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Small farmers' awareness of body mechanics and assistive technology

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SMALL FARMERS' AWARENESS OF BODY MECHANICS AND ASSISTIVE TECHNOLOGY

A Masters Thesis presented to the Faculty of the Graduate Program in Occupational Therapy Ithaca College

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In partial fulfillment of the requirements for the degree Master of Science

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by

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CERTIFICATE OF APPROVAL

This is to certify that the Thesis of

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Submitted in partial fulfillment of the requirements for the degree of Master of Science in the Department of Occupational Therapy, School of Health Sciences and Human Performance at Ithaca College has been approved.

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Abstract

Agricultural work is a hazardous occupation, leading to fatalities and life-altering injuries. Due to a lack in regulations requiring farmers to report their injuries, an accurate estimate of the amount of farmers working with injuries is unavailable. Literature on small-scale farmers' awareness of proper body mechanics and assistive technology is scarce. This non-experimental survey study was designed a) to investigate small-scale farmers' awareness of these two concepts in order to identify the possible needs of this population; b) to identify what techniques or adaptations farmers may currently be implementing; and c) to analyze whether age, ethnicity, education, or years of farming experience had an impact on the farmers' awareness of these concepts.

Fifty-seven participants fully completed a questionnaire that was distributed to farmers included on the email list serves of Groundswell, Cornell Small Farms Program, and the Cornell Cooperative Extension (CCE)- Tompkins County division, as well as in-person to farmers in attendance at a meeting hosted at the CCE- Tompkins County headquarters. Data analysis included descriptive statistics, with mean and standard deviation, and comparative analyses.

Results of this exploratory study indicated that small farmers demonstrated an understanding of basic body mechanics, but showed inconsistencies with the implementation of this knowledge. Additionally, participants of the study expressed a lack of awareness of assistive technology, but reported utilizing personal protective equipment. Finally, statistical significance was found from the analysis of the effects of age, educational level, and years of farming experience on awareness and receptiveness of proper body mechanics and assistive technology. Based on these results, some small-scale farmers may benefit from enhanced education regarding these concepts from occupational therapists.

Acknowledgments

It is with great indebtedness that I recognize the guidance and expertise that Dr. Lynn Gitlow lent to this research. Dr. Gitlow's consistent support and enthusiasm have been invaluable. I would also like to acknowledge my committee members, Dr. Amy Gerney and Statistician James Conklin, for their expertise and assistance for which I am grateful.

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It is with a full heart and immense gratitude that I recognize and thank the participants of this study for their thoughtful answers and their desire to aid my research. This work would be incomplete without their consideration, dedication, and participation.

"My grandfather used to say that once in your life you need a doctor, a lawyer, a policeman, and a preacher, but every day, three times a day, you need a farmer."

– *Brenda Schoepp*

Dedication

I dedicate this thesis to my parents, Michael and Abby Behrens, to my companion, Robert, and to my siblings, Michael, Maureen, Allison, Chris, Stephen, Andrew, and Ryan.

You each have instilled within me a passion to give back to others and to always strive for my personal best. It is the result of your guidance, love, and confidence in my abilities that I am where I am today.

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Background and Problem Statement

Agricultural work is a hazardous occupation, leading to fatalities and life-altering injuries (Agricultural Safety, 2012; Mathew, Field, & French, 2011; Van den Broucke & Colémont, 2011). Even with the incorporation of technology to assist with farming, farmers in the United States are twice as likely as other workers to experience a disabling injury and six times more likely to suffer a fatal injury (Mathew et al., 2011). Due to a lack in regulations that would require farmers to report their injuries, along with nonuniformity of survey methodologies collecting data regarding farmers' levels of injuries, there is not an accurate estimate of the amount of farmers working with injuries (Cook & Field, 2011; Mathew et al., 2011; Reed & Claunch, 2002). Farmers work through their disabilities and do not receive assistance from available resources (Cook & Field, 2011). Given the known evidence of injuries sustained by farmers while working in this occupational sector, along with this researcher's inability to locate research in the literature regarding small-scale farmers' awareness of proper body mechanics and assistive technology, research regarding these concepts is an essential first step in identifying the possible needs of this population.

Rationale

This study will enhance the available research pertaining to small-scale farmers by providing greater insight into farmers' awareness of body mechanics and assistive technology. In regard to these two concepts, it is within the occupational therapy profession's scope of practice to promote and educate individuals on the concepts of body mechanics and assistive technology in order to enhance the every day functioning and living of clients (Stoffel et al., 2005;

Voelkerding & Garza, 2004). Therefore, the occupational therapy profession may use its holistic approach to better understand its role within the agricultural occupational sector.

Purpose of Study

Previous research lacks content as to what extent small-scale farmers are aware of proper body mechanics and of available assistive technology. The purpose of this non-experimental survey study was a) to investigate small-scale farmers' knowledge and awareness of proper body mechanics and assistive technology; b) to identify techniques or adaptations farmers currently implement; and c) to analyze whether age, ethnicity, education, or years of farming experience had an impact on the participant's awareness of these two concepts.

Definition of Terms

Assistive technology (AT). The Assistive Technology Act of 2004 states that an assistive technology device is, "… any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" (H.R. 4278 (108th): Assistive Technology Act of 2004, p. 4). This definition was used throughout this study survey.

Body mechanics. According to a definition obtained from the The Free Dictionary.com, adapted for this study, body mechanics are the use of proper body movement in daily activities to help prevent and correct problems associated with posture (Body mechanics, n.d.). This researcher adapted the source's provided definition to the description above in order to make the term more easily understood by all participants of this study. This adapted definition was used throughout the study survey.

Personal protective equipment (PPE). According to the Occupational Safety and Health Administration (n.d.c), PPE is equipment worn to reduce exposure to a variety of hazards.

Examples of PPE include such items as gloves, foot and eye protection, protective hearing devices, hard hats, respirators, and full body suits. Though PPE was not identified in the study survey, its definition is provided because participants cited the use of devices consistent with the definition of PPE and did not differentiate between PPE and AT.

Review of Literature

Farming: An Occupational Hazard

According to the 2007 Census of Agriculture, the number of small farms in the United States is 1,995,133, or ninety-one percent of all farms, representing fifty-six percent of the total value of agricultural land and buildings (U.S. Department of Agriculture, 2007). The following year in 2008, the agriculture industry encountered the highest fatal work injury rate of all occupational sectors (Van den Broucke & Colémont, 2011). As estimated by Deboy, Jones, Field, Metcalf, and Tormoehlen (2008), anywhere between fourteen to nineteen percent of farmers and farm workers in the United States were living with disabilities. As recent as 2010, of the 1, 823, 000 full-time workers employed in production agriculture in the United States, 476 adult farmers and farm workers were killed from work-related injuries, and another 113 youth under the age of twenty were killed in farm-related injuries (Agricultural Safety, 2012).

Even with the incorporation of technology to assist with farming, farmers in the United States are twice as likely as other workers to experience a disabling injury and six times more likely to suffer a fatal injury (Mathew et al., 2011). Multiple occupational hazards are cited to contribute to this high incidence rate including heavy physical work beginning at a young age, the operator age of the farmer (averaging around fifty-seven years-old), the type of machinery used, the longevity of each work day, the solitary nature of the work itself, low socioeconomic status, farm size, and seasonal conditions (Cook & Field, 2011; Mathew et al., 2011; Reed & Claunch, 2002; Van den Broucke & Colémont, 2011).

Farmers who survive a work-sustained injury tend to be prone to disabling conditions. According to the Centers for Disease Control and Prevention (2012), an average of 243 agricultural workers are suffering every day from lost work time as the result of their acquired

farm injuries, with five percent of these individuals presenting with permanent impairments (Agricultural Safety, 2012). As of 2004, the estimated average direct cost for one of these disabling injuries was $28,000, but upward of an estimated $46,000 when considering indirect costs, with a rising trend in premature applications for social security disability (Cook & Field, 2011; Lehtola, Becker, & Brown, 2004).

Inaccurate Reporting of Injuries and Access to Care

In 1990, Congress attempted to direct the National Institute for Occupational Safety and Health (NIOSH) to develop an extensive agricultural safety and health program that would address the high rates of injuries and illnesses experienced by workers in the agricultural sector (Agricultural Safety, 2012). In reality, however, most family farms are exempt from the Fair Labor Standards Act regulations, and it is estimated that ninety-five percent of farms are exempt from the Occupational Safety and Health Administration (OSHA) regulations (Amshoff & Reed, 2005; Reed & Claunch, 2002). Reed & Claunch (2002) conveyed that reports of work-related injury reports amongst farmers were voluntary in thirty-five of the fifty states. Consequently, the actual prevalence of permanent disability is largely miscalculated.

OSHA contributes to the inaccurate reporting of injuries, as their organization mandates that only small-scale farmers with more than ten employees report and document their sustained injuries (Occupational Safety and Health Administration, n.d.b). Given the lack in regulations to mandate all farmers to report their injuries, and the nonuniformity of survey methodologies investigating farmers' levels of injuries, accurate estimates of injury rates amongst farmers and their associated costs of medical care are said to be grossly underestimated (Cook & Field, 2011; Mathew et al., 2011; Reed & Claunch, 2002). These statistics are of major importance because Congress enacted OSHA to assure the safe working conditions of all workers through the

implementation of health standards with an obligation to provide training, outreach, education, and assistance to workers (Occupational Safety and Health Administration, n.d.b). As the result of OSHA's exceptions to small-scale farmers, these farmers are not receiving the training, outreach, education, or assistance that should be readily available to them.

This situation does not appear to be contained to only farmers living in the United States. As stated in Van den Broucke & Colémont (2011), "in many countries there is no legal or administrative obligation to collect information on injuries among farmers" (p. 307). In a study conducted in Canada, investigators revealed that, in their country, nonfatal injury reports amongst farmers that result in ongoing disability are tremendously lacking and essentially nonexistent (Friesen, Krassikouva-Enns, Ringaert, & Isfeld, 2010). They concluded that, "data concerning long-term or permanent disability resulting from injuries is not available through CAISP (Canadian Agricultural Injury Surveillance Program), nor is it currently available from any other known sources" (Friesen et al., 2010, p. 49). In another study, authors in Finland also concluded that more attention needs to be designated to farmers due to the high injury rates amongst full-time farmers (Taattola, et al., 2012).

Limited Use of the Medical Model

Various factors may help to identify why the actual prevalence rate of injuries amongst farmers is much higher than what is being reported. Small-scale farmers have been found to avoid seeking medical help because of pride, the need to provide for the family, and an inability to miss work due to the adverse affects it would have on cost and production (Bushy, 2000; Cook & Field, 2011; Reed & Claunch, 2002). According to Dr. Steven Kirkhorn, the mindset of farmers is to overlook aches and pains in order to continue being productive, as the work has to be completed regardless of outstanding circumstances (as cited in Cook & Field, 2011). Dr.

Kirkhorn further explains that because of these factors, along with a farmer's lack of workers' compensation or health care coverage and their fear of premium increases, injuries are undocumented and underreported (as cited in Cook & Field, 2011; Costich, 2010).

Injured farmers have also reported perceiving that health professionals attempted to set up barriers to discourage return to work post-injury, whereas individuals in the farmer's community were supportive of the injured farmer's desire to return to work (Friesen et al., 2010). One of the outcomes of this perception is a documented tendency for farmers to seek out veterinarians for a diagnosis, and to self-medicate with drugs intended for livestock, avoiding to seek out a health care provider for medical attention (Cook & Field, 2011). As the result of this avoidance of the medical system's predesigned programs, injured farmers are then likely to be primarily cared for by their own family members or friends (Bushy, 2000).

Physical and Environmental Hazards and their Associated Affects

Physical hazards. Although farmers in industrialized countries are typically healthier than the general population, there is a noticeably high prevalence of musculoskeletal health problems (Anders & Homberg, 2013). Some of the most notable musculoskeletal health problems among farmers include osteoarthritis, neck pain, chronic back pain, herniated lumbar disks, accelerated degeneration of the spine, hernia, fractures/crush injuries, tendonitis, and sprains or strains (Cook & Field, 2011; Friesen et al., 2010; Milosavljevic, Bagheri, Vasiljev, McBride, & Rehn, 2012; Van den Broucke & Colémont, 2011). Other authors have estimated that nearly one in three active farmers has acquired a form of arthritis that impairs the farmer's independence and ability to carry out activities of daily living (Cook & Field, 2011). As referenced in Cook & Field (2012), NIOSH has now prioritized their focus on musculoskeletal disorders, citing its prevalence in agriculture as a main area of concern.

Other physical injuries associated with farming include amputations, spinal cord injuries, traumatic brain injuries, vision loss, and hearing loss (Friesen et al., 2010; Mathew et al., 2011). In addition to the initial disabilities farmers may acquire, they are at an increased risk to develop secondary conditions including pain, weight gain, fatigue, limited socialization, falls, sleep disorders, muscle spasms, decreased reaction time, and bowl and bladder impairments (Mathew et al., 2011).

Environmental hazards. Farmers are also at a high risk for environmental-related diseases, including but not limited to (1) respiratory disease from the inhalation of grain dust or pesticides; (2) poison exposure resulting from the use of WD40 to relieve the pain acquired from repetitive stress injuries; or (3) neurological disorders and skin problems as the result of pesticide use (Cook & Field, 2011; Friesen et al., 2010). Other concerns include impaired temperature regulation or sensation (risking the possibility of heat exhaustion), element exposure from working in extreme weather conditions, working in cluttered work areas, and risked stability from working on uneven terrain (Mathew et al., 2011).

Associated conditions. The fast pace of the work on a farm results in many farmers reporting feelings of decreased physical functioning, increased work disability, depression, stress and anxiety, and increased intake of drugs and alcohol, culminating in an increased suicidal rate (Cook & Field, 2011; Friesen et al., 2010). These associated conditions may then also cause decreases in attention, reaction time, and accuracy and judgment in decision-making, leading to further potential injuries (Xiang, Stallones, Chiu, & Epperson, 1998). Mental stress and weakened work ability are not the only growing problems among farmers, rates of diabetes and heart disease have also been recognized conditions amongst the farming population, secondary to the lack of rest (Friesen et al., 2010; Taattola et al., 2012).

Several theories have been proposed to explain why physical and mental conditions are high within this occupational sector. A group of researchers cited noticeable elevated rates of injuries when comparing reports of self-perceived health to an individual's alcohol consumption, off-farm paid employment, involvement of livestock as the primary source of income, and living with pre-existing conditions including back pain, hearing loss, and cancer (Xiang, Sallones, & Chiu, 1999). Xiang et al. (1999), alluded to the decreases in sensory abilities, information processing, and decision-making abilities as possible contributing factors to increased injuries amongst older farmers.

Other investigators noted that the increased health and longevity of older adult farmers (allowing for extended years of farming into old age), combined with age-related limitations (including vision loss, hearing loss, and deficits in balance and sensation) placed older farmers at risk of injury (Cole & Donovan, 2008). They also identified a trend where individuals who are retiring from an unrelated occupation are becoming farmers, placing themselves at greater risk of injury due to their inexperience in farming.

Relevance of Proper Body Mechanic Execution to Farming

The use of proper body mechanics is essential in order to help prevent and correct problems associated with posture. Knowledge and expertise of proper body mechanics are within the occupational therapy profession's scope of practice, as this profession promotes and educates clients on such strategies in order to enhance the every day functioning and living of individuals (Stoffel et al., 2005). In regard to farming, the correct execution and utilization of body mechanics is crucial due to the intense physical labor required to engage in this occupation, and due to the trend that farmers typically work past retirement age (Friesen et al., 2010). Both factors expose farmers to greater risk of injury, as their aging bodies are physically incapable of

keeping up with the physical demand of work (Friesen et al.). Farmers are displaying insight, more commonly after a disabling injury has occurred, that their injury could have been prevented with improved safety and injury education (Friesen et al.). Occupational therapists can support this self-awareness with farmers by using one's expertise in body mechanics to develop interventions and strategies that promote a farmer's safe participation in job performance. Furthermore, this intervention may also improve the farmer's overall quality of life and mental health.

A review of the available literature addressing body mechanic strategies for farmers indicated a high prevalence of back injuries. And, most of the available literature on body mechanic strategies and techniques for this population focused on minimizing this condition. Several theories have emerged in an attempt to explain the high prevalence of back injuries amongst this population. Evidence suggests that back problems are related not so much to how physical a farmer's work is, but to how the farmer executes lifting or bending tasks (Rodriguez, Domingo, & Stiles, 2002). Another source also pointed to overexertion as a contributing factor to injuries (Agricultural Safety and Health Program at the Ohio State University Extension, n.d).

Arguably one of the most important notions regarding body mechanics is to avoid lifting objects or performing work before the body's muscles are 'warm,' which has been associated with the onset of future sprain and strains (Rein & Fluegel, 1989; Rodriguez et al., 2002). To avoid this onset, farmers are advised to perform warm-up stretches prior to work in order to activate blood flow to muscle groups (2002). Other suggestions to minimize injuries amongst farm workers include eliminating poor lifting and carrying habits including bending from the waist to pick up objects, lifting objects heavier than twenty-five pounds, lifting boxes above the chest, twisting one's body while carrying or lifting heavy objects, attempting to lift objects when

in poor physical shape, and repeatedly lifting lighter objects (Agricultural Safety and Health Program at the Ohio State University Extension, n.d; Farm Safety Association Inc., 2000; Rein & Fluegel, 1989; Rutgers Cooperative Research & Extension, 2004). Yet another suggestion to minimize these injuries is to have farmers 'think' and 'envision' the moving process before lifting objects (Agricultural Safety and Health Program at the Ohio State University Extension, n.d).

An overview of the most common suggestions for farmers regarding proper body mechanic techniques for safe lifting and carrying includes: a) sizing up a load and checking the overall conditions of the surrounding environment (e.g., not lifting a load that is too heavy or awkward, using equipment if load is too heavy, checking to make sure there is enough space for movement and a clear pathway); b) making certain that one's balance is good before moving or traversing the environment (e.g., feet should be in line with the hips and shoulders, one foot should be beside the object being lifted while the other foot should be staggered behind the object); c) bending at the knees and avoiding stooping (e.g., keeping back straight but not vertical, lifting in one fluid motion and avoiding jerking, tucking in chin to keep one's back straight); d) gripping the load with the palms of one's hands and fingers and then transferring the weight of the object to the forearms (i.e., promoting better kinesthetic movements by reducing the lever); e) using one's body weight to start load moving and then lifting the object by pushing upward with force driven from the legs (e.g., rocking while keeping back straight in preparation for lifting); f) keeping arms and elbows close to the body while lifting; g) carrying the load close to the body (e.g., avoiding twisting back when lifting by shifting foot position and turning whole body); and, h) bending at the knees to lower the load to the ground/surface (e.g., placing a load on a bench or shelf edge and then pushing it into position, avoid lifting or lowering with

extended arms) (Agricultural Safety and Health Program at the Ohio State University Extension, n.d; Farm Safety Association Inc., 2000; Rein & Fluegel, 1989; Rodriguez et al., 2002).

Rodriguez et al. (2002) provided a series of body mechanic strategies for farmers. When they are working close to the ground, they should avoid stooping or bending from the waist, and instead kneel using one or both knees. They should also wear pads to protect their knees and back, as well as designate time to occasionally stand and stretch the back muscles (Rodriguez et al.). To promote body mechanic strategies when farmers are standing for long periods of time, the authors advised farmers to wear comfortable shoes, stand with one foot resting on a higher surface than the other, change the position of their feet intermittently, and stand on a comfortable surface (Rodriguez et al.). When farmers are driving a tractor or sitting for long periods of time, they should sit up straight, support their lower backs with a small cushion or rolled-up towel, and adjust their seats to where they can still reach the controls while their knees are level with their hips (Rodriguez et al.).

Although there is a variety of available literature for farmers regarding proper body mechanic strategies and techniques, this researcher was not able to locate literature from previous research detailing the awareness of body mechanics amongst small-scale farmers.

Relevance of Assistive Technology to Farming

Assistive technology (AT) ranges from basic, low-tech options assembled from inexpensive, sustainable materials to expensive, sophisticated, high-tech technology (Driscoll, Rodger, & Jonge, 2001). By means of AT awareness and implementation, one has the potential to overcome physical difficulties and barriers through use of appropriate workplace accommodations and supports (Driscoll et al., 2001). AT devices can also drastically improve the functional abilities of individuals living with cognitive, visual, or auditory limitations by

providing the support that facilitates successful engagement in meaningful occupations.

Although AT techniques and strategies prevent injuries and aid participation in other occupational sectors (Driscoll et al., 2001; Gamble, Dowler, & Hirsh, 2004), this researcher was only able to identify limited published research detailing small-scale farmers' use of AT. Even with federal and state governments supporting access to assistive technology devices and services, the majority of the general population remains uninformed of AT and unaware of how to acquire AT devices (H.R. 4278 (108th): Assistive Technology Act of 2004, 2004).

Knowledge of and expertise concerning AT is within the occupational therapy profession's scope of practice. This profession promotes and educates on the use of such devices and modifications in order to enhance the every day functioning and living of individuals following the onset of a disability (Voelkerding & Garza, 2004). In regard to farming, the utilization of AT following an acquired disability is important in order to assist a farmer's ability to return back to work and continue providing for the family. Occupational therapists can support awareness of assistive technology amongst farmers by using their expertise in this field to develop strategies or modify tools and the workplace in order to promote the continued independence of a farmer and his or her safe return to work.

In regard to farming, it can be presumed that AT could prevent or decrease the severity and incidence of injury, while also equalizing opportunities to continue farming (Friesen et al., 2010). Investigators have found that even after farmers experience injuries or permanent disabilities, they will make necessary adjustments to their work in order to return to their primary occupation of farming (Friesen et al., 2010; Mathew et al., 2011). These farmers, in particular, demonstrate abilities to make modifications to their farm equipment or fabricate a self-designed device in order to overcome their disability-related restrictions (Mathew et al.). However, these

authors determined that home-fabricated assistive technologies directly or indirectly increased the risk of secondary conditions or injuries due to the lack of commercial regulations in fabricating the equipment (Mathew et al.).

The New York AgrAbility Project (2005) group published a “Back Saving Solutions” handout for farmers detailing both body and structural modifications that can be made by farmers to reduce future injuries and reduce back pain. Such modifications include: a) adding a non-slip step to farm machinery to help with safe mounting and dismounting of farm machinery; b) adding suspension seating or seat cushions to encourage lumbar support; c) installing adjustable arm rests to minimize stress or pressure to the lower back; d) installing automatic hitching devices or gate openers to decrease the number of mounts and dismounts from farm machinery; e) installing additional mirrors to minimize associated pains reported in the neck and back areas from twisting; f) utilizing stools to decrease standing, bending, or stooping time and promote better body mechanics; g) using long-handled tools or grabbers to avoid bending or reaching; h) using handle extenders to improve leverage; and i) using adapted devices to transport objects too heavy for lifting. Other basic modifications recommended to enhance a farmer’s participation in farming after returning to work include: installing platforms on chemical sprayers, modifying utility vehicles, developing personal lifts, or even devising carts to hover over rows of plants or move alongside the rows of planted crops (Mathew et al., 2011).

Although there is some available literature and resources for farmers regarding AT devices and basic farm modifications, this researcher was not able to locate literature from previous research detailing the awareness of AT devices amongst small-scale farmers.

Methods and Procedures

Research Design

For the purposes of this study, a non-experimental survey research design was used (Portney & Watkins, 2009). The Human Subject Review Board at Ithaca College approved the study proposal (see Appendix 1) in October 2013 (see Appendix 2). Prior to partaking in the study's survey, participant informed consent was obtained; a cover letter detailed this researcher's position in relation to the research, this researcher's perceived need for the study, what the research process would entail, how it can contribute to the field of Occupational Therapy, and this researcher's intentions to share the results of the survey through a research presentation and planned publication (see Appendix 3).

Research Questions

The goal of this study was to investigate the following three primary research questions and their associated sub-questions:

1. To what extent does a small-scale farmer have knowledge of proper body mechanics?
    a. What techniques or methods are utilized to promote proper body mechanics?
2. To what extent is a small-scale farmer aware of assistive technology?
    a. How has the farmer incorporated assistive technology into his/her lifestyle?
3. Do age, ethnicity, educational level, and years of farming experience influence knowledge of body mechanics and assistive technology?

Participants and Selection Method

Participants were recruited via convenience and snowball sampling (Portney & Watkins, 2009) with the assistance from workers in organizations involved in small farming: the Cornell Small Farms Program, the Cornell Cooperative Extension-Tompkins County Division, and

Groundswell. All three organizations are located in Ithaca, New York. These organizations assisted in the distribution of a questionnaire to farmers on their email list serves, or in-person during a 'Farmer 2 Farmer' meeting held in November 2013 at the Cornell Cooperative Extension- Tompkins County headquarters, regardless of whether or not they met the study's specific criteria.

Inclusion and exclusion criteria. For the purposes of this study, a farmer was defined as any person over the age of eighteen who cultivates land or crops or raises animals, and a small-scale farmer included those that grow and sell between $1,000- $250,000 per year in agricultural products (Farmer, n.d.; USDA-ERS, 2013). The survey was only to be completed by farmers (farm owners, recreational farmers, or farm employees) and hired helpers.

Measurement Tool

Instrument. The instrument used for this research was a novel-designed questionnaire developed by this researcher based on a review of the literature and this researcher's proposed research questions. The questionnaire, *Small Farmers' Awareness of Body Mechanics and Assistive Technology,* was comprised of five demographic questions, nine farming history questions, thirty-five Likert scale items pertaining to body mechanics, eighteen Likert scale items pertaining to AT, and another sixteen exploratory multiple choice questions further investigating farmers' assistive technology awareness (see Appendix 4). For various demographic questions, farming history questions, and the last sixteen exploratory multiple-choice questions, participants also had the ability to fill in sections listed as "other." The purpose of these sections was for farmers to further identify themselves or to provide descriptive data that enhanced this researcher's ability to recognize implemented body mechanic strategies or assistive technology

use and awareness. The questionnaire was formatted through Ithaca College's online survey tool, Qualtrics (version 54,412), and was also printed as a booklet (Qualtrics, 2013).

Establishing validity of the survey tool. Prior to the distribution of the survey tool, validity for the survey tool was established through field-testing of the survey with ten, self-identified farmers that met the survey's inclusion criteria. Participants that completed the field-testing received a printed cover letter and Informed Consent form (see Appendix 3). At the end of the questionnaire, participants were encouraged to provide feedback to assist with enhancing the survey prior to distribution. The participants involved in the field-testing answered four questions that investigated their general impressions of the survey, whether the survey was too long, how much time did the survey take to complete, if any questions were redundant, and if the participants had any suggestions or advice for improvement. Based on the field testers' reactions to the survey tool, the definition of body mechanics was improved to enhance clarity. The survey tool was also sent to two experts in the field (occupational therapists from New Hampshire and South Dakota who have specialized in AT) to ensure content validity. No test-re-test reliability session for the survey tool was conducted.

Operationalization of variables. During the development of the tool, the researcher determined that it was imperative that terminology used throughout the study would be understandable to all participants. The researcher provided definitions of the key terms used in the survey process (see page 2).

Procedures

Data collection methods. Questionnaires were distributed to farmers online or in-person if they were attending the "Farmer 2 Farmer" meeting with the assistance of the various organizations mentioned previously. Farmers who volunteered to partake in the survey at the in-

person meeting were allotted fifteen minutes to complete the questionnaire. There was not a time limit for farmers completing the survey online, and date was collected online over the course of three months. The questionnaire and ensuing instructions were phrased the same way to both farmers in-person at the meeting and farmers completing the survey online. Participants completing the survey online entered their response directly into Ithaca College's Qualtrics program (Qualtrics, 2013). This researcher entered data from the paper copies of the survey into the Qualtrics program.

Based on the study's convenience sampling method and the snowball sampling used, attempts to determine the sample size, or identify which respondents replied to the survey, was not feasible. This was because workers at these organizations were unsure of which employees emailed certain list serves, and in turn, were unsure of further list serves that were reached secondary to snowball sampling.

Analysis of Data

Of the eighty-three farmers that initially responded to the survey, fifty-seven surveys were fully completed, forty-five online and twelve paper copies collected at the Farmer 2 Farmer meeting. Once all of the data was gathered in Qualtrics, it was exported into IBM SPSS, version 21.0, a Statistical Product and Service Solutions software program designed for statistical analysis (IBM Corp, 2012). Data analysis included descriptive statistics, with mean and standard deviation, and comparative analyses, as seen below. Written responses were tallied and documented in Tables 2, 3, and 4.

Statistical analysis was performed to detect any statistically significant differences of body mechanics and assistive technology based on various demographic variables. The category of ethnicity was not testable due to the almost unanimous responses from participants identifying

as White/Caucasian. Levels within the other three categories, related specifically to the research questions (age, educational level, and years of farming experience), were combined into larger categories in order to compare means and investigate possible statistical significance with farmers' awareness of body mechanics and AT. This combination was necessary due to the large number of questions and the relatively small number of responses. Others categories with compared means included gender, prior history of injuries or chronic injuries, and prior history of growing up with a farming background, however, these were not related to the focus of the study so their results were not investigated further beyond statistical significance.

Age was analyzed by comparing farmers under the age of forty-four to farmers over the age of forty-five. Level of education was analyzed by comparing farmers with less than a four-year advanced degree to farmers with a four-year advanced academic degree or higher. Years of farming experience was analyzed by comparing farmers with less than or equal to thirty years of farming experience to farmers with greater than thirty-one years of farming experience.

Study Limitations and Assumptions

Several limitations are important to note related to this study. First, the convenience and snowball sampling method did not allow this researcher to find out the participants' level of representation from the total population, and so the response rate could not be calculated. Second, the findings of this study cannot be generalized to the full USA population of small-scale farmers based on the study's sampling method and restriction to two states. Third, most participants were recruited by e-mail, which limited the potential respondents who may not be email users. This aspect also limited the ability to generalize the results of the study. Not knowing who the respondents were affected the ability to send out reminder emails to increase the survey's response rate. Fourth, this researcher had not identified the difference between

personal protective equipment (PPE) and assistive technology (AT) and thus could not differentiate farmers' awareness of these two types of devices. This researcher also did not establish validity, beyond face validity, and test-re-test reliability for the novel-designed questionnaire.

This researcher assumed that the participants answered the questionnaires honestly and accurately. It was also assumed that the participants read the instructions and definitions accompanying the survey in order to have all participants think and answer questions as precisely and similarly to other participants.

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Small Farmers' Awareness of Body Mechanics and Assistive Technology Manuscript

Introduction

Agricultural work is a hazardous occupation, leading to fatalities and life-altering injuries (Agricultural Safety, 2012; Mathew, Field, & French, 2011; Van den Broucke & Colémont, 2011). Due to a lack in regulations that would require farmers to report their injuries, along with nonuniformity of survey methodologies collecting data regarding farmers' levels of injuries, there is not an accurate estimate of the amount of farmers working with injuries (Cook & Field, 2011; Mathew et al., 2011; Reed & Claunch, 2002). Given the known evidence of injuries sustained by farmers while working in this occupational sector, along with this researcher's inability to locate research in previous literature regarding small-scale farmers' awareness of proper body mechanics and assistive technology, the purpose of this non-experimental study is to investigate small-scale farmers' awareness of these two concepts. These two concepts are of major importance as the use of proper body mechanics can help to prevent and correct problems associated with the awkward postures often assumed by farmers, and the implementation of assistive technology can help an individual overcome physical, cognitive, visual, or auditory limitations, particularly those that occur following the onset of an injury. In addition to investigating small-scale farmers' awareness of proper body mechanics and assistive technology, this study investigated what techniques or adaptations farmers may currently be implementing, along with whether age, ethnicity, education, or years of farming experience impact the participant's awareness of these concepts. This study is an essential first step in identifying the possible needs of this population, as well as helping to enlighten the occupational therapy profession of its role within the agriculture occupational sector.

Farming: An Occupational Hazard

According to the 2007 Census of Agriculture, the number of small farms in the United States is calculated at 1,995,133, or ninety-one percent of all farms, with small farms accounting for fifty-six percent of the total value of agricultural land and buildings (U.S. Department of Agriculture, 2007). The following year in 2008, the agriculture industry reported the highest fatal work injury rate of all occupational sectors (Van den Broucke & Colémont, 2011). Even with the incorporation of technology to assist with farming, farmers in the United States are twice as likely as other workers to experience a disabling injury and six times more likely to suffer a fatal injury (Mathew et al., 2011). Multiple occupational hazards are cited to contribute to this high incidence rate including heavy physical work beginning at a young age, the operator age of the farmer (averaging around fifty-seven years-old), the type of machinery used, the longevity of each work day, the solitary nature of the work itself, low socioeconomic status, farm size, and seasonal conditions (Cook & Field, 2011; Mathew et al., 2011; Reed & Claunch, 2002; Van den Broucke & Colémont, 2011).

Many farmers that survive a work-sustained injury are then prone to disabling conditions. According to the Centers for Disease Control and Prevention (2012), an average of 243 agricultural workers are suffering every day from lost work time as the result of their acquired farm injuries, with five percent of these individuals presenting with permanent impairments, contributing to a trend in premature applications for social security disability (Agricultural Safety, 2012; Cook & Field, 2011).

Inaccurate Reporting of Injuries and Limited Use of the Medical Model

The actual prevalence of permanent disability is drastically miscalculated, however. Most family farms are exempt from the Fair Labor Standards Act regulations, and it is estimated that

ninety-five percent of farms are exempt from the Occupational Safety and Health Administration (OSHA) regulations (Amshoff & Reed, 2005; Reed & Claunch, 2002). This is most likely because OSHA only mandates that small-scale farms with more than ten employees report and document sustained injuries (Amshoff & Reed, 2005; Reed & Claunch, 2002; Occupational Safety and Health Administration, n.d.b). These statistics are of major importance because Congress enacted OSHA to assure the safe working conditions of all workers through the implementation of health standards along with an obligation to provide training, outreach, education, and assistance to workers (Occupational Safety and Health Administration, n.d.). As the result of OSHA's exceptions to small-scale farmers, these farmers are not receiving the training, outreach, education, or assistance that should be readily available to them.

While there is a definite lack in regulations contributing to the inaccurate reporting of injuries, small-scale farmers also contribute to inaccurate reporting due to trends that they avoid seeking medical help. Some of the reasons cited for this include pride, the need to provide for the family, the inability to miss work due to the adverse affects it would have on cost and production, a lack of workers' compensations or heath coverage, and the fear of premium increases (Cook & Field, 2011; Reed & Claunch, 2002).

Physical Hazards and Associated Conditions

Although farmers in industrialized countries are typically healthier than the general population, there is a noticeably high prevalence of musculoskeletal health problems (Anders & Homberg, 2013). Some of the most notable musculoskeletal health problems reported among farmers include osteoarthritis, neck pain, chronic back pain, herniated lumbar disks, accelerated degeneration of the spine, hernia, fractures/crush injuries, tendonitis, and sprains or strains (Cook & Field, 2011; Friesen et al., 2010; Milosavljevic, Bagheri, Vasiljev, McBride, & Rehn, 2012;

Van den Broucke & Colémont, 2011). Other physical injuries associated with farming include amputations, spinal cord injuries, and traumatic brain injuries (Friesen et al., 2010; Mathew et al., 2011).

Additionally, due to the pace of the work, many farmers also report feelings of depression, stress, and anxiety, as well as an increased intake of drugs and alcohol, culminating in an increased suicidal rate (Cook & Field, 2011; Friesen et al., 2010). Older farmers are also at risk of injury secondary to age-related limitations, including vision loss, hearing loss, and deficits in balance and sensation (Cole & Donovan, 2008).

Relevance of Proper Body Mechanics Execution to Farming

In regards to farming, the correct execution and utilization of body mechanics is crucial due to the intense physical labor required to engage in this occupation, and due to the trend that farmers typically work past retirement age (Friesen et al., 2010). A review of available literature for body mechanic strategies for farmers identifies a high prevalence of back injuries and most of the available literature regarding body mechanic strategies and techniques for this population is specified for minimizing this condition. Evidence suggests that back problems are related not so much to how physical a farmer's work is, but to how the farmer executes lifting or bending tasks (Rodriguez, Domingo, & Stiles, 2002). Another source also identified overexertion as a contributing factor to injuries (Agricultural Safety and Health Program at the Ohio State University Extension, n.d.). Although there is a variety of available literature for farmers regarding how to use proper body mechanic strategies and techniques, this researcher was not able to locate literature from previous research detailing the knowledge, awareness, or use of body mechanics amongst small-scale farmers.

Relevance of Assistive Technology to Farming

By means of assistive technology awareness and implementation, one has the ability to compensate for physical, cognitive, visual, or auditory limitations. In regards to farming, the utilization of assistive technology following an acquired disability may be essential in order to return back to work and continue providing for the family. In fact, there are federally funded resources (e.g., National AgrAbility Project) as well as university-based resources (e.g., Breaking New Ground Resource Center) that are specifically designed to provide assistive technology to farmers. Studies have found that even after farmers experience injuries or permanent disabilities, they will make necessary adjustments to their work in order to return to their primary occupation of farming (Friesen et al., 2010; Mathew et al., 2011). Although there is limited published research detailing small-scale farmers' use of assistive technology devices and implementation of basic farm modifications, this researcher was not able to locate literature from previous research detailing small-scale farmers' awareness and use of assistive technology devices.

It is within this profession's scope of practice to educate clients and community members on topics that promote the development of skills needed for successful interactions within their occupations and lives. This includes education on body mechanics along with information on assistive technology. This education addresses many of the areas within the Occupational Therapy Practice Framework (2014) that occupational therapists try to promote for the individuals we serve. As occupational therapists are aware, this education not only assists an individual's performance skills (e.g., motor skills including aligning, stabilizing, positioning, reaching, bending, gripping, manipulating, lifting, walking, and transporting) but also positively impacts an individual's client factors (e.g., specific mental functions including memory,

attention, and emotional regulation), contexts (e.g., cultural and personal), and environment (e.g., physical and social) (American Occupational Therapy Association, 2014). By providing education pertaining to these concepts, occupational therapists address much more than physical performance skills in order to enhance another individual's health and well-being.

Methodology

Research Design

A non-experimental survey research design was used for this study (Portney & Watkins, 2009). The Human Subject Review Board at Ithaca College approved the study in October 2013. The goal of this study was to investigate the following:

1. To what extent does a small-scale farmer have knowledge of proper body mechanics?
    a. What techniques or methods are utilized to promote proper body mechanics?
2. To what extent is a small-scale farmer aware of assistive technology?
    a. How has the farmer incorporated assistive technology into his/her lifestyle?
3. Do age, ethnicity, educational level, and years of farming experience influence knowledge of body mechanics and assistive technology?

Participants and Selection Method

Participants were selected via convenience and snowball sampling (Portney & Watkins, 2009), with the assistance of workers employed by the Cornell Small Farms Program, the Cornell Cooperative Extension-Tompkins County Division, and Groundswell. All three organizations are located in Ithaca, New York. These organizations distributed the questionnaire to any farmer on their email list serves, regardless of whether or not they met the study's specific criteria.

Inclusion and exclusion criteria. For this study, a farmer was defined as any person, eighteen years of age or older, who cultivates land or crops or raises animals, and a small-scale farmer included those that grow and sell between $1,000- $250,000 per year in agricultural products (Farmer, n.d.; USDA-ERS, 2013). The survey was only to be completed by farmers (farm owners, recreational farmers, or farm employees) and hired help over the age of eighteen that met the survey's criteria.

Measurement Tool

Instrument. The instrument used for this research was a novel-designed questionnaire developed by the researcher based on a review of the literature and the researcher's proposed research questions. The questionnaire, *Small Farmers' Awareness of Body Mechanics and Assistive Technology,* was comprised of five demographic questions, nine farming history questions, thirty-five Likert scales pertaining to body mechanics, eighteen Likert scales pertaining to assistive technology, and another sixteen exploratory multiple choice questions further investigating farmers' assistive technology awareness. For various demographic questions, farming history questions, and the last sixteen exploratory multiple choice questions, participants also had the ability to fill in sections listed as "other" to further identify themselves or to provide descriptive data that enhanced the researcher's ability to recognize implemented body mechanic strategies or assistive technology use and awareness.

Establishing validity of the survey tool. Prior to the distribution of the survey tool, validity for the survey tool was established through field-testing of the survey with ten farmers that met the survey's inclusion criteria. The survey tool was also sent to two experts in the field (occupational therapists from New Hampshire and South Dakota who have specialized in AT) to ensure content validity. No test-re-test reliability for the survey tool was established.

Procedures

Data collection methods. The majority of surveys were distributed to farmers included on the email list-serves of the Cornell Small Farms Program, The Cornell Cooperative Extension- Tompkins County division, and Groundswell. The emails described the study and provided a link to the survey, which was distributed through an online survey program, Qualtrics (2013). Surveys were also distributed to farmers in attendance at a "Farmer 2 Farmer" meeting held in November 2013 at the Cornell Cooperative Extension- Tompkins County headquarters. Based on the study's convenience sampling method and the snowball sampling that ensued, attempts to determine the sample size, or identify which respondents replied to the survey, was not feasible.

Analysis of Data

In regards to the participants completing the survey online, data was directly entered into Ithaca College's Qualtrics program (Qualtrics, 2013). This researcher transferred data from the twelve paper copies of the survey into the Qualtrics program. Once all of the data were included in Qualtrics, it was then exported into IBM SPSS, version 21.0, which is a Statistical Product and Service Solutions software program designed for statistical analysis (IBM Corp, 2012). Data analysis included descriptive statistics, with mean and standard deviation, and comparative analyses.

Results

Participants' Demographics

Eighty-three farmers from seventeen counties in New York State and from one county in Massachusetts (see Figure 1) responded to the survey questionnaire. From this sample, 46% of the participants stated that they were employed in another field, and 48% of the participants

stated that farming was their secondary occupation. The majority (56%) of participants identified themselves as female, 43% male and 1% transgender. More than 50% of the participants comprised the 45-54 and 55-64 age cohorts and the majority of participants identifying themselves as of White/Caucasian ethnicity (see Figures 2 and 3). Approximately 70% of participants reported that they had received a bachelor's degree or higher (See Figure 4). Years of farming experienced varied amongst the participants; they represented primarily 2 groups: farmers with ≤ 20 years of experience and farmers ≥ 40 years of experience (see Figure 5).

Research Questions 1 and 1a

Respondents indicated an identified understanding of body mechanics (see Table 1) but their answers showed some inconsistencies with the implementation of this knowledge, evidenced by a high rate of injury reports. Sixty-one percent of participants reported having experienced injuries while farming along with experiencing associated conditions including stress (43%), anxiety (20%), and depression (17%). Twenty percent of participants reported experiencing chronic injuries while farming, along with experiencing associated conditions including stress (86%), anxiety (57%), and depression (14%). Noteworthy is the fact that 69% of injured farmers reported feeling that their injury could have been prevented with improved safety and injury education.

Research Questions 2 and 2a

Participants identified a lack of knowledge concerning assistive technology (AT). However, there is knowledge and implementation of personal protective equipment (see Table 2). Of the four available AT resources listed in this survey (i.e., AbleData, Breaking New Ground Resource Center, The Center for Assistive Technology and Environmental Access, and the National AgrAbility Project), only one participant was aware of Breaking New Ground

Resource Center and six participants were aware of the National AgrAbility Project, an AT program designed specifically for injured farmers.

Table 3 and 4 represent what ATs the small-scale farmers were using based on the most frequently identified problems experienced by farmers reported in the literature. Only devices/methods consistent with the provided definition of AT were included. Responses were categorized into lifting, reaching, and seating aides, braces, other, and PPE given the overlap in responses among participants.

Research Question 3

Statistical significance (p-value ≤ 0.05) and near statistical significance were found for the following when comparing receptiveness and knowledge of body mechanics and assistive technology to:

- Age:
  - "I could benefit from learning more about body mechanics and how this relates to farming." (.061)
  - "I have a tendency to lift heavy objects." (.028)
  - "I often work in stooped positions for multiple hours/days per week." (.018)
  - "I lift heavy objects above shoulder height." (.024)
  - "I could benefit from learning more about assistive technology and how it relates to farming." (.061)
  - "While working, I try to sit on a moveable seat or kneeling pad to avoid kneeling directly on the ground." (.000)
  - "I wear ear protection while operating or using loud machinery." (.037)
  - "I wear a back brace or corset while farming." (.044)

- "I wear a respirator mask while working with grain or chemical sprays." (.055)

- Education:
  - "I frequently work through aches and pains." (.020)
  - "Before lifting an object, I bend with the knees and keep my back straight." (.060)
  - "By the end of the day, I feel pain." (.019)
- Years of farming experience:
  - "I could benefit from learning more about body mechanics and how this relates to farming." (.033)
  - "I frequently stand or sit the same position for extended periods of time." (.006)
  - "I am receptive to learning new ideas and strategies." (.052)
  - "While working, I try to sit on a moveable seat or kneeling pad to avoid kneeling directly on the ground." (.017)
  - "I wear a back brace or corset while farming." (.001)

Several findings were related to participants' age. First, although farmers under the age of forty-five tended to demonstrate poor body mechanic execution, they were more likely to use PPE. Second, farmers under the age of forty-five were more likely to agree that they could benefit from learning more about body mechanics and how it relates to farming; they also benefited from increased AT awareness and how it relates directly to farming. Third, farmers over the age of forty-five were more likely to utilize AT strategies.

Two findings were related to participants' level of education. First, farmers without higher education typically worked through their aches and pains. Second, farmers with higher education demonstrated better body mechanic awareness, although they still reported feeling pain at the end of the day.

Lastly, two findings related to participants' years of farming experience. First, farmers with less farming experience felt that they could benefit from further education and were more receptive to learning new ideas and strategies. Second, although farmers with more farming experience were more likely risk their body mechanics, they were more likely to protect their bodies by using AT methods or devices.

Discussion

The results of this study survey provide new information pertaining to small-scale farmers. Participants reported being aware of *body mechanics* although they were not using related strategies in daily farming activities. They showed low awareness of *assistive technology* (AT) but greater use of personal protective equipment (PPE). This group of farmers only reported using basic lifting, reaching, and sitting aides, braces, and other small, better-known types of assistive devices. Farmers also indicated a positive responsiveness to learning body mechanics strategies. They felt that body mechanic strategies were not impractical for their work, and that they could benefit from learning more about body mechanics and how it relates to farming. In this sample of participants, 69% reported feeling that their injuries could have been prevented with improved safety and injury education. Despite the existence of organizations and information regarding assistive technology, these small-scale farmers were not aware of these resources.

The high rate of response from female participants in this study was consistent with the 2007 Census of Agriculture data that indicated a rising trend in female farm operators (U.S.

Department of Agriculture, 2007). Unexpected, however, is the fact that the majority did not seek medical care when, it is well known that women do so to a greater extent than men; women farmers may need to be considered as a unique sub-group that should be studied separately.

It should also be noted that a majority of the respondents (70%) had received advanced collegiate degrees, bachelor's degree or higher, and demonstrated statistically significant differences in their awareness of proper body mechanics, although they also showed some inconsistencies with the implementation of this knowledge. Higher education did not seem to have an impact on one's likelihood of implementing known body mechanics strategies or safety techniques, thus affecting their safety while working.

Consistent with the work of Friesen et al. (2010), a substantial number (69%) of small-scale farmers who participated in this study displayed insight, more commonly after a disabling injury has occurred, that their injury could have been prevented with improved safety and injury education. Another finding reinforces the work of Mathew et al. (2011) who reported that some small-scale farmers design home-fabricated assistive technology resources in order to minimize the effects of injuries and help them return to work. From information obtained from a personal communication with a member of the Kentucky AgrAbility staff, the higher level of participants' awareness and implementation of PPE over AT may have been attributed to farmers knowledge of the New York Center for Agricultural Medicine and Health publications on PPE.

Small-scale farmers recognized the benefits of gaining additional information. Knowledge of and expertise concerning assistive technology is within the occupational therapy profession's scope of practice, as this profession promotes and educates on the use of such devices and modifications in order to enhance the everyday functioning and living of individuals following the onset of a disability (Voelkerding & Garza, 2004). Occupational therapists have

the capability to assist farmers in these areas, develop adaptations, and provide resources and strategies that promote a farmer's safe participation in job performance prior to the development of an injury, as well as after they sustain injuries. Occupational therapists could also develop educational material using a similar model to the PPE educational model to assist in educating small-scale farmers about AT. Programming might also emphasize the impact that injury prevention could have on the farmer's overall quality of life and mental health.

Study Limitations

Some limitations are important to note. First, based on the study's convenience sampling method and the snowball sampling used, attempts at finding out the participants' level of representation from the total population could not be calculated. Additionally, the findings cannot be generalized to the full USA population of small-scale farmers based on the study's sampling method and participants being from few counties in two states. The great majority of participants were female and of White/Caucasian ethnicity. These characteristics may well reflect the demographics of the specific regions but further restrict the generalizability of the results.

Most participants were recruited by email, which may have limited the potential respondents who may not be email users. Not knowing who the respondents were restricted the ability to send out reminder emails and increase the survey's response rate. Content wise, a clear difference between personal protective equipment (PPE) and assistive technology (AT) was not established, and the separate farmers' awareness of these two types of devices could not be studied.

The questionnaire was a self-report tool, which has some inherent limitations. This researcher also assumed that participants answered the questionnaires honestly and accurately.

Another assumption was that they read the instructions and definitions accompanying the survey in order to have all participants approach questions as similarly as possible. Finally, while face validity of the questionnaire was established, other types of validity and test-retest reliability was not determined, limiting confidence in the questionnaire.

Future Research Recommendations

Further investigations are warranted to address different aspects of the small-scale farmers' well-being. Potential correlations between farmers' gender, their history of injuries or chronic injuries, and their farming history should be investigated. Given that nearly half of the participants reported farming as a secondary occupation, it is unclear whether correlations exist between farmers' educational levels, their identified primary occupations, and their associated awareness of body mechanics and assistive technology. Investigators may perform pre-post testing after implementing a body mechanics and assistive technology course to investigate the effectiveness of implementing such strategies on reducing farmers' reports of injury. A model of education and service delivery that incorporates PPE could also be developed and studied to ensure body mechanics and AT become as well-known as PPE.

Participants' responses regarding their desire to become more aware and knowledgeable of how body mechanics and assistive technology relates to farming cannot be ignored or overlooked. How can healthcare professionals, specifically occupational therapists, meet the needs of farmers when it is well documented that farmers do not typically seek medical services through the medical model? Community-based and preventive models of practice and service delivery would need to be identified in order for the occupational therapy profession to share its wealth of knowledge and information regarding proper body mechanics and assistive technology resources and adaptations with this population.

Conclusion

The results of this study demonstrated farmers' awareness of body mechanics with, yet, a limited implementation of related strategies and a limited awareness of assistive technology resources. These findings are pertinent to occupational therapists working with clients who are small-scale farmer clients. They should include information about body mechanics and assistive technology in their interventions, and not limit their therapy session to offering the traditional service delivery. They should also ensure they are well versed in these concepts and aware of various organizations that can assist this distinctive population.

It is also within the occupational therapy's scope of practice to address farmers' identified reports of stress, anxiety, and depression, areas of the Occupational Therapy Practice Framework. Occupational therapists may, therefore, contribute to farmers' physical, mental and emotional health as part of the holistic nature of the professional practice.

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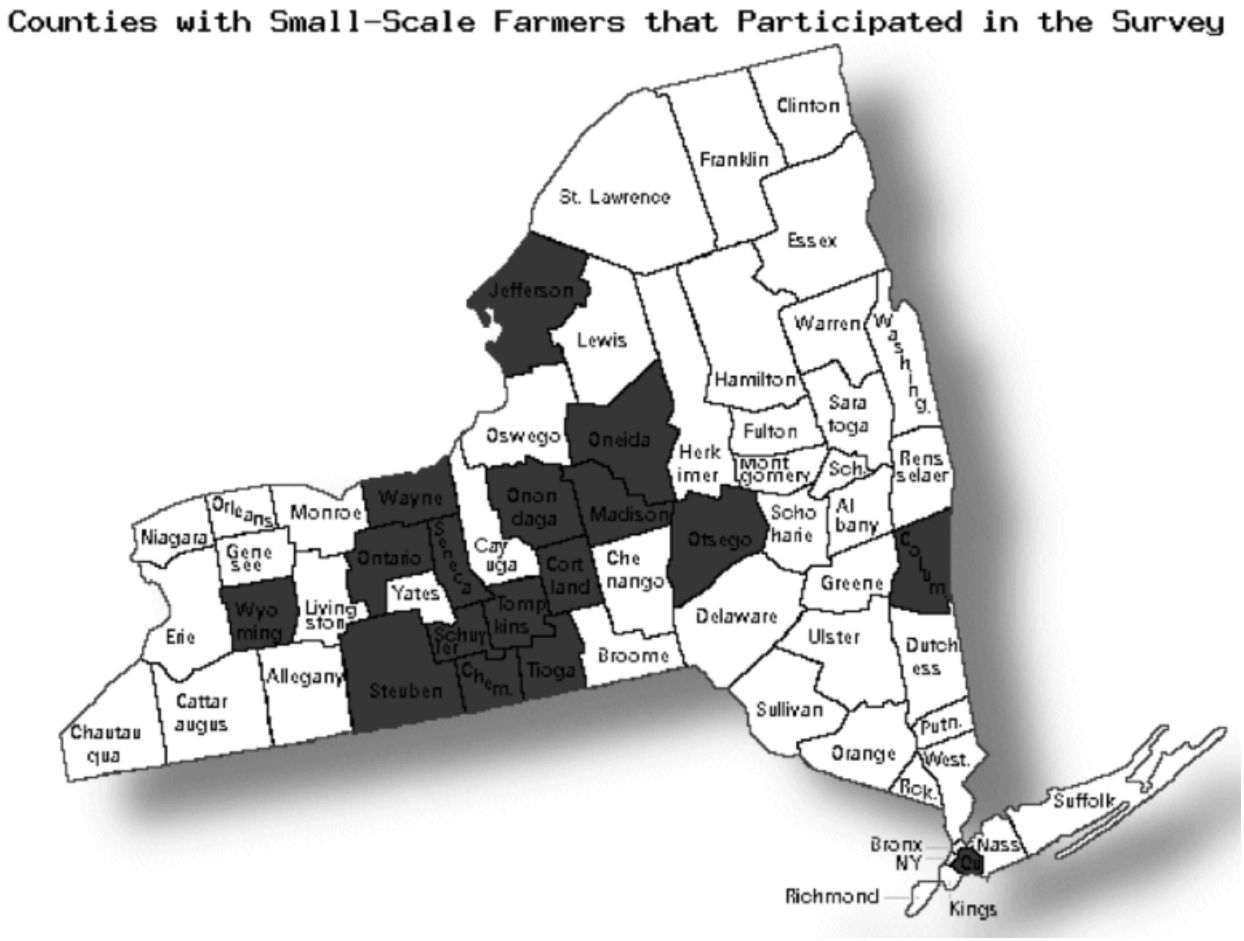

Figure 1. Represented Counties with small-scale farmers that participated in the survey. Seventeen counties in New York participated (Columbia County, Cortland County, Chemung County, Jefferson County, Madison County, Oneida County, Onondaga County, Ontario County, Otsego County, Queens County, Schuyler County, Seneca County, Steuben County, Tioga County, Tomkins County, Wayne County, and Wyoming County), along with one county from Massachusetts.

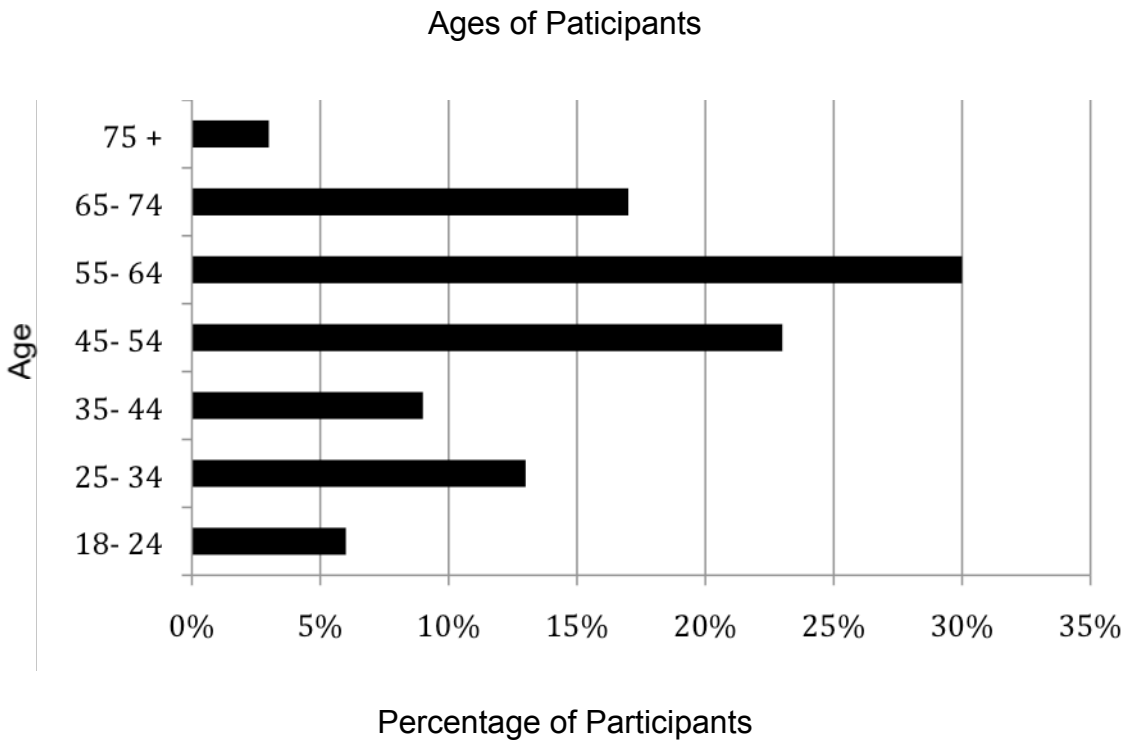

Figure 2. Represented age cohorts of farmers that participated in the survey. Six-percent of farmers identified with the 18-24 age cohort, thirteen-percent of farmers identified with the 25-34 age cohort, nine-percent identified with the 35-44 age cohort, twenty-three-percent of farmers identified with the 45-54 age cohort, thirty-percent of farmers identified with the 55-64 age cohort, seventeen-percent of farmers identified with the 65-74 age cohort, and three-percent of farmers identified with the 75+ age cohort.

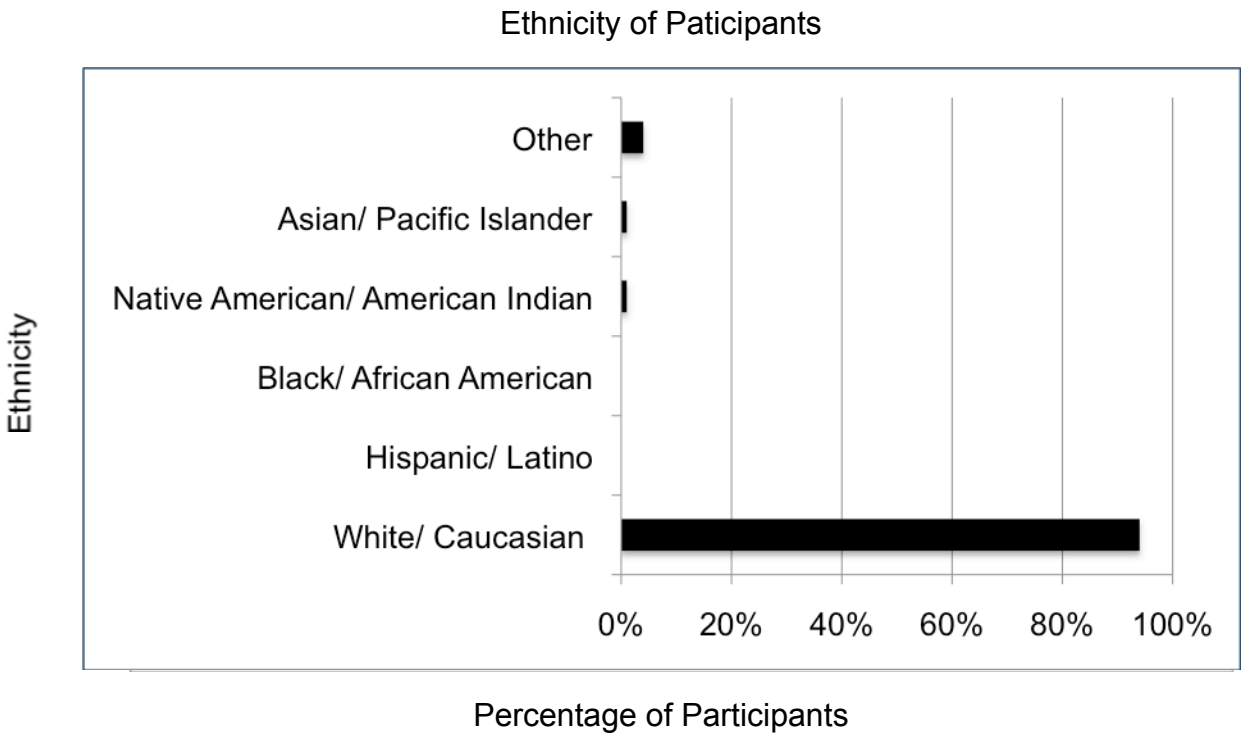

Figure 3. Represented ethnicities of farmers that participated in the survey. Ninety-four-percent of farmers identified as White/Caucasian, one-percent of farmers identified as Native America/American Indian, one-percent of farmers identified as Asian/Pacific Islander, and four-percent of farmers identified as "Other," identifying themselves as White Anglo Saxon/Scandinavian, White Anglo Germanic, and Asian/Caucasian.

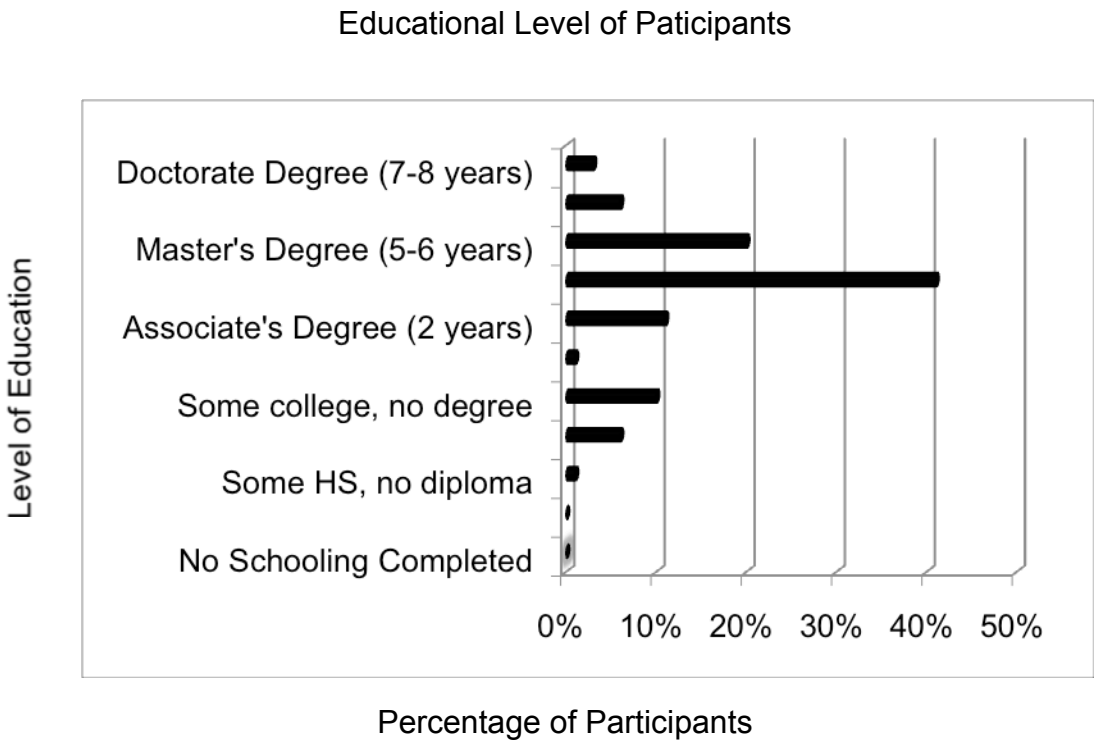

Figure 4. Represented educational levels of farmers that participated in the survey. One-percent of farmers identified with receiving some high school, no diploma. Six-percent of farmers identified with receiving a high school diploma or the equivalent (e.g., GED). Ten-percent of farmers identified with receiving some college, no degree. One-percent of farmers identified with receiving trade/technical/vocational training. Eleven-percent of farmers identified with receiving an Associate's Degree. Forty-one percent of farmers identified with receiving a Bachelor's Degree. Twenty-percent of farmers identified with receiving a Master's Degree. Six-percent of farmers identified with receiving a Professional Degree. Three-percent of farmers identified with receiving a Doctorate Degree.

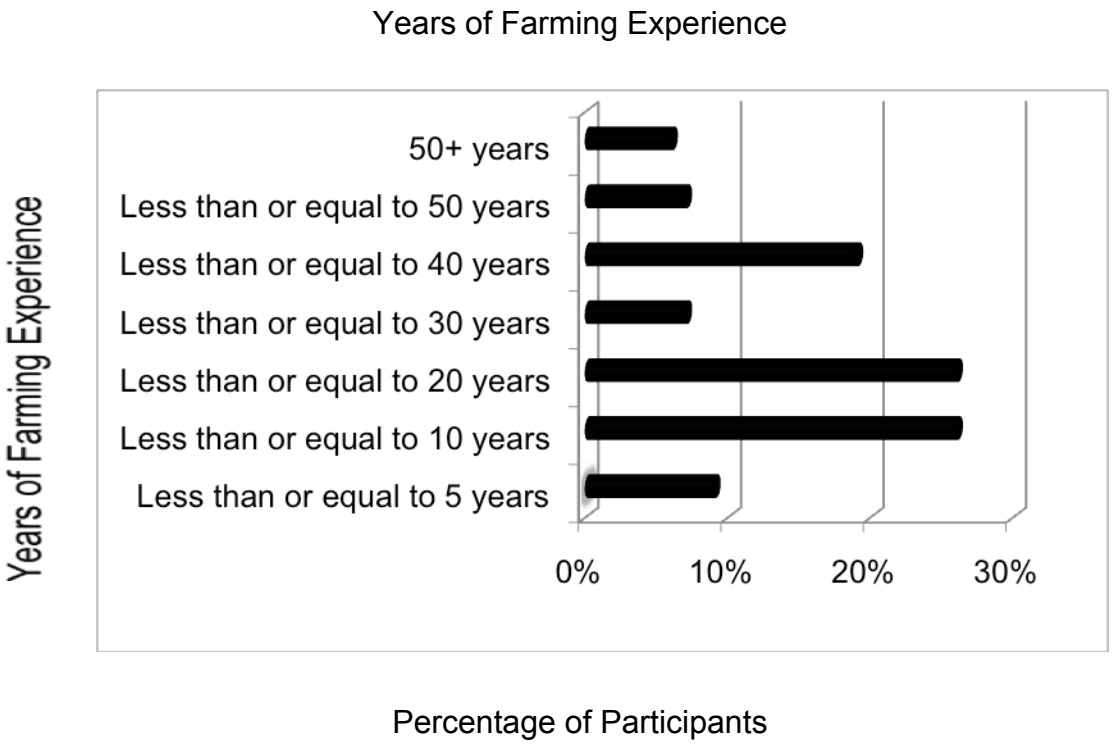

Figure 5. Distribution of years of farming experience among farmers that participated in the survey. Nine-percent of farmers identified with less than or equal to 5 years, twenty-six percent of farmers identified with less than or equal to 10 years, another twenty-six percent identified with less than or equal to 20 years, seven-percent of farmers identified with less than or equal to 30 years, nineteen-percent of farmers identified with less than or equal to 40 years, seven-percent identified with less than or equal to 50 years, and six-percent of farmers identified with 50+ years.

Examples of Body Mechanics Currently Being Utilized	**Percent of Participants**
"I keep the weight of an object close to my body while carrying it."	*94%*
"I assess the weight of an object before attempting to lift it."	*89%*
"I avoid lifting heavy objects above shoulder height."	*81%*
"I use a trolley cart instead of carrying an object that is heavy."	*78%*
"Before lifting an object, I bend with the knees and keep my back straight."	*77%*
"Before lifting an object, I position my feet shoulder width apart."	*75%*
"Before lifting an object, I ask for help if it is too heavy."	*70%*

Table 1. Examples and percentages of the highest reported techniques/methods currently being utilized by farmers to promote proper body mechanics.

Note. These were statements that this researcher had created, based on body mechanics principles found during a review of the available literature, which participants then rated their level of agreement to using Likert scales.

Personal Protective Equipment Currently Being Utilized:

Category	Examples Mentioned
Vision	Protective (safety) glasses, goggles, prescription safety glasses, magnified bifocal safety glasses, polarized lenses, sunglasses, face (vision) shields, welding mask, cap with visor
Hearing	Ear plugs, ear muffs, headsets, occlusive ear protectors
Respiratory Disease	Dust Mask, Paper Mask, Gas Mask, Filter Cartridge Mask, Pesticide Respirator

Table 2. Examples of personal protective equipment (PPE) farmers use to minimize the risks and effects associated with vision, hearing, and respiratory disease.

Types of Aides and Associated Examples of AT Devices/Methods Utilized to Minimize the Effects of Injuries Experienced While Farming:

Aide Categories	Symptoms/Injury	AT Devices/Methods Utilized
Lifting Aides	Back Pain	Wheelbarrow, Yoke, Chain Fall, Hydraulic bucket on tractor, Skid Steer, Hay Elevator, Front Loader, Carts, Pallet Jack, Trailer, Trucks
Reaching Aides	Back Pain Sprains/Strains Osteoarthritis	Long-handled precision hoe for weeding, Ladders
Seating Aides	Back Pain Sprains/Strains Osteoarthritis	Sitting on a 5-gallon bucket, Kneeling pad for weeding and planting, devised cart to sit on while planting
Seating Aides	Herniated Discs Tendonitis Osteoarthritis	Raised cushions seats, cushion props, Rollator
Braces	Back Pain Herniated Discs Spinal Cord Injuries	Back Brace, Corset
Braces	Tendonitis	Elastic Braces, Wrist/Elbow/Knee Braces, Arm Strap for “Tennis Elbow”

Table 3. Examples of assistive technology devices and strategies farmers use to minimize the experienced effects of back pain, strains/sprains, osteoarthritis, herniated discs, spinal cord injuries, and tendonitis.

Assistive Technologies Used to Minimize the Effects of Injuries Experienced While Farming:

Symptoms/Injury	**AT Devices/Methods Utilized**
Back Pain	Gripping Gloves, Orthotics
Hernia	Hernia Belt, Supportive Briefs
Tendonitis	Heating Pads*
Osteoarthritis Sprains/Strains	Ball-top tools without handles, Large-grip tools, Ace Bandages, Carpal Tunnel Gloves, Wraps, Temporary Hand Splints
Vision	Enlarged Print (e.g., computer phone), Talking Cues, Carefully-placed lighting, Corrective Lenses
Hearing	Low-noise Emission Machines, Hearing Aids
Respiratory Disease	Inhalers

Table 4. Examples of assistive technology devices or strategies farmers use to minimize the experienced effects of back pain, hernias, tendonitis, osteoarthritis, sprains/strains, vision, hearing, and respiratory disease. Farmers did not report any assistive technology devices or strategies that may minimize the effects of neck pain/chronic neck pain, fracture/crush injuries, amputations, or rheumatoid arthritis.

**Note.* The use of heating pads as an intervention method used to minimize the effects of tendonitis is a contraindication to therapy, demonstrating limited awareness by this participant to effective and safe interventions.

Appendix 1

ALL-COLLEGE REVIEW BOARD FOR HUMAN SUBJECTS RESEARCH
COVER PAGE

Primary Investigator: Katherine Behrens
Department: Occupational Therapy
School: HSHP
Telephone: (518)-929-6083
Email: kbehren1@ithaca.edu

Position: Graduate Student

If Student/Graduate Student please list Faculty Advisor Name and e-mail:
Faculty Advisor: Lynn Gitlow, Ph. D, OTR/L
Department: Occupational Therapy
School: HSHP
Telephone: (607) 274-1532
Email: lgitlow@ithaca.edu

Additional Investigators-Names and E-Mail:
Advisor Committee:
Amy Gerney, OTD, OTR/L
Department: Occupational Therapy
School: HSHP
Telephone: (607) 274-1737
Email: agerney@ithaca.edu

James Conklin
Department: Mathematics
School: Humanities and Sciences
Telephone: (607) 274-3570
Email: Conklin@ithaca.edu

Project Title: *Small-Farmers' Awareness of Body Mechanics and Assistive Technology*

Abstract (Maximum of 400 words- single spaced):

Agricultural work is a hazardous occupation, leading to fatalities and life-altering injuries. Currently, however, there is not an accurate estimate of the amount of farmers working with chronic injuries. Due to lack in regulations that would require farmers to report injuries, farmers work through their chronic disabilities and do not receive assistance from available resources. The result of this is a lack of awareness of proper body mechanics as well as a lack of awareness of available assistive technology resources. Due to the lack of research regarding small farmers' awareness of proper body mechanics and assistive technology, this study has been developed to investigate the extent of small farmers' knowledge and awareness of these concepts.

ALL-COLLEGE REVIEW BOARD FOR HUMAN SUBJECTS RESEARCH CHECKLIST

PLEASE MAKE SURE THAT ALL ITEMS INCLUDED HAVE BEEN CHECKED:

1. ___X___ General Information
2. ___X___ Related Experience of Investigators
3. ___X___ Benefits of the Study
4. ___X___ Description of Subjects
5. ___X___ Description of Subject Participation
6. ___X___ Description of Ethical Issues/Risks of Participation
7. ___X___ Description of Recruitment of Subjects
8. ___X___ Description of how Anonymity/Confidentiality will be maintained
9. ___X___ Debriefing Statement
10. __X___ Compensatory follow-up
11. __X___ Appendix A – Recruitment Statement or Tear-off Cover Sheet
12. __X___ Appendix B – Informed Consent Form(s)
13. __X___ Additional Appendices – Survey Instruments

Items 1-8, 11, 12 must be addressed and included in the proposal. Items 9, 10, 13 should also be checked if they are appropriate.

ALL-COLLEGE REVIEW BOARD FOR HUMAN SUBJECTS RESEARCH PROPOSAL

1. General Information:

a. **Funding:** As part of this research, we do anticipate minimal expenditures that would require financial assistance. Anticipated costs to conduct this survey would be an estimated $100. This budget would cover printing of surveys, postage and envelopes, and light refreshments for those in attendance at workshops where surveys will also be distributed. Any funds within this budget not utilized would be returned to the Occupational Therapy Graduate Program.
b. **If externally funded (federal or state funds), please list CITI certification date of ALL researchers:** N/A
c. **Location:** Groundswell Workshops, Cornell Cooperative Extension- Tompkins County Workshops
d. **Time Period:** With the help of colleagues at Groundswell and the Cornell Cooperative Extension- Tompkins County, surveys will be distributed in the fall of 2013 at local meetings, through the postal service to farmers with a self-return envelope with postage, and electronically with a provided hyperlink to the survey through email announcements. All surveys will be collected by December 2013 to ensure time for data analysis. This in turn will lead to a completed thesis paper ready for defense and anticipated publication in the spring of 2014.
e. **Expected Outcomes**: Based on the lack of awareness of body mechanics and assistive technology amongst the general population, it is hypothesized that this will be reflected in our study amongst small-scale farmers. We anticipate high reports of work-related injuries and minimal knowledge of the aforementioned concepts, thus providing us with the support that there is a need for intervention and education within this occupational sector. This information will be presented to academic peers and faculty during the senior symposium at Ithaca College. Publication in a peer-review journal or presentation at a professional conference is anticipated.

2. Related Experience of Researchers: Katherine Behrens is a current Occupational Therapy graduate student at Ithaca College. She has experience with CITTI Project (an organization that travels annually to Ecuador to build assistive technology out of local, sustainable materials for individuals with disabilities), student clinician experience where a local farmer inspired her research topic, and academic experience in both statistics and research methods. She is currently enrolled in both “Technological Interventions” and “Adaptation and Environmental Modification” classes to broaden her knowledge of available assistive technology and universal design. Advisor Lynn Gitlow, Ph. D, OTR/L, has over twenty years experience as an occupational therapist. Dr. Gitlow is certified by RESNA as an assistive technology practitioner and is the current Chair of the OT Professional Specialty Group (PSG). Dr. Gitlow has been an active member with CITTI Project, was the Director of a federally funded assistive technology program in Maine, and has numerous publications in professional journals and books. Advising committee member, Amy Gerney OTD, OTR/L, holds a doctoral degree and has over twenty-five years experience as an occupational therapist. Dr. Gerney has been published in various professional journals and books and has co-authored in the American Journal of Occupational

Therapy. Dr. Gerney has previous experience working with farmers in Pennsylvania. Advising committee member, James Conklin, has previous research experience with the Ithaca College campus and is proficient in statistical analysis and data interpretation with Statistical Product and Service Solutions (SPSS), a software package used for statistical analysis.

3. Benefits of the Study: Completion of the described research will result in this researcher fulfilling a department requirement for graduate work, resulting in an earned Master's degree in Occupational Therapy. This researcher will also gain improved skills and expertise in conducting formal research with an anticipated scholarly publication. This research will enhance the available research pertaining to small farmers and provide greater insight into awareness of body mechanics and assistive technology. This study will also allow for the participants to receive knowledge and feedback regarding proper body mechanics and available assistive technology resources, which may then further reduce occupational injuries and increase safe participation in job performance.

4. Description of Participants:

a. **Number of participants:** Participants will be selected via a convenience sample from local organizations that support small farming (e.g., Groundswell, Cornell Cooperative Extension- Tompkins County). We anticipate distributing 30 surveys.
b. **Salient Characteristics:** The questionnaires will be dispersed amongst small-scale farmers. For the purposes of this study, a farmer will be defined as "any person who cultivates land or crops or raises animals" and a small-scale farmer will include those that grow and sell between $1,000- $250,000 per year in agricultural products. This survey will only be available to farmers (farm owners, recreational farmers, or farm employees) and hired help over the age of 18 that meet the survey's criteria. No workers under the age of 18 can partake in the survey process.

5. Description of Participation: Participation in this survey process is entirely volunteer-based. The questionnaire will be distributed at local meetings in the community and will take approximately 15-20 minutes to complete. All results from this survey will remain confidential and only myself as the researcher, and my advisor committee, will be aware of personal information. My intention is to replace all identifying information with coding to protect individual's privacy and ensure participants that there is no breach in confidentiality. I elected confidentiality over anonymity in order to send reminders to participants to enhance the survey response rate. It will also allow me to share the results of my literature review and questionnaire to those participants interested at the conclusion of my research.

6. Ethical Issues:

a) **Risks of Participation**: The ethical risk for participating in this survey process is minimal. The survey is in the form of a questionnaire so participants will not be adversely affected by any biomedical or behavioral research that may result in physical, psychological, social, legal, or economic issues. The questionnaire is almost entirely

comprised of questions that attempt to determine an individual's awareness of body mechanics and assistive technology, thus the risk of psychological and emotional distress are very minimal. The participant's information will be coded to ensure confidentiality so there is not a breach of privacy. Participants are also participating in this survey process under their own free will and therefore may choose to opt out of the survey at any time if their willingness to participate changes.

b) **Have you attached an Informed Consent Form or Tear-Off Cover Sheet for anonymous surveys?** Yes, please see Appendix A and B within this proposal.

7. Recruitment:

a) **Procedures:** Participants will be recruited through the combined efforts of Groundswell and Cornell Cooperative Extension- Tompkins County. Solicitation by mail will be utilized when appropriate and this information will be accessed with the help of both the aforementioned organizations. Both Groundswell and Cornell Cooperative Extension will be sending out announcements in their newsletters to their email list serve stating that I will be in attendance at local meetings and welcome their participation in my research. Participants will then fill in the questionnaire right at the local discussion meetings. Along with our convenient sampling method (i.e., reaching out to farmers at local meetings), we also will utilize snowball sampling (i.e., word of mouth from farmer to farmer) in order to reach a greater number of farmers. This will be achieved by asking participating farmers to share my contact information with others whom they may feel would have an interest in the study (See Appendix A, pg 8). An online survey will be available. It will be distributed through email announcements and email invitations, especially for those recruited through snowball sampling in order to further increase our survey response rate. Please see Appendix A (pages 7-8 of this document) for the Cover Sheet that has been included.

b) **Inducement to Participate/Extra Credit:** Participants that participate in this survey process at local meetings will receive complimentary refreshments.

8. Confidentiality/Anonymity: Participants will be contacted via email through our connections with Groundswell and Cornell Cooperative Extension- Tompkins County. All personal information will remain confidential throughout the survey process. Any personal information that can lead to an individual's identity will be coded to ensure participant's privacy. Coding will be utilized so the researchers can email/mail reminders to participants in order to increase the survey response rate. Personal information related to this study will be saved on a password protected and locked computer. Following the conclusion of this study, data will be stored in a locked faculty office on campus for the next year.

9. Debriefing: N/A.

10. Compensatory Follow-up: N/A

Appendix 2

ITHACA COLLEGE
Center for Faculty Excellence

October 30, 2013

Katherine Behrens, Graduate Student
Department of Occupational Therapy
School of Health Sciences and Human Performance

Re: HSR #1013-11, Small Farmers' Awareness of Body Mechanics and Assistive Technology

Thank you for responding to the stipulations made on October 24, 2013 by the All-College Review Board for Human Subjects Research (HSR). You are authorized to begin your project.

This approval will remain in effect for a period of one year from the date of authorization. After you have finished the project (when data collection is complete and there is no further risk to human subjects), please complete the *Notice-of-Completion Form* found on the HSR website. Please note that review/approval of future proposals is contingent upon submission of this form.

Should you wish to continue the approved project beyond the expiration date, you may request an extension by sending an email to hsrlog@ithaca.edu before October 29, 2014. *If the project expires, you must complete a new application online for expedited review.* Also, if there are any adverse events that result from this research, they must be reported to the HSR Board at hsrlog@ithaca.edu.

Sincerely,

Wade Pickren, PhD
Director, Center for Faculty Excellence/Sponsored Research
All-College Review Board for Human Subjects Research

/mat

c: Lynn Gitlow, Associate Professor

Appendix 3

My name is Katherine Behrens and I am currently enrolled in Ithaca College's Graduate Occupational Therapy program. I am involved in research focused on farmer's awareness of body mechanics (the use of proper body movement in daily activities to enhance coordination and endurance and to help prevent and correct problems associated with posture) and assistive technology (any item, piece of equipment, or product system used to increase, maintain, or improve functional capabilities). My review of the literature revealed a significant lack of research regarding small-scale farmers. As part of my research, I wish to discover the extent of body mechanics and assistive technology awareness amongst small-farmers. I strongly believe that this topic can contribute to my field of study, as Occupational Therapists can benefit farmers by developing educational programs for them.

For my research, I will be distributing surveys amongst small-scale farmers. The survey should take 10-15 minutes to complete. For the purposes of this study, a farmer will be defined as "any person who cultivates land or crops or raises animals" and a small-scale farmer will include those that grow and sell between $1,000- $250,000 per year in agricultural products. This survey will only be available to farmers (including farm owners, recreational farmers, farm employees) and hired help over the age of 18 that meet the survey's criteria. No workers under the age of 18 can partake in the survey process.

Your participation in this survey process is entirely volunteer-based. All results from this survey will remain confidential and only myself as the researcher, and my advisor committee, will be aware of personal information. I do intend to share the results of these surveys, while maintaining the confidentiality of the participant's information, during my Graduate Thesis Defense in March 2014. It is my goal that I will then publish these results in order to raise awareness of this topic at a national level.

If you are interested in participating in this survey process, I ask that you please sign the following form. The form with your signature is not a binding contract, but rather a document that verifies that you understand my perceived need for this study, how it relates to my field of practice, my intentions to publish the research, and your verification that you have read the confidentiality disclaimers and are completing this survey under your own free will. I understand that my access to farmers will be limited, and I would appreciate your help with sharing my contact information to others whom you may feel would have an interest in this study. The more surveys completed, the more voices that will be heard, and the more likely we can help raise awareness for this topic and the farmers involved!

Please feel free to contact myself, or my research advisor, Lynn Gitlow, at any time with any questions, comments, or concerns you may have. I am eager to see how this study enfolds!

Best regards,

Katherine Behrens
Ithaca College
Occupational Therapy, M.S. 2014
Email: kbehren1@ithaca.edu

Advisor: Lynn Gitlow, Ph.D, OTR/L
Ithaca College
Email: lgitlow@ithaca.edu
Phone: (607) 274-1532

Informed Consent Form

Small Farmer's Awareness of Body Mechanics and Assistive Technology

1. Purpose of the Study
   Due to the lack of research in previous literature regarding small farmers' awareness of proper body mechanics (the use of proper body movement in daily activities to enhance coordination and endurance and to help prevent and correct problems associated with posture) and assistive technology (any item, piece of equipment, or product system used to increase, maintain, or improve functional capabilities), this study has been developed to discover the extent of small farmers' knowledge and awareness of these concepts.

2. Benefits of the Study
   This research will enhance the available research pertaining to small farmers and provide greater insight into awareness of body mechanics and assistive technology. This study will also allow for the participants to receive knowledge and feedback regarding proper body mechanics and available assistive technology resources, which may then further reduce occupational injuries and increase safe participation in job performance.

3. What You Will Be Asked to Do
   Participation in this survey process is entirely volunteer-based. The survey is in the form of a questionnaire that will be dispersed amongst small-scale farmers. For the purposes of this study, a farmer will be defined as "any person who cultivates land or crops or raises animals" and a small-scale farmer will include those that grow and sell between $1,000- $250,000 per year in agricultural products. This survey will only be available to farmers (farm owners, recreational farmers, or farm employees) and hired help over the age of 18 that meet the survey's criteria. No workers under the age of 18 can partake in the survey process. If you meet this study's criteria, you will be asked to complete a questionnaire that is expected to take 15-20 minutes to complete.

4. Risks
   The risk for participating in this survey process is minimal. The questionnaire is almost entirely comprised of questions or scales that attempt to determine an individual's awareness of body mechanics and assistive technology, thus the risk of psychological and emotional distress are very minimal.

5. Compensation for Injury
   You will not be exposed to any physical harm by completing this questionnaire, however, if you do suffer an injury that requires any treatment or hospitalization as a direct result of this study, the cost for such care will be charged to you. If you have insurance, you may bill your insurance company. You will be responsible to pay all costs not covered by your insurance. Ithaca College will not pay for any care, lost wages, or provide other financial compensation.

Please Initial Line Before Submitting Tear-Off Signature _____

6. If You Would Like More Information about the Study
   Please feel free to contact myself or my research advisor, Lynn Gitlow, at any time with any questions, comments, or concerns you may have.

Katherine Behrens
Email: kbehren1@ithaca.edu

Lynn Gitlow, Ph. D, OTR/L
Email: lgitlow@ithaca.edu
Phone: (607)-274-1532

7. Withdraw from the Study
   You are participating in this survey process under your own free will and therefore may choose to opt out of the survey at any time if your willingness to participate changes. There is no penalty for such withdrawal. If you are presented with any questions that make you feel uncomfortable answering, please accept my condolences and elect to skip the question without penalty.

8. How the Data will be Maintained in Confidence
   All personal information will remain confidential throughout the survey process. Any personal information that can lead to an individual's identity will be coded to ensure participant's privacy. Coding will be utilized so the researchers can email/mail reminders to participants in order to increase the survey response rate. Personal information related to this study will be saved on a password protected and locked computer. Following the conclusion of this study, data will be stored in a locked faculty office on campus for the next year.

I have read the above and I understand its contents. I agree to participate in the study. I acknowledge that I am 18 years of age or older.

_____
Print or Type Name

_____ _____
Signature Date

Please check one:

☐ I am interested in receiving an overview of the research pertaining to this topic and wish to receive a summary of this survey's results when it becomes available in March 2014.

☐ Though participating in this survey, **I am not interested** in receiving an overview of the research pertaining to this topic and do not wish to receive a summary of this survey's results when it becomes available in March 2014.

"Tear-off" Cover Page for Online Survey

My name is Katherine Behrens and as part of my graduate research for my Master's program in Occupational Therapy, I am conducting a survey of small farmers in the local region to gain insight on farmers' awareness of body mechanics and assistive technology. The questions you will be asked to answer will focus on your body positioning while farming, if you have ever used any devices to assist you during farming, and if you have ever sustained an injury from farming. If you wish to not answer a question, please leave the question blank. Your participation in this survey-process is entirely volunteer-based and you have the right to opt out of the survey at any time. This survey should take approximately 15 minutes to complete. When you have completed the survey, please be sure to click on the last "next" arrow. I understand that my access to farmers will be limited, and I would appreciate your help with sharing my contact information to others who you may feel have an interest in this study. Please feel free to contact myself, or my research advisor, Lynn Gitlow, at any time with any questions, comments, or concerns you may have.

PLEASE DO NOT WRITE YOUR NAME OR ADDRESS in any of the answer boxes to ensure your own confidentiality in this survey process. This survey may only be completed by those over the age of 18 that meet the study's criteria.

Best regards,

Katherine Behrens
Ithaca College
Occupational Therapy, M.S. 2014
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Please print this page for your records. Thank you for the time you are dedicating to help me with my research!

Appendix 4

Small-Farmers' Awareness of Body Mechanics and Assistive Technology

General Demographic Questions:

1. **Gender (Circle one)**
   a. Male
   b. Female
   c. Transgender

2. **What is your age?**
   a. 18- 24
   b. 25- 34
   c. 35- 44
   d. 45- 54
   e. 55- 64
   f. 65- 74
   g. 75+

3. **What is your ethnicity? (Circle one)**
   a. White
   b. Hispanic/Latino
   c. Black/ African American
   d. Native American/ American Indian
   e. Asian/ Pacific Islander
   f. Other: _____

4. **What is your highest degree or level of school completed? If you are currently enrolled, please indicate highest degree received.**
   a. No schooling completed
   b. Kindergarten – 8th grade
   c. Some High School, no diploma
   d. High School Diploma or the equivalent (for example: GED)
   e. Some college, no degree
   f. Trade/ Technical/ Vocational Training
   g. Associate's Degree (2 years of college)
   h. Bachelor's Degree (4 years of college)
   i. Master's Degree (5-6 years of college)
   j. Professional Degree (7-8 years of college)
   k. Doctorate Degree (7-8 years of college)

5. **Which county in the Central/ Finger Lakes Regions is the location of your farming operation?**
   a. Cayuga County
   b. Cortland County
   c. Chemung County
   d. Chenango County
   e. Broome County
   f. Livingston County

g. Madison County
h. Monroe County
i. Montgomery County
j. Oneida County
k. Onondaga County
l. Ontario County
m. Otsego County
n. Schoharie County
o. Schuyler County
p. Seneca County
q. Steuben County
r. Tioga County
s. Tompkins County
t. Wayne County
u. Yates County
v. Other: _____

Farming History Questions:

1. **How many years of experience do you have in farming?**
   a. Less than or equal to 5 years
   b. Less than or equal to 10 years
   c. Less than or equal to 20 years
   d. Less than or equal to 30 years
   e. Less than or equal to 40 years
   f. Less than or equal to 50 years
   g. 50+ years

2. **Were you raised with a farming history (did you grow up on a farm, work on a farm in your youth)?**
   a. Yes
   b. No

3. **Is farming your primary occupation?**
   a. Yes
   b. No
      i. If "No," please list primary occupation: _____

4. **Are you employed in another field?**
   a. Yes
   b. No
      i. If "Yes," please list: _____

5. **Have you ever been injured while farming?**
   a. No
   b. Yes
      i. If "Yes," what type of injuries did you sustain? (Circle all that apply)
         a. Strains
         b. Sprains
         c. Herniated Discs
         d. Hernia
         e. Fracture/Crush Injury
         f. Tendonitis

g. Eye Injury
h. Vision Loss
i. Hearing Loss
j. Amputation
k. Other: _____

ii. After sustaining your injury, did you experience any of the following? (Circle any/all that apply).
a. Depression
b. Stress
c. Anxiety
d. Back Pain
e. Neck Pain

6. Have you acquired a permanent disability as the result of farming?

a. No
b. Yes
i. If "Yes," please circle all permanent disabilities/conditions that apply to you as the result of your injury:
a. Chronic Back Pain
b. Chronic Neck Pain
c. Osteoarthritis
d. Arthritis
e. Compressed/ Herniated Discs
f. Loss of digit (i.e., loss of finger, loss of toe)
g. Loss of Limb
h. Vision Loss
i. Hearing Loss
j. Spinal Cord Injury
k. Respiratory Disease (resulting from grain dust)
l. Other: _____

ii. After sustaining your permanent disability, did you experience any of the following? (Circle any/all that apply).
f. Depression
g. Stress
h. Anxiety

7. <u>If you answered "Yes" to question 5 or 6, please complete</u>: After experiencing your injury, did you ever feel that your injury could have been prevented with improved safety and injury education?

a. No
b. Yes

8. Have you gone to your primary care physician, urgent care, or emergency room regarding your injuries?

a. No
b. Yes

i. If "Yes," were you referred to a rehabilitative specialist (physical therapist, occupational therapist, prosthetist/orthotist)?
   a. No
   b. Yes
      i. If you answered "Yes" again, did this specialist provide information on how to promote better body movements or strategies to further prevent future injuries?
         a. No
         b. Yes

9. Please circle any of the following resources that you are familiar with:

a. AbleData
b. Breaking New Ground Resource Center
c. Center for Assistive Technology and Environmental Access
d. The National AgrAbility Project
   i. If you were familiar with any of these resources, who made you aware of them?
      a. Physician
      b. Rehabilitative Specialist (Physical Therapist, Occupational Therapist)
      c. Cornell Cooperative Extension
      d. Cornell Cooperative Extension: Tompkins County
      e. Groundswell
      f. Other: _____
   ii. For each circled, have you actively explored these resources?
      a. Yes
      b. No

Body Mechanics:

"The use of proper body movement in daily activities to enhance coordination and endurance and to help prevent and correct problems associated with posture."

Instructions: Please circle the degree to which you agree with each of the following statements.

1. I have a good understanding of proper body mechanics.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

2. I could benefit from learning more about proper body mechanics and how this relates to farming.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

3. I understand how the use of proper body mechanics can protect me while I'm working.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

4. I feel that proper body mechanic strategies are impractical for my work.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

5. I often feel too rushed to implement body mechanic strategies.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

6. I consistently implement proper body mechanic strategies to protect myself while working.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

7. I frequently work through aches and pains.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

8. I have a tendency to lift heavy objects.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

9. Lifting heavy objects can lead to disabilities or conditions including back pain, neck pain, and hernias.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

10. I have experienced chronic pain or acquired disabilities because of lifting heavy objects.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

11. I have lost work time because of pains experienced from lifting heavy objects.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

12. I often work in stooped positions for multiple hours/days per week.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

13. I dread working in a stooped position because of its associated aches and pains.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

14. Before lifting an object, I assess the weight before attempting to lift it.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

15. Before lifting an object, I ask for help if it is too heavy.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

16. Before lifting an object, I position my feet shoulder width apart.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

17. When lifting an object, I typically bend at the waist to pick it up.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

18. I avoid lifting heavy objects above shoulder height.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

19. I keep the weight of an object close to my body while carrying it.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

20. Before lifting an object, I avoid bending at the waist.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

21. Before lifting an object, I bend with the knees and keep my back straight.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

22. When I need to turn while carrying a heavy load, I turn at the feet to avoid twisting my back.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

23. I hold heavy objects away from my body.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

24. I lift heavy objects above shoulder height.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

25. I utilize long-handled reachers, shovels, mops, or dustpans to avoid bending over.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

26. I use a trolley or cart instead of carrying an object that is heavy.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

27. I frequently stand or sit in the same position for extended periods of time.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

28. I frequently spend time seated while operating machinery.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

29. By the end of the day, I feel pain.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

30. I find my footwear to be supportive.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

31. I take the time to stretch on a daily basis.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

32. I stretch most days of the week.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

33. I work out (for example: jog or run) most days of the week or on a daily basis.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

34. I practice Yoga.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

35. I wear a mask or respirator while working.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Assistive Technology Questions:

"Any item, piece of equipment, or product system used to increase, maintain, or improve functional capabilities."

Instructions: Please circle the degree to which you agree with each of the following statements.

1. I am familiar with the term "assistive technology" and know what it is comprised of.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

2. I could benefit from learning more about assistive technology and how it relates to farming.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

3. I understand how the use of assistive technology can protect me while I'm working.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

4. I feel that assistive technology strategies are impractical for my work.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

5. Using technology frustrates me.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

6. I feel intimidated by technology.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

7. Overall, I have a positive perspective about technology.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

8. I am receptive to learning new ideas and strategies.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

9. I think of creative ways to adapt my work environment or tools to make my work easier.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

10. I've had to adjust handles on my shovels or equipment.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

11. While working, I try to sit on a moveable seat or kneeling pad to avoid kneeling directly on the ground.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

12. I wear ear protection while operating or using loud machinery.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

13. I wear eye protection while farming.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

14. I wear a back brace or corset while farming.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

15. I wear a respirator mask while working with grain or chemical sprays.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

16. I wear cut-resistant gloves when repairing machinery or working with livestock.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

17. I use orthotics in my boots while working to add comfort and relief for my feet.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

18. I wear steel-toe boots while working.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

1. **Based on the definition of Assistive Technology (AT), have you used any devices to minimize <u>back pain or chronic back pain</u>?**
    a. N/A (I have not experienced this condition).
    b. Yes
        i. Please describe:

        _____
    c. No
        i. Were you aware that there are products to minimize these symptoms?
            a. No
            b. Yes

2. **Based on the definition of Assistive Technology (AT), have you used any devices to minimize <u>neck pain or chronic neck pain</u>?**
    a. N/A (I have not experienced this condition).
    b. Yes
        i. Please describe:

        _____
    c. No
        i. Were you aware that there are products to minimize these symptoms?
            a. No
            b. Yes

3. **Based on the definition of Assistive Technology (AT), have you used any devices to minimize the effects of <u>strains or sprains?</u>**
    a. N/A (I have not experienced this condition).
    b. Yes
        i. Please describe:

        _____
    c. No
        i. Were you aware that there are products to minimize these symptoms?
            a. No
            b. Yes

4. **Based on the definition of Assistive Technology (AT), have you used any devices to minimize the effect of a <u>herniated disc</u>?**
    a. N/A (I have not experienced this condition).
    b. Yes
        i. Please describe:

        _____
    c. No
        i. Were you aware that there are products to minimize these symptoms?
            a. No
            b. Yes

5. **Based on the definition of Assistive Technology (AT), have you used any devices to minimize the effects of <u>a hernia</u>?**
    a. N/A (I have not experienced this condition).
    b. Yes
        i. Please describe:

        _____
    c. No
        i. Were you aware that there are products to minimize these symptoms?
            a. No
            b. Yes

6. **Based on the definition of Assistive Technology (AT), have you used any devices to minimize or reduced the effects of <u>a fracture or crush injury</u>?**
    a. N/A (I have not experienced this condition).
    b. Yes
        i. Please describe:

        _____
    c. No
        i. Were you aware that there are products to minimize these symptoms?
            a. No
            b. Yes

7. **Based on the definition of Assistive Technology (AT), have you used any devices to minimize the effects of <u>tendonitis?</u>**
    a. N/A (I have not experienced this condition).
    b. Yes
        i. Please describe:

        _____
    c. No
        i. Were you aware that there are products to minimize these symptoms?
            a. No
            b. Yes

8. **Based on the definition of Assistive Technology (AT), have you used any devices to minimize the effects of <u>vision loss</u>?**
    a. N/A (I have not experienced this condition).
    b. Yes
        i. Please describe:

        _____
    c. No
        i. Were you aware that there are products to minimize these symptoms?
            a. No
            b. Yes

9. **Based on the definition of Assistive Technology (AT), have you used any devices to minimize or reduce the effects of <u>hearing loss?</u>**

a. N/A (I have not experienced this condition).
b. Yes
    i. Please describe:

    _____
c. No
    i. Were you aware that there are products to minimize these symptoms?
        a. No
        b. Yes

10. Based on the definition of Assistive Technology (AT), have you used any devices to minimize the effects of an amputation?

a. N/A (I have not experienced this condition).
b. Yes
    i. Please describe:

    _____
c. No
    i. Were you aware that there are products to minimize these symptoms?
        a. No
        b. Yes

11. Based on the definition of Assistive Technology (AT), have you used any devices to minimize the effects of arthritis?

a. N/A (I have not experienced this condition).
b. Yes
    i. Please describe:

    _____
c. No
    i. Were you aware that there are products to minimize these symptoms?
        a. No
        b. Yes

12. Based on the definition of Assistive Technology (AT), have you used any devices to minimize the effects of osteoarthritis?

a. N/A (I have not experienced this condition).
b. Yes
    i. Please describe:

    _____
c. No
    i. Were you aware that there are products to minimize these symptoms?
        a. No
        b. Yes

13. **Based on the definition of Assistive Technology (AT), have you used any devices to minimize the effects of a spinal cord injury**?

a. N/A (I have not experienced this condition).
b. Yes

i. Please describe:

_____

c. No
   i. Were you aware that there are products to minimize these symptoms?
      a. No
      b. Yes

14. **Based on the definition of Assistive Technology (AT), have you used any devices to minimize the effects of <u>respiratory disease</u>?**
    a. N/A (I have not experienced this condition).
    b. Yes
       i. Please describe:

       _____

    c. No
       i. Were you aware that there are products to minimize these symptoms?
          a. No
          b. Yes

15. **Have you used any devices to reduce or minimize the effects of depression?**
    a. N/A (I have not experienced this condition).
    b. Yes
       i. Please describe:

       _____

    c. No
       i. Were you aware that there are products to minimize these symptoms?
          a. No
          b. Yes

16. **Have you used any devices to reduce or minimize the effects of stress or anxiety?**
    a. N/A (I have not experienced this condition).
    b. Yes
       i. Please describe:

       _____

    c. No
       i. Were you aware that there are products to minimize these symptoms?
          a. No
          b. Yes