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ORIGINAL ARTICLE

Changing a Dangerous Rural Cultural Tradition: A Randomized Control Study of Youth as Extra Riders on Tractors

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Abstract

Purpose: This study used a randomized control design to evaluate the effectiveness of *AgTeen*, an in-home, family-based farm safety intervention, in decreasing extra riding on tractors by youth. Having children as extra riders on tractors has deep roots in farm culture, but it can result in serious injury or death.

Methods: The study randomized 151 families into 3 groups: parent-led intervention (fathers taught their families about farm safety), staff-led intervention (staff members who were peer farmers taught families), and a no-treatment control. Mothers, fathers, and all children aged 10-19 participated in the lessons.

Findings: At study entry, 93% of youth reported that they had been an extra rider on a tractor in the past year. Although they were aware of the injury risk, fathers frequently gave tractor rides to their children. After the intervention, fathers in both *AgTeen* groups were less likely than control fathers to give youth tractor rides. Intervention youth were less likely than control youth to be extra riders. The intervention positively affected the extra-riding attitudes and injury risk perceptions of mothers and fathers. The parent-led and staff-led groups did not significantly differ across study outcomes.

Conclusions: Findings confirm the effectiveness of a family-based intervention in decreasing extra riding on tractors by youth.

Key words child safety, evaluation design and research, farm safety, health promotion, rural youth.

In 2009, an estimated 1.03 million US youth lived on farms.[1] The family farm is often idealized as the perfect setting for rearing children. In many aspects, this depiction is true. Farm life can build a strong work ethic, appreciation for nature, and close family bonds.[2] It is also true that farming is dangerous. Family farms are unique in that children live in the midst of a dangerous workplace. Every year, youth are seriously injured and killed in farm accidents. Farm accidents often involve powerful farm equipment, especially tractors.[3-7] An estimated 22,894 farm youth sustained injuries in 2006.[4] Each year, between 100 and 150 youth are killed on farms.[5,8] Boys are almost twice as likely to be injured compared to girls.[4]

One of the common romanticized images of farm life is a child sitting with an adult on a tractor.[9] Across generations, young children have enjoyed sitting in their father or grandfather's lap, "driving" a tractor.[2] Data from Lee et al[10] revealed positive associations between allowing children to be extra riders on tractors and father's endorsement of spending family time together, having fun, and having children gain work experience. Sharing tractor work with children is often viewed as a "cherished enculturation practice"[11] and an important rural tradition.[2,10,11] Children often begin riding on tractors as toddlers or preschoolers.[12,13] One study found that over half of farm children aged 3 months to 2 years had been

an extra rider on a tractor.[13] Rates of extra riding remain high across childhood and adolescence.[13-15]

Despite the romanticized image, being an extra rider on a tractor is dangerous.[14,16,17] Half of the injuries occurring to farm children in the crop field involve extra riding on tractors.[17] Regardless of the speed of the tractor, it is impossible to stop a tractor before the back wheel or an attached implement rolls over a child who has slipped off the tractor and fallen to the ground. Even when tractors have enclosed cabs, safety experts caution that children can fall from unlocked doors or create a safety hazard by distracting the tractor operator.[18,19] Unlike many other high-risk behaviors on farms, extra riding is usually under the direct control of an adult, who, as the operator of the tractor, invites, or at least condones, the behavior.

Farm Safety Day Camps, attended by thousands of youth each year, teach about the dangers of extra riding. Although there is some evidence that the camps may result in decreased extra riding,[20] evaluation studies are limited.[21] National campaigns, such as those implemented through *Farm Safety 4 Just Kids*,[22] have addressed the issue through "no riders" initiatives, as has the Childhood Agricultural Safety Network campaign: *Keep Kids Away from Tractors – It's Easier to Bury a Tradition than a Child.*[18] Unfortunately, the practice of allowing children to be extra riders on tractors persists in spite of the efforts of safety specialists to convince farmers and youth of the danger involved.[23]

This study evaluated the effectiveness of *AgTeen*, a family-based farm safety intervention, in decreasing extra riding on tractors by youth. *AgTeen* lessons were taught to participating families either by the father or by a peer farmer employed by the project. When fathers taught the lessons, cognitive dissonance[24] was expected to cause fathers to change their behavior to be consistent with the information that they were teaching. As such, we hypothesized that fathers who served as teachers would be more successful than staff/peer farmers in reducing youth extra riding and in changing family attitudes related to extra riding. We expected both interventions to be associated with more positive safety changes as compared to a no-intervention control.

Method

Research Design

The research utilized a randomized design with 3 groups: parent-led intervention (fathers taught their families about farm safety), staff-led intervention (*AgTeen* staff members who were peer farmers taught families), and a no-treatment control. The research questions addressed in this paper were a part of a larger family home-based intervention study focused on youth farm safety. Parents and youth aged 18 and older signed consent forms approved by the University of Georgia Institutional Review Board. Younger youth signed assent forms.

Participating Families

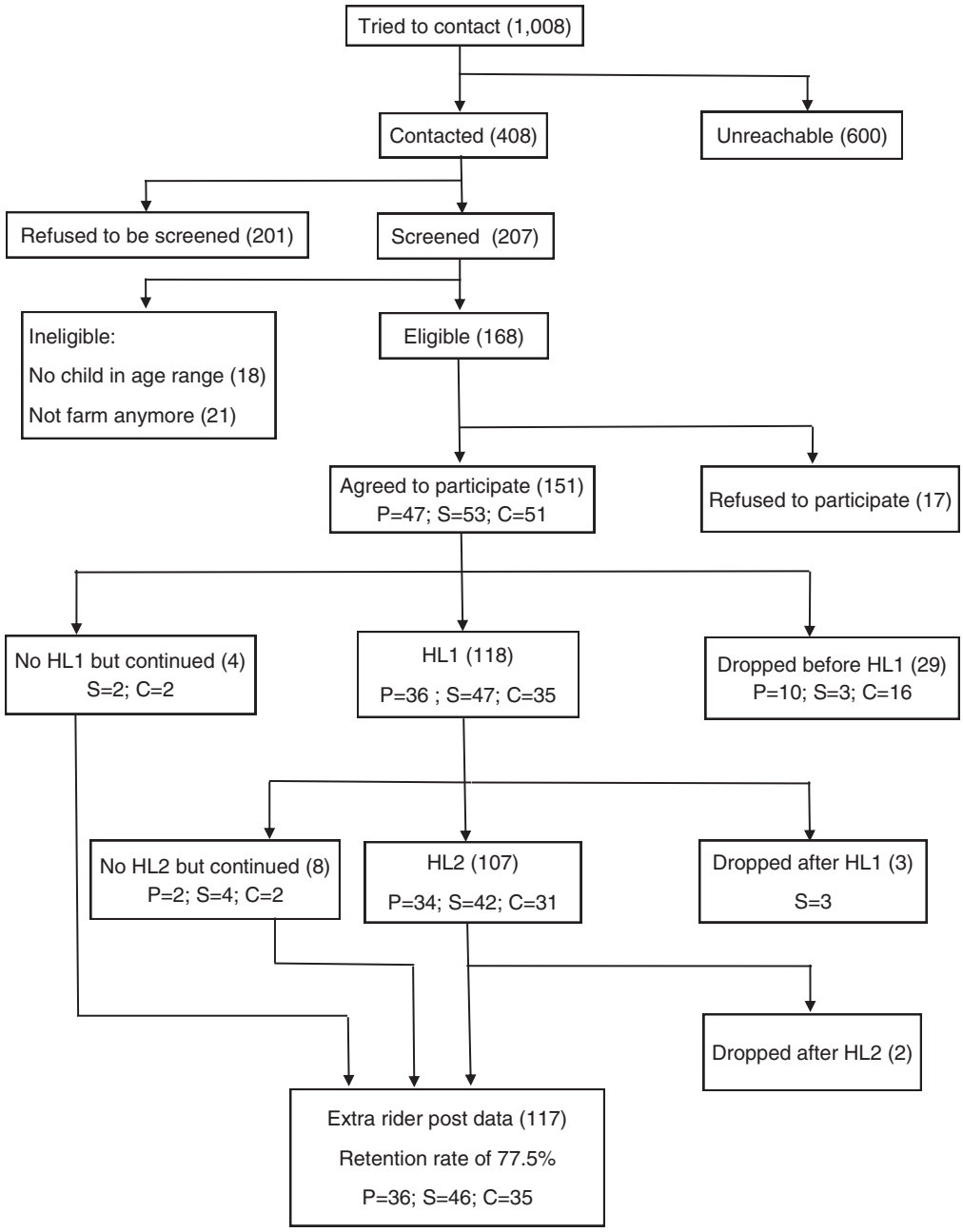
Inclusion criteria were: (1) family had a child aged 10-19; (2) farm produced row crops and was in active production; (3) farm was owned and operated by the parent or extended family; (4) during the past year, the child worked on the farm at least 1 day a week during times that crops were in production; and (5) family members spoke English. Families representative of local farm production were recruited from rural South Georgia. Families were recruited from the mailing list of the *Farmers and Consumers Market Bulletin*, published by the Georgia Department of Agriculture and through collaborations with organizations such as Future Farmers of America (FFA), Georgia Young Farmer's Associations, and the network of University of Georgia Cooperative Extension Service agents. We also utilized farmer-to-farmer referrals, placed ads in local newspapers, and hung recruitment posters in feed stores, farm equipment dealerships, and other agriculture-related organizations. Of 168 eligible families, 151 agreed to participate and were randomized (see Figure 1). The sample of 151 primary farmers (defined as the adult most involved in farming) comprised 147 men (144 fathers, 3 grandfathers) and 4 mothers. Because of the preponderance of men, the terms "primary farmers" and "fathers" are used interchangeably in this manuscript, as are the terms "nonprimary farmers" and "mothers."

Fathers ranged in age from 34 to 65 years (mean = 45 years). The average farmer grew up on a farm (83%), had been farming for 25 years, had some college or technical school, and farmed 955 acres (range: 100-5,700 acres). Average incomes ranged from $70,000 to $79,000. Mothers ranged in age from 30 to 56 years (mean = 42 years); 47% of mothers were reared on farms. Families had an average of 2 children. If families had more than 1 child in the age range, parents designated a target child who was most involved with work on the farm. Only data from that child are analyzed in this study. Target youth ranged in age from 10 to 19 years (mean = 13.8 years); 72% were male. Only 3 study youth (1 in each group) had received tractor certification; 12% had attended farm safety camp and 46% were FFA members.

Implementation and Collection of Preintervention Data

Local farmers hired by the *AgTeen* project called prospective families to ascertain eligibility. After a family was

Figure 1 Study Enrollment and Participant Flow.
Notes: P, parent led group; S, staff led group; C, control group; HL1, home lesson 1; HL2, home lesson 2.



deemed eligible based on the inclusion/exclusion criteria and agreed to participate, computer-generated random numbers were used to assign families to study groups. Preintervention group meetings were scheduled to explain the study, obtain informed consent, and collect preintervention data. For intervention families, the meetings provided information about the study lessons. For that reason, meetings were scheduled separately for intervention and control families, necessitating randomization before meetings were scheduled and, therefore, before collection of preintervention data. Follow-up home visits were made to obtain consent/assent and data from any family members not attending the preintervention meeting.

As the study progressed, this procedure was modified. Few families had all members attend the preintervention

meetings, necessitating numerous home visits to obtain consent/assent and preintervention data from nonattending family members. As a result, group meetings were eliminated and home visits were scheduled for all families. To ensure confidentiality among family members, each member individually sealed their preintervention completed data forms in an envelope, identified only by their family number. Another set of data forms was left with the family to be completed after the home visit. Forms were placed in individually sealed envelopes, which were put into a postage-paid preaddressed box and mailed to the university. At the end of the home visit, a sealed envelope was opened to reveal the family's randomized group assignment. After this point in the study, research procedures differed depending on group assignment. Families were paid honoraria in incremental amounts, totaling $490 for completing all project activities across approximately a year.

Enrollment Flow and Sample Retention

The study was implemented from 2007 to 2012 with rolling enrollment across most of that time period. Enrollment flow is displayed in Figure 1. A total of 107 families completed *AgTeen* Lesson 2, which included the extra rider content (or for controls, completed Lesson 2 data forms). Of the 151 families randomized, 117 families (77.5% of the randomized sample) completed the extra rider post measures. Retention was highest for the staff-led group (86.8%), next highest for the parent-led group (76.6%), and lowest for controls (68.6%). Retention was enhanced through payment of honoraria, numerous phone and mail/e-mail contacts, and follow-up mailings and phone calls when data packets were not returned.

The largest attrition was for families that were randomized but did not attend the preintervention meeting or successfully schedule an initial home visit. The only data available for these families was a limited set of eligibility screening questions based on the inclusion/exclusion criteria. This precluded examination of possible differences between these early dropouts and families who remained in the study. For families who dropped out after completing preintervention data, there were no differences between completers and noncompleters on any demographic measures.

Randomization success was tested by comparing families assigned to the 3 groups. Groups did not differ on mother, father, or youth age; family income; mother education; target child gender; hours youth worked on the farm; or nonfarm employment of the father. Groups did differ on father education, $F(2,127) = 3.89$, $P < .02$. Fathers in the staff-led group had slightly greater educational attainment.

AgTeen Lessons

The *AgTeen* intervention consisted of 2 lessons: (1) power take-off and hydraulics safety and (2) tractor safety (which included the dangers of being an extra rider). Families could receive Lesson 2 only after they completed Lesson 1. *AgTeen* draws from the messaging approach used by Will et al[25] based on the Extended Parallel Process Model.[26] Namely, *AgTeen* lessons inform, persuade, evoke emotion, create vulnerability, and instill in parents a high sense of efficacy for protecting their children. Families read a farmer-authored article[27] telling an emotional story of an 8-year-old boy who was killed while riding on a tractor with his father. The intervention also included a mildly fear-inducing video about a youth tractor injury and a video on teenage brain development—neither video focused directly on extra riding. For lessons, mothers, fathers, and all youth between the ages of 10 and 19 were always present. If not, the lesson was rescheduled.

Parent-Led Intervention

A preliminary home visit was conducted in which a staff member taught the *AgTeen* lesson to the father without other family members present. The staff member next visited the family home while the father taught the lesson to his family.

Staff-Led Intervention

A staff member who was a peer farmer from the local community taught the lessons to the family. No preliminary home visit was held to teach the lesson content to the father. Lesson content and all other procedures were identical to the parent-led group.

Sequencing of Lessons and Data Collection

The hectic demands of farm life, combined with the requirement that mothers, fathers, and all youth aged 10-19 be present, made scheduling of lessons difficult. In addition, postintervention data had to be obtained at times when families frequently operated tractors (excluding winter months). As a result, the time between the tractor safety lesson and postintervention data collection varied across families. The average lag was 7 months.

Control Group

Each time the intervention families completed data, control families were sent corresponding data forms to complete. After study completion, control families received DVD versions of the lessons.

Fidelity of Intervention

To monitor the extent to which parents implemented the intervention as planned, parent-led sessions were video recorded. The videos were examined to make sure each key component was covered. Staff teaching the lessons were monitored through weekly meetings and written notes made after each home visit.

Study Measures

The following measures, analyzed in this paper, were included in a larger research protocol focused on multiple aspects of farm safety.

Extra Riding

All fathers, as well as the subset of youth who operated tractors, used a 4-point scale (3 = *Frequently* to 0 = *Never*) to indicate how often they gave a ride to a child on their tractor. Youth used the same scale to indicate how often they had taken a ride on a tractor operated by someone else. At pretest, respondents reported their behavior for the past year. At posttest, respondents in the intervention groups reported their behaviors from the time of the last *AgTeen* lesson. Control families reported behavior since they last completed a set of data forms.

Attitudes and Beliefs

Pre- and postintervention, fathers and mothers were asked 19 attitudinal questions about farm safety, rating agreement from 4 = *Strongly agree* to 1 = *Strongly disagree*. Only 3 of the items related to extra riding: "Having children ride on a tractor with an experienced adult can help to teach them about farm safety;" "For children, riding on a tractor with father or grandfather helps build close family relationships;" and "It is dangerous for children to ride on tractors." The first 2 of these items, derived from Cole[11] formed a positive cultural attitude composite (alphas for the 2-item scale: 0.72 for fathers, 0.80 for mothers). At preintervention only, youth were asked 2 of the aforementioned questions concerning danger and building close family relationships.

To measure perception of injury risk, mothers and fathers were asked: "Would (target child) be likely to be injured if he/she engaged in this behavior: Riding on a tractor (with a skilled adult)?" Responses ranged from 4 = *Definitely yes* to 1 = *No*. Fathers (but not mothers) were asked if it was dangerous for an experienced, adult farmer to give a child a ride on a tractor, using the aforementioned scale. For fathers, these 2 items and the danger item from the attitude scale were summed to create 1 injury perception variable, $\alpha = 0.73$. For mothers, the injury perception and danger items were summed, $\alpha = 0.60$. Toward the end of the study, the attitude and injury perception questions were deleted to shorten the questionnaire. This resulted in a reduced sample for these measures.

Data Analysis

The Likert items and composites constituting the study outcome measures were not normally distributed (Kolmogorov-Smirnov and Shapiro-Wilk tests were significant). Data were analyzed using nonparametric statistics. Comparisons across the 3 study groups were made using the Kruskal-Wallis test. Post hoc analyses were executed using Mann-Whitney *U* tests comparing 2 groups and calculating effect sizes for pairs of data. To further understand the data, we also compared pre- and postintervention data for each study group using the Wilcoxon Signed Ranks Test. Correlations were run using Spearman Rank Order coefficients.

Results

Youth as Extra Riders

At study entry, 93% of youth reported they had been an extra rider on a tractor in the past year. Almost half of the youth (45%) reported being less than 6 years old when they first rode on a tractor. Fathers affirmed their important role in extra riding; 88% of fathers reported that they gave youth rides on tractors; 21% frequently did so. Youth who reported taking tractor rides almost always (90%) had fathers who reported that they gave youth rides on their tractors. The frequency of extra riding as reported by fathers was negatively associated with youth age, r_s (130) = –0.23, $P < .008$, and father age, r_s (129) = –0.34, $P < .001$. Youth self-reports of extra riding were not significantly correlated with youth age.

Youth rode on tractors operated by other youth. Of the study youth, 72% reported that they operated tractors (mean age = 14.2 years); 70% of tractor-operating youth were male. A majority of the youth who operated tractors reported that they had given rides to other youth either frequently (21%) or a few times (43%) in the past

Table 1 Differences Between Preintervention Mother and Father Perceptions of Danger and Injury Risk for Youth Who Are Extra Riders on Tractors

	Mothers *M* (Median)	Fathers *M* (Median)	N	Z[a]	*P*
It is dangerous for children to ride on tractors[b]	2.72 (3)	2.92 (3)	124	2.46	.01
Your youth would likely be injured being an extra rider[c]	1.70 (2)	2.32 (2)	126	5.88	.001

[a]Wilcoxon Signed Ranks Test.
[b]Scores range from 1, Strongly disagree to 4, Strongly agree.
[c]Scores range from 1, No to 4, Definitely yes.

year. Among tractor-operating youth, older youth gave rides more frequently than younger youth, r_s (93) = 0.37, $P < .001$. Boys were more likely than girls to give other youth rides, U (93) = 519, $P < .02$ (mean [median]: girls, 0.81 [0]; boys, 1.51 [2]). Youth who frequently rode on tractors operated by others were more likely to give rides when they, themselves, operated a tractor, r_s (93) = 0.35, $P < .001$. Being an FFA member or attending a farm safety camp was not significantly related to youth reports of extra riding or giving another youth a tractor ride.

Families (62% of fathers, 71% of mothers, and 77% of youth) endorsed the cultural belief that extra riding helps build close family relationships. Mother and father beliefs about the role of extra riding in building family closeness were positively correlated, r_s (119) = 0.40, $P < .001$. Cultural beliefs were predictive of behavior. Fathers who believed that having a child as an extra rider on a tractor helps to build close relationships were more likely to give their youth tractor rides, r_s (127) = 0.30, $P < .001$. Mothers with similar beliefs had husbands who were more likely to give their youth tractor rides, r_s (122) = 0.26, $P < .003$.

Family members knew that extra riding was dangerous (82% of fathers, 60% of mothers, and 77% of youth) and that their youth could be injured when extra riding (77% of fathers and 54% of mothers). Fathers were more likely than mothers to believe that extra riding was dangerous and that their youth might be injured engaging in this behavior (See Table 1). Fathers' beliefs about the risk that their youth would be injured while extra riding were negatively correlated with the frequency of rides they gave to youth, r_s (129) = –0.21, $P < .02$. However, beliefs in the danger of extra riding did not keep the behavior from occurring. Of the fathers who agreed with the statement that extra riding was dangerous, 90% acknowledged that they occasionally or frequently gave tractor rides to their sons and daughters. Of the youth who perceived extra riding to be dangerous, 97% had been an extra rider in the past year. Among the subset of youth who operated tractors, 71% of youth who perceived extra riding to be dangerous had given a tractor ride to another youth in the past year.

Effects of the *AgTeen* Intervention

Kruskal-Wallis tests conducted on preintervention data revealed no significant differences between groups on any of the study measures. Families varied in the amount of time they took to complete the study. To examine the potentially confounding effect of this variance, we correlated time lag (between the tractor lesson and postintervention data) with the pre-post change in each outcome measure. None of the correlations were significant. As described earlier, for many dropout families we had neither pre- nor postintervention data, negating our ability to implement the planned intention to treat analyses. Families who missed the tractor lesson and thus did not receive the extra-rider intervention were included in the final analyses if they provided postintervention data. Table 2 provides pre- and postintervention group means and medians, Kruskal-Wallis test results for group differences in postintervention data, and postintervention effect sizes for both intervention groups as compared to the control group. Table 3 provides tests of pre- and postintervention differences for each of the 3 study groups.

Behavioral Outcomes

Postintervention, fathers in both the parent-led and staff-led groups were less likely to have given a child a ride on a tractor compared to control fathers; 26% of fathers in the combined intervention groups reported giving rides to youth either occasionally or frequently compared to 61% of control fathers. Fathers in the 2 intervention groups did not differ from each other. Youth in the parent-led group were less likely than control youth to report that they had taken a ride on a tractor someone else was operating. The differences between staff-led and control youth, and between parent-led and staff-led youth, did not reach significance. Of the youth in the parent-led group, 29% had been an extra rider either a few times or frequently since the tractor lesson, compared to 38% of staff-led and 59% of control youth. There were no postintervention differences among the 3 groups for youth giving tractor rides to other youth. Both of the intervention groups, however, showed significant declines in this behavior from pre- to postintervention.

Table 2 Pre- and Postintervention Group Means and Medians, and Kruskal-Wallis Tests With Postintervention Data as the Dependent Measures

	Parent- led (Pa)		Staff-led (S)		Control (C)						
	Pre *M* (Median)	Post *M* (Median)	Pre *M* (Median)	Post *M* (Median)	Pre *M* (Median)	Post *M* (Median)	N	Post $\chi 2^a$	*P*	Pa vs C r^b	S vs C r^b
Fathers											
Gave child a tractor ride	1.91 (2)	0.51 (0)	2.02 (2)	0.84 (0)	1.86 (2)	1.44 (2)	116	15.86	.001	0.46	0.29
Injury perception	8.14 (8)	8.30 (8)	7.70 (7.5)	8.07 (8)	8.36 (8.5)	7.33 (7)	110	6.83	0.03	0.30	0.24
Cultural attitudes	5.26 (5.5)	4.82 (5)	5.48 (6)	4.95 (5.5)	5.28 (5)	5.67 (6)	104	10.33	0.006	0.41	0.28
Mothers											
Injury perception	4.34 (4)	5.43 (5)	4.42 (4)	5.47 (5)	4.34 (4)	4.47 (4)	93	12.06	0.002	0.35	0.41
Cultural attitudes	5.60 (6)	4.55 (4)	5.31 (6)	4.63 (4)	5.68 (6)	5.34 (6)	95	7.48	0.02	0.28	0.33
Youth											
Youth was extra rider	2.53 (3)	0.94 (1)	2.30 (2)	1.07 (1)	2.36 (2)	1.50 (2)	113	5.68	0.05	0.28	0.21
Gave child a ride	1.50 (2)	0.81 (1)	1.55 (2)	1.13 (1)	0.92 (0)	0.92 (0)	77	1.44	0.59	0.04	0.10

[a]Kruskal-Wallis tests with 3 groups and postintervention data as the dependent measure.
[b]Effect sizes based on post hoc Mann-Whitney Test Z scores for pairs of groups.

Table 3 Pre-Post Intervention Wilcoxon Signed Ranks Test Comparisons for the 3 Study Groups

	Parent-Led Pre-Post Z[a]	*P*	Staff-Led Pre-Post Z[a]	*P*	Control Pre-Post Z[a]	*P*
Fathers						
Gave child a tractor ride	4.71	.000	4.79	.000	2.08	.04
Injury perception	0.95	.35	1.30	.19	3.13	.002
Cultural attitudes	2.10	.04	2.52	.01	1.89	.06
Mothers						
Injury perception	3.24	.001	4.50	.000	0.78	.43
Cultural attitudes	3.01	.003	3.25	.001	2.12	.03
Youth						
Youth was extra-rider	4.83	.000	4.70	.000	3.75	.000
Gave child a ride	2.04	.04	2.10	.04	0.04	.97

[a]Pre-Post *Z* scores from the Wilcoxon Signed Ranks Test.

Injury Perception and Cultural Attitudes

Postintervention, mothers in both the parent-led and staff-led groups evidenced an increased belief that extra riding was dangerous and could lead to youth injuries, compared to control mothers. The injury perceptions of fathers in the 2 intervention groups did not change from pre- to postintervention. Control fathers showed a decrease in their beliefs about the danger of extra riding. Preintervention differences in the injury perceptions of mothers and fathers (Table 1) disappeared postintervention. Mothers in the 2 intervention groups increased their danger awareness such that their scores were similar to fathers (danger item mean [median]: fathers, 3.18 [3]; mothers, 3.17 [3]; risk of injury to own youth item mean [median]: fathers, 2.06 [2]; mothers, 2.30 [2]).

Fathers and mothers in both the parent-led and staff-led groups demonstrated a decrease in positive cultural attitudes about extra riding compared to control fathers. Many parents, however, continued to endorse the value of extra riding. After intervention, 36% of mothers and 53% of fathers in the 2 intervention groups continued to believe that extra riding resulted in strong family

relationships (compared to 76% of control mothers and 87% of control fathers).

Discussion

Study data confirmed that farm youth frequently ride on tractors operated by parents and others. Even though they knew it was dangerous, most fathers gave their children tractor rides. Since extra riding often occurs in the context of close parental supervision, changing the behavior of parents is critical to keeping youth safe.[28] Safety knowledge, alone, is not sufficient to change this deeply rooted behavior. Before entering the study, most fathers realized that extra riding was dangerous, but they allowed youth to engage in the behavior anyway. Although youth were aware of the danger, they accepted tractor rides. It is clear that interventions solely aimed at increasing father or youth knowledge would be of limited effectiveness. *AgTeen* created positive change in this culturally cherished behavior by involving the whole family in an intervention that combined knowledge about safety risks with emotion-provoking accident stories highlighting youth vulnerability, discussion of rural cultural beliefs, and clear, achievable action steps. After the intervention, fathers were less likely to give youth tractor rides and youth were less likely to be extra riders. Intervention youth gave fewer tractor rides to other youth. The anticipated advantage of having fathers teach the lessons, as compared to peer farmers as teachers, was not found. For father outcomes, however, effect sizes tended to favor the parent-led group over the staff-led group.

Both mothers and fathers in the intervention groups changed their cultural beliefs about extra riding. Parent's endorsement of extra riding as a time for parent-child bonding and safety training was weakened. Nonetheless, postintervention, over a third of mothers and over a half of fathers held on to the belief that extra riding resulted in strong family relationships. Parents were clearly torn between extra riding as an engrained, enjoyable tradition and their strong desire to keep their children safe. As suggested by Lee et al,[10] it can be difficult for parents to balance the perceived benefits of extra riding against the risk of injury.

Before the study began, mothers were less aware than fathers of the risks to youth of extra riding. *AgTeen* made mothers more aware of this injury risk. Although not measured in this research, it is possible that mothers, newly sensitized to danger for their children, exerted influence on fathers to encourage them to stop taking children in the field on tractors. Lee et al[10] argued that the social pressure exerted by mothers "should not be overlooked" when developing farm safety interventions, noting that immediate family members exert more pressure on fathers than do safety experts and others outside the family.

Throughout the study, decreases in unsafe behavior and attitudes occurred in the control group, even though they received no intervention. In their review, McCallum et al[21] concluded that youth farm safety programs often resulted in positive effects for the control group. As in this study, effects were less than for the intervention groups but still present. It is plausible that completing study questionnaires reminded control families of the dangers of extra riding and served as an unintended intervention.

This study focused on youth aged 10-19. Children begin being extra riders on tractors at younger ages than the youth who participated in this research.[13-15] The youth targeted in the study were the children most involved in farm work. These youth were often older siblings. It will be important for future research to focus on effective interventions to decrease extra riding among younger children. The study also had other limitations. Because the families volunteered for the study, they may not have been representative of the general population of farm families with similar-aged children. In general, the sample was white, reasonably affluent, and well educated. The study measures were self-report rather than observational, and the non-normative nature of the outcome measures necessitated the use of less powerful nonparametric statistics.

Farm parents face dual roles of engaging in farm work and simultaneously caring for children who live in the family workplace.[10] Having children ride with parents on tractors is one solution to this dual responsibility, albeit a dangerous one. Extra riding on tractors has strong roots in farm culture. It is an enjoyable experience passed from generation to generation. This study demonstrated that a family-based intervention could counter this strong cultural tradition and reduce the rate of extra riding. The National Childhood Agricultural Injury Prevention Initiative developed by National Institute for Occupational Safety and Health (NIOSH) called for the creation of farm safety interventions that "...build better, stronger, safer traditions—traditions that build as the first priority, the preservation of children, not the preservation of history."[29(p. 190)] We believe that *AgTeen*, implemented as a family-based intervention, can represent an important step in that direction.

References

1. United States Department of Agriculture. NASS publications: Farms, land in farms, and livestock operations 2011 summary; 2012. Available at:

http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1259. Accessed April 16, 2013.
2. Sanderson LL, Dukeshire SR, Rangel C, Garbes R. The farm apprentice: agricultural college students recollections of learning to farm "safely." *J Agric Saf Health*. 2010;16(4):229-247.
3. Heaney CA, Wilkins JR 3rd, Dellinger W, et al. Protecting young workers in agriculture: participation in tractor certification training. *J Agric Saf Health*. 2006;12(3):181-190.
4. Hendricks KJ, Goldcamp EM. Injury surveillance for youth on farms in the U.S., 2006. *J Agric Saf Health*. 2010;16(4):279-291.
5. Jepsen SD, Beaudreault AR. Ohio farm safety day camps: developing a successful statewide program through surveillance and evaluation. *J Agric Saf Health*. 2012;18(2):95-102.
6. Marlenga B, Pickett W, Berg RL, Murphy D. Operational characteristics of tractors driven by children on farms in the United States and Canada. *J Agric Saf Health*. 2004;10(1):17-25.
7. Myers JR, Adekoya N. Fatal on-farm injuries among youth 16 to 19 years of age: 1982–1994. *J Agric Saf Health*. 2001;7(2):101-112.
8. Adekoya N, Pratt SG. *Fatal Unintentional Farm Injuries Among Persons Less than 20 Years of Age in the United States: Geographic Profiles*. Washington, DC: Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health; 2001.
9. Reed D, Claunch D, Haurylko C. Farm safety through the camera's eye. *J Agric Saf Health*. 2008;14(3):321-332.
10. Lee BC, Jenkins LS, Westaby JD. Factors influencing exposure of children to major hazards on family farms. *J Rural Health*. 1997;13(3):206-215.
11. Cole HP. Cognitive-behavioral approaches to farm community safety education: a conceptual analysis. *J Agric Saf Health*. 2002;8(2):145-159.
12. Darragh AR, Stallones L, Sample PL, Sweitzer K. Perceptions of farm hazards and personal safety behavior among adolescent farmworkers. *J Agric Saf Health Spec Issue*. 1998;1:159-161.
13. Pryor SK, Carruth AK, LaCour G, Pryor SK, Carruth AK, LaCour G. Occupational risky business: injury prevention behaviors of farm women and children. *Issues Compr Pediatr Nurs*. 2005;28(1):17-31.
14. Browning SR, Westneat SC, Szeluga R. Tractor driving among Kentucky farm youth: results from the farm family health and hazard surveillance project. *J Agric Saf Health*. 2001;7(3):155-167.
15. Yang J, O'Gara E, Cheng G, et al. At what age should children engage in agricultural tasks? *J Rural Health*. 2012;28(4):372-379.
16. Marlenga B, Pickett W, Berg RL. Assignment of work involving farm tractors to children on North American farms. *Am J Ind Med*. 2001;40(1):15-22.
17. Morrongiello BA, Pickett W, Berg RL, Linneman JG, Brison RJ, Marlenga B. Adult supervision and pediatric injuries in the agricultural worksite. *Accident Anal Prev*. 2008;40(3):1149-1156.
18. Fisher RM, Lee BC. "Keep kids away from tractors": Childhood agricultural safety public awareness campaign. *Paper presented at Safety 2010 World Conference,* London, UK; September 2010.
19. Farm Safety Association I. A guide to safe farm tractor operation. National Ag Safety Database; 2012. Available at: http://nasdonline.org/document/1659/d001534/a-guide-to-safe-farm-tractor-operation.html. Accessed April 4, 2013.
20. McCallum D, Conaway M, Reynolds S. Evaluation of a farm safety day program: participants and non-participants over a one-year follow-up period. *J Agric Saf Health*. 2009;15(3):255-271.
21. McCallum DM, Murphy S, Reed DB, Claunch DT, Reynolds SJ. What we know about the effectiveness of farm safety day programs and what we need to know. *J Rural Health*. 2013;29(1):20-29.
22. Farm Safety for Just Kids. "No riders"; 2010. Available at: http://www.farmsafetyforjustkids.org. Accessed March 29, 2013.
23. Ambe F, Bruening TH, Murphy DJ. Tractor operator's perceptions of farm tractor safety issues and implications to agricultural and extension education. *J Agric Educ*. 1995;35(4):67-73.
24. Festinger L. *A Theory of Cognitive Dissonance*. Vol. 2. Redwood City, CA: Stanford University Press; 1962.
25. Will KE, Sabo CS, Porter BE. Evaluation of the "boost'em in the back seat program": using fear and efficacy to increase booster seat use. *Accident Anal Prev*. 2009;41(1):57-65.
26. Witte K. Putting the fear back into fear appeals: the extended parallel process model. *Commun Monogr*. 1992;59(4):329-349.
27. Reynolds RT. Just say no, please say no. *Progressive Farmer*. 1990;16.
28. Ashida S, Heaney CA, Kmet JM, Wilkins J. Using protection motivation theory and formative research to guide an injury prevention intervention: increasing adherence to the North American guidelines for children's agricultural tasks. *Health Promot Pract*. 2011;12(3):396-405.
29. Castillo D, Hard D, Myers J, Pizatella T, Stout N. A national childhood agricultural injury prevention initiative. *J Agric Saf Health*. 1998;4(Suppl 5):183-191.