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Crossbow Evaluation Study

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Graduate Programs
Nominated by Ellen Herlache, Department of Occupational Therapy

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Abstract

Objective

The purpose of this study was to gather data regarding the effectiveness of the evaluation methods that were being used by therapists to determine client eligibility for crossbow permits in the state of Michigan prior to 2008. A mixed methods survey was mailed to 60 physical/occupational therapists in the state of Michigan who may have performed crossbow evaluations in the past. Thirty-seven therapists returned completed surveys. Overall, the respondents noted that the crossbow evaluation process prior to 2008 was inefficient, too time consuming, and did not assess all applicants fairly. Most agreed that a standardized, functional-based evaluation process was needed. Findings from the surveys determined that there was significant variation in the process being used to evaluate individuals, and that there was a need for a more functional, standardized form of evaluation.

Introduction

Under current Michigan law, the Department of Natural Resources requires a permit to use a crossbow during archery season. A crossbow is a weapon consisting of a bow mounted horizontally on a frame which is designed to fire an arrow by the use of a trigger. The difference between a crossbow and the typically used compound bow is that a crossbow can be drawn, locked into place, and stabilized on an object when firing. Prior to 2008, individuals could receive a crossbow permit if they were "at least eighty percent permanently disabled, in combination or individual impairment of a hand, elbow, or shoulder" ("Accessibility Law," 2006, p. 9). To qualify for a permit, individuals also had to first obtain a physician's written consent, and then undergo an evaluation by a physical or occupational therapist ("Accessibility Law," 2006).

Research Problem

According to physical therapist Curt Best, prior to 2008 there was no standardized evaluation process expressed in the law that could be used by physical or occupational therapists to determine the eighty percent disability requirement to obtain the permit. Therefore, it was left up to the discretion of

the therapist to determine the percentage of disability of the individual being evaluated. No documentation of the evaluation was required to be submitted with the application for the crossbow permit. The only requirement was a general diagnosis from the physician and a signature from both the physician and the therapist. As a result, some people were receiving the permit who should not have otherwise qualified, and others who actually were in need of a permit, but did not qualify under those standards, were denied permits (Curt Best, personal communication, June 19, 2007).

This study, initiated in 2007, sought to determine the effectiveness of the crossbow evaluation methods being used by physicians or therapists at that time. Later in 2007, the Crossbow Disability Workgroup was formed by the Michigan Department of Natural Resources (DNR) to revise the crossbow evaluation process. This workgroup revised the evaluation process under study and created a standardized format that has since been used by the physician, physical therapist, or occupational therapist when completing a crossbow evaluation. Although changes were made prior to the completion of this study, much of the information gathered from this study can be used to support the changes already made, as well as to suggest further changes that could help shape future revisions to the crossbow evaluation process in Michigan.

Purpose of the Study

The purpose of this mixed methods survey research study was to gather data regarding the evaluation methods that were being used by therapists to determine client eligibility for crossbow permits in the state of Michigan prior to the changes in the evaluation system. Another intention of this study was to gain professional opinions pertaining to the effectiveness of the evaluation system and suggestions for how to construct a more standardized or functional system if it was felt necessary.

Research Questions

The following research questions were addressed by this study:

1. What are the current methods used by physical and occupational therapists in administering crossbow evaluations in the state of Michigan?
2. How is the percentage of disability determined in the present evaluation process?
3. Is there a need for a more standardized crossbow evaluation in the state of Michigan?
4. Is "functional testing" an adequate target or goal for the evaluation process?
5. If therapists feel functional testing is appropriate, what should be included in a functional evaluation process?

Significance of the Study

The results of this study provided information on the perceived effectiveness of the crossbow permit evaluation methods performed by physical and occupational therapists prior to the changes made to the evaluation process. The results also helped to determine if there was a need for a more standardized or functional evaluation process, and if so, what components should be included in this process. Ultimately, a standardized evaluation can provide equal opportunity to all disabled individuals interested in obtaining a crossbow permit. The goal of this study was to gain the opinions of a larger population of therapists who perform crossbow evaluations but were not involved in the process of changing the evaluation format. The significance of the information gained will help shape future revisions to the crossbow law.

Literature Review

This section will discuss the previous law regarding crossbow evaluations and the issues that were found with the previous evaluation process. It will also briefly describe the muscles involved in pulling back a compound bow. Finally, it describes the usefulness of functional capacity training in the workforce, as well as how it may be useful in the crossbow evaluation process to make it more functional.

Previous Law

Under current law in Michigan, it is legal for anyone to hunt game with a crossbow during regular firearm seasons. However, only individuals who have a certain level of disability and qualify for a permit through various clinical evaluations can take game with a crossbow during archery season. The law in force when this study was conducted qualified an individual for use of a crossbow; the law

as stated in the Michigan Department of Natural Resources document titled "Accessibility Law, Mandates, Regulations, Guidelines, Orders and Procedure for Hunting and Fishing" (2006) can be reviewed in Appendix A.

Issues with the Previous System of Evaluation

There is a lack of information within the literature regarding current methods of crossbow evaluation in Michigan, as well as the issues or problems involved with the previous methods. However, Curt Best, a physical therapist and clinical manager at Michigan Hand & Sports Rehab Centers and also an avid bow hunter, described many problems or issues that he recognized or had experienced with the previous system of crossbow evaluations. Best explained that there was no official evaluation form that had been approved by the state for use, and the state did not receive any evidence of the exam other than the therapist's signature. Therefore, each individual therapist used whatever form he/she felt was appropriate when performing an evaluation. Also, the previous process of evaluation was time consuming, and it was difficult to determine the degree of disability an individual had once the data was obtained. Another issue Best saw with the previous evaluation was that the functionality of the patient (what the patient physically could and could not do) was not considered directly. Finally, Best explained that the only diagnoses that qualified an individual for a crossbow permit under the previous law were conditions of the upper extremities, neurological conditions, and spinal cord injury above the level of a C-8 lesion. However, Best stated, "Other conditions could affect the basic skills necessary for successful use of a compound/traditional bow, which may include cardiac conditions, conditions affecting the lower back, and cervical problems" (personal communication, June 19, 2007).

Muscle Involvement for Use of a Compound Bow

According to the state law prior to 2008, an individual could only receive a crossbow permit upon diagnosis of permanent disability consisting of "at least 80%, in combination or individual impairment, of a hand, elbow, or shoulder" ("Accessibility Law," 2006, p. 9). However, the complete process of drawing, aiming, and firing a compound bow requires the use of more than just the hand, elbow, or shoulder. According to Cole (2002), a physical therapist, "Shooting a bow, just like any other sport, is a total body activity that involves the muscles of the legs, trunk, and upper body, all working together to execute the shot" (p. 48). The following situation described by Cole illustrates and supports this statement:

> Try drawing a hunting bow while sitting with your feet lifted in the air. You will notice that not only must your shoulder muscles work harder than normal to pull the bow back, but your stomach and back muscles, which are normally stabilized in part by planted feet, must kick in fiercely to stabilize your trunk. (p. 48)

McKinney & McKinney (1990), described a brief anatomical analysis of shooting a bow from the standing position. (A bow can also be shot from a seated position, which places less stress on the muscles involved in weight-bearing during standing; however, the muscles used to stabilize the trunk are still of great importance when in the seated position.) The authors discussed in detail the muscles involved throughout the process of drawing and firing a bow. The muscles used in the bow arm and drawing arm during the act of drawing and releasing the bow were, by the previous state law, to be included in the disability measurement. However, the muscles used to maintain a stable and steady stance are often overlooked, as was the case in the prior law.

One of the most important aspects of shooting a bow is the stance. Accuracy of the shot is largely based on the stance and the strength and endurance of the muscles involved in stabilizing the body. The anteroposterior antigravity muscles involved are described as "the muscle groups which perform the function of extending the major joints at the ankles, knees, hips, and spine" (McKinney & McKinney, 1990, p. 151). The muscles included in the anteroposterior antigravity muscle groups include the triceps surae, quadriceps, gluteus maximus, erector spinae, and rectus abdominus (abs). The triceps surae, more commonly known as the calf muscles, are responsible for plantar flexion of the ankle to anchor the feet firmly on the ground or platform. The quadriceps are responsible for knee extension, and the gluteus maximus is responsible for hip extension, aiding in the body's ability to remain upright. The erector spinae, a muscle group located in the back, extends and stabilizes the spinal column and trunk. The rectus abdominus also is important for counteraction of the erector spinae, allowing for stabilization of the trunk and spinal column (McKinney & McKinney).

All of these muscle groups work together to maintain balance, stabilization, and alignment of the body, which is of utmost importance for a steady and accurate shot with a bow (McKinney &

McKinney, 1990). Therefore, it would be reasonable to suggest that the ability to stabilize the body in an upright position should be taken into consideration when determining eligibility for a crossbow permit. This was not the case under the previous law in Michigan.

Functional Capacity Screening

In today's workforce, functional capacity screening is becoming more common as an employer requirement for qualification for a job. Functional capacity screening can be described as "testing to determine whether a job applicant can perform the required job functions" (Miller, 2001, para. 8). Using this testing as part of the job qualification process, employers are able to make sure that the physical abilities of the worker are consistent with the physical demands of the job. In other words, it ensures that the worker will be able to safely and correctly perform the given job. For example, one such company that has found success in using functional screening as a job qualification requirement is Goodyear Rubber and Tire. Since implementation of the functional screening process, Goodyear has reduced worker's compensation costs by $5 million. The turnover rate of workers has also decreased (Miller, 2001).

For the same reasons that functional screening is an effective tool for screening applicants in the workplace, it could also be a reasonable tool for screening individuals in leisure activities, such as for the crossbow evaluation. An unlimited number of variables come into play in the various conditions or disabilities that may affect an individual. The previous system used for crossbow evaluations seemed to be invalid, as it did not take into consideration all of these possible variables or conditions. As noted by physical therapist Barb Bishop, "the method of assessing and computing eighty-percent disability is too time consuming and unfair" (personal communication, June 14, 2007). Bishop also stated that "bow hunting is a functional, recreational activity, and everything in physical and occupational therapy has to be functional." Therefore, it seems functional screening is a practical and fair approach, in that the individual is assessed as to whether he/she can perform the tasks required for firing a compound bow effectively based on certain specifications.

As demonstrated by the literature, the process of shooting a bow requires the use of several different muscle groups. The previous system used for crossbow evaluation testing did not take all of these muscle groups into consideration and thus was in need of improvements. The previous system of measuring disability was inefficient and impractical for use in a clinical setting. It was also not a fair method to evaluate the need for a crossbow permit. A more standardized and functional screening process may be more efficient and would better justify the need for a crossbow permit by taking into consideration all of the possible conditions that may affect an individual's use of a compound bow.

Methods

Research Design

A mixed methods survey was utilized for this study. The survey included quantitative questions using the format of a Likert scale. It also included qualitative questions to gain opinions and knowledge from the experience of therapists who have performed the evaluations.

Participants

In order to participate in the survey, an individual had to be a licensed physical or occupational therapist in the state of Michigan who had performed crossbow evaluations in the past. Participants who met the criteria were selected from a convenience sample provided by the Department of Natural Resources and other sources. To further increase the accessible population for the study, a snowball sampling strategy was also used. Therapists who agreed to participate in the study were asked to provide contact information for any other therapists who they believed would qualify to participate in the study.

Instrumentation

The mixed methods survey constructed by the researchers consisted of both open-ended questions and closed-ended questions measured quantitatively using a Likert scale. The survey asked questions related to the effectiveness of the systems used by therapists for crossbow evaluations at that time. The survey also asked for opinions and input as to how the system at the time could be modified to be more standardized and provide equal opportunity to all disabled individuals interested in obtaining a crossbow permit (see Appendix B to view a copy of the survey).

Procedure

First, a preliminary draft of the survey was constructed. This draft was then pilot tested on Curt Best and two occupational therapists found by convenience. The pilot testing was done to determine the clarity and neutrality of the questions. This pilot testing also helped to improve the validity of the survey by ensuring that the questions asked matched the proposed meaning originally intended for each question. A final draft was constructed based on the results of the pilot testing.

A cover letter was designed to inform participants of the purpose of the research and to address the importance of the study to the participants. The cover letter also requested that the therapist provide the researchers with contact information of any other therapists who might qualify to participate in the current study. Prior to mailing the survey, all documents were reviewed and approved by the Institutional Review Board at the researchers' university.

The survey was then mailed to the accessible population of therapists. To obtain the largest possible sample size, a follow-up letter was mailed four weeks after the original mailing date to all of the potential participants, either thanking them for their participation or reminding them about the study. Another copy of the survey was included with the follow-up letter to those who had not yet responded to the survey.

To ensure confidentiality of responses on the surveys, names were not included on the survey. Each survey was numerically coded using numbers which matched a master list of participants stored and locked in a secure office area. The purpose of coding the surveys was only to determine the individuals who had returned the survey and who had requested the results of this study. After this information was recorded, the number code was detached from the response portion of the survey.

Data Analysis

Out of a total of 60 mailed surveys, 37 individuals replied to the study, resulting in a response rate of 62%. The respondents consisted of 35 physical therapists and two occupational therapists currently practicing in the state of Michigan.

As the surveys were returned, the responses were recorded. A strategy of peer debriefing was used when reviewing the qualitative responses to ensure consistency of the interpretations among the researchers. Each of the research investigators independently reviewed the responses on each of the surveys. They then discussed each other's perceived meanings to ensure that the researchers had accurately translated the participants' viewpoints into data. The responses were then analyzed to form categories/themes. A narrative summary of the results was then formulated for each category/theme.

The quantitative questions of the survey were numerically coded using a Likert scale with ratings ranging from 1 (strongly disagree) to 5 (strongly agree). The frequency of the responses to each question was recorded and percentages were calculated. From this information, descriptive statistics were calculated.

Results

Quantitative Results

Please refer to Appendix C at the end of this report to review the entire quantitative portion of the survey with the response percentages for each question. Of the 37 individuals who responded, a total of 35 (94.6%) agree/strongly agree to supporting the use of crossbows for disabled hunters. A total of 25 (67.5%) disagree/strongly disagree that the system of performing crossbow evaluations was efficient, and 30 (81%) also disagree/strongly disagree that the system of performing crossbow evaluations assessed all applicants fairly.

Regarding ease of administering a crossbow evaluation, 18 (48.6%) disagree/strongly disagree, 5 (13.5%) are neutral, and 14 (37.8%) agree/strongly agree that the current system of performing crossbow evaluations was easy to administer. Of the 35 individuals who responded to the question regarding the use of a standard method of evaluation for all crossbow applicants, 23 (62.2%) stated that they agree/strongly agree that they do use a standard method for evaluation when assessing all applicants. However, 32 (86.5%) of the respondents recorded that they agree/strongly agree that a standardized evaluation form is needed for use by all therapists when performing crossbow evaluations. Also, 34 (91.9%) agree/strongly agree that this standardized form should be included with the permit application that is submitted to the DNR.

Overall, a total of 18 (48.6%) of the therapists who responded to the survey recorded that they are neutral, 5 (13.5%) stated that they disagree, and 13 (35.1%) stated that they agree that under the

system at the time, therapists were honest/trustworthy when evaluating clients who wanted to receive a crossbow permit. Also, 28 (75.6%) agree/strongly agree that a change in the crossbow evaluation process was needed, with 34 (91.9%) who agree/strongly agree that the system for performing crossbow evaluations should be function-based.

Qualitative Results

In the qualitative questions of the survey, the therapists were asked for their input and opinions on how to change or enhance the current crossbow evaluation process. In reviewing the responses, several themes emerged. There seemed to be much consensus among the therapists' viewpoints and ideas. However, there were also a few unique, creative thoughts on how to perform the evaluation and ways to improve the overall process.

First, the therapists were asked if they follow the American Medical Association (AMA) standards for calculating levels of disability when performing a crossbow evaluation. According to the previous law, an individual must have been at least 80% disabled to qualify for a crossbow permit. Nineteen out of the 37 participants claimed that they did follow AMA standards for measuring percentage of disability. Twelve participants stated that they did not use the standards. The other six participants chose not to respond to the question. The therapists who stated that they did follow the AMA standards were then asked what process they used to measure and determine a level of 80% disability, since there was no standardized way of doing so. Most stated that they used range of motion and manual muscle testing to determine a level of 80% disability. Others noted that they have their own approach, supplemented by charts and tables. Still others expressed that they were unsure of an accurate way of determining percentage of disability, so they relied on professional judgment.

The participants were then asked to identify problems they face when evaluating an individual for a crossbow permit. Several thought that the evaluation process was too time consuming. Twelve therapists noted that they have evaluated an individual who did not qualify as being 80% disabled but was still unable to use a regular bow. Ten others stated that the main problem that they encounter is that there is no standardized way of evaluating someone for a crossbow permit. Three therapists were concerned whether the individuals being evaluated were actually giving an honest effort during the assessment. Other issues described were that the evaluation is nonfunctional, that physicians approve the permit before a therapist can even evaluate the individual, and that a level of 80% disability to qualify for the permit is too high a percentage.

The therapists were then asked to state the steps they use when performing an entire crossbow evaluation. Twenty-four of the 37 participants assess the individual's coordination, grip strength, joint range of motion, and muscle strength (using manual muscle testing) and use the results to formulate a percentage of disability for the individual being evaluated. Two therapists stated that they have their own personal way of assessing for a level of 80% disability. A few others incorporate sensation, cognition, safety awareness, and sport-specific tests into their assessments. Seven therapists did not answer this question.

The survey then asked the therapists for their ideas or opinions on how crossbow evaluations could be implemented to improve the efficiency and fairness of the current system of evaluation at the time of the study. Fourteen participants thought that the evaluation process should be more functional or task specific. Seven participants thought that it needed to be standardized and less time consuming. Three participants stressed the idea of decreasing the 80% disability standard. Other ideas and opinions included the consideration of pain as a limitation during evaluation; requiring occupational and physical therapists to have a special certification in order to perform crossbow evaluations; and the idea that crossbow use should be the choice of the consumer. Eight of the participants did not provide any ideas or opinions to this question.

Lastly, the therapists were asked to express any ideas as to how the evaluation could be changed to make the test more functionally based. Nine therapists thought that the evaluation should be made more functional by the use of simulated tasks. Seven thought that there should be an increased emphasis on strength testing during the evaluation process. Three noted that the evaluation should be simplified and less time consuming. Other ideas included the consideration of lower extremity dysfunction and low blood pressure; the use of 80% disability related to just the limbs (not the entire body); and relating the evaluation to the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire. Sixteen therapists did not respond to this question.

Discussion

Interpretation of Results

It is apparent that there is consensus among practicing occupational and physical therapists who perform crossbow evaluations that the previous process of evaluation was in need of improvements. The majority of therapists who took part in this study concluded that the old method of completing crossbow evaluations was inefficient, too time consuming, and did not assess all applicants fairly. However, there was a fairly even split regarding the ease of administering an evaluation.

There was also a wide range of answers regarding the methods used to calculate percentage of disability. Although 23 stated that they feel they do use a standard method of evaluation to assess all applicants, it is likely that it is their own format, as there was no standardized method in place that was required to be used. This suggests that the previous system was unjust, as each individual was assessed differently, depending on the evaluating therapist. Also, many of the therapists believed that the 80% disability criterion was too high. One therapist stated that "An individual's true level of disability is not always fairly represented … [the patient] could not use a standard bow but also would not qualify for a crossbow." Another therapist stated that "Some individuals do not meet 80% disability for standard muscle testing, but prolonged position or repeated testing show significant fatigue that would certainly impact using a bow."

It was also agreed that there is a need for a more standardized and functional evaluation process. This idea is consistent with the functional capacity screening process used in much of today's workforce. A standardized process will also require all therapists to perform a similar evaluation, making the process more consistent and fair for individuals wishing to receive a crossbow permit. Two therapists also suggested the idea of having no restrictions on the use of crossbows, as is the case in many other states.

Sixteen therapists did not express any ideas of how to make the test more functionally based, even though 34 out of 37 agreed/strongly agreed that it needs to be more functionally based. Also, many individuals who did respond to this question gave general responses, such as "the evaluation should be made more functional by the use of simulated tasks" and "the evaluation should be simplified and less time consuming." Clearly, there was a need for the creation of a standardized and more functional evaluation process, as many therapists may not have had ideas of how to accurately and fairly test an individual for use of a crossbow.

Limitations

Although there was a high return rate of surveys mailed in this study, it was not possible to include all practicing physical and occupational therapists in the state of Michigan in the study. The results of this study may have been different had it been possible to allow all therapists to participate in the study. However, there was a consistency among the answers provided by the participating therapists, leaving the researchers confident that the answers given in the study accurately represent the overall view of the majority of therapists regarding the crossbow evaluation issue in Michigan.

Future Research Direction

The results of this study and the results of another study performed that used surface electromyography (SEMG) to determine the muscle groups required to draw a standard bow will be combined to analyze the new process of evaluation recently created by the Crossbow Disability Workgroup. Based on the results of these two studies, the researchers will determine if the new process of evaluation accurately and fairly measures an individual's need for use of a crossbow through testing and/or simulation of drawing a standard bow. Any suggestions for further improvements to the current evaluation process that are derived from analyzing the two studies will be made to the Michigan Department of Natural Resources.

Conclusion

The purpose of this study was to gather data regarding the effectiveness of the evaluation methods being used by therapists to determine client eligibility for crossbow permits in the state of Michigan (prior to the changes in the evaluation system) and also to gather ideas for how to construct a more standardized and functional system if it was felt necessary. Thirty-seven responses were received out of 60 mailed surveys. From the surveys, it was determined that there was significant variation in the

process being used to evaluate individuals, and that there was a need for a standardized form of evaluation. Many also felt that the process should include functional testing, but few gave suggestions as to what the functional testing process should include.

Acknowledgment

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References

Accessibility law, mandates, regulations, guidelines, orders and procedure for hunting and fishing. (2006, February 3). Retrieved June 14, 2007, from Michigan Department of Natural Resources Website: http://www.michigan.gov/ documents/laws-mandates-regsguidelines_161413_7.pdf

Cole, D. (2002, December). Muscle power. *Bowhunter*, *32*(2), 48-50.

McKinney, W. C., & McKinney, M. W. (1990). *Archery* (6th ed.). Dubuque, IA: Wm. C. Brown.

Miller, M. (2001). Functional capacity screening. *Occupational Health and Safety, 70*(4), 71-73. Retrieved June 12, 2007, from ProQuest database.

Appendix A: ***Accessibility Law, Mandates, Regulations, Guidelines, Orders and Procedure for Hunting and Fishing (2006)***

5.95 Permit to take game with a crossbow

Sec. 5.95. (1) The department may issue a permit to a person who is certified as being permanently disabled by a physician as provided in this section. That permit shall be issued without cost to the applicant and shall authorize that person to take game with a crossbow during the open season for that game if that person holds a license to take that game issued pursuant to part 435 and complies with all other laws and rules for the taking of game.

(2) An applicant for a permit under this section shall submit to the department a signed certification from a physician indicating that the physician received from a physical therapist and reviewed and confirmed objective test findings indicating the percentage of disability determined to be present in the permit applicant by the physical therapist. Based on the test findings, the physician may certify that the applicant is permanently disabled as required by this section if the physician finds that the permit applicant has at least 80%, in combination or individual impairment, of a hand, elbow, or shoulder. In support of such a determination, the physician and the physical therapist shall utilize the following standards and criteria:

(a) If applicable, muscle weaknesses with a grade of fair or below for involved upper extremity muscle groups will be used to determine if a person is eligible for a permit under this section. Testing by the physical therapist will use as a guideline "Techniques of Manual Muscle Testing", by Daniels and Worthingham, or other guidelines accepted by the American medical association.

(b) Impaired range of motion. Goniometric measurements using the "American medical association guide to evaluation and permanent impairment rating", or other guidelines accepted by the American medical association.

(c) Peripheral nerve involvement, using the "American medical association guide to evaluation and permanent impairment rating", or other guidelines accepted by the American medical association.

(d) Amputations involving 4 fingers at the proximal interphalangeal joint, wrist, elbow, and shoulder do

not require objective test findings. However, the applicant is required to present a physician's diagnosis to be qualified for a permit.

(e) Unilateral hand weakness disabilities. In addition to manual muscle testing, a grip dynamometer, pinch grip, and lateral grip measurements will be used to compare dominant to nondominant hand. A 5% deficit is standard acceptance for the nondominant hand. Bilateral hand weaknesses or bilateral upper extremity weaknesses, or both, are subject to manual muscle testing only.

(f) Any spinal cord injury above the level of C-8, resulting in permanent disability to the lower extremities, leaving the applicant permanently nonambulatory, as diagnosed by a physician, do not require objective test findings. However, the applicant is required to present a physician's diagnosis to be qualified for a permit.

(g) Coordination assessment. Coordination is the ability to execute smooth, accurate, controlled movement. In coordination or coordination deficit describes abnormal motor function characterized by awkward, extraneous, uneven, or inaccurate movements, caused by central nervous disorders, including, but not limited to, Parkinson's disease, cerebral palsy, hemiplegia, hemiparesis, and closed head trauma; or by progressive neuromuscular diseases, such as muscular dystrophy, multiple sclerosis, and amyotrophic lateral sclerosis. Purpose: to assess the ability of muscles or groups of muscles to work together to perform a task. For safety considerations, this test will eliminate severely impaired applicants from qualifying for a permit.

(3) A person shall not seek diagnosis from a physical therapist or a physician for purposes of meeting the requirements of this section on more than 2 occasions within a 6-month period. If a person seeks a diagnosis from a physical therapist and the results of the testing do not meet the requirements of this section for eligibility for a permit, the person may do either of the following:

(a) Within 30 days of obtaining the test results, seek another opinion from the same or a different physical therapist.

(b) After 180 days or more, seek another opinion from the same or a different physical therapist.

(4) A permit issued under this section to a person who is eligible for that permit because he or she has a progressive neuromuscular disease or a central nervous disorder shall be issued for 2 years and then is renewable only upon reapplication pursuant to this section. All other crossbow permits issued pursuant to this section are valid unless revoked pursuant to the administrative procedures act of 1969, Act No. 306 of the Public Acts of 1969, being sections 24.201 to 24.328 of the Michigan Compiled Laws.

Appendix B: **Crossbow Evaluation Research Survey**

Please answer the following questions by circling the number that you feel best describes the given question, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

	SD	D	N	A	SA
1. I support the use of crossbows for disabled hunters.	1	2	3	4	5
2. The current system of performing crossbow evaluations is efficient.	1	2	3	4	5
3. The current system of performing crossbow evaluations assesses all applicants fairly.	1	2	3	4	5
4. The current system of performing crossbow evaluations is easy to administer.	1	2	3	4	5
5. I use a standard method of evaluation for all crossbow applicants.	1	2	3	4	5
6. A change in the current crossbow evaluation process is needed.	1	2	3	4	5
7. The system for performing crossbow evaluations should be function-based.	1	2	3	4	5
8. Under the current system, I believe that therapists are honest/trustworthy when evaluating clients who want to receive a crossbow permit.	1	2	3	4	5
9. A standardized evaluation form is needed for use by all therapists when performing crossbow evaluations.	1	2	3	4	5
10. If a standardized evaluation form is used for all crossbow evaluations, it should be included with the permit application that is turned in to the DNR.	1	2	3	4	5

Please answer the following questions to the best of your ability based upon the current system of evaluation and your thoughts, feelings, and opinions as a therapist who performs crossbow evaluations. If you run out of space to write, continue your answer on the back side of this page.

1.) Please circle your area of practice: PT or OT

2.) Do you follow the AMA standards for levels of disability when performing a crossbow evaluation? Please circle YES or NO

a.) If so, what process do you use to measure and determine 80% disability?

3.) What problems do you face when evaluating an individual for a crossbow permit?

4.) What steps do you use to perform an entire crossbow evaluation?

5.) Do you have any ideas or opinions on how crossbow evaluations could be implemented that may improve the efficiency and fairness of the current system?

6.) Do you have any ideas as to how the evaluation could be changed to make the test more functionally based?

[ ] Please check the box if you would like to receive a copy of the results of this study.
**If you know of any other physical or occupational therapists who perform crossbow evaluations and who may be interested in participating in this study, please provide their name and contact information on the back side of this page.

Appendix C: **Quantitative Response Data**

	SD	D	N	A	SA
1. I support the use of crossbows for disabled hunters.	0 (0%)	0 (0%)	2 (5.4%)	11 (29.7%)	24 (64.9%)
2. The current system of performing crossbow evaluations is efficient.	11 (29.7%)	14 (37.8%)	7 (18.9%)	5 (13.5%)	0 (0%)
3. The current system of performing crossbow evaluations assesses all applicants fairly.	12 (32.4%)	18 (48.6%)	2 (5.4%)	5 (13.5%)	0 (0%)
4. The current system of performing crossbow evaluations is easy to administer.	9 (24.3%)	9 (24.3%)	5 (13.5%)	13 (35.1%)	1 (2.7%)
5. I use a standard method of evaluation for all crossbow applicants.	2 (5.4%)	4 (10.8%)	6 (16.2%)	19 (51.4%)	4 (10.8%)
6. A change in the current crossbow evaluation process is needed.	2 (5.4%)	3 (8.1%)	4 (10.8%)	13 (35.1%)	15 (40.5%)
7. The system for performing crossbow evaluations should be function-based.	2 (5.4%)	0 (0%)	1 (2.7%)	15 (40.5%)	19 (51.4%)
8. Under the current system, I believe that therapists are honest/trustworthy when evaluating clients who want to receive a crossbow permit.	0 (0%)	5 (13.5%)	18 (48.6%)	13 (35.1%)	1 (2.7%)
9. A standardized evaluation form is needed for use by all therapists when performing crossbow evaluations.	0 (0%)	1 (2.7%)	4 (10.8%)	11 (29.7%)	21 (56.8%)
10. If a standardized evaluation form is used for all crossbow evaluations, it should be included with the permit application that is turned in to the DNR.	1 (2.7%)	1 (2.7%)	1 (2.7%)	10 (27.0%)	24 (64.9%)