**Annual Physical Therapy Exam for Farmers and Agricultural Workers**

An underserved population that is exposed to unique risks and work conditions is farmers and agricultural workers. This is particularly relevant in North Carolina, as it one of the top ten agriculture producing states, and is home to 48,000 farm operations1,2. About half of all farm workers have at least one of the chronic conditions of obesity, hypertension, and hyperlipidemia3. Additionally, it has been found that 81% of male and 76% of female farm workers have a body mass index of greater than 303. This places this population at risk for the development of ischemic heart disease, stroke, and type 2 diabetes4.

The unique nature of agricultural work also lends farmers to a greater risk for orthopedic injuries, hearing loss, and respiratory diseases5. Farmers are exposed to a variety of environmental hazards including: loud equipment, dust, animals, chemicals, and pesticides5. A study by Hoppin et al. found that the farming population has a higher prevalence of respiratory symptoms such as wheezing, coughing, and phlegm, which could indicate respiratory irritation in response to environmental stressors6.

Though there is conflicting research on this subject area, smoking and tobacco use are conditions that needs to be considered in farmers. A study by Demos et al. found that a larger percentage of farmers as compared to non-farmers report heavy alcohol consumption and heavy smoking habits5. However, the study by Hoppin et al. found that a greater proportion of farmers were less likely to smoke currently as compared to the non-farming population6. Regardless, smoking is a risk factor for developing pulmonary cancers and COPD4, and those risks are magnified with the exposure to environmental hazards. Additionally, it has been found that chewing tobacco use is higher in farmers7. This puts them at a higher risk of developing oropharyngeal cancer, heart disease, and pancreatic cancer7.

Another vulnerability of the farming population is the risk for orthopedic injuries. A study by Lighthall reported that 41% of farm workers reported having musculoskeletal pain lasting at least a week in the previous year, and that approximately 70% of those workers reported receiving no treatment for such pain3. The most commonly experienced pain is back, neck, knees, shoulders, hands, and feet3.

With all of the evidence in mind, it is clear that the farming population would benefit from an annual physical therapy (PT) examination. An objective outcome measure that would be particularly useful in this population is the short form 36 health survey questionnaire (SF-36). This outcome is designed to quantify health-related quality of life8. The SF-36 has been found to be a reliable outcome measure (Cronbach’s a>0.85)8. It has also been found to have high construct validity in distinguishing intergroup health differences8. Lastly, it has been shown to have no floor effects, as compared to other outcome measures like the Nottingham health profile8. This outcome measure is a quick, easy way to get an overall picture of the individual’s health perceptions. Additionally, use of the SF-36 allows year-by-year comparisons at each annual exam.

The questions of the subjective portion of the annual PT exam are listed in Table 1. These 8 questions are the most critical to ask in this population based on the evidence mentioned above about the vulnerability of this population in developing chronic and secondary conditions. These questions are all within the PT scope of practice as are a key part of the PT’s role in health and wellness. The APTA denotes that PTs should provide education, behavioral strategies, resources, and appropriate referrals for active living, injury prevention, smoking cessation, and prevention of chronic diseases9. The follow-up questions, though not extensive, are largely based on the transtheoretical model of change which assesses the individual’s readiness to change, and then provides resources and support to shift from one stage to the next10. For example, if an individual expressed a desire to quit smoking, it would be the responsibility of the PT to counsel the patient in making a behavior change. For smoking cessation, this counseling could follow the 5 A’s framework (ask about tobacco use, advise to quit, assess willingness to quit, assist by using counseling, and arrange a follow-up), which has been shown to be effective11. Another example from these subjective questions would be if the individual reports poor nutritional habits or weight management. Evidence-supported counseling could include suggesting a reduction in daily calorie intake by 500-1000, as this has been shown to reduce body weight by 8% over 3-12 months12. The main purpose of the subjective examination questions is to gain an understanding of the patient’s lifestyle to serve as a catalyst for appropriate health behavior counseling. Effective counseling includes providing information about the effect of lifestyle on health, goal setting, plan development, support, identifying barriers, feedback, and follow-up13.

The objective examination can be divided into two major components, the objective measures of overall health and the functional capacity evaluation. Table 2 lists the objective measures that should be utilized to detect the presence of various chronic conditions in farmers. Any positive finding from this table warrants referral to the individual’s physician for further exploration. Body mass index and waist circumference measurements are being used as they have been determined to be reliable measures of body fat and risk of developing type 2 diabetes, hypertension, hyperlipidemia, and cardiovascular disease12. Respiratory rate and oxygen saturation levels are important in this population, as they are key measurements in screening for pulmonary disease14. Lastly, the Calibrated Finger Rub Auditory Screening Test (CALFRAST) is a quick screen that a practitioner can perform by rubbing the thumb and forefingers together at specified distances from the individual’s ears15. The CALFRAST-strong 70 condition, where the examiner rubs the fingers together as strongly as possible without snapping from a distance of 70cm away from the ear, has been found to have a specificity and positive predictive value of 100%15. Thus, this condition is able to detect hearing loss reliably and accurately in the general population.

The second component of the objective annual PT exam that is critical in the farming population is the functional capacity evaluation (FCE). FCEs are designed to measure an individual’s capacity to perform work activities, and can be used to make personalized recommendations for such work activities16. FCE protocols can be job specific, pathology specific, or general16. For farm workers, the FCE would likely be most telling if it were job specific, seeing as farmers have unique tasks they must complete on a daily basis. Additionally, it has been found that predictability of workplace injuries improves when evaluation involves job-specific demands17.

A study by Soer et al. is particularly applicable to the farming population, as its aim was to determine normative values for the FCE in a population of healthy working subjects that included farm workers16. The FCE used in this particular study consisted of five major components, including material handling, postural tolerance, coordination and repetitive tasks, hand and finger strength, and energetic capacity16. While this FCE was lengthy, taking 2 hours to complete, many of the tasks can be extrapolated as there is normative data for each16. Some of the farm-specific tasks that should be included in the annual exam are presented in table 316. The normative values are broken down by category of workload (farmers are in DOT 4 heavy physical demand) and percentile, so the FCE can be a great tool in determining which areas the individuals underperform in and thus are at higher risk for injury with16. Another study by Gross et al. found that floor-to-waist lifting has as much predictive ability as the FCE in its entirety in patients with chronic low back pain17. Seeing as low back pain is highly prevalent in farm workers, special attention should be given to this task within the FCE. Of course, these values do not replace the value of clinical-reasoning, and thus it is critical for the PT to observe for any biomechanical flaws that could lead to injury. It is also necessary to do a gross range of motion and strength assessment prior to completing the FCE to ensure that there are no major strength or ROM limitations that would increase the individuals risk for a work related injury.

One specific referral that might need to be provided to an individual in the farming population would be to an audiologist for further hearing tests. While the CALFRAST has good psychometric properties in determining whether someone has hearing loss or not, it is not within the PT scope of practice to address hearing loss. An audiologist would be able to provide the individual with a hearing aid or custom earplugs, and tips to prevent further hearing loss in the workplace. A good resource created by the Occupational Safety and Health Administration could also be provided to these individuals, as well as individuals that admit to not wearing masks around chemicals and dust. The handout, which is included in the supplemental documents, does a nice job of addressing ways to protect oneself from head injuries, leg injuries, eye and face injuries, hearing loss, hand injuries, and respiratory issues18.

Another resource that could be provided to these individuals in the agricultural field is a resource for healthy eating. One hypothesis for the prevalence of obesity in farmers is the work demands, which leads to a lack of time to obtain and cook healthy food3. Another reason could be the fact that many farmers live in rural areas, which are typically more likely to be food deserts, so access could be a barrier to healthy habits. A great resource that is user-friendly, easily accessible, and evidence-based is the “MyPlate Daily Checklist” from the Choose My Plate website19. On this website, the individual can enter their age, sex, height, weight, and physical activity and see how many calories are recommended for weight loss or weight maintenance19. This tool also will generate a daily checklist that states suggested food group amounts and limitations19. A sample checklist based on a 2200 calorie diet is included in supplemental documents.

Lastly, an appropriate referral for this population would be to a PT if there are any musculoskeletal injuries or pain present, or if the individual demonstrates increased risk for injury through the FCE. One resource that could be provided to the farmer is, “Getting to Grips with Manual Handling”, which comes from the OSHA website on ergonomics training and assistance resources20. This resource, which is provided in the supplemental documents, explains ways to deal with excessive manual handling through avoidance, assessment of risk, and reduction of risk20. In addition to these printed resources, it is also within the scope of PT practice to provide personalized suggestions based on the exam findings.

Farmers and agricultural workers have a unique work environment that exposes them to different risks that are seen in the general population. A comprehensive annual examination with appropriate referrals is warranted to reduce the risk of the chronic conditions and musculoskeletal injuries that farmers are an increased risk for. Though on-farm workers only account for 2.6 million or 1.4% of US employment, this special population is the foundational base for the booming agricultural industry that impacts the everyday life of all Americans2.

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Table 1: Original and Follow-Up Subjective Questions

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| **Subjective Question** | **Follow-up Question (if applicable)** |
| Do you have any chronic conditions like diabetes, high blood pressure, high cholesterol, or COPD? | Is that condition well controlled with either medication or lifestyle habits like diet and exercise?Do you regularly check your blood sugar?Do you regularly check your blood pressure?Do you have regular follow-ups with your physician for these conditions? |
| Do you consume a balanced diet? | What do you typically eat for breakfast, lunch, and dinner?Do you eat at least 5-9 servings of fruits and vegetables per day?How much water do you drink per day?Do you try to limit sodium and sugar intake?Are you interested in improving your diet? |
| Do you smoke or use other tobacco products (like chewing tobacco)? | How many cigarettes do you smoke per day?How much chewing tobacco do you use per day?Are you interested in reducing your cigarette or tobacco intake or quitting altogether? |
| Have you had an injury at work in the last year? | If so, what happened?Did you seek medical attention?Do you still have pain or limitations because of this injury? |
| Do you have any pain right now? | If so, where?How severe is it on a scale of 0-10?Does it limit you in your work?What sorts of activities aggravate it?Are you seeing a health professional for this pain, like a PT? |
| Do you wear a mask when around chemicals, pesticides, or dust? |  |
| Do you wear ear plugs when around loud equipment? | Are you having difficulty hearing? |
| Are you currently experiencing any respiratory symptoms like coughing, shortness of breath, wheezing, or phlegm? | If so, have you seen a physician about it? |

Table 2: Objective Examination Components and Positive Findings

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| Measurement | Positive Finding  |
| Body Mass Index12 | 25-29.9 = overweight30-34.9 = mild obesity35-39.9 = moderate obesity>40 = severe obesity |
| Waist Circumference12 | >35 inches for women>40 inches for men |
| Blood Pressure21 | <120/80 for the general population under 50<130/80 for general population 50-74<140/80 for general population over 75<130/80 for population under age 74 with cardiovascular disease (CVD), increased CVD risk, chronic kidney disease, or diabetes <140/80 in population over age 75 with cardiovascular disease (CVD), increased CVD risk, chronic kidney disease, or diabetes  |
| Respiratory Rate14 | <12 or >20 breaths per minute |
| Oxygen Saturation14 | <95% spO2 |
| Calibrated Finger Rub Auditory Screening Test15 | Patient cannot hear strong finger rub 70cm from the ear |

Table 3: Descriptions of FCE Tasks

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| Task | Description |
| Lifting Low | Lifting from table that is 74cm in height to the floor. Participant completes 5 lifts in 90 seconds and the sequence is repeated until the maximal amount the patient can lift safely is reached.  |
| Overhead Lifting | Lifting from 74cm table to head height. Participant completes 5 lifts in 90 seconds and the sequence is repeated until the maximal amount the patient can lift safely is reached. |
| Two-handed Carrying | Carry an object at waist height for 20m. The sequence is repeated until the maximal amount the patient can lift safely is reached. |
| Overhead Working | Stand with arms at head height, manipulating nuts and bolts with 1kg cuff weights on wrists. Measure is the time that the position is maintained in seconds. |
| Forward Bending Stand | Stand with trunk flexed between 30 and 60º and 5kg weight placed between shoulder blades. Manipulate nuts and bolts on floor. Measured in times that position can be maintained in seconds. |
| Dynamic Bending  | Stand with knees flexed between 30 and 60º and move marbles vertically from floor to head height as fast as possible. Measured as time to move 20 marbles in seconds. |
| Repetitive Side Reaching | While standing at 74cm table height, move marbles from right to left as fast as possible and vice versa. Measured as time to move 30 marbles in seconds. |