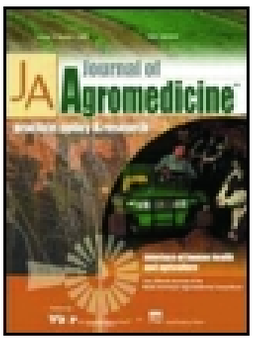

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Difficult Decisions: A Simulation That Illustrates Cost Effectiveness of Farm Safety Behaviors

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SUMMARY. A paper-and-pencil simulation exercise depicts the difficult decisions of a farm family as they struggle to work safely while trying to expand farm size, maintain production, cope with labor shortages, bad weather and equipment problems. Response patterns of 34 persons mimic choices of other farmers faced with real-life decision alternatives like those depicted in the exercise. Farmers judged the exercise as authentic and useful for teaching them relationships among workload, stress, economics, safety, and injury prevention as an integral part of farm planning and management. Many reported that the exercise convinced them to make safety a higher priority. *[Article copies available for a fee from The Haworth Document Delivery Service: 1-800-342-9678. E-mail address: getinfo@ haworth.com]*

KEYWORDS. Agriculture, farming, occupational injury prevention, safety, economics, planning

INTRODUCTION

During 1992-95 a multidisciplinary team conducted: (a) focus group interviews with 180 Kentucky farm family members[1,2,3,4,5] and (b) studies of farm production, labor load, work plans, economic constraints, financial decisions, risk factors for injury events,[1,2,6,7,8] and actual farm injuries and fatalities.[9,10,11] Because of debt, production and labor demands, farm family members tend to work long hours with poorly maintained equipment. They tend to underestimate their risk of injury from this practice, and at the same time, overestimate their ability to manage the risk through being careful and working harder. Yet, farmers often experience near-injury and injury events that result from trying to maintain production, being in a hurry, and using poorly maintained equipment.

THEORY

There are two ways of knowing and understanding the world: through narrative and through formal logical paradigms.[12,13] Narrative thinking involves knowing through stories heard, stories lived, and stories told.[14] Such narratives serve as mental models that direct one's attitudes, judgments, decisions, and behavior. Interactive-narrative simulation exercises can provide insights to farmers about the labor and economic stressors they face, the associated risk of injury events, and the long-term emotional, social, and economic costs of the stressors themselves as well as the

injury events they cause. Such training materials can translate key information into powerful and memorable concepts and strategies that are more likely to change behavior than the usual didactic presentation of the same material.[12,15]

METHOD

The "Kayle's Difficult Decisions" (KDD) simulation exercise depicts the struggles of a typical farm family to maintain production, pay off debt, and cope with labor demands, bad weather, and equipment problems. The simulation is interactive in two ways. First, as the scenario develops, the participants interact with the plot, characters, and predicaments by making a series of choices at critical decision points and receiving immediate feedback about the consequences of these decisions. Second, the persons working the exercise interact with one another weighing and debating the merits of several alternative actions at each of ten key decision points, such as whether or not to hire part-time help or to obtain a roll over protection structure (ROPS) equipped tractor.

SAMPLE

The initial version of the simulation exercise was administered to approximately 20 farmers and 60 College of Agriculture students. The exercise was then revised and administered to 34 persons including 10 farmers in one central Kentucky county and 24 agricultural extensions agents from several Kentucky counties. All the extension agents had farming backgrounds and experience and most currently worked on family farms. The average age of the participants in the sample was 47 years (SD = 9.50) with average farming experience of 24 years (SD = 13.38). The farmers and extension agents did not differ significantly in age or farming experience.

RESULTS

Five types of results are presented for the 34 persons involved in the formal field test of the simulation exercise.

Participants' Prior Experiences–A questionnaire administered follow-

ing the simulation exercise solicited information about the participants' experiences in three areas related to the exercise content. First, 17.6% of the sample reported having experienced a serious injury event that resulted in a large economic cost to their family farm. Second, only 5.9% of the sample had any prior training in farm financial planning and management. Third, 70% of the persons in the sample reported that they had sometimes compromised safety in order to complete important farming tasks.

Participants' Evaluation of the Exercise-The participants evaluated the quality, worth, and utility of the simulation exercise on a standard form immediately after they completed the exercise. The results of these evaluations are presented in Table 1.

Participants' Performance-The KDD simulation exercise is primarily a teaching tool but also is designed as an embedded test that can be scored. Embedded tests are used to teach, but they also provide a measure of the participants' performance on the judgment and decision making tasks that are included in a simulation exercise.[16,17] The KDD exercise is scored on a zero to 100% scale. The total score is the weighted sum of the correct decisions alternatives selected and the incorrect responses avoided. A t-test found no significant difference in the total scores for farmers (Mean = 78.6%, *SD* = 4.96) and extension agents (Mean = 78.1%, *SD* = 6.98). However, the extension agents scored significantly higher than the farmers on two items concerned with first aid decision alternatives when caring for a youth injured in a tractor roll over. The farmers scored significantly

TABLE 1. Participants' Evaluation of the Simulation Exercise

Question stem (The Kayle's Difficult Decisions exercise . . .)	% Agreeing (n = 32)
Is a realistic case	100
Economic information is realistic	100
Is well written and well designed	98
Is about the right length	94
Will help me to make better farm production decisions	97
Taught me farm productivity/injury relationships	96
Will help me to make better safety decisions	94
Will help me to anticipate and plan work load	90
Will help me to prevent injuries	80
Prior to the exercise I had not thought about the economic costs of injury for my farm	59

higher than the extension agents on the last question that asks participants to reflect on the entire exercise scenario and think about what actions the Kayle family might have taken to prevent the injury event (see Table 2).

Impact of Exercise Upon Participants-At the end of the simulation, participants were asked to rate (a) the degree to which they were at risk of a serious farm injury event like the one depicted in the Kayle's simulation exercise, (b) to what degree the exercise had convinced them to make safety a higher priority on their farm, and (c) to judge the impact of a serious farm injury or fatality on the operation of their family farm. In each case, participants responded to these three different questions by checking a single value on a 0 to 10 scale. The 0 value indicated no effect while a 10 indicated maximum effect. The participant ratings are summarized in Table 3. Only about 20 of the 34 persons completed the three

TABLE 2. Exercise Question Score Differences by Group

Group	Question Number	Question Content	Mean % Correct	*SD*	*p* <
Farmers	5	First Aid	82.2	25.4	.031
Agents	5	First Aid	95.2	8.7	
Farmers	6	First Aid	69.4	11.0	.018
Agents	6	First Aid	82.0	13.5	
Farmers	10	Reflection	72.2	19.5	.008
Agents	10	Reflection	54.0	15.6	

TABLE 3. Participants' Ratings for "At Risk," "Convinced," and "Impact" Scale

Scale Content	Number Persons	Mean Rating*	*SD*
To what degree are you *at risk* of a similar injury?	19	5.6	2.61
To what degree has the exercise *convinced* you to make safety a higher priority?	20	7.5	2.01
What *impact* would a serious injury or fatality have on your farm?	20	9.1	1.33

*Scale values are from 0-10 (0 = no value, 10 = maximum value)

rating scales. Some persons who failed to complete the ratings were not currently engaged in regular farming activity.

Measurement Properties–Table 4 describes six independent qualitative methods used to determine the face and content validity of the exercise. At the present time too few data exist to estimate the exercises' predictive validity. The reliability of the exercise was estimated at 0.56 by the Kuder-Richardson 20 formula method.[18] However, the exercise violates two assumptions that underlie standard methods of reliability estimates for tests, unidimensional structure and item independence. The Kayle's exercise content is multidimensional rather than unidimensional. The exercise questions and decision alternatives are not independent because they are presented in an interactive story format with immediate feedback to participants' at each decision point. These two characteristics make the simulation an effective teaching device, but also require a different method for estimating the exercise's reliability. The exercise reliability can best be estimated by the replication of performance score patterns of multiple groups of farmers sampled from several different sites.

DISCUSSION AND CONCLUSIONS

Participants' responses to some of the 58 individual decisions alternatives in the simulation exercise parallel real-life decision errors as determined from focus group interviews and from farm injury and fatality investigations. For example, during planning to expand farm size, only 12% of the participants made the correct decision to increase long term debt payments by a small amount in order to purchase a larger and ROPS-

TABLE 4. Simulation Exercise Validity

Method	Valid?
Judgment of expert exercise authenticators	Yes
Exercise participants' judgment	Yes
Content grounded in focus group interview data (n = 180)	Yes
Content grounded in farm management, planning, and economics	Yes
Content grounded in formal reviews of farm injury data	Yes
Simulation exercise design and method grounded in prior R & D*	Yes

*R & D = Research and Development

equipped tractor which was needed for both increased production demands and safety. This response pattern mimics what farmers often actually do when they expand farming operations (e.g., make do with undersized, poorly maintained, and inadequate equipment).

As a second example, 53% of the participants thought it was reasonable for an already overworked full-time farmer to take an off-farm job to help pay increased farm debt and operating costs that resulted from expansion of farm size and production. In the exercise, as in real life, farmers often overestimate their ability to work long hours at multiple jobs. Yet, they do so at considerable risk of increased stress, fatigue, illness, and injury events.

A third example is a decision point that involves recognizing that an old utility tractor is too small and underpowered to safely haul full silage wagons up and down hills. Yet, in the interest of harvesting corn before the arrival of rain, half of the participants selected this incorrect alternative. Dialog following the simulation exercise and focus group interviews with other farmers suggest that farmers understand the risk of using the undersized tractor, but that they believe by being careful and being skilled they can manage the risk. In the simulation this decision resulted in a tractor overturn and a life-threatening injury with $170,000 of medical costs for the Kayle family. Once again, the exercise response pattern mimics real-life events reported in fatality investigations.

The exercise is a new approach to educating and empowering farm family members to invest in better planning and management of labor, finances, and production to decrease the risk of injury events and catastrophic economic, social, and emotional loss. Using data from actual cases, the simulation dramatically illustrates the cost effectiveness of relatively inexpensive safety decisions and actions and the potential catastrophic cost of safety compromises and shortcuts. The participants evaluated the exercise as authentic in all details. They report that experiencing the exercise will help them to make better production and safety decisions, better anticipate and plan workloads, and help make safety and injury prevention a higher priority on their farms.

REFERENCES

1. Kidd PK, Cole HP, McKnight RH, Townley K, Piercy LR. The use of focus groups in assessing injury risk factors of farm youth. Unpublished manuscript. Lexington, KY: University of Kentucky, 1994.

2. Kidd PK, McKnight RH, Koetke C. Surveillance of behavioral risk factors in older farmers. Technical report 1191 prepared for Kentucky Farm Family Health and Hazard Surveillance NIOSH Cooperative Agreement. Lexington, KY: University of Kentucky, 1993.

3. Kidd PK, McKnight RH, Koetke C. Surveillance of behavioral risk factors in older farmers. Technical report 1193 prepared for Kentucky Farm Family Health and Hazard Surveillance NIOSH Cooperative Agreement. Lexington, KY: University of Kentucky, 1994.

4. Kidd P, Huddleston S, McKnight R, Townley K, Cole H, Piercy L. University-based collaborative efforts to prevent childhood agricultural injuries. Poster session at the Second World Injury Control Conference, Atlanta, GA. May 17-19,1993.

5. Kidd P, Townley K, Huddleston S, McKnight R, Cole H, Piercy L. Youth perceptions of risk in the farm environment. Abstract American Public Health Association 121st Annual Meeting, San Francisco, CA, October 24-28,1993.

6. Kidd P, Huddleston S, McKnight R, Townley K, Cole H, Piercy L. Risk factors for agricultural injury in farm youth. Paper presented at the 32nd Biennial Convention of Sigma Theta Tau International, Indianapolis. December 7-9, 1993.

7. McKnight RH, Piercy LR, Townley KF, Kidd PS, Cole HP. Parents' concern for children's farm safety. Tex J Rural Health 1995; 14:10-19.

8. Kidd P, Scharf T, Veazie M. Lining stress and injury in the farming environment: A secondary analysis of qualitative data. Health Educ Q 1996; 23: 224-237.

9. Struttmann TW, Spurlock C, Pollack SH, Moon-Hampton E, Browning SR, et al. Farm-tractor related fatalities–Kentucky 1994. MMWR 1994; 44:481-484.

10. Kentucky Fatality Assessment Circumstances and Evaluation (FACE) Project. Kentucky farm fatalities–1994. Lexington, KY: University of Kentucky, Kentucky Injury Prevention and Research Center, 1994.

11. Kentucky Fatality Assessment Circumstances and Evaluation (FACE) Project. Kentucky farm fatalities–1995. Lexington, KY: University of Kentucky, Kentucky Injury Prevention and Research Center, 1995.

12. Cole HP. Stories to live by: A narrative approach to health-behavior research and injury prevention. In Gochman DS (editor), Handbook of health behavior research, New York: Plenum; in press.

13. Bruner IS. Actual minds, possible worlds. Cambridge, MA: Harvard University Press, 1986.

14. Howard GS. Culture tales: A narrative approach to cross-cultural psychology and psychotherapy. Am Psychol 1991; 46:187-197.

15. Wallerstein N, Weinger M. Health and safety education for worker empowerment. Am J Ind Medicine 1992; 22:619-635.

16. Cole HP. Embedded performance measures as teaching and assessment devices. Occup Med: State of the Art Reviews 1994; 9(2): 261-281.

17. Cole HP, Moss I, Gohs FX, Lacefield WE, Barfield BJ, et al. Measuring learning in continuing education for engineers and scientists. Phoenix: Oryx Press, 1984.

18. Ghiselli EE, Campbell JP, Zedeck S. Measurement theory for the behavioral sciences. San Francisco: W. H. Freeman, 1981.