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A Survey: Frequency of Spondylolysis or Spondylolisthesis in Young Athletes

Kara D. Dewhirst
University of North Dakota

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A SURVEY: FREQUENCY OF SPONDYLOLYSIS OR
SPONDYLOLISTHESIS IN YOUNG ATHLETES

by

Kara D. Dewhirst
Bachelor of Science in Physical Therapy
University of North Dakota, 1997

An Independent Study

Submitted to the Graduate Faculty of the

School of Medicine

University of North Dakota

in partial fulfillment of the requirements

for the degree of

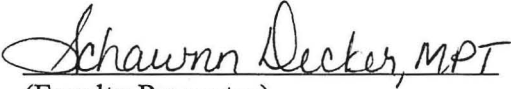
Master of Physical Therapy

Grand Forks, North Dakota


May
1998



This Independent Study, submitted by Kara D. Dewhirst in partial fulfillment of the requirements for the Degree of Master of Physical Therapy from the University of North Dakota, has been read by the Faculty Preceptor, Advisor, and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.


(Faculty Preceptor)


(Graduate School Advisor)


(Chairperson, Physical Therapy)

PERMISSION

Title A Survey: Frequency of Spondylolysis or Spondylolisthesis in
Young Athletes

Department Physical Therapy

Degree Master of Physical Therapy

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Signature Kana S. Sewkiest

Date 12/8/97

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ABSTRACT

The purpose of this survey research is to survey male and female high school varsity track athletes regarding the occurrence of low back pain, and then correlating the occurrence of a spondylolysis and/or spondylolisthesis with athletic involvement in the sport of track. A questionnaire was sent to 115 high school varsity track athletes in varsity track programs in the state of North Dakota. Only those athletes who participate in high jump, pole vault, discus, shot put, javelin, and 400M sprints or shorter were asked to take part in the survey.

The survey results were unable to answer the research question stated in the purpose statement due to a number of limitations; however, the survey results were reported with traditional descriptive statistics described graphically in table form. Suggestions for improving outcome of the survey results in this study are given in the discussion.

CHAPTER I

INTRODUCTION

The participation of children and adolescents in organized competitive sports has vastly grown over the years in the United States. It is estimated that 30 million children now participate in organized sports across the nation.¹ Because of the increased participation in competitive sports by this age group, there has also been an increase in the occurrence of injuries. Among these injuries experienced by this population, low back pain has been reported as having one of the highest incidence rates in young athletes.¹ Those athletes who are involved in a sport which requires repetitive flexion, extension, or rotation of the spine are by far more prone to a low back injury than the athlete who is not exposed to these stresses.¹

One of the most common and misdiagnosed pathologies that young adolescent athletes experience is a spondylolysis of the spine. A spondylolysis is the result of a stress fracture of the pars interarticularis in the vertebra. This most often occurs from repetitive hyperextension maneuvers as in gymnastics, diving, wrestling, weightlifting, and track and field.² In a study conducted by Micheli and Wood¹ on young athletes suffering from low back pain, 47 out of 100 adolescents were ultimately shown to have a spondylolysis stress fracture of the pars interarticularis. This diagnosis was made by plain roentgenography, bone scanning, magnetic resonance imaging, or single-photon emission computed tomography with a specific lesion in the spine corresponding to the pattern of pain

symptoms. All patients had pain on provocative hyperextension testing. Out of this group of 100 cases, 73 were injuries to the posterior elements of the spine. This is a major site for pathology in athletically active adolescents with back pain. A spondylolysis stress fracture is potentially the most severe posterior element injury. Other posterior element injuries include hyperlordotic mechanical back pain which accounted for 26 out of the 100 cases for low back pain diagnosis in the study.¹

Unfortunately, many of these adolescent low back injuries are overlooked by the medical professionals because of two reasons. 1) The primary care physician who initially sees the athlete presenting with low back pain will usually give the diagnosis of a “back strain”. This is a “waste basket” diagnosis given primarily because historic reports of studies of adolescents have suggested a low incidence rate of back pain in this age group in general. The majority are considered to have “nonspecific” lumbar pain that will resolve without specific treatment.¹ 2) Since the North American adult population has an incidence of >80% of severe low back pain and the major cause of that back pain is due to degenerative changes in the spine, the trend is to minimize diagnostic interventions since this back problem results from inevitable degenerative sequence. The low back pain experienced in young athletes is thought to be related to this adult back pain etiology; therefore, spondylolysis is often overlooked as a means of priority back treatment.¹

Because there has proven to be a high incidence rate in low back injury among adolescent athletes, health professionals who deal with this population should not overlook the serious pathologies which could lead to long-term problems. It is important as professionals to gain the knowledge of the symptoms and which pathologies those

symptoms predispose the athlete to. This may not only help reduce the amount of money spent on low back rehabilitative care and surgery, but decrease the long-term problems these young athletes may face.

Currently, studies documenting the frequency of spondylolysis and other overuse defects of adolescent athletes or even the general population are not available.³ The purpose of this study is to survey male and female high school varsity track athletes regarding the occurrence of low back pain, and then correlating the occurrence of a spondylolysis and/or spondylolisthesis with athletic participation in the sport of track.

CHAPTER II

LITERATURE REVIEW

Predisposing Conditions to Back Injury in Young Athletes

Factors predisposing the young athlete to back injury cover a wide array of conditions that are both intrinsic and extrinsic. In this review of conditions however, only the most common will be discussed. The conditions range from growth spurts the young athlete experiences throughout puberty, abrupt increases in training intensity or frequency throughout this adolescent phase, improper techniques performed by the athletes, to leg-length inequality.²

Growth Spurt

During the early adolescent phase, the young athlete's body experiences many hormonal changes. If the paraspinous musculature, which parallels the spine, does not grow at the same rate as bone, the result is an imbalance in the tissue. The lumbodorsal fascia becomes tight which causes the hamstrings to stress the spine, therefore, predisposing the athlete to back pain.^{4,5}

Training Errors

Abrupt increases in intensity or frequency while the adolescent athlete is training in the pre-season are quite often cited in association with the onset of low back pain in adolescents. Too much too soon may create long-term problems for the young athlete

because of lack of knowledge by the coach and/or athlete. A teen-age dancer may abruptly switch to an intense practicing schedule of rehearsing for 10 to 12 hours a day when she was only taking classes for two hours a day previously. This dramatic increase in back stress can injure ligaments, muscles, and tendons.²

Improper Techniques

Improper technique in a number of sports may predispose the athlete to low back strain. A football lineman for example, who blocks an opponent while maintaining an erect posture may suffer a hyperextension injury if not positioned with a stable base of support.² If a gymnast is not physically conditioned for back walkovers and dismounts during an intense performance, the excessive lordosis may produce low back pain pathologies such as a spondylolysis.²

Leg-Length Inequality

Leg-length discrepancies cause an unequal transmission of force across the athlete's spine during weight-bearing activities. In situations where the athlete moves quickly as in track and field events, the stress transmission throughout the spine amplifies the predisposition to low back injury.⁵

Leg-length inequality is somewhat of a controversial subject when deciding whether the leg-length difference is clinically meaningful or not.² According to Magee, Ph.D., B.P.T.⁶, a leg length difference of as much as 1.0 to 1.5 centimeters is considered normal. Others, including those who have studied the effects in athletes specifically, tend to consider 4 millimeters of difference to be clinically important.^{2,5}

Diagnostic Entities

The diagnosis of low back pain in adolescents is complicated because of the nonspecificity of pain.^{2,7} The specific cause of low back pain may range from a contusion (direct blow to the tissue causing a bruise) to a disc herniation. In either case, the injury or pain must not be overlooked. The most common entities of low back pain in adolescents are discussed below.

Fractures

Compression fractures are the most common traumatic injury to the lumbar spine.⁸ This injury occurs when the spine is forced into flexion, crushing the vertebral body into a wedge. Depending whether the spinal ligaments are torn or not categorizes the fracture as stable or unstable. If the posterior ligaments are torn and the vertebral body is also fractured, the lesion is unstable, however, if the posterior ligaments remain intact, the injury is stable. The fracture occurs at the weakest site which lies at the anterior part of the body secondary to the lack of horizontal trabeculations.⁹ This injury occurs most often by acute flexion of the spine such as occurs if the athlete falls from a height or by heavy weight falling on the shoulders.^{2,9}

Comminuted fracture of the lumbar spine is far less common than the simple compression fracture. The intervertebral disc is always injured with this type of fracture due to an abrupt flexion force driving one vertebral body or its adjacent intervertebral disc into the superior plate of the next lower body. Posterior fragments may be driven posteriorly, producing or cord compression or injury.^{2,8}

Sprain/Strain

Lumbosacral strain is an acute injury of the muscle-tendon units of the extensor muscles of the spine. It is characterized by immediate onset after activity or provocative maneuver, muscle tenderness, decreased motion away from injured muscle group, and lack of neurological signs.¹ A sprain or strain to the low back occurs when the adolescent either lifts incorrectly or twists the spine causing acute low back pain. Mild to moderate acute low back pain in adolescents usually heals quickly, similar to the peripheral joints.¹⁰ A sprain refers to an injury to a ligament, while a strain refers to microtears, tears of the muscle, tendon, or musculotendinous junction. The exact structure injured is often difficult to detect. Sprain/strain mechanisms can be grouped into 3 categories:

1. Acute injury: a sudden overloading of musculotendinous units, as might occur in sprinting or tackling.
2. Chronic or overuse injury: a repeated overload and/or frictional resistance, which might occur in highly repetitive action, or endurance training.
3. Acute injury imposed on a chronic injury.^{2,5}

Lumbar Facet Syndrome

The lumbar facet syndrome is an irritation of the posterior elements of the lumbar spine. This classic syndrome is characterized by local paralumbar tenderness, pain on hyperextension, normal neurological examination, and hip, buttock or back pain with straight leg raising. Pain may occur with forward flexion, or it may be referred to multiple areas. These areas include the groin, the greater trochanter, and the posterior thigh as far down as the knee. The pain is made worse by movement and relieved by rest.^{2,5}

Athletes who participate in sports involving repeated and forceful hyperextension of the lumbar spine suffer from lumbar facet syndrome at a higher incidence than those who do not. Tennis players, gymnasts, divers, golfers, power lifters, and football players.⁵

Disc Herniation

Disc herniation is a focal protrusion of the nucleus pulposus through a defect in the annulus fibrosis, most commonly protruding in the posterolateral portion. This happens to be the weakest part of the annular wall secondary to the annulus having the smallest radius as well as being the thinnest and the least firmly attached to the bone.¹¹ The lumbar region is the most common area for disc herniation due to the fact that this area has the greatest mobility, especially at the L5 to S1 and L4 to L5 levels.²

Adolescent disc herniation is precipitated by trauma or lifting heavy objects and may be accompanied by a snapping sensation. The presenting signs in the adolescent may occur suddenly or gradually and may be confined to hamstring and back inflexibility.^{2,5}

Spondylolysis/Spondylolisthesis and Young Athletes

Spondylolysis is a defect of the spine affecting the pars interarticularis that most commonly affects the L5 and S1 vertebral bodies. Spondylolysis may progress to spondylolisthesis, an anterior slippage of a vertebra (usually L5).^{2,3} 'Spondylo' means vertebra, '-lysis' means crack or fracture, and '-olistheses' means sliding down an incline.¹²

The most frequent clinical pattern is back pain that is not incapacitating, but is exacerbated after a specific event. The athlete may present with a chronic dull aching

pain of the lumbosacral spine that is exacerbated by movements requiring vigorous repetitive hyperextension, or rotation with the back in a hyperlordotic position. The pain usually comes on without specific injury and no clear time of onset. This follows a pattern that supports the hypothesis of a stress reaction progressing to a frank fracture by a biomechanical load or stress.^{3,13} In the athlete, this spinal defect is thought to be due to repetitive hyperextension maneuvers. Gymnastics, diving, pole vaulting, or collision/contact sports such as football, soccer, hockey, and la crosse are the most common sports that produce an increased risk and frequency for this disorder. All of these activities share a pattern of sudden loaded hyperextension with torsion.¹⁴

Physical examination findings include pain upon extension of the back or hip and occasionally paraspinal muscle spasm.^{2,3,14} The detection of an adolescent athlete's spondylolysis may or may not be able to be detected depending upon the duration of symptoms. Diagnostic tests, such as the bone scan or radiograph may or may not show fractures of the pars interarticularis and confirm the spondylolysis, but are quite often used in confirming the diagnosis.^{2,3,5}

Diagnostic Tests

The diagnostic tests such as radiographs, bone scans, computed tomography, and magnetic resonance imaging are often considered in determining a diagnosis in the adolescent with severe back pain. A thorough history and physical examination are usually more effective in determining a diagnosis because often there is no anatomic defect visible by imaging techniques. After conservative treatment has failed throughout several weeks, the diagnostic tests are performed to help clarify the diagnosis.

Radiographs

The film on which an image is produced through exposure to x-radiation is most commonly used when an athlete has undergone some kind of trauma.¹⁵ Anteroposterior and lateral radiographs of the lumbar spine and pelvis are initially the only projections required. Plain films allow detection of fractures and subluxations. An anteroposterior projection may pick up lumbar transverse process fractures or avulsion fractures off the tip of the process. Lateral views will pick up a compression fracture, which consists of a buckling of the superior plate, anterior wedging, or loss of stature of a vertebral body. Oblique radiographs are often necessary to identify defects in the pars interarticularis indicating a spondylolysis.^{2,7,8} The spondylolysis presents as a defect known as the 'scotty dog'.⁷

Computed Tomography

Computed tomography (CT) is a step up from the plain radiograph in that the CT defines the extent of a spinal fracture. The major disadvantage of tomography (transverse planes of tissue swept by a pinpoint radiographic beam computerized to produce a precise reconstructed image) is the high radiation dose and the limited field of view.^{7,15}

Bone Scan

The radionuclide bone scan is a diagnostic test used in the detection for early inflammatory or malignant processes of the spine. Although the test is very sensitive, it is time-consuming and produces poor localization for anatomic structures.¹⁶

Identification for a spondylolysis is possible through the bone scan and is often compared to the oblique radiograph. Depending upon the stage of the fracture, the spondylolysis may be difficult to detect on radiograph by able to be detected on bone

scan. There are 4 stages of the spondylolysis: Stage I. Acute fracture; Stage II. Healing fracture; Stage III. Unhealed fracture; Stage IV. Healed fracture. Until spondylolysis occurs, repetitive microtears may be radiographically invisible but detectable on bone scan.^{2,16}

Magnetic Resonance Imaging

Although magnetic resonance imaging has provided the most accurate identification of the intervertebral disc for low back pain, this technique may not be the diagnostic test of choice for the detection of a spondylolysis. This technique is valuable in providing images of soft tissue (intervertebral discs, large blood vessels, the brain, and heart). This technique does not involve exposure to ionizing radiation or require the need to inject a contrast medium.¹⁵ Considering that the MRI is expensive and requires the patient to stay immobile to lengthy periods of time, this diagnostic test is most often used as a last resort.^{7,17}

Purpose of Study

The purpose of this study is to survey male and female high school varsity track athletes regarding the occurrence of low back pain, and then correlating the occurrence of a spondylolysis and/or spondylolisthesis with athletic involvement in the sport of track. In researching this topic, the following research question arose: Does athletic participation in the sport of track increase the occurrence of low back pain with a specific diagnosis of a spondylolysis and /or spondylolisthesis?

CHAPTER III

METHODOLOGY

Procedure

A survey was mailed to student athletes who participate in varsity track at their respective class A High School in North Dakota. Each survey was mailed to the varsity track coach(es) at the participating school with a self-addressed, stamped, return envelope included. The coaches then distributed the surveys and consent forms to the varsity track athletes. The completed consent forms and surveys were collected by the coach(es) and returned directly to the Physical Therapy Department in the self-addressed, stamped, return envelopes. Once the surveys and consent forms arrived at the Physical Therapy Department, a third party separated the surveys and consent forms and assigned each survey a number before being given to the researcher. The data was then collected aggregately and analyzed for descriptive trends. Survey procedures were conducted in accordance with and the consent of the University of North Dakota Institutional Review Board's policies and procedures (Appendix A).

Survey Construction

The questionnaire was developed from a review of current literature regarding low back pain and its occurrence in young athletes. The literature cites the lack of documentation regarding the frequency of spondylolysis and other overuse injuries in

athletes. The survey questions were developed to address these insufficiencies. A copy of the questionnaire can be found in Appendix B.

Research Question

Does athletic participation in the sport of track increase the occurrence of low back pain with specific a diagnosis of a spondylolysis and/or spondylolisthesis?

Data Analysis

In order to maintain confidentiality, survey responses remained anonymous. Following the return of the questionnaires, all data were reported in aggregate and analyzed for descriptive trends. The results were reported with traditional descriptive statistics described graphically in tables listed in Chapter IV, Results.

CHAPTER IV

RESULTS

Twenty-seven (23%) of the 115 high school varsity track athletes participated in the questionnaire. There was equal representation of the two sexes—52% males and 48% females. The age range was 14-18 years old with 79% of the males falling in the 16-17 age range category and 62% of the females in the 16-17 age category. In my sample 64% (9 out of 14) males and 69% (9 out of thirteen) females reported to have low back pain on the questionnaire. The research question presented in chapters I and II was unable to be answered with the survey results due to a number of limitations; however, the survey results are presented through traditional descriptive statistics in the following tables.

Table I displays the summary of survey responses for all of the male and female varsity track athletes, with and without low back pain, who participated in the questionnaire. Those items that pertained to the entire respondent group are marked with an asterisk.

Table II reports that 3 out of 9 (33%) of the female athletes had been seen by a doctor for the low back pain. Only one of those females had been given a diagnosis which was reported as sciatica in the survey. That same person had been given an X-ray but was not informed of the results as per the survey response. Out of the male athletes, 6 out of 9 (66.7%) were given diagnosis for their low back pain, the responses included: low back strain, pinched nerve, hip out of place, and vertebrae out of alignment. Among

the six males who had been given a diagnosis, three had received X-rays. The reported results of the X-rays included: vertebrae out of alignment, and extra tailbone vertebrae. One survey respondent had not been informed of the X-ray results.

Table I. Summary of Survey Responses for the Male and Female Athletes
With and Without Low Back Pain (LBP)

	MALE (n=14)	FEMALE (n=13)
Age*		
14-15	1	3
16-17	11	8
18 & Older	2	2
Track Event(s) Competed in*		
High Jump	2	0
Pole Vault	3	0
Shot Put	4	2
Discus	3	2
Javelin	2	2
400 M Sprint or Shorter	8	10
Years Competed in Varsity Track*		
1 st Year	0	0
1	1	3
2	1	4
3	10	2
4	2	4
Experiencing/Experienced LBP	9	9
Duration of Symptoms		
Less than 1 wk	0	0
1-3 wks	2	4
3 wks-1 mo	3	2
1-2 mo	2	1
2-3 mo	0	1
Greater than 3 mo	2	1
Motion Causing Pain		
Leaning Right	2	0
Leaning Left	2	1
Twisting Right	3	4
Twisting Left	1	3
Bending Forward	9	3
Bending Backward	5	5
Age First Noticed LBP		
13 yrs	0	3
14 yrs	5	2
15 yrs	2	2
16 yrs	0	2
17 yrs	2	0
Pain Scale (0=no pain; 10=worst pain)		
0-3	0	1
4-7	9	8
8-10	0	0

* Total number of respondents

Table II. Summary of Survey Responses for Male and Female Athletes
Who Reported Low Back Pain (LBP)

SURVEY QUESTION	MALE (n=9)	FEMALE (n=9)
Do you compete in any other sport besides track?	9 (100%)	9 (100%)
Do experience LBP with any other sport?	9 (100%)	6 (66.7%)
Were you involved in sports at the onset of LBP?	9 (100%)	9 (100%)
Do experience LBP in the off season?	6 (66.7%)	5 (55.6%)
Is the LBP experienced the same pain you experienced while in season?*	6 (100%)	4 (80%)
Have you ever seen by a doctor for your LBP?	7 (77.8%)	3 (33.3%)
Have you been given a diagnosis for your LBP?	6 (66.7%)	1 (11.1%)
Have you ever had an X-ray taken on your spine for your LBP?	3 (33.3%)	1 (11.1%)

* Not based on total number of participants (based on off season)

CHAPTER V

DISCUSSION AND CONCLUSION

The research question (Does athletic involvement in the sport of track cause an increase occurrence in low back pain with a specific diagnosis of a spondylolysis and/or spondylolisthesis?) was unable to be answered with the survey results due to a number of limitations. These limitations include both intrinsic and extrinsic factors.

The intrinsic factors include survey construction and survey population. The survey was constructed in such a way where the questions were aimed at assuming too much by the researcher. The questions were general and did not specifically focus on questions pertaining to spondylolysis itself, but rather asked about low back pain in general. Had the questions been more specific to finding out if the athlete had spondylolysis symptoms, the research question may have been better determined. The survey population I included in my study were adolescent high school varsity track athletes who participated in the six specified track and field events. If I had surveyed athletes over the age of eighteen, consent forms would not have been required for the athletes to participate in the study. The extra step of taking the forms home to the parents of the athletes for the required permission signature and then mailing the completed surveys themselves might have contributed to the small number of returned survey responses.

Extrinsic factors include the time of year in which the surveys were distributed and the flood of 1997. The questionnaire was originally planned to be distributed in the spring of 1997 during the North Dakota high school track season. Due to Mother Nature and the great flood of 1997, the plan was backed up to the fall of 1997 instead. During the fall, the athletes are no longer in track season, but concentrating on another sport. Had the athletes filled out the surveys during the original track season, the response rate probably would have greatly increased.

Looking back, if I had to conduct this research study again, the following things would change. The survey construction would consist of questions pertaining to the specific diagnosis of spondylolysis. I would include all varsity sports for male and female varsity high school athletes and try to correlate which sports are participated in most frequently, if any, with the occurrence of low back pain the individual experiences. The survey population would consist of already diagnosed adolescents who experience low back pain with a specific diagnosis of a spondylolysis. This population would be obtained through orthopedic doctors who have treated these patients for low back pain and have been diagnosed with a spondylolysis through and X-ray. The adolescents would be asked to attend a meeting with parents present so the surveys could be filled out and completed at that time. The response rate would be 100% and no postage would be needed for self-addressed, stamped, return envelopes. Finally, the adolescents would be surveyed at a time of year where attendance would be high to accommodate to the schedules of the parents and young adults. The meeting would include an educational, informative session to the parents and young adults about the stresses the low back is

exposed to during athletics as well as signs and symptoms to watch out for indicating low back spinal pathologies.

Conclusion

The value of this study was not of statistical results of the research, but the valuable knowledge of my learning experience of which I gained with this study.

APPENDIX A

REPORT OF ACTION: FULL BOARD REVIEW
University of North Dakota Institutional Review Board

DATE: September 24, 1997 PROJECT NUMBER: IRB-9709-049
NAME: Kara Dewhirst DEPARTMENT/COLLEGE: Phyiscal Therapy
PROJECT TITLE: A Survey: Frequency of Spondylolysis or Spondylolisthesis in Young Adults

The above referenced project was reviewed by the Chair/Vice Chair/Designated Member of the University of North Dakota Institutional Review Board on September 24, 1997 and the following action was taken:

- Project **approved**. Next scheduled review is on September 1998.
(See REMARKS SECTION for any special condition.)
- Project approved **PENDING** receipt of corrections/additions in ORPD. These corrections/additions should be submitted to ORPD for review and approval. **This study may NOT be started UNTIL final IRB approval has been received.** (See REMARKS SECTION for further information.)
- Project approval **deferred**. **This study may not be started until final IRB approval has been received.** (See REMARKS SECTION for further information.)
- Project **denied**. (See REMARKS SECTION for further information.)

REMARKS: Any changes in protocol or adverse occurrences in the course of the research project must be reported immediately to the IRB Chairperson or ORPD.

cc: S. Decker, Adviser
Dean, Medical School

Richard Furaw
Signature of Chairperson/Vice Chair/Designated Member
UND's Institutional Review Board

9-24-97
Date

If the proposed project (clinical medical) is to be part of a research activity funded by a Federal Agency, a special assurance statement or a completed 596 Form may be required. Contact ORPD to obtain the required documents.

REPORT OF ACTION: FULL BOARD REVIEW
University of North Dakota Institutional Review Board

DATE: November 5, 1997 PROJECT NUMBER: IRB-9709-049
NAME: Kara Dewhirst DEPARTMENT/COLLEGE: Physical Therapy
PROJECT TITLE: A Survey: Frequency of Spondylolysis or Spondylolisthesis in Young
Adults (Protocol Change)

The above referenced project was reviewed by the Chair/Vice Chair/Designated Member of the University of North Dakota Institutional Review Board on November 5, 1997 and the following action was taken:

- Project **approved**. Next scheduled review is on September 1998.
(See REMARKS SECTION for any special condition.)
- Project approved **PENDING** receipt of corrections/additions in ORPD. These corrections/additions should be submitted to ORPD for review and approval. **This study may NOT be started UNTIL final IRB approval has been received.** (See REMARKS SECTION for further information.)
- Project approval **deferred**. **This study may not be started until final IRB approval has been received.** (See REMARKS SECTION for further information.)
- Project **denied**. (See REMARKS SECTION for further information.)

REMARKS: Any changes in protocol or adverse occurrences in the course of the research project must be reported immediately to the IRB Chairperson or ORPD.

cc: S. Decker, Adviser
Dean, Medical School

Richard Fraw
Signature of Chairperson/Vice Chair/Designated Member
UND's Institutional Review Board

11/5/97
Date

If the proposed project (clinical medical) is to be part of a research activity funded by a Federal Agency, a special assurance statement or a completed 596 Form may be required. Contact ORPD to obtain the required documents.

(3/96)

**THE GRADUATE SCHOOL
UNIVERSITY OF NORTH DAKOTA OUTLINE**

(Check One)

Outline of Independent Study X Thesis _____ Dissertation _____ Project Design _____

Student: Kara D. Dewhirst Date: 4 / 9 / 97

Proposed Title: A Survey: Frequency of Spondylolysis or Spondylolisthesis In Young Athletes

Anticipated Date of Graduation: 05 / 10 / 98

Description of the nature of the problem/study, the procedure or methodology to be followed, and the proposed results:

The participation of children and adolescents in organized competitive sports has vastly grown over the years in the United States. Because of the increased participation in competitive sports, particularly those which require repetitive stresses on the low back, there has been an increase in the occurrence of low back injuries. The young adolescent athlete is prone to low back pain and specifically stress fractures due to the repetitive stresses which are put on their developing spine because of these highly demanding sports.

The purpose of this survey is to obtain information from male and female varsity track athletes who experience low back pain and to correlate the occurrence to a diagnosis of spondylolysis and/or spondylolisthesis. A questionnaire will be sent to 10 class A varsity track schools in eastern North Dakota. From each track program, only those athletes who participate in pre-selected events will be asked to participate in the survey. Results from this survey will be shared with all track programs who request results.

Signatures of approval as specified in the "Degree Requirements" section of the Graduate Bulletin:

Peggy M. Moberg _____

THIS OUTLINE MUST BE FILED IN THE GRADUATE SCHOOL BEFORE ADVANCEMENT TO CANDIDACY.

EXPEDITED REVIEW -/REQUESTED UNDER ITEM ____ (NUMBER(S)) OF HHS REGULATIONS
 EXEMPT REVIEW REQUESTED UNDER ITEM ____ (NUMBER(S)) OF HHS REGULATIONS

UNIVERSITY OF NORTH DAKOTA
HUMAN SUBJECTS REVIEW FORM
FOR NEW PROJECTS OR PROCEDURAL REVISIONS TO APPROVED
PROJECTS INVOLVING HUMAN SUBJECTS

PRINCIPAL

INVESTIGATOR: Kara Dewhirst TELEPHONE: 777-5722 DATE: 4-9-97

ADDRESS TO WHICH NOTICE OF APPROVAL SHOULD BE SENT: 213 Swanson Grand Forks, ND 58202-2014

SCHOOL/COLLEGE: School of Medicine DEPARTMENT: PT PROPOSED PROJECT DATES: 8/97 - 12/97

PROJECT TITLE: A Survey: Frequency of Spondylolysis or Spondylolisthesis In Young Athletes

FUNDING AGENCIES (IF APPLICABLE): N/A

TYPE OF PROJECT:

DISSENTATION OR
 NEW PROJECT CONTINUATION RENEWAL THESIS RESEARCH STUDENT RESEARCH PROJECT
 CHANGE IN PROCEDURE FOR A PREVIOUSLY APPROVED PROJECT

DISSERTATION/THESIS ADVISER, OR STUDENT ADVISER: Schawnn Decker

PROPOSED PROJECT: INVOLVES NEW DRUGS (IND) INVOLVES A COOPERATING
INVOLVES NON-APPROVED USE OF DRUG INSTITUTION

IF ANY OF YOUR SUBJECTS FALL IN ANY OF THE FOLLOWING CLASSIFICATIONS, PLEASE INDICATE THE CLASSIFICATION(S):

MINORS (<18 YEARS) PREGNANT WOMEN MENTALLY DISABLED FETUSES MENTALLY RETARDED
 PRISONERS ABORTUSES UND STUDENTS (>18 YEARS)

IF YOUR PROJECT INVOLVES ANY HUMAN TISSUE, BODY FLUIDS, PATHOLOGICAL SPECIMENS, DONATED ORGANS, FETAL MATERIAL, OR PLACENTAL MATERIALS, CHECK HERE

1. ABSTRACT: (LIMIT TO 200 WORDS OR LESS AND INCLUDE JUSTIFICATION OR NECESSITY FOR USING HUMAN SUBJECTS.)

The participation of children and adolescents in organized competitive sports has vastly grown over the years in the United States. Because of the increased participation in competitive sports, particularly those which require repetitive stresses on the low back, there has been an increase in the occurrence of low back injuries. The young adolescent athlete is prone to low back pain and specifically stress fracture because of the repetitive stresses which are put on their developing spine because of these highly demanding sports.

The purpose of this survey is to obtain information from male and female varsity track athletes who experience low back pain and to correlate the occurrence of a spondylolysis and/or spondylolisthesis with athletic involvement in the sport of track. A questionnaire will be sent to 10 class A varsity track schools in eastern North Dakota. From each track program, only those athletes who participate in pre-selected events will be asked to participate in the survey. Results from this survey will be shared with all track programs who request results.

PLEASE NOTE: Only information pertinent to your request to utilize human subjects in your project or activity should be included on this form. Where appropriate attach sections from your proposal (if seeking outside funding).

2. **PROTOCOL:** (Describe procedures to which humans will be subjected. Use additional pages if necessary.)

Subjects: Approximately 95 - 500 student athletes (with a minimum of 95 students) ages 12-18 who participate in varsity track at the 10 specified class A High Schools in North Dakota, will be asked to participate in the survey. Confidentiality will be maintained by keeping the subject's responses anonymous. The responses will be kept confidential as each survey will be assigned a reference number when it is returned. This number will be used if the data is referred to in the results. A listing of the 10 class A High Schools participating in the survey will be obtained from Red River High School in Grand Forks, North Dakota.

Survey Development: The questionnaire was developed from a review of current literature regarding low back pain and its occurrence in young athletes. The literature cites the lack of documentation of frequency of spondylolysis and other overuse injuries in athletes. The survey questions were developed to address these insufficiencies.

Procedure: Each survey will be mailed to the varsity track coach(es) at the participating school with a self-addressed, stamped, return envelope included. The coaches will then distribute the surveys and consent forms to the varsity track athletes. The completed consent forms and surveys will be collected by the coach(es) and returned directly to the Physical Therapy Department in the self-addressed, stamped, return envelopes. Once the surveys and consent forms arrive at the Physical Therapy Department, a third party will separate the surveys and consent forms and assign each survey a number before being given to the researcher. The data will then be collected aggregately and analyzed for descriptive trends.

3. BENEFITS: (Describe the benefits to the individual or society.)

Frequency of overuse injuries of the spine, such as spondylolysis in young athletes, is important knowledge to the medical professionals especially physical therapists. The questionnaire results could benefit all physical therapists and physicians as they continue to evaluate and treat young athletes with low back pain.

4. RISKS: (Describe the risks to the subject and precautions that will be taken to minimize them. The concept of risk goes beyond physical risk and includes risks to the subject's dignity and self-respect, as well as psycho-logical, emotional or behavioral risk. If data are collected which could prove harmful or embarrassing to the subject if associated with him or her, then describe the methods to be used to insure the confidentiality of data obtained, including plans for final disposition or destruction, debriefing procedures, etc.)

Risk to the subject is minimal. Survey responses will remain anonymous and results will be reported in aggregate, there by protecting confidentiality.

5. **CONSENT FORM:** A copy of the **CONSENT FORM** to be signed by the subject (if applicable) and/or any statement to be read to the subject should be attached to this form. If no **CONSENT FORM** is to be used, document the procedures to be used to assure that infringement upon the subject's rights will not occur.

Describe where signed consent forms will be kept and for what period of time.

Copies of resulting data and consent forms will be kept at the University of North Dakota Physical Therapy Department at Grand Forks for three years, after completion of the research study, then destroyed.

6. For **FULL IRB REVIEW** forward a signed original and thirteen (13) copies of this completed form, and where applicable, thirteen (13) copies of the proposed consent form, questionnaires, etc. and any supporting documentation to:

Office of Research & Program Development
University of North Dakota
Box 8138, University Station
Grand Forks, North Dakota 58202

On campus, mail to: Office of Research & Program Development, Box 134, or drop it off at Room 101 Twamley Hall.

For **EXEMPT** or **EXPEDITED REVIEW** forward a signed original and a copy of the consent form, questionnaires, etc. and any supporting documentation to one of the addresses above.

The policies and procedures on Use of Human Subjects of the University of North Dakota apply to all activities involving use of Human Subjects performed by personnel conducting such activities under the auspices of the University. No activities are to be initiated without prior review and approval as prescribed by the University's policies and procedures governing the use of human subjects.

SIGNATURES:

Kara Dewkirst
Principal Investigator

DATE: 9/22/97

Shawn Decker, MPT
Project Director or Student Adviser

DATE: 9/22/97

Training or Center Grant Director

DATE: _____

APPENDIX B

Kara Dewhirst, SPT
University of North Dakota
Dept. of Physical Therapy
P.O. Box 9037-9037
Grand Forks, ND 58202
(701) 777-2831
(701) 777-4199 FAX

Dear Athletic Directors and/or Varsity Track Coaches,

My name is Kara Dewhirst and I am a Physical Therapy student at the University of North Dakota. As part of my fulfillment for my M.P.T. degree, I am required to conduct an independent project. The focus of my independent project is to survey male and female high school varsity track athletes regarding the occurrence of low back pain. The purpose of this survey is to obtain information from male and female athletes who experience low back pain and to correlate the occurrence of a spondylolysis and/or spondylolisthesis with athletic involvement.

The responses will be kept confidential as each survey will be assigned a reference number when it is returned. This number will be used if the data is referred to in the results. The student athletes are under no obligation to complete this survey and no prejudice will occur if they do not. If you approve of my request to survey your varsity track athletes, please sign where indicated and return to me by faxing to the above number by April 18, 1997. Upon receiving the returned signed letter, I will immediately send copies of the survey along with a consent form for each athlete's parent(s) to sign. Included with the surveys and consent forms will be a cover letter with directions for distribution to the specified athletes. Only those athletes who participate in the following events will be surveyed: **high jump, pole vault, shot-put, discus, javelin, and 400 meters and under sprints.** If you have any questions regarding the survey, please call me at (701) 777-5794.

Thank you for your time and effort.

Sincerely,

Kara Dewhirst, SPT

signature

date

approximate # of surveys

Kara Dewhirst, SPT
University of North Dakota
Dept. of Physical Therapy
P.O. Box 9037
Grand Forks, ND 58202
(701) 777-4199 FAX

Dear Superintendents and Principals,

My name is Kara Dewhirst and I am a Physical Therapy student at the University of North Dakota. As part of my fulfillment for my M.P.T. degree, I am required to conduct an independent project. The focus of my independent project is to survey male and female high school varsity track athletes regarding the occurrence of low back pain. The purpose of this survey is to obtain information from male and female athletes who experience low back pain and to correlate the occurrence of a spondylolysis and/or spondylolisthesis with athletic involvement.

As part of the requirement for conduction of this study, your permission and signature of approval are required as per the Institutional Review Board at the University of North Dakota. As you may have already known, the varsity track coach(es) at your school have been contacted by me through a letter of request describing the details of this study. After reading my letter, the coach(es) have given me permission to survey the athletes. If you approve of my request to survey your school's varsity track athletes, please sign where indicated and return to me by faxing to the above number. If you have any questions regarding the survey, please call me at (701) 764-5532. Your signature of approval would be greatly appreciated as it is needed to proceed with the research study.

Thank you for your time and effort.

Sincerely,

Kara Dewhirst, SPT

Superintendent's signature

Date

Principal's signature

Date

Kara Dewhirst, SPT
University of North Dakota
Dept. of Physical Therapy
P.O. Box 9037
Grand Forks, ND 58202
(701) 777-4199 FAX

Dear Superintendents and Principals,

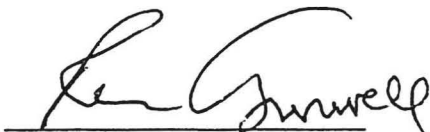
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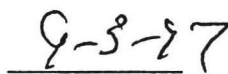
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Thank you for your time and effort.

Sincerely,

Kara Dewhirst, SPT


Superintendent's signature


Date


Principal's signature


Date

08/18/97 10:24 FAX 7012416070

FARGO NORTH HIGH

01

Kara Dewhirst, SPT
University of North Dakota
Dept. of Physical Therapy
P.O. Box 9037
Grand Forks, ND 58202
(701) 777-4199 FAX

Dear Superintendents and Principals,

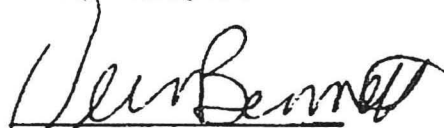
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Thank you for your time and effort.

Sincerely,

Kara Dewhirst, SPT


Superintendent's signature


Date


Principal's signature


Date

Kara Dewhirst, SPT
University of North Dakota
Dept. of Physical Therapy
P.O. Box 9037
Grand Forks, ND 58202
(701) 777-4199 FAX

Dear Superintendents and Principals,

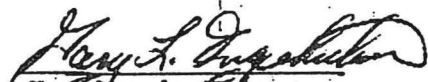
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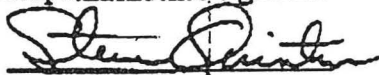
Thank you for your time and effort.

Sincerely,

Kara Dewhirst, SPT


Superintendent's signature

Nov 5, 1997
Date


Principal's signature

11-5-97
Date


Kara Dewhirst, SPT
University of North Dakota
Dept. of Physical Therapy
P.O. Box 9037
Grand Forks, ND 58202
(701) 777-2831

Dear Varsity Track Coach(es),

Enclosed you will find self-addressed, stamped envelopes that individually include one survey along with one consent form for your varsity track athletes to complete. Please distribute the envelopes to the varsity track athletes involved in: **high jump, pole vault, shot-put, discus, javelin, and 400 meters and under sprints**. The athletes are to complete the surveys after their parent(s) have signed the enclosed consent forms. Please instruct the student athletes that they or their parent(s) should return the completed survey and consent form directly to me in the envelope provided. If you receive any completed surveys and consent forms out of confusion, I would greatly appreciate if you would return them to me in the provided envelope. I have enclosed an extra survey and consent form for you to look at if you have any questions about what the students are filling out. Thank you for your participation in this research study as well as your time and effort. Please tell the students to return the surveys and consent forms to me no later than **OCTOBER 17, 1997**.

Sincerely,

Kara Dewhirst, SPT



SURVEY

The following is an independent project focused at surveying male and female high school varsity track athletes regarding the occurrence of low back pain. The purpose of this survey is to obtain information from male and female athletes who experience low back pain and to correlate the occurrence of a spondylolysis and/or spondylolisthesis with athletic involvement.

Please complete:

1. What is your age? (circle category)

12-13 14-15 16-17 18 & older

2. What is your gender? (circle one)

male female

3. Which track event(s) do you compete in?
(please check all that apply)

----- high jump ----- shot-put ----- javelin
----- pole vault ----- discus ----- 400M sprint or shorter

4. How many years have you competed in varsity track?
(please circle one)

1st year competing 1 2 3 4

5. Do you currently or have you ever experienced low back pain? (circle one)

Yes No -if No, you are completed with this survey
-if Yes, for how long? (circle one)

<1 week 1-3wks 3wks-1month 1-2mo 2-3mo >3mo.

6. If you answered YES to #5, during what motion do you experience your pain?

(please circle one, or none if neither of these motions cause pain) Leaning Right or Left

(please circle one, or none if neither of these motions cause pain) Twisting Right or Left

(please check all that apply) _____ Bending forward at the waist

_____ Bending backwards at the waist

7. At what age did you first notice your low back pain? (please indicate) _____

8. Were you involved in sports at that time? (circle one)

Yes No

9. Do you compete in any other sport besides track? (circle one) Yes No

10. Do you experience low back pain with any other sport? (circle one)

Yes No -if Yes, which ones? _____

11. Do you experience low back pain in the off-season? (circle one)

Yes No

12. If you answered yes to question #11, is it the same low back pain as you experience while in-season? (circle one)

Yes No

13. How would you rate your level of low back pain on a scale of 0-10
(0=no pain; 10=worse pain)

(please circle) 0 1 2 3 4 5 6 7 8 9 10

14. Have you ever been seen by a doctor for your low back pain? (circle one)

Yes No

15. Have you been given a diagnosis for your low back pain? (circle one)

Yes No -if Yes, what diagnosis _____

16. Have you ever had an X-Ray taken on your spine for your low back pain?

(circle one) Yes No -if Yes, were you informed of the conditions?
And what were they? _____

Your participation is appreciated and additional comments are welcome. Your responses will remain anonymous and confidential. If you have any questions or would like the results of this survey sent to you, please contact Kara Dewhirst at the following address:

University of North Dakota
Dept. of Physical Therapy
P.O. Box 9037
Grand Forks, ND
58202-9037

Thank you.

AdditionalComments: _____

-

INFORMATION AND CONSENT FORM

TITLE: *A Survey: Frequency of Spondylolysis or Spondylolisthesis in Young Athletes.*

You are being invited to participate in a study conducted by Kara Dewhirst, a physical therapy student at the University of North Dakota. The purpose of this study is to **obtain information from male and female varsity track athletes, ages 12-18, who experience low back pain and to correlate the occurrence of a spondylolysis and/or spondylolisthesis (the breaking down of a low-back vertebrae because of a forward slipping of the vertebrae on the tailbone) with athletic involvement in the sport of track.** A questionnaire will be sent out to 10 class A varsity track schools in eastern North Dakota. From each track program, only those athletes who participate in pre-selected events will be asked to participate in the survey. Results from this survey will be shared with all track programs who request results.

The questionnaire was developed from a review of current literature regarding low back pain and its occurrence in young athletes. The literature cites the lack of documentation of frequency of spondylolysis and other overuse injuries in young athletes. The survey will ask questions regarding the athlete's past and present experiences with low back pain and its relation to the participation in sports. The survey will take approximately 10 minutes to complete.

Each survey will be mailed with a self-addressed, stamped, return envelope included. After the survey has been completed by the athlete, the varsity track coach(s) will then collect the surveys and return them to the University of North Dakota Physical Therapy Department. Survey responses will remain anonymous and results will be reported in aggregate, there by protecting confidentiality.

Your name will not be used in any reports of the results of this study. Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission. The data will be identified by a number known only be the investigator. The investigator or participant may stop the experiment at any time if the participant is experiencing discomfort, fatigue, or any other symptoms that may be detrimental to his/her health. Your decision whether or not to participate will not prejudice your future relationship with the Physical Therapy Department, the University of North Dakota, or your School Athletic Program. If you decide to participate, you are free to discontinue participation at any time without prejudice.

The investigator involved is available to answer any questions you have concerning this study. In addition, you are encouraged to ask any questions concerning this study that you may have in the future. Questions may be asked by calling Kara Dewhirst at (701) 777-5794. A copy of this consent form is available to all participants in the study.

REFERENCES

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2. Harvey J, Tanner S. Low back pain in young athletes: a practical approach. *Sports Med.* 1991;12:394-406.
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5. Hochschuler SH. *The spine sports*, Hanley and Belfus, Philadelphia, 1990.
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11. McKenzie RA. *The Lumbar Spine.* Spinal Publications; 1981.
12. Cacayorin E, Hochlauser L, Petro GR. Lumbar and thoracic spine pain in the athlete: radiographic evaluation. *Clin Sports Med.* 1987;6:767-783.
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14. van den Oever M, Merrick MV, Scott JHS. Bone scintigraphy in symptomatic spondylolysis. *J Bone Joint Surg.* 1987;69B:453-6.
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17. Boden SD, Davis DO, Dina TS, et al. Abnormal magnetic-resonance scans of the lumbar spine in asymptomatic subjects. *J Bone Joint Surg.* 1990;72.