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TITLE: Research and Dissemination Needs for Ergonomics in Agriculture

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SYNOPSIS: In 1998, the National Institute for Occupational Safety and Health convened a conference of researchers interested in the ergonomics of agricultural workers. Participants included 20 representatives from universities, state governments, private agricultural and insurance companies, **migrant** worker organizations, agricultural industry organizations, and the Agricultural Extension Service. The attendees divided into three groups and brainstormed about research ideas and dissemination methods related to ergonomics for farm workers. The groups separately reported that interventions, cost-benefit analyses, and cultural belief systems were the main topics that needed to be researched to reduce physical risk factors for musculoskeletal disorders. The participants also presented ideas for disseminating information to farm owners and workers.

TEXT:

In 1998, researchers at the National Institute for Occupational Safety and Health (NIOSH) began a project on ergonomic interventions for agricultural workers, specifically crop or greenhouse workers. James published an article on ergonomics using examples from agriculture [n1]; otherwise, very little information had been published in this area and only a handful of researchers were addressing these issues. Therefore, NIOSH convened a meeting to gather information and determine research issues.

The one-day conference, "Ergonomics in Agriculture," was held in July 1998 at NIOSH to encourage exchange and discussion among researchers and others concerned with the prevention of musculoskeletal disorders (MSDs) in farm workers. The meeting consisted of a series of presentations and discussions in which participants identified major priorities, gaps, and barriers for future research in the area. Attendees included representatives from universities, state and

federal governments, private agricultural companies, private insurance companies, **migrant** worker organizations, farm industry organizations, and NIOSH researchers.

Attendees participated in a two-hour brainstorming session. They were divided into three groups of at least five participants and two NIOSH facilitators. Each group addressed three questions: (1) informational needs for the prevention of MSDs in farm workers, (2) research priorities, and (3) dissemination strategies.

For each question, participants were asked to offer one idea or to pass, until everyone had exhausted their ideas. There were a few basic rules; participants were allowed to build off previous ideas but were not allowed to criticize other suggestions.

Group results from the brainstorming session were tallied, then results from all three groups were consolidated by question. For each question, the groups averaged six responses, for a total of 57 ideas. One group consolidated ideas somewhat during the process and finished with fewer ideas than other groups. Tables 1, 2, and 3 list the responses generated, by topic and the number of groups that gave the response. Those ideas that were discussed in all groups are listed first, followed by those mentioned in two groups, etc. Each idea that was mentioned in two or more groups was consolidated into one statement.

Table 1. Responses to the question "What information does the agricultural community need to address the prevention of musculoskeletal injuries in farm workers?"

Topic	Explanation	Number of groups n1
Interventions	Information on interventions that have worked for others, e.g., effectiveness, success stories, demonstration of specific tools, financial feasibility, and personal protective equipment or engineering control outcomes.	3
Cost-benefit analyses	Cost-benefit analyses are needed, including analyses of Workers' Compensation costs, the value of interventions, the added value of early interventions, the long-term disability rates associated with musculoskeletal disorders, the economic effects of piece rate, and the use of contractors.	3
Cultural belief systems	Information on cultural belief systems	3

	is needed because population differences need to be better understood. Some topics that should be addressed are: determine the effectiveness of social marketing n2 at regional and national levels, evaluating cultural differences that result in different perceptions of disease and exposure, understanding worker's perception of risks, finding effective ways to convey research results to workers, including how to convey long-term health benefits over short-term benefits, and deciphering cultural and language barriers to effective communication.	
Education	Understanding musculoskeletal disorders and their risk factors are important for workers and growers. Specifically: educate workers on the long-term impact of these injuries for them; educate workers and managers on the risk factors that lead to musculoskeletal disorders; educate workers and managers on the concept of prevention; provide more information on musculoskeletal disorders, e.g., when are they work-related?	3
Surveillance	Surveillance data, e.g., changing patterns of **migrant** workers, and developing injury rates with comparisons to other industries.	2
Exposure limits	Exposure limits are needed to inform the community about when action is necessary.	1
Workplace communication	Management organizations need to commit to get information to workers, so workers feel empowered to solve their problems.	1

Worker self-help	Workers need information on pain management and activity modification.	1

n1 Number of groups generating the response.

n2 Social marketing is a theory which suggests that the best way to disseminate results is to segment your audience, develop custom messages, and identify media channels and people/ change agents that each audience segment already listens to. [n17]

Table 2. Responses to the question "What should the research priorities be to adequately address the gaps in current information?"

Topic	Response	Number of groups n1
Interventions	Include cost data, worker acceptance, implementation barriers, and effect on income and production, and identification and evaluation of alternative technologies for engineering interventions (or case studies) that reduce ergonomic risk factors. Gather intervention ideas from groups not traditionally included, for example, through school science fairs.	3
Cost-benefit analyses	Analyze the costs and benefits of reducing ergonomic risk factors by performing cost-benefit case studies, refining measurement techniques for health outcomes in agricultural populations, and determining the economics of change for workers and management.	3
Cultural belief systems	Conduct research on cultural beliefs for best health communication, e.g., social marketing research (measuring communication effectiveness), how to effectively communicate the magnitude of the problem and the need for interventions directed to farm	3

	workers, who farm workers trust, where they get information that they will use, who or what motivates them for change, how best to quantify and communicate the social and economic consequences of the problem, what workers believe will make their jobs easier, which ethnic populations should be reached, what these populations believe about personal health, what the barriers are for each culture and how they are overcome.	
Surveillance	Determine the greatest impact area or industry to develop interventions based on the number of workers affected, severity, cost, amenability to intervention, or occupational health care worker's assessment.	2
Standards	Develop criteria or standards for measuring effectiveness of health programs and exposure to risk factors.	1
Anthropometry	Compile anthropometric data for Latino populations.	1
Crop-specific research	Develop crop-specific and farm size--specific ergonomic interventions to reduce hazards.	1
Health care	Determine which patterns of health care utilization (or treatment protocols) are most successful for different populations.	1
Communication	Conduct research that is multi-disciplinary and involves all stakeholders.	1

n1 Number of groups generating the response.

Table 3. Responses to the question "What are the best strategies for disseminating to the agricultural community the information we currently have, as well as information we hope to generate through continued research activities?"

Topic	Response	Number of groups n1
Cost-benefit analyses	Cost-benefit analyses are needed, including analyses of Workers' Compensation costs, the value of interventions, the added value of early interventions, the long-term disability rates associated with musculoskeletal disorders, the economic effects of piece rate, and the use of contractors.	3
Computers	Most farm owners and managers now use computers regularly and will access the Internet, websites, and cost-benefit computer programs. For workers, computer programs geared for them and websites for improving computer literacy.	3
Migrant clinics	Develop patient education materials for **migrant** rest centers, clinical networks (**migrant** clinics), **migrant** advocacy networks, camp first aide staff, emergency responders, pharmacists, and others who communicate with workers.	3
Form of the information	Short fact sheets rather than long manuals; videos; or previews to rental videos. The information needs to be audience-and crop-specific. The diffusion of innovation model could be used: simple, engaging, punchy message at awareness stage, more complex message at subsequent stages. The stages are awareness, evaluation, trial, and use.	3
Agricultural networks	Agricultural networks could reach management, e.g., commodity/ trade journals, commodity groups,	3

	Agriculture Extension Service, U.S. Department of Agriculture farm safety program, feed/ seed/ equipment suppliers, Future Farmers of America, schools, and farm trade shows.	
Other media	Other media for workers, e.g., Spanish media outlets and language-appropriate radio broadcasts. Channel Earth (cable TV channel) is an alternative media outlet that could reach managers.	2
Personal communication	Focus groups or a peer model approach could be used.	1
Nontraditional sources	Job placement centers (402 program), Department of Education, AmeriCorps, **migrant** education, **Migrant** Head Start, grocery stores, and churches.	1

n1 Number of groups generating the response.

DISCUSSION

There are a number of reports available that overview research needs for ergonomics in other industries [n2-n5] and one publication developed after this conference that mentions agriculture. [n6] The agricultural industry has unique attributes that require a specific research agenda. The information gained from the conference attendees takes into account the uniqueness of the agricultural industry.

The researchers who attended the meeting made strong recommendations for future work in this area and for the wide dissemination of information. There were three primary areas that each of the three groups separately discussed and strongly recommended: interventions, cost-benefit analyses, and cultural belief systems.

Meeting attendees stressed that information on specific successful tools and reengineered processes that reduce physical risk factors for MSDs are needed to win over managers to make needed changes. Research should be conducted to verify that interventions work, how they are accomplished, and their effect on MSDs. Case studies or success stories should be written and disseminated widely. Case studies need to include information on how the interventions affect

the worker, including such things as incentive pay, job satisfaction, health, and safety and how they affect the manager, including information on productivity, health, safety, costs, and benefits.

Tables 1 and 2 give many specific ideas for research topics. Some reports are available on aspects of the costs and benefits of MSD prevention programs in industries other than agriculture. [n7-n12] Research on costs and benefits of MSD programs or interventions in agriculture are needed so that agricultural managers can see how MSD programs will affect them financially. Case studies or confirmed data on a company's costs associated with MSDs could put a dollar amount on program savings. Additional research must strive to quantify the effect on workers' wages and managers' production after incentive systems are reduced or eliminated.

Research on cultural differences among farm workers is necessary. It is known that cultural differences can result in different perceptions of disease and exposure. [n13] It is important to understand workers' perceptions of risks as well as what motivates safe working habits in different cultures, and to realize that there are cultural as well as language barriers to effective communication. Many meeting attendees reported that it was common for farm workers to continue working very hard or fast even though they felt pain or were injured. This may result from the economic pressures they experience or may be a result of cultural expectations that cause them to consider pain to be a "normal" part of work. Better understanding of the cultural and economic factors that motivate farm workers may in turn enable other research or methods to help with prevention. Also, some case studies in this area may help managers learn the long-term costs of workers continuing to work with pain.

A number of articles describe how to disseminate information to the agricultural community. [n14-n17] The conference attendees were also able to make suggestions for dissemination. Among the methods mentioned were computers, **migrant** clinics, and agricultural networks. An important consideration mentioned was the form for conveying the message to the farm worker or farm owner. Participants felt that farm owners could be best reached through computers or traditional agricultural networks. Many farm owners now have access to computers and are accustomed to receiving information on insects, seeds, and equipment from traditional networks, including the U.S. Department of Agriculture and commodity groups. Farm workers could best receive information through **migrant** clinics and other sources from which they already seek health and welfare information. The method of conveyance is especially important to farm workers because they often have low literacy levels. The conference attendees felt that complicated documents with scientific jargon should be avoided and replaced with short fact sheets, videos, or information presented as "previews" added onto rental videos.

Another research objective discussed was surveillance of illness, injury, and exposures among agricultural workers. Research to better describe current conditions and patterns of injuries is important in determining the areas, crops, or tasks that are most suitable for intervention.

Following the Ergonomics in Agriculture conference, NIOSH researchers compiled several examples of successful interventions and disseminated those results in a NIOSH publication entitled *Simple Solutions: Ergonomics for Farm Workers.* [n18] This publication, written at a

high school level and targeted to farm owners or managers, gives some generic information about ergonomics such as definitions, rules of thumb, and lists of resources. It outlines 14 interventions that have already been successful in agricultural settings. Each intervention is discussed in a two-page "tip sheet," which gives a definition of the problem, describes an intervention or solution, and provides information on how to build the intervention or where to purchase it. The dissemination of this publication is through farm worker groups, farm owner groups, farm safety groups, Agricultural Extension agents, and agricultural trade magazines. It is believed that these tip sheets will motivate and encourage farm owners and managers to adopt these solutions, invent their own, or initiate a participatory program with workers to identify and make changes. *Simple Solutions* is currently being translated into Spanish for use in the U.S. and abroad.

CONCLUSION

There is much work for researchers who are interested in reducing physical risk factors for musculoskeletal disorders. According to participants in the conference convened by NIOSH, research should center on interventions, cost-benefit analyses, and cultural belief systems. Participants recognized that these research areas were most needed to precipitate change for both farm managers and farm workers. In addition to these research needs, it is imperative that researchers and health communicators use new and innovative methods to disseminate information to the agricultural community. These dissemination factors must also take into account the worker's and manager's cultural belief systems.

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