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Factors That Influence Young Adult Farm Safety Decisions While Entering Agricultural Grain Bins

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Abstract

The approach parents take in the supervision of their youth as they complete hazardous tasks can affect youth safety outcomes on family farms. This research examines the most significant factors affecting youths' decisions to enter agricultural grain storage facilities. Over 200 students attending a Midwestern land-grant university who had grain bin experience as youth completed a decision-making survey. Students chose from a list of actions in three realistic but hypothetical scenarios involving grain bin entry. Afterwards, they ranked factors according to the level of importance in their decision. Although most participants chose options that emphasized safety when answering the scenario questions and held the "personal safety" factor in highest regard, some chose higher risk options and valued "productivity." The findings revealed that youth held little value in their parents' authority and pressure while making decisions related to grain bin entry. The study's limitations are addressed, as are the implications of these findings on youth safety outcomes on family farms.

Keywords

Decision-making, Farm youth safety, Grain bin safety, External pressures

Disciplines

Agriculture | Bioresource and Agricultural Engineering | Risk Analysis

Comments

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FACTORS THAT INFLUENCE YOUNG ADULT FARM SAFETY DECISIONS WHILE ENTERING AGRICULTURAL GRAIN BINS

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Highlights

- A grain handling scenario-based survey instrument was administered to college students studying agriculture.
- Participants chose an action after reading the scenario and ranked factors affecting their decision-making.
- Most participants chose a "safe" option and claimed to value their personal safety when making decisions.
- Parental authority and pressure had little influence on youth decisions to enter grain bins.

ABSTRACT. *The approach parents take in the supervision of their youth as they complete hazardous tasks can affect youth safety outcomes on family farms. This research examines the most significant factors affecting youths' decisions to enter agricultural grain storage facilities. Over 200 students attending a Midwestern land-grant university who had grain bin experience as youth completed a decision-making survey. Students chose from a list of actions in three realistic but hypothetical scenarios involving grain bin entry. Afterwards, they ranked factors according to the level of importance in their decision. Although most participants chose options that emphasized safety when answering the scenario questions and held the "personal safety" factor in highest regard, some chose higher risk options and valued "productivity." The findings revealed that youth held little value in their parents' authority and pressure while making decisions related to grain bin entry. The study's limitations are addressed, as are the implications of these findings on youth safety outcomes on family farms.*

Keywords. *Decision-making, Farm youth safety, Grain bin safety, External pressures*

INTRODUCTION

In 2012, there were approximately 14,000 documented injuries of youth living on, working on, or visiting United States farms (Hendricks et al., 2018). Youth in agriculture are at a unique risk for injuries for several reasons. The lack of separation between their home and work is a primary reason (Rivara, 1997), but there are other risk factors. Youth are more susceptible to injury because they are smaller, weaker, and lack maturity and experience (Arcury et al., 2015). The frequency of injuries and fatalities of agricultural youth has declined in recent years; however, this is not the case when analyzing incidents involving grain storage facilities, or grain bins (Issa et al., 2016).

A grain bin is a type of agricultural confined space that poses both entrapment and engulfment hazards. Grain entrapment is a partial submersion where the victim's head remains visible above the line of grain, whereas grain engulfment is where the victim is fully submerged, and their head is not visible above the line of grain (Issa et al., 2017). Historically, one in five recorded grain entrapment and engulfment cases has involved a youth aged 20 years old and younger (Issa et al., 2016). In 2018 alone, there were five grain entrapment and engulfment cases involving a youth aged 21 years old and younger where age was known (Cheng et al., 2019). From 2015 to 2019, the average annual number of grain entrapment and engulfment cases where age was known that involved a youth aged 21 years old and younger was 2.4 (Cheng et al., 2020; Cheng et al., 2019; Cheng et al., 2018; Issa et al., 2017; Issa et al., 2016).

In an industry with the second-highest fatality rate among youth workers, there are regulations dedicated to protecting young agricultural employees' health and welfare (Miller, 2012). The Hazardous Occupations Orders for Agriculture (HOOA) labeled eleven tasks as too dangerous for youth aged 16 years and younger to complete. One task is "Working inside a fruit, forage, or grain storage designed to retain an oxygen-deficient or toxic atmosphere" (U.S. Department of Labor, 2007, p. 5). However, there are exemptions to this regulation, including, "Youths employed on farms owned or

operated by their parents" (U.S. Department of Labor, 2007, p. 5). The exemption means there is an opportunity for youth under the age of 16 to legally work on a farm owned by their parents. Injury data from Chang et al. (2019), Issa et al., (2017), and others suggest that youth under the age of 16 are not only working on the farm, but they are also injured on the farm. Whether parents are supervising in these situations is not documented in the published literature. Further, little published research has examined the role that parents and other external parties play in influencing youth decision-making about farm hazards.

PARENT AND YOUTH INTERFACE IN AGRICULTURE

Parents may involve their children in farm work because they perceive the benefits outweighing the risks (Elliot et al., 2018). Parents recognize their responsibility in making the farm environment as safe as possible for their youth yet feel unable to protect them in every way (Nilsson, 2016). Parents modeling safe farm behaviors could mitigate their youth's risk-taking tendencies (Jinnah and Stoneman, 2016). Still, unsafe behaviors occur. A positive correlation between fathers' unsafe farm behaviors and their children's behaviors has been documented, as youth often mimic their elders (Jinnah and Stoneman, 2016).

Nearly half of all youth injured on the farm are under the supervision of an adult who is actively completing farm work (Wright et al., 2013). Parents may assume that farm safety is "common sense" (Summers et al., 2017) and that safety conversations can be disregarded because their youth know the hazards. Some parents insist that doing farm work while young teaches youth how to be safe and argue that a minor injury is beneficial because it allows youth to learn safety on their own (Nilsson, 2016). However, because youth have limited life experience, they require explicit safety training.

YOUTH DEVELOPMENT AND RISK-TAKING

Parents may rely on a child's age to determine when youth can complete specific farm tasks (Jinnah

and Stoneman, 2016). Per Piaget's Stage Theory of Cognitive Development, most individuals are inadequate at reasoning and abstract thinking until they reach the Formal Operational Stage at 18 years old (Huitt and Hummel, 2003). Piaget's Stage Theory of Cognitive Development does not account for individual differences between children, but it is accepted by many child development specialists as the best description for how children learn, take in information, and take action (National Research Council, 2000). Given the framework offered by Piaget, farm tasks that require the consideration of multiple moving parts and several hazards, such as those related to grain bins, may be inappropriate for youth younger than 18 years old to complete.

Gender is often another determinant of youth responsibility level on the farm (Summers et al., 2017). Stoneman and Jinnah (2016) determined that fathers believed boys could safely operate machinery at a younger age than girls. This belief was true even though the number of youth farm injuries increases with age, and boys are twice as likely to be injured than girls (Rivara, 1997). Gender also plays a role in risk-taking propensity, as boys are twice as likely to partake in risky activities than girls (Lasenby-Lessard et al., 2013).

Youth who have increased experience with an activity may show heightened risk-taking, and the experience may not necessarily translate to lower levels of injuries (Lasenby-Lessard et al., 2013). Instead, more experience could lead to more injuries because children might take added risks with familiar activities. According to Lasenby-Lessard et al. (2013), children will take added risks when they assess an activity as having low danger and low vulnerability for injury. Thus, continuous exposure to grain storage facilities likely leads to lower risk-assessment levels due to youths' increased experience. Because of their added experience with specific activities, youth decision-making could be skewed.

DECISION-MAKING

The Theory of Cognitive Dissonance explains the relationship between contradicting cognitions, which causes an uncomfortable state of mind (Festinger, 1957). An individual will typically attempt to quickly resolve contradicting cognitions to reduce the mind's discomfort (Mosher et al., 2013). There are three ways an employee could address conflict: (1) ignore their judgment and obey the leadership, (2) ignore the leadership and follow their judgment, or (3) delay the decision until forced to act (Das et al., 2008).

Previous research acknowledges that youth work on their family farms under parental supervision (Summers et al., 2017; Jinnah and Stoneman, 2016; Stoneman and Jinnah, 2016). Any worker must make decisions based on their safety knowledge and external pressures (Mosher et al., 2014), yet there are various additional factors that play a role in decision making. A study by Mosher et al. (2014) presented adult grain elevator workers with a grain bin entry scenario and asked them to choose an action. The study found that safety was the main factor in worker decisions, whereas productivity, peer-pressure, and supervisor opinion were less critical to the decision-making process (Mosher et al., 2014).

This study seeks to determine if youth decision-making patterns concur with adult workers regarding grain bin entry, as documented by Mosher et al. (2014). Data were collected in response to two research questions:

1. What role does parental supervision play in youth safety-related decisions on the family farm?
2. How do the factors of personal safety, productivity, hazard level of the task, likelihood of engulfment, parental authority and pressure, and sibling and peer pressure affect youths' decisions?

METHODS

The study population included students enrolled in the following departments at a Midwestern land-

grant institution: Agricultural and Biosystems Engineering, Agricultural Education and Studies, Agronomy, Animal Sciences, Horticulture, and Economics (N = 2,687 students). The specific academic departments were selected due to their hypothesized concentration of students who grew up on farms, and therefore would have grain bin experience. The sampling frame included students who self-identified as having experience inside grain bins while younger than 18 years old. The precise number of students within the targeted departments who met this criterion cannot be measured or confirmed. Therefore, coverage error is possible (Dillman et al., 2009).

SURVEY

The Qualtrics®^{XM} platform was used for survey development and administration. The Dillman et al. tailored design (2009) helped frame the survey development process. Participant consent was obtained, followed by a screening question to ensure all participants had grain bin experience while younger than 18 years old. Included participants were asked to describe why they were in grain bins as a youth and what tasks they completed.

Next, the survey presented three scenarios involving grain bins. Students chose an action that best reflected how they would react if they were presented with that scenario as a youth under 18 years of age on their family farms. The scenarios read:

Scenario #1

You are working with your parent to unload a grain bin on your family farm when you notice the auger is moving less corn than before. Your parent suggests there may be a blockage of bad grain and asks you to drop into the top of the bin to physically break up the obstruction while the auger continues running. Your parent agrees to supervise the auger.

What is your next step?

A. *Enter the grain bin the remove the blockage*

B. *Use a pole to break up the blockage from outside the bin*

C. *Wait five minutes to see if the blockage breaks down itself*

D. *Tell your parent it is dangerous to enter the bin*

Scenario #2

Your neighbor agreed to help you unload corn from your bin when she gets home from work at 4:00 PM. The local elevator closes at 5:00 PM, and you need to take in your final load of the season to complete your contract. You figure you can at least start without your neighbor's help, and as the clock is ticking, you think about entering the bin to walk down the corn for quicker loading.

What is your next step?

A. *Call your neighbor to see how much longer they will be*

B. *Wait ten minutes and then check the progress of the unloading*

C. *Enter the bin to walk down the corn, potentially speeding up the unload*

D. *Patiently wait for the grain to unload*

Scenario #3

You have a sibling of the same gender and similar age. You are both working to unload a grain bin when you learn there is moldy corn caked on the side of the bin from top to bottom. Your sibling offers to enter the bin to break up the moldy corn they can reach with a shovel. Your sibling suggests you turn off the auger and help him/her break up the blockage.

What is your next step?

A. *Beat on the outside of the bin to break up the blockage*

B. *Communicate the possibility of avalanched grain to your sibling*

C. *Enter the bin to remove the blockage with your sibling*

D. *Wait a few minutes to see if the blockage breaks down itself*

After answering the three scenario questions, respondents were then asked to recall each individual scenario and rank how specific factors affected their decision making in the scenarios. The factors were chosen based on their significant association with safety decision choices in previous research (Mosher et al., 2014; Kouabenan, 2009; Mullen, 2004). The factors included personal safety, productivity, hazard level of the task, likelihood of engulfment, parental pressure and authority, and sibling and peer pressure.

The instrument also collected demographic data such as age, gender, home state, and academic major. Lastly, the survey asked if the participant had been entrapped or engulfed in grain when they were younger than 18 years old. If so, the participant was asked the year of the incident, how old they were when the incident occurred, and, if they wished, to briefly describe the situation.

STATISTICAL ANALYSES

Results were calculated using IBM SPSS® (ver. 27). Chi-square tests of independence were performed to determine if there were dependent relationships between variable pairs. In this study, the variable pairs were the way that participants answered each scenario and the demographic characteristics of gender, age, state, and academic major.

Following the chi-square tests of independence, the standardized adjusted residuals were analyzed to determine the strength of the dependent relationships (Agresti, 1999, p. 261-262). The positive or negative sign of the residuals depend on the difference between the observed frequency of a variable versus its expected frequency. When the observed frequency is greater than the expected frequency, a positive residual is detected. Conversely, when the observed frequency is less than the expected frequency, a

negative residual is found (Agresti, 1999, p. 261-262). An adjusted residual value greater than 2 suggests a dependent relationship between a pair of variables. However, substantial evidence for a dependent relationship between two variables is demonstrated when an adjusted residual value is greater than 3 (Agresti, 1999, p. 261-262).

A statistical analysis was adopted from Keren et al. (2006) to examine the significance of individual decision-making factors versus all other factors. The factors were arranged in the order they were most commonly ranked for each individual scenario. The calculation analyzed the number of times a certain factor was chosen in its most common placing versus the number of times it was chosen in all other placings. For example, the personal safety factor was ranked most commonly as first for Scenario #1. The analysis divided the number of times personal safety was chosen as first by the number of times personal safety was chosen as second, third, fourth, or fifth. One was labeled the ultimate mean, which represented factors that were not prioritized more or less than other factors. If a value less than one was calculated, the factor was deemed less important than other factors. If a value greater than one was calculated, the factor was deemed of greater importance in relation to other factors.

A t-test analysis was also conducted to determine the significance of each factor's mean value compared to the assumed mean value. Because there were five factors to be ranked for Scenarios #1 and #3, the hypothesized mean value, or middle ranking value, was 3. In Scenario #2 however, which only had four factors to be ranked, the hypothesized mean value was 2.5. A significant result indicated that the particular factor was prioritized more than other factors.

RESULTS

The survey yielded 229 recorded responses (11.73% response rate). Of the recorded responses, 206 participants had grain bin experience while younger than 18 years old and were therefore included in the study. Participants who met this criterion were involved with the following grain bin

experiences: cleaning or removing grain from the bin (n = 172, 92.9%), repairs and maintenance (n = 67, 36.2%), playing inside the bin (n = 33, 17.8%), checking the grain level, condition, or moisture content (n = 25, 13.5%), or leveling grain (n = 20, 10.8%). Because the demographic questions were positioned at the end of the survey, there was a percentage of survey breakoff. Some participants completed the scenario portion of the survey but failed to answer the demographic questions. Survey demographics are in Table 1.

One student disclosed that they had been entrapped in grain as a youth. The incident occurred in 2006 when the individual was 11 years old. According to the participant, they were, "Cleaning a bin and following [the] sweep and was wrapped in [the] auger." The participant stated that the local fire department came to the farm to remove them from the grain. The participant was flown to the area hospital for treatment.

Table 1. Characteristics of Student Sample

Gender[1]	Frequency	Percentage
Male	113	66.9%
Female	56	33.1%
Age[2]		
18-21	132	78.1%
22-33	37	21.9%
State[3]		
Iowa	133	79.2%
Non-Iowa	35	20.8%
Academic Major[4]		
Agricultural & Biosystems Engineering	28	16.7%
Agricultural Business	39	23.2%
Agricultural Studies	34	20.2%
Agronomy	39	23.2%
Animal Science	28	16.7%

Note: **[1]N = 169, [2]N = 169, [3]N = 168, [4]N = 168**

SCENARIOS

Two of the variable pairs showed a significant relationship using the chi-square test of independence. The level of significance (α) = .05. The significant pairs were the relationship between gender and Scenario #2, X^2, (3, N = 169) = 12.41, p = .006, and the relationship between gender and Scenario #3, X^2, (3, N = 169) = 8.56, p = .035. Table 2 shows the associations between the demographic variables for each

scenario.

Table 2. Chi Square Values and Significance Levels of Variable Pairs Per Scenario

Variables		Chi-Square Value	Degrees of Freedom	p-Value
Scenario #1:	Gender	7.13	3	0.067
Safety vs. External Pressure	Age	0.41	3	0.938
Scenario #2:	Gender	12.41	3	0.006*
Safety vs. Saving Time	Age	1.85	3	0.602
Scenario #3:	Gender	8.56	3	0.035*
Safety vs. Sibling/Peer Pressure	Age	1.85	3	0.603

Note: *** significant at α = 0.05**

The standardized adjusted residual analysis suggested there was a strong association between males and entry into grain bins in all three scenarios, with males more likely to enter the bin rather than wait. The analysis also indicated that the younger component of the sample, 18 to 21-year-olds, were more likely to choose options that were productive but did not require them to enter the bin, such as using a pole to break up the blockage, beating on the outside of the bin, communicating, or waiting.

Table 3. Adjusted Standardized Residual Analysis of Scenario #1: Safety versus External Pressure

Scenario #1 Options	Gender	
	Male	Female
Enter the grain bin to remove the blockage	3.0**	-2.0*
Tell your parent it is dangerous to enter the bin	0.8	2.1*
Use a pole to break up the blockage from outside the bin	3.4**	1.4
Wait five minutes to see if the blockage breaks down itself	0.7	1.8
	Age	
	18-21	22-33
Enter the grain bin to remove the blockage	1.3	0.0
Tell your parent it is dangerous to enter the bin	2.4*	0.3
Use a pole to break up the blockage from outside the bin	3.2**	1.9
Wait five minutes to see if the blockage breaks down itself	1.7	0.7

Note: ***evidence of association; **evidence of strong association**

Table 4. Adjusted Standardized Residual Analysis of Scenario #2: Safety versus Saving Time

Scenario #2 Options	Gender	
	Male	Female
Call your neighbor to see how much longer they will be	1.0	1.5
Enter the bin to walk down the corn, potentially speeding up the unload	4.3**	-2.6*
Patiently wait for the grain to unload	2.8*	2.3*
Wait ten minutes and then check the progress of the unloading	-0.1	2.9*
	Age	
	18-21	22-33
Call your neighbor to see how much longer they will be	0.8	2.1*
Enter the bin to walk down the corn, potentially speeding up the unload	1.8	0.4
Patiently wait for the grain to unload	4.0**	1.1
Wait ten minutes and then check the progress of the unloading	2.4*	0.0

Note: ***evidence of association; **evidence of strong association**

Table 5. Adjusted Standardized Residual Analysis of Scenario #3: Safety versus Sibling and Peer Pressure

Scenario #3 Options	Gender	
	Male	Female
Beat on the outside of the bin to break up the blockage	3.5**	0.2
Communicate the possibility of avalanched grain to your sibling	0.7	4.7**
Enter the bin to remove the blockage with your sibling	3.1**	-0.8
Wait a few minutes to see if the blockage breaks down itself	1.0	-0.2
	Age	
	18-21	22-33
Beat on the outside of the bin to break up the blockage	3.5**	0.3
Communicate the possibility of avalanched grain to your sibling	4.1**	0.9
Enter the bin to remove the blockage with your sibling	1.0	2.0*
Wait a few minutes to see if the blockage breaks down itself	0.3	0.7

Note: ***evidence of association; **evidence of strong association**

Factors Affecting Scenarios

Scenario #1 analyzed personal safety versus external pressure. In addition to the personal safety factor, external pressure also calculated a value greater than one. This indicates the importance of each factor over other dimensions of the decisions. In Scenario #2, which analyzed personal safety versus saving time, personal safety was the only factor to calculate a value greater than one. Therefore, personal safety was the only factor participants held of great importance in Scenario #2. Scenario #3 examined personal safety versus sibling and peer pressure. The factors of personal safety and sibling and peer pressure provided calculations that were significantly greater than one, indicating their greater importance over the remaining factors. Table 6 outlines the full analysis versus the ultimate mean.

Table 6. Analysis of Factors versus Ultimate Mean

Scenario	Factor	Value
#1: Safety vs. External Pressure	Personal Safety	2.45*
	Productivity	0.72
	Hazard Level of the Task	0.52
	Likelihood of Engulfment	0.69
	Parental Authority and Pressure	1.27*
#2: Safety vs. Saving Time	Personal Safety	1.69*
	Productivity	0.82
	Hazard Level of the Task	0.64
	Likelihood of Engulfment	0.60
#3: Safety vs. Sibling and Peer Pressure	Personal Safety	1.70*
	Productivity	0.67
	Hazard Level of the Task	0.79
	Likelihood of Engulfment	0.58
	Sibling and Peer Pressure	1.70*

Note: ***significant (value greater than the ultimate mean of 1)**

The significance level for the t-test analysis (α) = .001. In Scenario #1, the factors of personal safety,

productivity, and parental authority and pressure all yielded p-values less than .001, which indicated their importance over the factors of hazard level of the task and likelihood of engulfment (Table 7). Two factors yielded significant values for Scenario #2. They were personal safety and likelihood of engulfment (Table 8). Lastly, Scenario #3 yielded three significant p-values less than .001. The factors showing significant values were personal safety, hazard level of the task, and sibling and peer pressure (Table 9). Because all three scenarios exhibited t-test values showing that personal safety was significant, the factor was extremely important in respondents' decision-making.

Table 7. Testing Mean Values for Scenario #1: Safety versus External Pressure

Factor	Mean	Std. Deviation	t-Score	p-Level
Personal Safety	1.42	0.77	-26.444	.000*
Productivity	3.37	1.24	3.872	.000*
Hazard Level of the Task	2.78	1.11	-2.512	.013
Likelihood of Engulfment	3.25	1.12	2.908	.004
Parental Authority and Pressure	4.17	1.12	13.482	.000*

Note: ***N*** **= 166; * significant at α = .001**

Table 8. Testing Mean Values for Scenario #2: Safety versus Saving Time

Factor	Mean	Std. Deviation	t-Score	p-Level
Personal Safety	1.49	0.74	-16.500	.000*
Productivity	2.81	1.25	3.005	.003
Hazard Level of the Task	2.74	0.82	3.476	.001
Likelihood of Engulfment	2.96	0.91	6.142	.000*

Note: ***N*** **= 148; * significant at α = .001**

Table 9. Testing Mean Values for Scenario #3: Safety versus Sibling and Peer Pressure

Factor	Mean	Std. Deviation	t-Score	p-Level
Personal Safety	1.59	0.89	-19.485	.000*
Productivity	3.36	1.31	3.438	.001
Hazard Level of the Task	2.53	0.91	-6.472	.000*
Likelihood of Engulfment	3.11	1.18	1.155	.250
Sibling and Peer Pressure	4.41	0.96	18.073	.000*

Note: ***N*** **= 154; * significant at α = .001**

DISCUSSION

Several noteworthy findings transpired from this study. Research question 1 examined the role of parental supervision in youth safety-related decisions on the family farm. Results from Scenario #1, which

analyzed personal safety versus external pressure (including parental pressure), showed that participants in this study generally did not place these external pressures above their personal safety. Instead, the participants looked for other ways to remain productive rather than enter the bin, confront the parent, or wait until they were forced to act.

Research question 2 analyzed the factors that affected youths' decision-making. The factors analyzed were personal safety, productivity, hazard level of the task, likelihood of engulfment, parental pressure and authority, and sibling and peer pressure. From the survey results, it is evident that participants considered their personal safety when making grain bin entry decisions. Both results aligned with the findings of Mosher et al. (2014) and Keren, Mills, Freeman, and Shelley (2009), which found that personal safety was important to workers while making decision choices in grain handling and industrial settings, respectively. The t-tests generated the same result – personal safety was significant in the decision-making processes for all three scenarios, indicating that respondents highly valued their personal safety in this decision choice.

The findings revealed differences among participants' choices according to their demographics. The younger population was much more likely to find alternative methods to remain productive instead of entering the bin. This population favored using a pole or beating on the outside of the grain bin to break up the blockage. The older population could have indicated more risk-averse behavior for various reasons, but the younger population, likely due in part to their lack of experience, may feel differently.

Gender differences played a noteworthy role in youth safety-related decisions. In Scenarios #2 and #3, there was a significant difference between the decision-making of males and females. In both scenarios, males were more willing to enter the grain bin. Females were more likely to wait until forced to act or choose an alternative option, even if it took more time. The findings concur with previous research that determined females and males behave differently in high-risk environments (Lasenby-Lessard et al.,

2013). The differences in responses with gender raises a question about how parents supervise their sons versus how they supervise their daughters while working on the farm. A closer examination of these differences in future research is warranted.

Aside from their decision-making and demographic associations, participants were highly aware of grain entrapment hazards. The t-test result for Scenario #3 showed a significant value for hazard level of the task, indicating that respondents knew the level of hazards associated with the avalanched grain scenario and hazards of the confined space. The finding aligns with other work suggesting that youth are familiar with hazards (McCallum, Murphy, Reed, Claunch, and Reynolds, 2013; Ramaswamy and Mosher, 2015; Wright, Marlenga, and Lee, 2013). Similarly, Scenario #2's t-test produced a significant value for likelihood of engulfment. Therefore, respondents knew the dangers of walking down grain in Scenario #2 and thought there was a high likelihood that they may become engulfed. In general, participants knew the hazards associated with grain bin entry.

Because self-preservation was held in such high regard, and participants were well aware of the hazards, it is questionable why grain entrapment incidents continue to occur. Knowing the hazards associated with grain bin entry does not always correspond with safely completing tasks (Sanderson, Dukeshire, Rangel, and Garbes, 2010). Undoubtedly, the factor related to saving time plays a role in youth grain bin entry decisions, although the data suggests that participants did not hold saving time at a high level of importance. The findings of this study point toward the need for additional research to understand more broadly the influencing factors in youth decisions regarding hazardous farm tasks, including entry into grain bins.

LIMITATIONS

Several limitations of the study should be noted. Because participants were aware that the study was analyzing farm safety, they may have responded in a more risk-averse manner, resulting in response

bias (Creswell, 2012). Further, the characteristics of the study population – undergraduates at a Midwestern land-grant institution – could have influenced each person's perspective on safety, also raising the possibility of response bias. Specifically, social desirability bias is possible, as participants may have responded in socially appropriate ways instead of revealing their true stance (Grimm, 2010). To help combat this issue, the survey reminded participants that "There are no right or wrong answers," because what may be considered "right" from a safety perspective differs drastically from what is "right" from a productivity standpoint. Additionally, participants were reminded that the researcher wanted to identify "How you would first react if you were in each situation." Despite the reminders, it is possible that some respondents still provided biased responses.

The scenarios were intended to be as realistic as possible, however, they are hypothetical. A participant could have answered the scenario one way on the survey but a different way in person. Therefore, it is acknowledged that there could be a difference between what respondents reported they "might" do in a situation versus what they would "actually" do in a real situation. However, Kahneman and Tversky (1979) determined that providing respondents with the chance to make a hypothetical choice is the simplest procedure to examine theoretical questions. Therefore, posing hypothetical scenarios and asking respondents how they would react is a rational method for collecting the data for this study.

Instead of sampling a population that was younger than 18 years old, the sample population in this research was college students studying agriculture at a Midwestern university who were responding to hypothetical scenarios that may have occurred while they were younger. This population was selected primarily since there is a lack of research on how collegiate-aged individuals perceive safety hazards on the farm. The study sought to fill this void. Additionally, Institutional Review Board approval was less rigorous while utilizing a population greater than 18 years old, since parental consent was not needed for each individual respondent. Therefore, this study does not adequately capture the attitudes and safety

perceptions of youth aged 18 and younger, as it was not the intention of this study. There is also a possibility that respondents will not remember their actions as they actually occurred due to the respondents' distance from the choice from a time standpoint. While the population utilized in this study may seem like a possible limitation, the researchers do not consider it to have influenced the findings.

Lastly, this study only surveyed students from one Midwestern university. The results cannot be generalized to other universities or various years at the same university due to discrepancies in enrollment figures and demographics. In addition, because this population is studying at a four-year institution, they may think about safety differently or be more safety-conscious than a population within the same age range but who are not pursuing post-secondary education. Again, these results cannot be adequately generalized to other populations within the same age range, without accounting for discrepancies in education levels. The researcher acknowledged this limitation before beginning the study. The study was intended to better understand the situations in which youth made safe or unsafe decisions on the farm all while facing external pressures of parental authority and pressure, sibling and pressure, or productivity.

CONCLUSION

Youth value their personal safety and are aware of hazards associated with grain bin entry. Factors of parental authority and pressure, sibling and peer pressure, and productivity do not influence youth decisions regarding grain bin entry. Though, it is still questionable why youth choose to make hazardous decisions involving grain bins.

It is evident that there is much more to understand about youth decision-making in hazardous agricultural situations. Additional research should be conducted expanding the participant population to include a broader scope and adapting the survey instrument to include various agricultural tasks. There may also be associations between participant demographics and decision-making. A better understanding of the youth decision-making process would allow safety professionals to pinpoint the

contributing factors in youth farm incidents and prevent their occurrence.

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