



Original article

## Social and Individual Influences on Tractor Operating Practices of Young Adult Agricultural Workers

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 A B S T R A C T

**Purpose:** Tractor-related incidents are the leading cause of agricultural-related fatalities in the United States. Injuries from rollovers can be prevented by equipping tractors with rollover protective structures (ROPS, an engineering approach) and by using seatbelts (a behavior-based approach). While adult farmers report low seatbelt use and frequent use of tractors without ROPS, it is unknown whether the young adult population has adopted similar tractor driving practices. This study was designed to identify tractor operating practices among young adult agricultural workers and the influence of supervisors, peers, and parents on their safety behaviors.

**Methods:** An online survey was conducted among college students enrolled in agricultural science classes in four Midwestern colleges and universities. Participants answered questions about their tractor operating practices, the influence of supervisors, peers, parents, and individual risk taking tendencies on their workplace practices. A tractor operation safety score was estimated from participants' responses. Linear regression was used to examine the association of these influences and the tractor operation safety score.

**Results:** Of the 193 respondents, most (78.8%) reported that they never or rarely wear a seatbelt when operating a tractor with a ROPS. Supervisory influences, such as being negatively evaluated by a supervisor, were found to be more strongly associated with tractor operating behaviors than peer or parent influence.

**Conclusions:** Young adult agricultural workers frequently reported unsafe tractor operating behaviors. Supervisors were found to have the most influence over reported behaviors of young adult agricultural workers.

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**IMPLICATIONS AND CONTRIBUTIONS**

Tractor-related incidents are the leading cause of agricultural-related fatalities. Characterizing the tractor operating practices of young adult agricultural workers and identifying individuals who influence workplace practices are important first steps to developing interventions to improve the health and safety of this agricultural population.

Tractors are the leading cause of agriculture-related fatal and non-fatal injuries in the United States [1,2]. However, these injuries are preventable. Engineering solutions including rollover protective structures (ROPS) and seatbelts are effective in preventing operator injury and death [3]. In addition to engineering

controls, tractor manufacturers publish operating manuals with recommendations on prevention of injuries. Common recommendations include using seatbelts, when so equipped, avoiding steep slopes or uneven terrain, and not allowing extra riders.

However, the effectiveness of most available prevention approaches for reducing tractor-related injuries is dependent on the tractor operator's compliance with recommended practices. For example, a driver must manually buckle the seatbelt to keep him/her from being ejected from or crushed by a ROPS-equipped tractor in the event of an overturn. Studies of adult farmers report that few use the seatbelt when operating a tractor with ROPS,

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**Conflict of Interest:** The authors have no conflicts of interest to disclose.

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and many are operating tractors not equipped with ROPS [4,5]. Similarly, adolescents (aged 10–19) report unsafe tractor operating behaviors [4]. However, previous research has not focused on young adult operators over the age of 19, whose behavioral profile and risk taking tendencies may be different from their younger peers nor has research focused on tractor operating practices other than seatbelt use, such as distracted driving or operating on various terrains.

The agricultural industry employs a large proportion of young adult workers, a population at increased risk of injury [6–8]. Tractor operation and maintenance are tasks commonly associated with injury among adolescents and young adults [9]. Exposure to tractors is known to begin at a young age. Youth report driving a tractor independently as young as age 10 years [10] and over 80% of college-aged agricultural students report using tractors consistently [11]. However, it is unknown how young adults are engaging with tractors and their specific operating behaviors.

Furthermore, it is unclear *who* influences the tractor operating practices of young adults. In other occupational settings, supervisors, peers, and parents are known to affect the adoption of safe work practices. Among adult workers, supervisors who apply pressures on workers to be productive and supervisors who do not emphasize safety have been associated with workers performing unsafe work practices [12]. Among adolescents (participant mean age = 16.43) in agricultural and nonagricultural workplaces, risk taking at work was less likely when supervisors were clear about not allowing risks at the workplace [13]. Adolescents are especially vulnerable to peer pressure and adjust their practices to match the practices of those around them to gain acceptance [14].

Tractor operating safety practices are not well documented among young adult agricultural workers (ages 18–24) and determinants of safety practices are largely unknown within the young adult farmer population. Perceived risk taking activities of peers, parents, and supervisors have been found to influence adolescent and adult work practices; however, the effect of these social influencers on young adult agricultural work practices is undetermined. To address these gaps in knowledge, this study was conducted to characterize tractor operating safety practices of young adult agricultural workers and to examine the influence of supervisors, peers, parents, and individual risk taking on safety practices.

## Methods

### Participants

Young adult agricultural workers were recruited from among students enrolled in agricultural science courses at four post-secondary institutions in the Midwest. These institutions included four-year and two-year degree programs and were selected based on the agricultural science courses they offer emphasizing agricultural production, their high student enrollment in the agricultural programs, and their placement of graduates in production agricultural settings. To participate in the study, students must have been between the ages of 18 and 24 and reported participating in agricultural work at least 4 hours a week, on average.

Twelve 15-minute informational presentations were made by the project principal investigator to students enrolled in agricultural courses at the four institutions during the fall of 2014 and spring of 2015. The study objectives and methods were ex-

plained, and interested students were asked to provide their email address to receive the link to the online questionnaire. Of the 373 students enrolled in the classes, 351 provided their email address, 342 emails were delivered, 242 students completed the questionnaire, and 193 responded to the tractor operating questions for an overall participation rate of 51.7%.

### Procedures

Survey materials were pilot tested for comprehension and clarity by recent graduates from agricultural programs who met the study inclusion criteria, and were revised in response to their recommendations.

Participants were emailed a link to the questionnaire administered through Qualtrics (Qualtrics Labs, Provo, UT). To increase participation, three reminder emails were sent to students. The questionnaire took 30 minutes to complete. Participants who completed the questionnaire were compensated \$15. All procedures were approved by the Institutional Review Board at the University of Iowa.

### Measures

The purpose of the survey was to characterize work practices of young adult agricultural workers. Six agricultural work areas were identified: (1) tractor operation, (2) all-terrain vehicle/utility vehicle use, (3) grain handling, (4) pesticide handling/application, (5) livestock handling, and (6) swine facility work. Within each of the six work areas, participants reported their frequency of engaging in specific operating practices. Between 6 and 12 operating practices were listed within each work area. In the present study, only the results relevant to tractor operation are presented.

**Demographic information.** Personal information including age, gender, race, educational status, institution type, and type of farm employed were collected from each participant (Table 1).

**Tractor operating practices.** Twelve questions related to tractor operation (e.g., “I wear a seatbelt if the tractor has a rollover protective structure”) were presented to participants who indicated they operated or drove a tractor (Cronbach  $\alpha = .83$ ) (Table 2). The 12 tractor operating activities included items related to personal protective equipment, distracted driving, and driving conditions/environment, and were selected based on manufacturer’s recommended best practices. Respondents indicated on a five-point Likert scale (1 = Never to 5 = Always) how frequently they participate in each of the activities.

**Social influence.** Participants rated their level of agreement (disagree, neither agree nor disagree, agree) with statements (Table 3) regarding the influence of (1) their supervisors at work (two items, Cronbach  $\alpha = .71$ ) [13], (2) peer/coworker risk taking (two items, Cronbach  $\alpha = .93$ ) [13,15], and (3) parental risk taking (two items, Cronbach  $\alpha = .72$ ) [13,16].

**Global risk taking.** Participants rated their level of agreement (disagree, neither agree nor disagree, agree) with statements regarding their individual risk taking tendencies (five items, Cronbach  $\alpha = .80$ ) (Table 3). Westaby and Lee’s five-item scale was used [8].

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