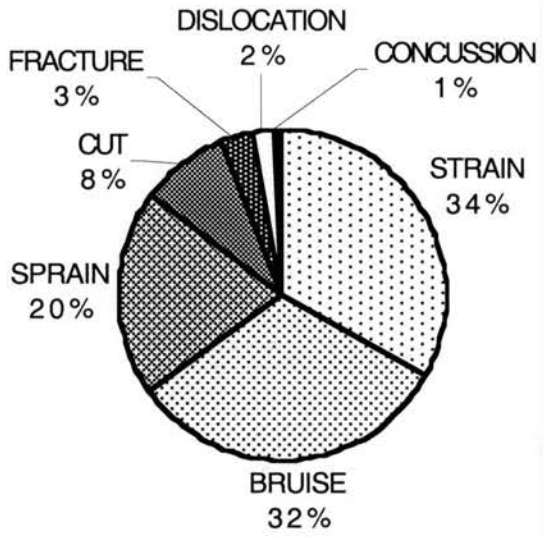


Figure 1. Percent of Self-reported Injury During the 2001 Rodeo Season
Note: Percentages calculated for whole group from 130 total injuries.

Table 4

Self-reported Injury Frequency by Group During the 2001 Season

Injury	TE	SW	SB	BB	BR	RS
Contusion	1	1	2	19	8	11
Laceration	3	1	1	3	2	1
Sprain	3	7	1	2	3	10
Strain	5	13	8	5	7	5
Fracture	0	0	1	0	3	0
Concussion	0	0	0	0	1	0
Dislocation	0	1	0	0	2	0
Total Injuries	12	23	13	29	26	27
Avg. Time Off (d)	.75	11.25	6	3.75	14.17	8.08

Note. TE = timed events, SW = steer wrestling,
SB = saddle bronc, BB = bareback, BR = bull riding
RS = rough stock events; Rate is based on reported injuries for
the 2001 season until time of survey.

Regular Workouts. Of the seventy-two subjects, 45 (62.5%) reported working out at least two times a week. Table 5 presents frequency distributions of their workouts.

Table 5

Exercise Program Frequencies by Rank

With whom do you most often do your physical activity?	No one	68.9%
	Friends	24.4%
	Family	2.2%
	Coworkers	2.2%
	Other	2.2%
When do you most often do your physical activity?	Weekdays	57.8%
	Both	42.2%
	Weekends	0%
At what time of day do you most often do your physical activity?	Evening	44.4%
	Morning	37.8%
	Afternoon	20.0%
	Whenever	17.8%
	Lunch	4.4%
Where do you most often do your physical activity?	Home	46.7%
	Commercial Club	20.0%
	Recreation Facility	11.1%
	Work	8.9%
	Outside/no facility	6.7%
	School	2.2%
	Shop/Garage	2.2%
	Other	2.2%
How long have you been doing your physical activity at least 2 times a week?	5 or moreyrs	42.2%
	1 yr to less than 3 yrs	20.0%
	3 yrs to less than 5 yrs	17.8%
	3 mos to less than 6 mos	13.3%
	6 mos to less than 1 yr	4.4%
	Less than 3 mo	2.2%
What type of equipment do you use when you workout?	Free weights	80.0%
	Machine weights	44.4%
	Treadmill	20.0%
	Therapy bands	17.8%
	Other	13.3%
	Home gym	11.1%
	Stairclimber	11.1%
	Bicycle	2.2%
	Stationary bike	2.2%
How much time do you spend stretching before working out?	2 to less than 4 min	33.3%
	Less than 2 min	28.9%
	4 to less than 6 min	22.2%
	6 to less than 10 min	15.6%

Note. Responses for subjects who reported participating in a routine 2 x week exercise program.

The write-in option for the "other" category for the question "with whom do you most often do your physical activity" was a member of the Justin Sportsmedicine Team during rehabilitation sessions. The write-in options for the "other" category for the question "what type of equipment do you use when you workout" were a hammer, elliptical trainer, sporting equipment, spurboard (saw-horse with boards attached to mimic the spurring motion), hay bales, rowing machine, and punching bag.

Daily Activity. Each subject reported their average daily activities for sitting, standing, walking, walking upstairs, and lifting heavy objects. The frequencies are presented in Table 6. The frequency distribution represents a variety of daily activity patterns for the rodeo athletes.

Table 6

Daily Activity

	Estimated Percent of Time				
Activity	100%	75%	50%	25%	0%
Sitting	5.6	4.2	20.8	31.9	37.5
Standing	19.4	11.1	13.9	37.5	18.1
Walking	16.7	23.6	16.7	34.7	8.3
Climbing Stairs	2.8	0	2.8	18.1	76.4
Lifting Objects	19.4	1.4	15.3	33.3	30.6

Note. All data presented in percentages.

Inferential Statistics

Correlation Coefficients. Individual earnings were divided by the number of rodeos participated in during the 2001 season to develop an earnings ratio of money earned per rodeo. The mean for the earnings ratios used for the calculation of the correlation coefficients was $298.16 ± $382.49. Injury ratios were calculated for each athlete and used for the correlation coefficient analyses. The mean injury ratio was

0.12 ± 0.27 injuries per rodeo. Metabolic calculations from the modified Canada Fitness Survey revealed a mean of 39.31 ± 25.84kcal/kg/d and a range of 2.14 to 124.91kcal/kg/d.

The primary null hypothesis stated that there would not be a significant interrelationship between physical activity level (MET level), injury rate and success rate (earnings) of rodeo athletes. Failure to reject the primary null hypothesis resulted as correlation coefficients ($r = \leq .29$; $p > .05$) were considered to be small and non-significant (Jaeger, 1990). Table 7 represents the correlation coefficients for the MET level, injury rate, and earnings rate. When examining practical significance, r^2 values demonstrated 0.5%, 2.2%, and 3.5% shared variance among injury rates and MET level, earnings rate and MET level, and earnings rate and injury rate, respectively.

Table 7

Pearson Bivariate Correlation Coefficients of MET Level, Injury Rate, & Earnings Rate

Variable	MET Level	Injury Rate	Earnings Rate
MET Level	1.000		
Injury Rate	-.074	1.000	
Earnings Rate	.151	-.188	1.000

$p > .05$

One-way Between Subjects ANOVA. Descriptive statistics on MET level between groups were calculated and are presented in Table 8. The multiple event rough stock group and the saddle bronc group reported the highest average MET level, respectively. These two groups also had the widest range of MET levels. The timed event, bareback, and bull riding groups had similar MET levels reported. The steer wrestling group reported the smallest MET levels.

Table 8

Descriptions of Central Tendency for MET Level

Group	Range	Mean	SD
TE	12.89-99.71	38.14	23.48
SW	2.14-54.36	26.66	16.62
SB	5.95-124.91	46.72	33.71
BB	12.92-83.82	38.98	21.94
BR	12.34-69.78	34.97	17.76
RS	7.30-113.33	50.37	34.02

Note. TE = timed events, SW = steer wrestling,
SB = saddle bronc, BB = bareback, BR = bull riding
RS = rough stock events

The secondary null hypothesis stated that there would not be a significant difference in physical activity level (MET calculation) between timed event athletes, steer wrestlers, saddle bronc riders, bareback riders, bull riders, or multiple event rough stock athletes. Data in this study were analyzed with a one-way between subjects ANOVA, where subjects were nested in their event group (timed events, steer wrestling, saddle bronc riding, bareback riding, bull riding, and multiple event rough stock). All underlying assumptions for the one-way ANOVA model were verified. The results indicated that there was not a significant [$F(5, 71) = 1.314$; $p = .269$] difference between the six groups. Calculation of omega squared suggested that 5.9% of the variability in energy expenditure was due to the event the rodeo athlete participates in, which is a medium effect size according to Cohen (as cited in Keppel, 1991).

Follow-up Analyses. As follow-up analyses, Pearson bivariate correlation coefficients were calculated for age, length of time in the PRCA and length of career in relationship to the earnings and injury ratios. A significant ($r = .243$; $p \leq .05$) correlation was found between earnings ratio and the length of membership in the PRCA. A significant ($r = .280$; $p \leq .05$) correlation was also found between earnings ratio and

length of career in rodeo. The relationships between age and the earnings and injury ratios were not significant ($r = .216$ and $-.176$, respectively; $p > .05$).

Summary

The purpose of this study was to determine the physical activity levels for male rodeo athletes competing in six rodeo events and to assess the relationship of this activity to their rate of injury and success in competition, and to determine differences in physical activity between groups. There was a failure to reject the primary null hypothesis as there were no significant correlations among MET level and injury rate ($r = -.074$), MET level and success ($r = .151$), or injury rate and success ($r = -.188$). This failure indicates that overall physical activity had no effect on injury and the successful performance of the rodeo athlete. Follow-up analyses determined that a significant relationship exists between earnings and the length of time in the PRCA ($r = .243$) and the length of participation in rodeo ($r = .280$). No significant differences [$F(5, 71) = 1.314$; $p = .269$] in MET level were found between the six groups and only 5.9% of the variability in the MET level was explained by the group.

Chapter 5

Discussion, Conclusions & Recommendations

This chapter will present discussion of results, and conclusions and recommendations for future research. The purpose of this study was to determine the physical activity levels for male rodeo athletes competing in six rodeo events and to assess the relationship of this activity to their rate of injury and success in competition, and to determine the difference in physical activity between groups. Seventy-two male rodeo athletes participating in at least one of six events completed a physical activity questionnaire assessing daily, weekly and monthly leisure time, sporting, and occupational activity. Conclusions were based on descriptive and inferential statistical analyses. Descriptive statistics included descriptions of central tendency and frequency distributions. Inferential analyses included Pearson bivariate correlation coefficients and a one-way between subjects ANOVA on the information provided by the subjects.

Discussion of the Sample

The subjects in this study (18-49 years) were similar to the subjects in previous studies in age, and were skewed to towards the younger athletes representing the short career of rodeo athletes (Copley, 1987). Of these subjects 79% were between the ages of 18-31 years. Other similarities of the sample to those in previous literature were mean height (69.94cm) and mass (77.64kg), with the steer wrestlers measuring the tallest and heaviest and the rough stock riders the smallest (Copley; Wilkinson & Meyers, 1993).

Copley (1987) reported a smaller mean of 9.6 years of participation in rodeo than the 12.25 years of participation reported by the subjects in this study. Interestingly, the

average number of annual rodeos reported by Copley (123.6) was sizably larger than the average result in this study (76.67). In concurrence with Evans and Freeman (1995), the average reported rodeos per year indicates that the rodeo athletes compete in two to three rodeos per weekend. The greatest number reported, 130, exceeds the two per weekend and if any time off is taken for an off-season, this increases the number of rodeos attended per week greatly. According to the rankings of the PRCA (2001), 31 of the 72 subjects in this study had earnings that placed them in the top 50 at the time of this study. The range of earnings was indicative that the whole population was represented in this study.

During this study, the investigator found that it was difficult to find many athletes who competed in only calf roping or team roping leading to the creation of the timed event group. Most of the athletes tended to compete in at least two timed events, which appears to be the current trend for trying to increase earnings while attending fewer rodeos (D. Andrews, personal communication, June 6, 2001). It was also difficult to engage timed event athletes in participating in this study as they tended to be grooming or warming up their horses before the event, cooling down and grooming their horses after they competed and were most often leaving the rodeo immediately after they finished to maximize their driving time to the next rodeo. Bareback riders and bull riders were readily available, as they did not have to care for animals and were often in the general vicinity of the Justin Sportsmedicine Team trailer. There also has been an increase in the number of bull riders since the increased television coverage of the Professional Bull Riders Tour has increased popularity in the sport (D. Andrews, personal communication, June 6, 2001; S. Honeycutt, personal communication, March 27, 2001).

Discussion of Stretching Time

When comparing the stretching practices of the sample before competition to the workout subgroup stretching before working out, the greater emphasis appears to be placed on stretching before competition than before working out. Over 60% of those in the workout subgroup spend less than 4 minutes stretching, while prior to competition, 75% spend 4 or more minutes stretching, with 55.6% spending 6 or more minutes stretching. The rodeo athletes appear to perceive a greater need to stretch prior to the violent activity of their rodeo event rather than the "less risky" workout. Through anecdotal evidence, stretching prior to competition may have become part of a regular pre-ride routine that rodeo athletes often are observed completing. The greater amount of stretching prior to competition may also be indicative of the education effort by sportsmedicine personnel regarding pre-competition stretching (Gauthier, 1986; Mobile Sports Medicine Systems, 2001). The contradiction in stretching time before competition and workout, and the motivation for stretching would provide an interesting topic for future research.

Discussion of Self-Reported Injury

Similar to previous injury frequency reports, strains, contusions, and sprains (34, 32, and 20%, respectively) represent the largest number of injuries reported in this study. (Butterwick, et al., 1996; Griffin, et al., 1983; Griffin, et al., 1987; Meyers, et al., 1990; Nebergall, et al., 1992). The frequency distribution of injury by group (see Table 4) was not consistent with the frequency distributions in the literature. In this study bull riders and bareback riders were interchanged from the norm, as were the steer wrestlers and saddle bronc riders. Typically, bull riders report the most injuries, followed by bareback

riders, saddle bronc riders, steer wrestlers (at times, interchanged with saddle bronc), and timed event athletes (ropers), respectively (Butterwick, et al.; Griffin, et al., 1983; Griffin, et al., 1987; Harvey, et al., 1995; Nebergall et al., 1992). However, the differences in injury frequency by group did not differ that dramatically from the bull riders and bareback riders (n = 26 and 29, respectively). As might be expected, the multiple event rough stock group reported a frequency of injuries (n = 27) similar to the bareback and bull riding groups. Although they reported the greatest number of injuries, the bareback group only reported an average time off due to injury of 3.75 days, which, other than the timed event group, was the least amount of time off. This may be due to the fact that 19 of the 29 reported injuries were contusions, which rarely keep a rodeo athlete out of competition. Bull riders reported the greatest amount of time off with an average of 14.17 days.

The contradictory frequency distribution may be a result of utilizing self-reported data rather than the data being recorded by sportsmedicine personnel. It was recognized by the investigator that while answering the question regarding the number of injuries, several of the athletes questioned what constitutes an injury, concurring with literature that suggests that rodeo athletes will compete with injuries that are considered injuries by the medical professional but not an injury by the rodeo athlete (Griffin, et al., 1987; Nebergall, et al., 1992; Smith, 1976). This difference in definition of injury may have affected the reporting of injuries.

Similarities are found when comparing the current rodeo injury frequencies to other sports involving kinesthetic abilities and collision situations. Hillman (2000) reports top frequencies of sprains, strains, and contusions in ice hockey, gymnastics, and

basketball. Rubin and Anderson (1996) indicated that strains, sprains, and contusions were also the most frequent injury types in diving. Rubin and Anderson expressed that when diving unlike some other sports, sub-optimal performance creates a situation where injury can occur, which is very similar to rodeo. For example, if a rodeo athlete has not developed the balance or strength necessary to stay on the animal, when trying to dismount he would not be in the optimal position to get off safely.

Regular Exercise Program Participation

Of the 72 subjects, 62.5% (n = 45) reported participating in a routine exercise program at least 2 times per week. This contrasts with the reported 43% participation by Meyers, et al. (1990), 44% by Meyers (1990) and 47% by Copley (1987). Exercise participants were seen across all six groups and were both injured and uninjured athletes, consistent with the report by Meyers (1990). By educating the rodeo athlete, one of the goals of rodeo sportsmedicine programs, sportsmedicine providers may be a cause of the increase in exercise (Gauthier, 1986; Mobile Sports Medicine Systems, 2001). A second explanation may be the encouragement of novice athletes to participate in regular exercise from other rodeo athletes that have had success with regular exercise. Historically, rodeo has not been depicted as a sport, but as a hobby, yet encouragement for conditioning has been reported since at least 1976, when Dr. Charles Rush, a Fort Worth, Texas on-sight rodeo physician, reported that he had seen less injuries because of an increase in conditioning by the rodeo athletes (Smith, 1976). However, this study is the first to report over 50% participation in regular exercise programs.

The trend presented by those athletes taking part in a routine exercise program indicates that 68.9% of the athletes work out alone and at home (see Table 5). The

prevalence (57.8%) of working out during the weekends fits the lifestyle of the rodeo athlete traveling to rodeos on the weekends, however 42.2% of the athletes workout on any day they can fit in a workout. In contrast to the results of Meyers, et al. (1992), the majority of the athletes in this study who workout (42.2%) reported they had been working out for greater than five years, indicating good adherence to the exercise routine (Annesi, 1999; Dishman, 1993). An additional 42.2% have been working out between six months and five years, also demonstrating adherence to their exercise program. The equipment used by rodeo athletes tends to be easily accessible, portable, and easy to keep at home. Free weights and machine weights were the most popular pieces of equipment. These descriptions of the rodeo athlete workout should be kept in mind when educating rodeo athletes about exercise programs and modifying exercises to fit the rodeo athlete lifestyle.

Discussion of Physical Activity

Rodeo athletes appear to be a fairly active group of individuals based on their report of daily activities (see Table 6). Thirty-seven percent reported sitting almost none of the time during the day. However, this does not seem to reflect the amount of time the rodeo athlete sits while traveling, especially when competing in 2 to 3 rodeos per week. An explanation of this misrepresentation may be that the rodeo athlete does not relate time spent in a car or truck as sitting, but as trying to get somewhere. The athletes reported walking and standing for a moderate portion of the day. The average MET level of 39.31 ± 25.84kcal/kg/d reported by the rodeo athletes indicates that many of them should be meeting the recommended CDC/ACSM level of energy expenditure for healthy living (Martin, et al., 2000; ACSM, 2000).

Discussion of Pearson Bivariate Correlation Coefficients

Coefficients were calculated for earnings ratios, injury ratios and MET level of the rodeo athletes. The primary null hypothesis stated that there would not be a significant interrelationship between physical activity level (MET calculation), injury rate and success rate (as represented by season earnings) of rodeo athletes. This hypothesis failed to be rejected as the correlations between earnings ratio and injury ratio ($r = -.188$), earning ratio and MET level ($r = .151$), and injury ratio and MET level ($r = -.074$) were not significant ($p > .05$). In contrast to Stone (1988, 1990), Kraemer, et al. (1998), and Fleck and Falkel (1986), it appears that total daily energy expenditure level does not have an effect on injury prevention or on the successful performance of the rodeo athlete. Contradicting suggestions that strength and power conditioning would improve performance made in previous literature on rodeo injuries (Griffin, et al., 1987; Meyers & Elledge, 1990; Wilkinson & Meyers, 1993), the results of this study do not support conditioning as being a solid means of increasing performance. Other factors exist that must play a role in the prevention of injury and performance of the athlete such as the type of livestock, the riding technique, or the equipment used (Evans & Freeman, 1995). Practical significance tests revealed small effect sizes for the relationships between MET level, injury rate and earnings rate with no more than 3.5% of the variance being explained. It should be noted that the relatively small correlations obtained in this study may have been due to the limited size of the sample. Future research could increase the sample size to examine the relationship of these measures

As follow-up analyses, Pearson bivariate correlation coefficients were calculated for length of time in the PRCA and length of career in relationship to the earnings ratio.

Motor learning principles explain that although underlying abilities are present, performance increases with practice and experience (Schmidt & Wrisberg, 2000). Consistent with these principles, a significant correlation ($r = .243$; $p \leq .05$) was found for the relationship between the earnings ratio and the length of time in the PRCA. Approximately 6% of the variability was shared between these two measures. Similarly, a significant correlation ($r = .280$; $p \leq .05$) was found for the relationship between the earnings ratio and the length of career with about 8% of the variance shared between the two measures. Both relationships demonstrate that as the rodeo athlete gains more experience from years of competition and practice, he might become more successful in his event as represented by the amount of money he wins. Surprisingly, however, age did not have a significant relationship with earnings or injury ratios ($r = .216$ and $-.176$, respectively; $p > .05$), which may be a result of the skewness of the age in the sample population. Evidence towards what might improve success might appear with investigation into the underlying abilities of the rodeo athletes.

An explanation for the lack of statistical significance between physical activity and injury may involve the absence of sport specific exercise. Feiring and Derscheid (1989) and Kraemer, et al. (1998) contend that sport specific strengthening is a key factor in preventing injuries and improving performance. Traditional conditioning exercises such as jogging, weight lifting and stationary bike riding do not replicate the events of rodeo, and therefore may not assist in preventing injury if the sport specific training contention is true. Items such as the spurboard that was written into the "other" option would be acceptable items for meeting the sport specific need for saddle bronc and bareback riders. Mechanical bulls are the closest piece of equipment for mimicking the

bull ride, yet very few bull riders use one to train with (Copley, 1987). Calf and team ropers do spend large amounts of time roping steer horns attached to a bale of hay, yet in return, they often develop chronic shoulder injuries (Harvey, et al., 1995). Butterwick, et al. (1996) report that the practice patterns of the rodeo athlete have not been documented and appear to be random. Further examination into the practice and sport specific training in which rodeo athletes may or may not participate, might lead to a component of injury prevention for this population.

Rather than overall physical activity, kinesthetic ability may be more important in preventing injury in rodeo, particularly in the rough stock events (S. Honeycutt, personal communication, July 4, 2001). Nebergall (1996) reported that 70% of rodeo injuries occur during the dismount from the animal. Griffin, et al. (1983; 1987) also suggested that a good proportion of the injuries in both studies were a result of dismounting. Improving the ability to land on one's feet or to maintain balance long enough to leave the animal at the best time may assist in decreasing injuries.

Discussion of ANOVA Analysis

A one-way between subjects ANOVA was conducted to determine if differences in MET level existed between the six groups (n = 12). The secondary null hypothesis stated that there would not be a significant difference in physical activity level (MET calculation) between timed event athletes, steer wrestlers, saddle bronc riders, bareback riders, bull riders, or multiple event rough stock athletes. There was a failure to reject the secondary hypothesis as the result of the ANOVA indicated a non-significant [$F(5, 71) = 1.314$; $p = .269$] difference in MET level between groups. Omega squared calculations indicated that 5.9% of the variance in MET level may be due to the event. According to

Cohen (as cited in Keppel, 1991) this is a medium effect size. In other words, about 6% of the variability in the MET level was based on the specific event chosen by the rodeo athletes. This finding suggests that there may be some practical difference in physical activity levels among the athletes in various rodeo events, which indicates that different workout protocols may be required for the different events.

The non-significant difference of MET level between groups may also indicate that the MET level variance is small enough to explain the non-significant correlation coefficients between MET level and earnings ratio and injury ratio. If the MET levels were similar, then there wouldn't be an affect on the other two variables. The steer wrestling group had the smallest mean MET level at 26.66 ± 16.62kcal/kg/d. Meyers, et al. (1992) reported that steer wrestlers in his sample had the smallest lean body mass, which could be supported by this slightly smaller reported energy expenditure.

There may have been a treatment effect in this study due to the time of the year this study was completed. Since the study was being conducted during the late spring and early summer, the rodeo athletes appeared to be dedicating most of their time to rodeo and were not spending much time at home and great amounts of time traveling. Several athletes commented that they had not been home for a month prior to the time of the survey. Others commented that they don't work out during their rodeo season. This concentration on rodeo may provide some explanation for the similar MET levels of the groups, since they appear to be not doing much more than "rodeoing." Kriska and Casperson (1997) indicate that a one-year time frame reflects usual activity patterns, but the shorter time frame avoids recall bias. This study was not trying to determine epidemiological patterns, but an estimated fitness level, therefore the shorter time frame

was selected. The effect of the time of year on the MET level of rodeo athletes would provide a basis for future research.

The MET levels during this time frame did not include participation in the six events since metabolic calculations for each of the events do not exist (Ainsworth, et al., 2000). During this portion of the rodeo season, this exclusion eliminated a portion of regular physical activity, and, although consistent across groups, may have affected the results of this study. Different results may be seen in physical activity level during the slow-season of rodeo, which occurs during the winter. Wilkinson and Meyers (1993) have suggested that pre and post-season conditioning be completed by rodeo athletes to enhance their performance. Examination into the level of physical activity during different times of the year may enhance the knowledge of sportsmedicine providers when caring for athletes.

Summary

The purpose of this study was to determine the physical activity levels for male rodeo athletes competing in six rodeo events and to assess the relationship of this activity to their rate of injury and success in competition. Analyses of Pearson bivariate correlation coefficients of 72 male rodeo athletes competing in timed events, steer wrestling, saddle bronc riding, bareback riding, bull riding, and multiple rough stock events completed a modified version of the Canada Fitness Survey to estimate their daily total MET level. Small, non-significant ($p > .05$) correlations of $r = .151$, $-.188$, and $-.074$ were found among MET level, earnings rate, and injury rate. Follow-up analyses revealed significant correlations ($p \leq .05$) of $r = .243$ and $.280$ between earnings ratio and length of PRCA membership and length of participation in rodeo, respectively,

explaining 5.9% and 7.8% of the variance in the relationship. A one-way between subjects ANOVA determined no statistically significant differences ($p > .05$) between MET level and event group, with 5.9% explained variance revealed through omega squared calculations.

Conclusions

Within the limitations of this study, the following conclusions were drawn.

1. General physical activity alone is not a means for preventing injury and improving performance in rodeo.
2. All rodeo athletes need to participate in physical activity regardless of their event.
3. Event specific practice and experience are an excellent way to improve performance in rodeo on top of physical activity.

Recommendations

The recommendations are based on the realization that the following methods may have enhanced this study. In the hope that future research will further explore different areas of exercise and injury prevention in the rodeo arena, the following recommendations are made:

1. Examination of physical activity level during different times of year, such as the slower season of rodeo during December through March, may determine if a different result is seen in the pattern of physical activity.
2. Examination of potential differences in physical activity in those athletes with larger earnings to those with small earnings during different times of the year may also provide insight into the success of rodeo athletes.

3. A larger sample size per group (greater than 12) would improve the statistical power in turn allowing for more effective experimental inference in between groups differences.

4. Exploration into the contradiction in stretching time before working out and competing would provide beneficial information for the education of rodeo athletes. Examination of the quality of the stretching programs used by rodeo athletes might also demonstrate beneficial insight into injury prevention.

5. Research completed on-site at a rodeo should be limited to a time span of 15 minutes or less per athlete to maximize the willingness to participate and fit the schedule of the athlete.

6. Prior to beginning research on-site at a rodeo involving the rodeo athlete, an investigator needs to gain an understanding of the pattern of availability of the athletes. For example, bareback riders are typically involved in the first event and are often not willing to participate until after their event.

7. Utilize physical activity journaling or personal interviews to augment the estimation of MET level.

8. Explore the practice and sport specific training of rodeo athletes to determine if it would provide insight into injury prevention for rodeo athletes.

9. Research focusing on rodeo athletes' musculoskeletal injuries (sprains and strains in particular), theoretically prevented by conditioning, may allude to the factors leading to these types of injuries.

10. Evidence towards improved success might appear with investigation into the underlying abilities of the rodeo athletes.

References

Ainsworth, B. E., Haskell, W. L., Whitt, M. C., Irwin, M. L., Swartz, A. M., Strath, S. J., Obrien, W. L., Bassett, D. R., Schmitz, K. H., Emplaincourt, P. O., Jacobs, D. R., & Leon, A. S. (2000). Compendium of physical activities: An update of activity codes and MET intensities. Medicine & Science in Sports & Exercise, 32, S498-S516.

Annesi, J. J. (1999). Effects of minimal group promotion on group cohesion and exercise adherence. Small Group Research, 30, 542-557.

Arnheim D. D., & Prentice, W. E. (2000). Principles of Athletic Training. Boston: McGraw-Hill.

Aspegren, D., & Keller, R. (1995). Injures in the Turquoise Professional Rodeo Circuit in 1994. Chiropractic Sports Medicine, 9(3), 94-96.

Boyer, M., Ellis, K., Harris, D. R., & Soukhanov, A. H. (Eds.) (1983). The American Heritage Dictionary. New York: Dell.

Butterwick, D. J., Nelson, D. S., LaFave, M. R., and Meeuwisse, W. H. (1996). Epidemiological analysis of injury in one year of Canadian professional rodeo. Clinical Journal of Sport Medicine, 6, 171-177.

Butterwick, D. J., & Meeuwisse, W. H. (2001). Effect of experience of rates and risks of injury in rodeo. Medicine & Science in Sports & Exercise, 33, S6.

Copley, B. B. (1987). The professional rodeo rider: A preliminary investigation, The New Zealand Journal of Sports Medicine, 15(4), 96-100.

Dishman, R. K. (1993). Exercise adherence. In R. N. Singer, M. Murphy, & L. K. Tennant (Eds.), Handbook of Research on Sport Psychology (pp. 779-798), New York; Macmillan.

Evans, J. P., & Freeman, T. R. (1995). Rodeo injuries. Sports Medicine Update, 10(4), 12-22.

Winnercomm (Producers). (2000, December 10). The National Finals Rodeo. New York: ESPN Broadcasting.

Feiring, D. C., & Derscheid, G. L. (1989). The role of preseason conditioning in preventing athletic injuries. Clinics in Sports Medicine, 8, 361-372.

Fleck, S. J., & Falkel, J. E. (1986). Value of resistance training for the reduction of sports injuries. Sports Medicine, 3, 61-68.

Gauthier, M. M. (1986). Taking care of the rodeo cowboy: The truly American athlete. The Physician and Sportsmedicine, 14(7), 142-145.

Griffin, R., Peterson, K. D., & Halseth, J. R. (1983). Injuries in professional rodeo. The Physician and Sportsmedicine, 11(8), 110-116.

Griffin, R., Peterson, K. D., Halseth, J. R., & Reynolds, B. (1987). Injuries in professional rodeo: An update. The Physician and Sportsmedicine, 15(2), 104-115.

Harvey, J., Foster, R., Koehler, K., & Smidt, C. (1995). Rodeo sports medicine. Sports Medicine Update, 10(4), 4-11.

Hershman, E. (1984). The profile for prevention of musculoskeletal injury. Clinics in Sports Medicine, 3(1), 65-84.

Hilscher, S. L. (1999). A descriptive analysis of high school rodeo athletes' injuries. Masters Abstracts International, 37(05), 0575B. (University Microfilms No. AAT 1394129).

Jacobs, D. R., Ainsworth, B. E., Hartman, T. J., & Leon, A. S. (1993). A simultaneous evaluation of 10 commonly used physical activity questionnaires. Medicine & Science in Sports & Exercise, 25, 81-91.

Jaeger, R. M. (1990). Statistics a Spectator Sport. Newbury Park, CA: Sage Publications.

Keppel, G. (1991). Design and Analysis: A Researcher's Handbook (3rd ed.). Upper Saddle River, N. J.: Prentice Hall.

Kirwan, L. A., & Scott, F. A. (1988). Roping injuries in the hand: Mechanism of injury and functional results. Plastic and Reconstructive Surgery, 81, 54-61.

Kraemer, W. J., Deschenes, M. R., & Fleck, S. J. (1988). Physiological adaptations to resistance exercise implications for athletic conditioning. Sports Medicine, 6, 246-256.

Kraemer, W. J., Duncan, N. D., & Volek, J. S. (1998). Resistance training and elite athletes: Adaptations and program considerations. Journal of Orthopeadic and Sport Physical Therapy, 28, 110-119.

Kriska, A. (2000). Ethnic and cultural issues in assessing physical activity. Research Quarterly for Exercise and Sport, 71(2), 47-53.

Kriska, A. M., & Casperson, C. J. (1997). Introduction to a collection of physical activity questionnaires. Medicine & Science in Sports & Exercise, 29, S5-S8.

Martin, S. B., Morrow, J. R., Jr., Jackson, A. W., & Dunn, A. L. (2000). Variables related to meeting the CDC/ACSM physical activity guidelines. Medicine & Science in Sports & Exercise, 32, 2087-2092.

Meyers, M.C. (1990). A physiologic, psychologic, and injury profile of the collegiate rodeo athlete. Dissertation Abstracts International, 51(07), 0575B. (University Microfilms No. AAT 9027253).

Meyers, M. C., Elledge, J. R., Sterling, J. C., & Tolson, H. (1990). Injuries in intercollegiate rodeo athletes. The American Journal of Sports Medicine, 18, 87-91.

Meyers, M. C., Wilkinson, J. G., Elledge, J. R., Tolson, H., Sterling, J. C., & Coast, J. (1992). Exercise performance of collegiate rodeo athletes. The American Journal of Sports Medicine, 20, 410-415.

Mobile Sports Medicine Systems. (2001). Justin Sportsmedicine Program [Brochure]. McKinney, TX: Author.

Nebergall, R. (1996). Rodeo. In D. J. Caine, C. G. Caine, K. J. Lindner (Eds.), Epidemiology of Sports Injuries (pp. 350-356). Champaign, IL: Human Kinetics.

Nebergall, R. W., Bauer, J. M., & Eimen, R. M. (1992). Rough Riders: How much risk in rodeo? The Physician and Sportsmedicine, 20(10), 85-92.

Patterson, P. (2000). Reliability, validity, and methodological response to the assessment of physical activity via self-report. Research Quarterly for Exercise and Sport, 71(2), 15-20.

Pereira, M. A., FitzGerald, S. J., Gregg, E. W., Joswiak, M. L., Ryan, W. J., Suminski, R. R., Utter, A. C., & Zmuda, J. M. (1997). Minnesota Leisure-Time Physical Activity Questionnaire. Medicine & Science in Sports & Exercise, 29, S62-S72.

Professional Rodeo Cowboys Association. (2001). The Events [On-line]. Available: www.prorodeo.com/html/1.1.eventdescriptions.html

Professional Rodeo Cowboys Association. (2000). The Professional Rodeo Cowboys Association Media Guide. Colorado Springs, CO: Author.

Raether, J., Sanders, M., & Antonio, J. (2000). Strength and conditioning for the rodeo athlete. Strength and Conditioning Journal, 22(4), 31-34.

Rosa, J. G., & May, R. (1989). Buffalo Bill and his wild west: A pictorial biography. Lawrence, KS: University Press of Kansas.

Smith, L. (1976). Cowboys court injury in battle of survival. The Physician and Sportsmedicine, 4(12), 90-93.

Stephens, T., Craig, C. L., & Ferris, B. F. (1986). Adult physical activity in Canada: Findings from the Canada Fitness Survey I. Canada Journal of Public Health, 77, 285-290.

Stephens, T., Craig, C. L., & Ferris, B. F. (1986). Adult physical activity in Canada: Findings from the Canada Fitness Survey II. Canada Journal of Public Health, 77, 291-295.

Stone, M. H. (1988). Implications for connective tissue and bone alterations resulting from resistance exercise training. Medicine & Science in Sports & Exercise, 20, S162-S168.

Stone, M. H. (1990). Muscle conditioning and muscle injuries. Medicine & Science in Sports & Exercise, 22, 457-462.

Taylor, H. L., Jacobs, D. R., Jr., Shucker, B., Knudsen, J., Leon, A. S., & DeBacker, G. (1978). A questionnaire for the assessment of leisure-time physical activities. Journal of Chronic Diseases, 31, 741-755.

Tuza, G. (1985). Training considerations for rodeo. National Strength and Conditioning Association Journal, 6, 38-41.

Weller, I. M. R., & Corey, P. N. (1998). A study of the reliability of the Canada Fitness Survey questionnaire. Medicine & Science in Sports & Exercise, 30, 1530-1536.

Wilkinson, J. G., & Meyers, M. C. (1993). Isokinetic leg strength and power in collegiate rodeo athletes. Journal of Strength and Conditioning Research, 7(1), 22-25.

Oklahoma State University
Institutional Review Board

Protocol Expires: 4/22/02

Date : Monday, April 23, 2001 IRB Application No ED01110

Proposal Title: THE RELATIONSHIP OF PHYSICAL ACTIVITY, INJURY AND SUCCESS OF RODEO ATHLETES

Principal Investigator(s) :

Mandy Sinclair
101 Colvin
Stillwater, OK 74078

Frank Kulling
103 Colvin
Stillwater, OK 74078

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s) : Approved

Signature :

Carol Olson, Director of University Research Compliance

Monday, April 23, 2001
Date

Approvals are valid for one calendar year, after which time a request for continuation must be submitted. Any modifications to the research project approved by the IRB must be submitted for approval with the advisor's signature. The IRB office MUST be notified in writing when a project is complete. Approved projects are subject to monitoring by the IRB. Expedited and exempt projects may be reviewed by the full Institutional Review Board.

Appendix B

Agreement to Participate in Research

Relationship of Physical Activity to Injury and Success of Male Rodeo Athletes

Primary Investigator: Amanda Sinclair, Doctoral Student, Oklahoma State University

I, _____, volunteer to participate in this Oklahoma State University research study assessing physical activity, injury and success of rodeo athletes to determine if physical activity can help decrease injuries and improve performance. I will be asked to complete a 20 minute survey upon completion of this informed consent form.

I understand that no risks are associated with my completing the questionnaire. Potential benefits from my participation in this study are: 1. the determination of the approximate fitness level and physical activities of rodeo athletes; 2. the determination of whether or not physical activity affects the number of rodeo related injuries; 3. the determination of whether or not physical activity affects the level of performance of rodeo athletes.

No alternative procedure is available for this study. I am aware that all efforts to maintain confidentiality will be attempted.

I understand that any questions, comments, or concerns may be directed to the Primary Investigator at (405) 377-2755. Dr. Frank Kulling, Study Chair, can be reached at (405) 744-5502 for any complaints about the study. Questions, concerns, or complaints about the research or subjects' rights should be directed to Sharon Bacher, IRB Executive Secretary, Oklahoma State University Office of Research Compliance, 305 Whitehurst, Stillwater, OK 74078, (405) 744-5700.

I know that should I decide to participate in the study, I can withdraw from the study at any time without penalty. By signing and dating this form of consent, I indicate that I have received a copy of the consent form and agree to voluntarily participate in this study.

_____ _____

Subject's Signature Date

_____ _____

Investigator's Signature Date

Appendix C

Descriptive Data Sheet

1. Age: _____ 2. Height: _____ft. _____in. 3. Weight: _____lbs.
4. 2001 Season earnings to date: _____
5. Event(s) you compete in: (circle all that apply) CR TR SW SB BB BR
6. How long have you been a member of the PRCA? _____
7. How long have you been competing in your event(s) either professionally or amateur?_____
8. How many rodeos do you compete in per year (on average)? _____
9. How many rodeos have you competed in during the 2001 season? _____

10. How much time do you spend stretching before competing?
☐ less than 2 minutes ☐ 2 to less than 4 minutes
☐ 4 to less than 6 minutes ☐ 6 to less than 10 minutes

11. Approximately how many injuries have you sustained during the 2001 season?_____

12 Of those injuries, how many were:
☐☐ bruise ☐☐ cut ☐☐ sprain ☐☐ muscle pull
☐☐ fracture ☐☐ head injury ☐☐ dislocation

13. What is the total amount of time off you have had to take due to injury during the 2001 season?
☐☐☐ days

14. Do you currently take part in a routine (at least 2 x week) exercise program? (circle one) Y N
If yes, please answer the following questions, if no, please move on to the next page.

15. With whom do you *most often* do your physical activity?
☐ No one ☐ Friends ☐ Family/relatives ☐ Coworkers
☐ Other: _____

16. When do you *most often* do your physical activity?
☐ Weekdays ☐ Weekends ☐ Both

17. At what time of day do you *most often* do your physical activity? Mark all that apply.
☐ Morning ☐ Lunch ☐ Afternoon ☐ Evening ☐ Whenever

18. Where do you *most often* do your physical activity?
☐ Home ☐ Shop/garage ☐ Work ☐ School/College
☐ Recreation Facility ☐ Commercial Club ☐ Outside/no facility ☐ Other

19. How long have you been doing your physical activity at least 2 times a week?
☐ less than 3 months ☐ 3 to less than 6 months ☐ 6 months to less than1 year
☐ 1 year to less than 3 years ☐ 3 to less than 5 years ☐ 5 or more years

20. What type of equipment do you use when you workout? Mark all that apply.
☐ free weights ☐ machine type weights ☐ home gym
☐ therapy bands ☐ treadmill ☐ stair climber
☐ stationary bicycle ☐ bicycle
☐ Other: _____

21. How much time do you spend stretching before working out?
☐ less than 2 minutes ☐ 2 to less than 4 minutes
☐ 4 to less than 6 minutes ☐ 6 to less than 10 minutes

Appendix D

Justin Sportsmedicine Team Agreement

April 6, 2001

Don Andrews
Mobile Sports Medicine Systems
P.O. Box 2070
McKinney, TX 75070

Dear Don:

As you know I am conducting my dissertation research on the physical activity levels of rodeo athletes and comparing that information to their self-reported injury and success rate. The results of the study will reveal the relationship between physical activity and injury rate and success. It will also determine if there are current differences in physical activity level between the events. The study will be conducted only after approval by the Institutional Review Board at Oklahoma State University.

I appreciate your offer to allow me to conduct my data collection in conjunction with the Justin Sportsmedicine Team. I look forward to working with the Team and benefiting the Team's mission to provide quality medical care and education to the rodeo athlete. If you have any questions regarding my study, please feel free to contact me at the number below, or my dissertation chair, Frank Kulling, at 405-744-5502. Should any concerns arise during my study, you may contact Sharon Backer, IRB Executive Secretary, Oklahoma State University Office of Research Compliance, 305 Whitehurst, Stillwater, OK 74078, (405) 744-5700.

Sincerely,

Amanda J. Sinclair, MA, ATC/L
Doctoral Student
Oklahoma State University
414 W. 8th St.
Stillwater, OK 74074
H)405-377-2755
W)405-744-9437
sinclaa@okstate.edu

Appendix E

Physical Activity Questionnaire

Physical Activity

What you regularly do at work or at school or in the home, plus your activity in your leisure time all contribute to your current level of fitness. The following questions will attempt to provide a complete picture of all your activities. Your activities have been divided into three questions—one for those you do daily, one for those you do each week, and one for those you have do monthly.

1. Daily Activities
For those activities which you do most days of the week (such as work, school, and housework), how much time do you spend:

	almost all of the time	about 3/4 of the time	about 1/2 of the time	about 1/4 of the time	almost none of the time
Sitting	☐	☐	☐	☐	☐
Standing	☐	☐	☐	☐	☐
Walking	☐	☐	☐	☐	☐
Walking up stairs	☐	☐	☐	☐	☐
Lifting/carrying heavy objects	☐	☐	☐	☐	☐

2. Weekly Activities
Please refer to the reference card for a list of activities. Answer the following for the physical activities you do each week. Select only one intensity per activity. Do not write in shaded areas.

Light Housework/handywork: washing dishes, ironing, etc.

Number of times per week	Average time spent on each occasion hrs. min.	INTENSITY **Light** slight change from normal	**Medium** some sweat faster breathing	**Heavy** heavy sweat heavy breathing
☐	☐ ☐☐	☐	☐	☐

Heavy housework/handywork: painting, remodeling, etc.

Number of times per week	Average time spent on each occasion hrs. min.	INTENSITY **Light** slight change from normal	**Medium** some sweat faster breathing	**Heavy** heavy sweat heavy breathing
☐	☐ ☐☐	☐	☐	☐

Please refer to the reference card to select other activities that you do on a weekly basis. Place the name of the activity in the blank. Time per week, average time and intensity levels will remain the same as above. If you need more space, please ask for another form.

Name of Activity: ____________________

Times/wk	**Avg. time** hrs. min.	**Intensity** Lt.	Med.	Heavy
☐	☐ ☐☐	☐	☐	☐

Name of Activity: ____________________

Times/wk	**Avg. time** hrs. min.	**Intensity** Lt.	Med.	Heavy
☐	☐ ☐☐	☐	☐	☐

Name of Activity: ____________________

Times/wk	**Avg. time** hrs. min.	**Intensity** Lt.	Med.	Heavy
☐	☐ ☐☐	☐	☐	☐

Name of Activity: ____________________

Times/wk	**Avg. time** hrs. min.	**Intensity** Lt.	Med.	Heavy
☐	☐ ☐☐	☐	☐	☐

Name of Activity: ____________________

Times/wk	**Avg. time** hrs. min.	**Intensity** Lt.	Med.	Heavy
☐	☐ ☐☐	☐	☐	☐

Name of Activity: ______________________________

Times/wk	**Avg. time** hrs. min.	Lt.	**Intensity** Med.	Heavy
☐	☐ ☐☐	☐	☐	☐

Name of Activity: ______________________________

Times/wk	**Avg. time** hrs. min.	Lt.	**Intensity** Med.	Heavy
☐	☐ ☐☐	☐	☐	☐

Name of Activity: ______________________________

Times/wk	**Avg. time** hrs. min.	Lt.	**Intensity** Med.	Heavy
☐	☐ ☐☐	☐	☐	☐

3. Activities in the Last Month

Please refer to the reference list for activities. Answer the following questions for activities you have done in the last month. Do Not include activities that you already listed in previous questions.

<u>Gardening: spading, digging, weeding, etc.</u>

Number of times per week	Average time spent on each occasion hrs. min.	**Light** slight change from normal	**INTENSITY** **Medium** some sweat faster breathing	**Heavy** heavy sweat heavy breathing
☐	☐ ☐☐	☐	☐	☐

<u>Mowing the lawn: pushing a power mower</u>

Number of times per week	Average time spent on each occasion hrs. min.	**Light** slight change from normal	**INTENSITY** **Medium** some sweat faster breathing	**Heavy** heavy sweat heavy breathing
☐	☐ ☐☐	☐	☐	☐

Name of Activity: ______________________________

Times/wk	**Avg. time** hrs. min.	Lt.	**Intensity** Med.	Heavy
☐	☐ ☐☐	☐	☐	☐

Name of Activity: ______________________________

Times/wk	**Avg. time** hrs. min.	Lt.	**Intensity** Med.	Heavy
☐	☐ ☐☐	☐	☐	☐

Name of Activity: ______________________________

Times/wk	**Avg. time** hrs. min.	Lt.	**Intensity** Med.	Heavy
☐	☐ ☐☐	☐	☐	☐

Name of Activity: ______________________________

Times/wk	**Avg. time** hrs. min.	Lt.	**Intensity** Med.	Heavy
☐	☐ ☐☐	☐	☐	☐

Name of Activity: ______________________________

Times/wk	**Avg. time** hrs. min.	Lt.	**Intensity** Med.	Heavy
☐	☐ ☐☐	☐	☐	☐

Name of Activity: ______________________________

Times/wk	**Avg. time** hrs. min.	Lt.	**Intensity** Med.	Heavy
☐	☐ ☐☐	☐	☐	☐

Appendix F

Instruction Script

Thank you for volunteering to be a subject in this study. You have been given a packet that contains an informed consent form, and forms for personal information and demographic data, and a physical activity survey. Please be assured that your responses are confidential and will not be identifiable to you. You may withdraw from the study at any time without penalty to you. Take a moment to read and sign the informed consent form.

Please answer all questions as honestly and as completely as possible. The physical activity survey will assess your daily, weekly, and monthly leisure, sport and occupational activity. When completing the physical activity survey, you will need to refer to the list of activities. The list has two columns: one is a general activity list, and the second is examples for that activity. Look through the list for activities that represent your activity during the past 7 days and the past month and write the example activity in the blank. Do not include activities that you have already listed in weekly activities in the monthly activity section. For each activity, you will report the number of times per week, the length of time each day, and the intensity at which you participate in that activity. You do not need to write anything in the gray areas. Once you are completed, your survey will be reviewed to ensure that they are readable and to clarify any activities that may not be clear. Do you have any questions?

Appendix G

Physical Activity List

SPECIFIC ACTIVITY	EXAMPLES
bicycling	BMX or mountain
bicycling	less than 10mph, leisure, to work or for pleasure
bicycling	general
bicycling	10-11.9mph, leisure, slow, light effort
bicycling	12-13.9mph, leisure, moderate effort
bicycling	14-15.9mph, racing or leisure, fast, vigorous effort
bicycling	10-11.9mph, leisure, slow, light effort
bicycling	16-19mph, racing/not drafting, very fast, racing general
bicycling	greater than 20mph, racing, not drafting
exercising	stationary bicycling, general
exercising	stationary bicycling, 50watts, very light effort
exercising	stationary bicycling, 100watts, light effort
exercising	stationary bicycling, 150watts, moderate effort
exercising	stationary bicycling, 200watts, vigorous effort
exercising	stationary bicycling, 250watts, very vigorous effort
exercising	calisthenics (pushups, pullups, situps), heavy vigorous effort
exercising	calisthenics, light or moderate effort, general (leg raises, sit ups)
exercising	circuit training, some aerobic movement, minimal rest, general
exercising	weight lifting, power lifting or body building, vigorous effort
exercising	weight lifting, light or moderate effort, light workout general
exercising	health club exercise, general
exercising	stair stepper, treadmill, general
exercising	rowing, stationary, general
exercising	rowing, stationary, 50watts, light effort
exercising	rowing, stationary, 100watts, moderate effort
exercising	rowing, stationary, 150watts, vigorous effort
exercising	rowing, stationary, 200watts, very vigorous effort
exercising	ski machine, general
exercising	stretching, hatha yoga
exercising	mild stretching
exercising	teaching aerobics exercise class
exercising	water aerobics, water calisthenics
dancing	ballet, modern, twist, jazz, tap, jitterbug
dancing	aerobic, general
dancing	aerobic, low impact
dancing	aerobic, high impact
dancing	ballroom, fast, country, line, Irish step, polka, contra, square
dancing	ballroom, slow, waltz, foxtrot, slow dancing, mambo, chacha
dancing	American Indian dancing
fishing / hunting	fishing, general

fishing / hunting	digging worms with shovel
fishing / hunting	fishing from river bank and walking
fishing / hunting	fishing from river bank, standing
fishing / hunting	fishing from boat, sitting
fishing / hunting	fishing in stream, in waders
fishing / hunting	fishing, ice, sitting
fishing / hunting	hunting, bow and arrow or crossbow
fishing / hunting	hunting, deer, elk, large game
fishing / hunting	hunting, duck, wading
fishing / hunting	hunting general
fishing / hunting	hunting, pheasants or grouse
fishing / hunting	hunting, rabbit, squirrel, prairie chick, raccoon, small game
fishing / hunting	pistol shooting or trap shooting, standing
home activities	carpet sweeping, sweeping floors
home activities	cleaning, heavy, vigorous effort (wash car, clean garage)
home activities	mopping
home activities	multiple household tasks all at once, light effort
home activities	multiple household tasks all at once, moderate effort
home activities	multiple household tasks all at once, vigorous effort
home activities	cleaning, house or cabin, general
home activities	butchering animals
home activities	cooking or food preparation, standing or sitting, manual appliances
home activities	cooking or food preparation, walking
home activities	serving food, setting table, walking or standing
home activities	feeding animals (house pets)
home activities	putting away groceries, carrying packages
home activities	carrying groceries upstairs
home activities	grocery shopping with or without a grocery cart, standing or walking
home activities	non-food shopping, standing or walking
home activities	ironing
home activities	implied standing--laundry, folding clothes, packing suitcase
home activities	implied walking--putting away clothes, gathering clothes to pack
home activities	making bed
home activities	moving furniture, household items, carrying boxes
home activities	scrubbing floors, on hands and knees, scrubbing bathroom, bathtub
home activities	sweeping garage, sidewalk or outside of house
home activities	standing, (un)packing boxes, occasional lifting, moderate effort
home activities	implied waking putting away household items, moderate effort
home activities	watering plants
home activities	building a fire inside
home activities	moving household items upstairs, carrying boxes or furniture
home activities	standing, light (pump gas, change light bulb)
home activities	walking, light, non-cleaning (closing windows, shutting doors)
home activities	sitting, playing with children--light, only active periods

home activities	standing, playing with children--light, only active periods
home activities	walk/run, playing with children--moderate, only active periods
home activities	walk/run, playing with children--vigorous, only active periods
home activities	carrying small children
home activities	child care: sitting/kneeling, occasional lifting, light effort
home activities	child care: standing, occasional lifting, light effort
home activities	elder cadre, disabled adult, only active periods
home activities	reclining with baby
home activities	sit, playing with animals, light only active periods
home activities	walk/run, playing with animals, moderate, only active periods
home activities	walk/run, playing with animals, vigorous, only active periods
home activities	standing, bathing dog
home repair	airplane repair
home repair	autobody work
home repair	automobile repair
home repair	carpentry, general, workshop
home repair	carpentry, outside house, installing rain gutters, building fence
home repair	carpentry, finishing or refinishing cabinets or furniture
home repair	carpentry, sawing hardwood
home repair	caulking, chinking log cabin
home repair	caulking, except log cabin
home repair	cleaning gutters
home repair	excavating garage
home repair	hanging storm windows
home repair	laying or removing carpet
home repair	laying tile or linoleum, repairing appliances
home repair	painting outside home
home repair	painting, papering, plastering, scraping, inside house, sheet rock
home repair	painting
home repair	roofing
home repair	sanding floors with a power sander
home repair	spreading dirt with a shovel
home repair	washing and waxing car, boat
home repair	washing, painting fence
home repair	wiring, plumbing
inactivity, quiet	lying quietly, watching t.v., doing nothing, listening to music
inactivity, quiet	sitting quietly and watching television, watching movie in theater
inactivity, quiet	sleeping
inactivity, quiet	standing quietly, in a line
inactivity, light	reclining, writing
inactivity, light	reclining, talking , talking on phone
inactivity, light	reclining, reading
inactivity, light	meditating
lawn and garden	carrying, loading, stacking wood, loading, carrying lumber

lawn and garden	chopping wood, splitting logs
lawn and garden	clearing land, hauling branches, wheelbarrow chores
lawn and garden	digging sandbox
lawn and garden	digging, spading, filling garden, composting
lawn and garden	gardening with heavy power tools, tilling a garden, chain saw
lawn and garden	laying crushed rock
lawn and garden	laying sod
lawn and garden	mowing lawn, general
lawn and garden	mowing lawn, riding mower
lawn and garden	mowing lawn, walk, hand mower
lawn and garden	mowing lawn, walk, power mower
lawn and garden	operating snow blower
lawn and garden	planting seedlings, shrubs
lawn and garden	planting trees
lawn and garden	raking lawn
lawn and garden	raking roof with snow rake
lawn and garden	riding snow blower
lawn and garden	sacking grass, leaves
lawn and garden	shoveling snow, by hand
lawn and garden	trimming shrubs or trees, manual cutter
lawn and garden	trimming shrubs or trees, power cutter, using leaf blower, edger
lawn and garden	walking applying fertilizer or seeding a lawn
lawn and garden	watering lawn or garden , standing or walking
lawn and garden	weeding, cultivating garden
lawn and garden	gardening, general
lawn and garden	walking/standing, picking up yard, light, picking vegetables
lawn and garden	walking, gathering garden tools
miscellaneous	sitting, playing cards, board games
miscellaneous	standing, drawing, casino gambling
miscellaneous	sitting, reading
miscellaneous	sitting writing, typing
miscellaneous	sitting, talking
miscellaneous	standing, talking
miscellaneous	sitting, studying
miscellaneous	sitting, in class, general, note taking
miscellaneous	camping with standing, walking, sitting, light to moderate effort
miscellaneous	sitting at sporting event as a spectator
music playing	drums
music playing	horn
music playing	piano, organ
music playing	violin
music playing	guitar
occupation	building road, hauling debris, driving heavy equipment
occupation	directing traffic

occupation	carpentry, general
occupation	carrying heavy loads
occupation	carrying moderate loads up stairs
occupation	coal mining, general
occupation	construction, outside, remodeling
occupation	custodial work, general cleaning, moderate effort
occupation	electrical work, plumbing
occupation	farming, baling hay, cleaning barn, poultry work, vigorous effort
occupation	farming, chasing cattle, non-strenuous, walking, moderate effort
occupation	farming, chasing cattle/livestock on horseback, moderate effort
occupation	farming, chasing cattle or other livestock, driving, light effort
occupation	farming, driving harvester, cutting hay, irrigation work
occupation	farming, driving tractor
occupation	farming, feeding small animals
occupation	farming, feeding cattle, horses
occupation	farming, hauling water for animals, general hauling water
occupation	farming, taking care of animals (grooming, shearing, branding)
occupation	farming, forking straw bales, cleaning corral/barn, vigorous effort
occupation	farming, milking by hand, moderate effort
occupation	farming, milking by machine, light effort
occupation	farming, shoveling grain, moderate effort
occupation	firefighter, general
occupation	forestry, general
occupation	horse grooming
occupation	horse racing, galloping
occupation	horse racing, trotting
occupation	horse racing, walking
occupation	locksmith
occupation	machine tooling, machining, working sheet metal
occupation	machine tooling, operating lathe
occupation	machine tooling, tapping and drilling
occupation	machine tooling, welding
occupation	masonry, concrete
occupation	massage therapist, standing
occupation	moving, pushing heavy objects, 75 lbs. or more
occupation	operating heavy duty equipment/automated, not driving
occupation	shoe repair
occupation	shoveling, digging ditches
occupation	shoveling, heavy, more than 16lbs per minute
occupation	shoveling, light, less than 10lbs per minute
occupation	shoveling, moderate, 10 to 15lbs per minute
occupation	sitting, light office work, driving at work
occupation	sitting, meetings, talking, eating
occupation	sitting, moderate, forklift, crane

occupation	standing, light office work, talking, bartending, assembling
occupation	standing, light/moderate, welding, stocking, auto repair
occupation	lifting, continuously, 10-20lbs
occupation	standing moderate, lifting 50lbs.
occupation	standing, moderate/heavy lifting, more than 50lbs.
occupation	steel mill, general
occupation	truck driving, loading and unloading, truck (standing)
occupation	computer typing
occupation	heavy power tools, jackhammer, drills
occupation	heavy tools, non-power, shovel, pick, spade
occupation	teaching physical education, non participation
occupation	teaching physical education, participate
running	jogging, general
running	jogging, on mini-tramp
running	running, 5mph (12min mile)
running	running, 5.2mph (11.5min mile)
running	running, 6mph (10min mile)
running	running, 6.7mph (9min mile)
running	running, 7mph (8.5min mile)
running	running, 8mph (7.5min mile)
running	running, 8.6mph (7min mile)
running	running, 9mph (6.5min mile)
running	running, 10mph (6min mile)
running	running, 10.9mph (5.5min mile)
running	running, cross country
running	running, up stairs
sports	archery, non-hunting
sports	badminton, social
sports	basketball, game
sports	basketball, non-game, general
sports	basketball, officiating
sports	basketball, shooting baskets
sports	pool
sports	bowling
sports	boxing, in ring, general
sports	coaching, football, soccer, basketball, baseball, swimming, etc.
sports	drag racing, pushing or driving a car
sports	football, competitive
sports	football, touch, flag, general
sports	football or baseball, playing catch
sports	frisbee
sports	golf, walking and carrying clubs
sports	golf, walking and pulling clubs
sports	golf, driving range

sports	golf, cart
sports	gymnastics, general
sports	handball, general
sports	hand gliding
sports	hockey, field
sports	hockey, ice
sports	horseback riding, general
sports	horseback riding, saddling horse, grooming horse
sports	horseback riding, trotting
sports	horseback riding, walking
sports	horseshoe pitching
sports	judo, jujitsu, karate, kickboxing, tae kwan do
sports	lacrosse
sports	motorcross
sports	polo
sports	racquetball, competitive
sports	racquetball, casual, general
sports	rock climbing, climbing
sports	rock climbing, rappelling
sports	rope jumping, fast
sports	rope jumping, moderate, general
sports	rope jumping, slow
sports	rugby
sports	skateboarding
sports	rollerblading
sports	sky diving
sports	soccer, general
sports	softball/baseball, fast or slow pitch, general
sports	softball, officiating
sports	softball, pitching
sports	tai chi
sports	tennis, general
sports	volleyball, non-competitive, 6-9 member team, general
sports	wrestling
transportation	automobile or light truck driving
transportation	riding in a car or truck
transportation	flying in an airplane
transportation	motorcycle
transportation	driving heavy truck, tractor, bus
walking	backpacking
walking	carrying infant or 15lb. load, level ground
walking	loading/unloading car
walking	hiking, cross country
walking	pushing or pulling stroller with child or walking with children

walking	pushing a wheelchair, non-occupational
walking	race walking
walking	rock or mountain climbing
walking	up stairs, climbing ladder
walking	walking the dog
walking	walking, 2mph, level, slow pace, firm surface
walking	walking, 2.5mph, firm surface
walking	walking, 2.5mph, downhill
walking	walking, 3mph, level, moderate pace, firm surface
walking	walking, 3.5, mph, level, brisk, firm surface, for exercise
walking	walking, 3.5mph, uphill
walking	walking, 4mph, level, firm surface, very brisk pace
walking	walking, 4.5mph, level, firm surface, very, very brisk pace
walking	walking 5mph
walking	walking, grass track
walking	walking, to work or class
water activities	boating, power
water activities	canoeing on camping trip
water activities	canoeing, rowing light effort, 2-3.9mph
water activities	canoeing, rowing, moderate effort, 4-5.9mph
water activities	canoeing, rowing, vigorous effort, greater than 6mph
water activities	canoeing, general
water activities	diving, springboard, platform
water activities	kayaking
water activities	sailing, boat, board, windsurfing, general
water activities	skiing, water
water activities	skindiving, scuba, general
water activities	snorkeling
water activities	swimming laps, freestyle, fast vigorous effort
water activities	swimming laps, freestyle, slow, moderate or light effort
water activities	swimming laps, backstroke
water activities	swimming laps, breaststroke
water activities	swimming laps, butterfly
water activities	swimming, leisure, general
water activities	water polo
water activities	water jogging
water activities	whitewater rafting
winter activities	skiing, general

VITA

Amanda J. Sinclair

Candidate for the Degree of

Doctor of Education

Dissertation: THE RELATIONSHIP OF PHYSICAL ACTIVITY, INJURY, AND SUCCESS OF RODEO ATHLETES

Major Field: Applied Educational Studies

Biographical:

Education: Las Animas High School, Las Animas, CO, May, 1990; Bachelor of Arts, Exercise Physiology & Leisure Science (Secondary Physical Education, Athletic Training), Adams State College, Alamosa, CO, December, 1994; Master of Arts, Movement Science (Athletic Training), San Jose State University, San Jose, CA, August, 1997; Completed the requirements for the Doctor of Education Degree in Applied Educational Studies at Oklahoma State University in December, 2001.

Experience: Seasonal Park Ranger for U.S. Army Corps of Engineers, Albuquerque District, John Martin Reservoir (7 summers between 1991 and 2000); Head Athletic Trainer, Cupertino High School, Cupertino, CA, 1995-97; Head Athletic Trainer, Instructor of Health Physical Education and Recreation, Oklahoma Panhandle State University, Goodwell, OK, 1997-99; Graduate Assistant Instructor, Department of Health and Human Performance, Oklahoma State University, Stillwater, OK, 1999-2000; Visiting Instructor, Department of Health and Human Performance, Oklahoma State University, Stillwater, OK, 2000-01; Justin Sportsmedicine Team Associate, Mobile Sports Medicine Systems, McKinney, TX, 1997-present; Special Event Coverage (National High School Finals Rodeo), Orthopeadic Center of the Rockies, Fort Collins, CO, 1999-2001; Assistant Professor, Coordinator of Clinical Education—Athletic Training Education, Southeast Missouri State University, Cape Girardeau, MO, 2001-present.

Professional Memberships: Oklahoma Athletic Trainers' Association, Mid-America Athletic Trainers' Association, National Athletic Trainers' Association, American College of Sports Medicine.