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Do Cialdini's "Principles of Influence" Motivate Safe Practices on Farms?

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ABSTRACT

On farms, power take-off (PTO) drivelines pose serious risks in terms of both fatal and non-fatal injuries. PTO shielding can prevent such injuries; however, is often underutilized by the farm population. This study aims assesses seven influence campaigns and their ability to change attitudes toward PTO shielding in order to encourage sustainable behavior change. Seven strategies based on common principles of influence (liking, social proof, authority, consistency, reciprocity, and scarcity) were implemented in seven agricultural counties in upstate New York. Pre- and post- tests focused on shielding behaviors and attitudes, as well as the presence of the influence strategies, were used to assess changes resulting from these interventions. Little change in the presence of influence strategies was noted from baseline to follow-up. Additionally, there were no significant changes in behavior or attitude toward PTO shielding in the same time period, indicating the failure of the interventions to create change. The findings of this study support the challenges identified in past efforts to increase the use of PTO shields on farms and highlight the need for more intensive, focused interventions. Future studies can use these lessons to develop more robust interventions for improved outcomes.

KEYWORDS

Power take-off; agricultural safety; behavior change; attitude change; Kelman's processes of change

Introduction

Power take-off (PTO) entanglements present significant challenges to the agricultural world. A recent report of NY agricultural fatalities indicated that machinery entanglements, including PTO entanglements, were the third most frequent cause of death on the state's farms.[1]However, according to assessments of agricultural driveline-related injuries and fatalities, only 40% of these events result in fatalities; an additional 40% of all PTO entanglements result in amputations, with the remaining 20% contributing to less-severe injury counts.[2] Such PTO entanglements can have devastating effects on the physical, emotional, and financial wellbeing of victims and their families, farms, and communities.

While PTO entanglements can be severe, proper guarding of PTO drivelines can prevent these events. Properly guarded PTO drivelines include shields that cover the length of the driveline, as well as the joints, and are free from deformities.[3] Improvements to PTO shields overtime have led to the development of universal fit, low-cost shielding options that are easier to install, maintain, and replace.[4] These improvements have addressed two of the three largest reported barriers to shielding: PTO shield cost and time required to purchase and install.[4,5] The final barrier – denial of personal risk[5] – is one which is better suited to being addressed through behavior change intervention.

Identification and promotion of these improved shields was the first component of a social marketing strategy previously trialed with farmers in NY. Social marketing strategies have proven successful in addressing other occupational safety and health (OSH) issues[6,7] and thus were employed for promoting PTO shield installation among farmers in NY.[4,8] Social marketing encourages voluntary behavior change by limiting barriers to engaging in healthier behaviors while enhancing motivational factors and facilitators.[9] In the prior study focused on social marketing of PTO shields, this not only included increasing access to the improved PTO shields, but also using tailored messages to highlight the benefits of adequate

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shielding as well as the real-life consequences of not shielding PTO drivelines.

At the end of the study; however, social marketing strategies were less successful than other "typical" OSH interventions, including safety trainings, at encouraging the uptake of PTO shields.[4] While trainings are beneficial, they are insufficient for motivating the extensive uptake of PTO shielding activity necessary to make a significant impact on the frequency of entanglement.

The limited success of the prior social marketing approach led to the hypothesis that while improvements to shields are important, a larger barrier to increasing shielding rates is the long history that farmers have had with products that are difficult to use, difficult to find, and which are expensive. These factors appeared to be integral to farmers' reluctance to even trial new and improved shields. The current study aims persuade farmers to move past prior negative experiences with older PTO shield designs and increase PTO shielding among NY farmers by using the six "Principles of Influence" (POIs) described by Cialdini: liking, social proof, authority, reciprocity, scarcity, and consistency.

Principles of influence

Cialdini's POIs outline common strategies used to encourage behaviors. These strategies are used in everyday life by marketers and individuals and can be preplanned or rely on more organic, off-the-cuff, methods (e.g. trying to persuade a friend to engage in an activity). In marketing, these strategies are purposefully implemented to gain consumer trust in brands and products. Similarly, in social marketing, these efforts can be used to gain trust in promotors (e.g. public health practitioners) and encourage health behaviors.

However, social marketing and POI campaigns differ slightly in that social marketing primarly focuses on removing barriers in ways that make behaviors easier and more accessible, while POIs focus on motivating factors that are largely driven by social relationships and social cues. Given the campaigns focus on social behaviors and social cues, the research team chose Kelman's Processes of Change to develop the evaluation framework for the study.

According to psychologist H. Kelman, there are three processes that characterize the impact of social influence on changes in attitude. These are 1) *Compliance*-which can be described as a change in behavior, but not necessarily a change in attitude, 2) *Identification*- which is described as a change in either attitude, behavior or both due to the influence of a person or group who is liked and 3) *Internalization*-which is characterized by a change in behavior and attitude due to the congruence of the behavior with the individual's belief system. While these levels are indicative of behavior change, they also provide an assessment of the motivational factors that encourage behavior change, as well as sustainability of those behaviors. Behaviors that are fueled by concerns about compliance, for example, are likely to end if the authoritative body or rule is removed. On the other hand, those who fall within the internalization stage for a particular behavior are likely to continue the behavior regardless of external stimulation. Thus Kelman's Processes of Change allowed the study team to focus the assessment of POI campaign impact on social factors (which are heavily emphasized in POI campaigns) and underlying motivations (which may indicate the sustainability of behavior changes).

Each of the POIs described by Cialdini[10] are outlined below, along with a brief description of the PTO intervention designed around each. An example of marketing materials used in the consistency intervention can be found in Figure 1, while other examples are available upon request to the authors. These interventions were designed with input from farmers and agribusiness partners via POI focus group discussions in each of the intervention counties.[11] Based on feedback from these discussions, the research team designed and implemented a POI strategy for each intervention county over a three month period. These POI strategies were organized in conjunction with local stakeholders, who assisted with the dissemination of intervention promotions. Because of financial constraints, several of the interventions relied on mailings versus more robust interventions. For each of these strategies, farmers were also given a toll-free number and information on where to easily and affordably obtain shields through the New York Center of Agricultural

Figure 1. Example of materials used in the consistency intervention.

Medicine and Health (NYCAMH) Personal Protective Equipment Program (PPE). The Center provides PTO drivelines that are user-friendly (i.e. features such as universal bearings and telescoping shield designs for ease of maintenance) at a reduced price ($59 to 83 USD). For interventions that required mailed materials, mailing lists were obtained from Farm Market iD.[12] Farm Market iD utilizes both public and private data sources to populate listings of farm contacts within defined regions. This database is updated quarterly.

Authority: The principle of authority indicates that individuals are more likely to heed the advice of those in authoritative positions. In this study, a county sheriff's department distributed letters (using their own stationary) to farmers urging them to consider shielding their unshielded PTO drivelines. In prior focus groups with farmers, emergency services, including police, were considered to be authority figures. Sheriff's departments were selected because they cover full counties, rather than individual towns. These letters detailed the importance of PTO driveline shielding and the consequences of using PTO drivelines that do not have well-maintained shields. Information on how to purchase shields through the NYCAMH PPE program was also provided.

Reciprocity: The reciprocity strategy focuses on the idea that individuals are likely to "return the favor," or do something for someone who has previously done something for them. Farmers in this region were mailed 5 USD Dunkin Donuts gift cards, along with packets of information about how to purchase PTO shields through the NYCAMH PPE program.

Scarcity: Limited time offers and limited supplies demonstrate the principle of scarcity, which indicates that individuals are more likely to immediately take advantage of something that is at risk of becoming unavailable. This intervention promoted a week-long PTO driveline shielding sale through the NYCAMH PPE program. This sale included free shipping on all PTO shield orders.

Liking: The principle of liking suggests that humans are more likely to respond positively to requests by individuals deemed "likable." The intervention around this POI focused on having popular, well-known farmers pass on information about the new PTO shields and where to purchase them. These individuals were selected based on their engagement in the local community and agricultural organizations, as well as referrals from local farmers and agribusinesses. These farmers were asked to track their interactions (number of instances and individuals in which information about the NYCAMH PPE PTO shield program was provided) and provide this information to the study team.

Social Proof: Social proof strategies can be considered similar to social norming campaigns. This POI states that as more individuals begin participating in a behavior, the behavior becomes more enticing. Farmers in this group were mailed materials highlighting the high percentage of farmers with a positive opinion of the new PTO shields. The materials also shared information on how to purchase PTO shields through the NYCAMH PPE program.

Consistency: The consistency principle relies on an intrinsic human need to be consistent with one's own thoughts, beliefs, and actions. Thus, materials were mailed directly to farms that highlighted how PTO shielding is aligned and consistent with farm values, such as responsibility, resourcefulness and stewardship. In particular, materials emphasized the need to work safely as a method of preserving the farm legacy – a common goal of farmers.

Miscellaneous: Though Cialdini's POIs have been well-documented and successful, the research team also wanted to give the farm community an opportunity to develop interventions outside of the six POIs. Farmer focus groups led to an intervention that involved farm wives distributing PTO shielding information through their own social circles in order to increase shielding rates. This intervention reflected aspects of the liking and social proof POIs. Individuals were identified and interactions were tracked and reported in manner similar to the liking campaign.

Methods

Survey development

The survey instrument used in this study aimed to understand changes in behavior and attitude over time as a result of the POIs. While a number of theories outline stages to behavior change, few highlight individual the motivations behind these attitudes and behaviors. Kelman's Processes of Change include three levels, or motivational reasons for individuals to participate in a behavior:

(1) Compliance: the individual feels the behavior is required
(2) Identification: the individual feels the behavior is socially encouraged by close family or peers
(3) Internalization: the individual has an intrinsic belief in the behavior

To understand which Kelman level participants fit into, survey questions were included to determine first if the individual was participating in the behavior (in this case, maintaining proper PTO shielding), and second to understand individuals' attitudes toward shielding.

In a prior survey of PTO shield use, farmers were asked "which [pieces of equipment] on your farm are completely shielded," referring to PTO shields. Unfortunately, self-reported use of PTO shields led to drastic overestimates in adequate shielding rates, as later determined by visual inspections of PTO drivelines.[13] To remedy these types of self-report errors behavior questions in the current survey focused on specific action steps to ensure proper PTO shielding. These questions asked participants if they had checked their PTO driveline shields, if any needed replacing, and if those that needed replacing were replaced. Questions related to attitude included, "do you feel that PTO shielding is important," and "why," with options related to each of the Kelman levels included as multiple choice responses.

In addition to questions pertaining to behaviors and attitudes, questions pertaining to the presence of each POI in the community were also included to gauge exposure to the interventions (or similar strategies) at both baseline and follow-up. These questions asked participants to rate their agreement that a particular POI was present in their community on a scale of 1 (strongly disagree) to 10 (strongly agree). Based on the principles behind each POI, each is predicted to encourage behavior either through compliance, identification, or internalization (Table 1).

In addition to these primary sections, participants were asked two eligibility and one demographic question at the beginning of the survey: if they intended to continue farming for at least two years, if they used PTO-driven equipment on their farm, and their farm commodity.

Table 1. POI strategies' anticipated influence in terms of Kelman's Processes of Change.

POI, Principles of Influence	Compliance	Identification	Internalization
Authority	X		
Reciprocity	X		
Scarcity	X		
Liking		X	
Social Proof		X	
Miscellaneous		X	
Consistency			X

Table 2. Agricultural rankings (based on number of farms), number of farms, and randomized POI assignment for intervention counties.[13]

County	NYS Agricultural Ranking	Number of Farms	Intervention
Steuben	1	1,542	Scarcity
St. Lawrence	2	1,253	Miscellaneous
Chautauqua	3	1,228	Reciprocity
Oneida	4	967	Consistency
Washington	7	915	Liking
Otsego	8	880	Social Proof
Cayuga	10	842	Authority
Cattaraugus	5	956	Control
Erie	6	940	
Yates	9	867	
Ontario	11	833	
Wayne	12	829	
Jefferson	13	792	
Madison	16	691	

POI, Principles of Influence; NYS, New York State

Study population

Fourteen New York counties with large agricultural populations (Table 2) were included in this study. This includes seven intervention counties (Cayuga, Oneida, St. Lawrence, Chautauqua, Steuben, Washington, and Otsego) and seven control counties (Cattaraugus, Erie, Jefferson, Madison, Ontario, Wayne, and Yates). Each POI intervention was randomly assigned to each of the intervention counties (Table 2).

Within each intervention and control county, study participants were randomly selected from a list of farmers provided by Farm Market iD.[12] Individual participants were excluded from the study if they did not plan to continue farming for at least two years from the baseline survey or if they did not have PTO-driven equipment on their farm.

Data collection

Baseline and follow-up surveys were conducted in order to capture changes in attitude and behavior as a result of the intervention. In general, the protocol for both survey rounds was the same. Surveys were first distributed to participants via mail. Up to seven telephone calls (two morning, two afternoon, two evening, and one weekend) were made to non-responders as well as those who returned partially completed surveys. Baseline surveys continued until an adequate number of participants [to conduct statistical analysis] had responded in each intervention and control county; follow-up surveys continued until the survey protocol was exhausted for all participants enrolled at baseline.

Baseline surveys were distributed in several rounds in order to acquire an adequate sample size. A total of 2,952 surveys were mailed to famers in three rounds between August 2017 and October 2018. From July to October 2018, a temporary hold to survey distribution and follow-up telephone calls was put in place due to the growing season. At this point 193 individuals who were previously contacted for participation but had not yet responded were excluded due to a clause in the Farm Market iD contract prohibiting further contact with non-responders after a period of one year.

Due to the interventions starting in January 2019, those whose surveys were mailed in October 2018 were not followed up with via telephone as this method was shown to be time-consuming and unproductive. These participants were instead issued a survey reminder along with a 5 USD gift card in December 2018. All baseline survey participants were entered in a raffle for a 1,000 USD Tractor Supply gift card.

Follow-up surveys were distributed via mail in July 2019. Follow-up surveys were distributed to 665 farmers from the baseline survey. Participants were sent the survey along with a 5 USD gift card. Due to the growing season, the study team did not begin making follow-up calls to non-responders until October 2019. The contact protocol was completed for all participants in the follow-up survey with calls being completed in December 2019. Participants were excluded in the follow-up survey if they were no longer farming or they did not have PTO-driven equipment on their farm.

Kelman classification

Participants were given a score for the baseline survey as well as for the follow-up survey. The questions on the survey demonstrated the participants reported attitude and behavior regarding PTO driveline shielding. Figure 2 demonstrates the process the study team used in classifying the

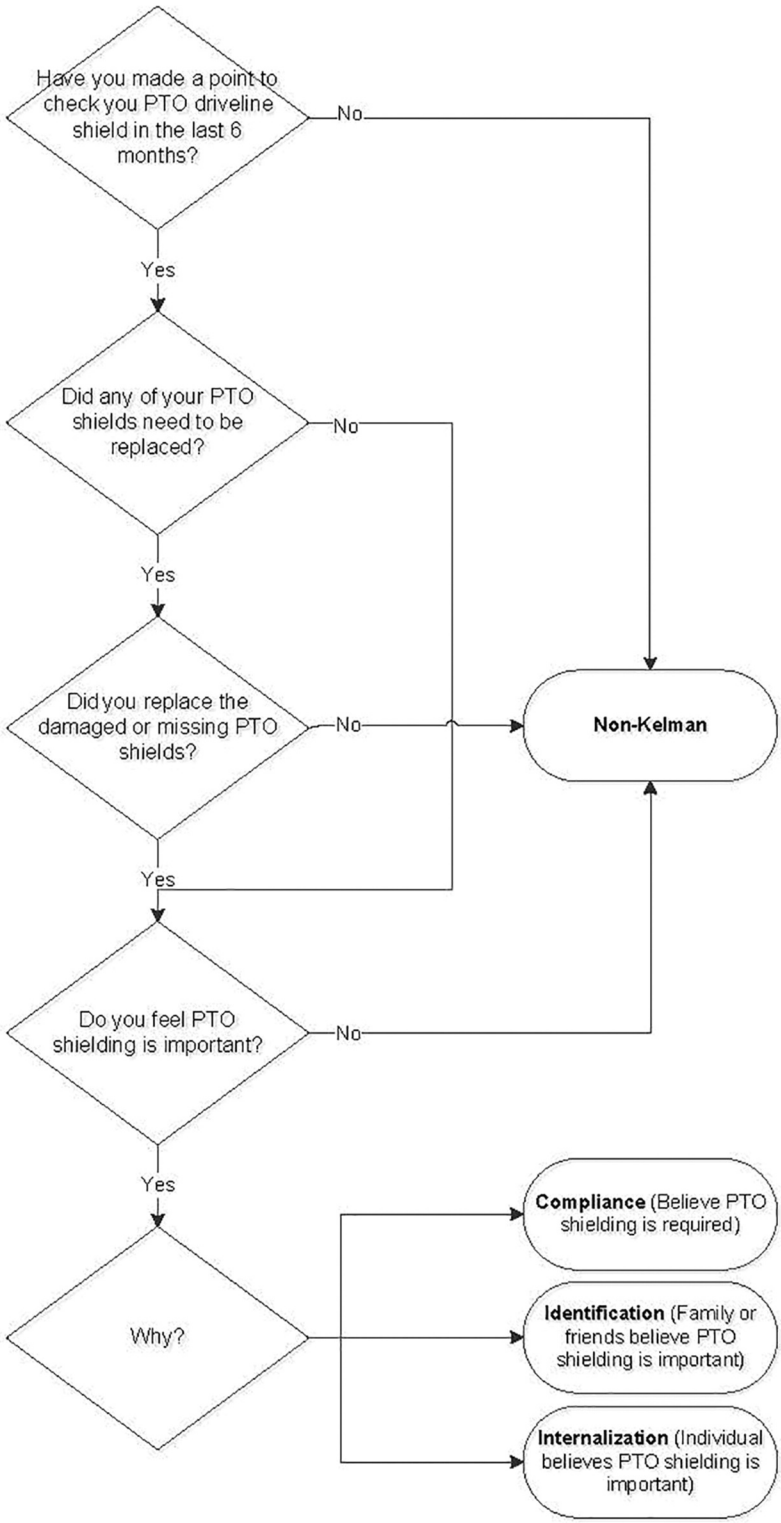

Figure 2. Simplified process demonstrating the classification of survey participants into Kelman stages.

participants based on their answers to the surveys. A participant who had reported proper maintenance of their PTO driveline shields (i.e. who had checked their PTO driveline shields and replaced them as needed) as well as indicated that PTO shielding was important were classified into one of three Kelman processes (compliance, identification, or internalization) based off their answer as to why they felt PTO shielding was important. Individuals who did not select one of

the pre-established responses to "why do you feel PTO shielding is important," had the option to enter a free-text response. Consensus among two members of the research team was used to categorize these responses into one of the Kelman categories, if appropriate. Those responses that did not fit within one of the Kelman processes led to a non-Kelman categorization.

A participant who reported improper maintenance of their PTO driveline shields (i.e. who had either not checked their shields or had not replaced damaged or missing shields) were classified as "non-Kelman". Participants were also classified as "non-Kelman" if they reported that their PTO driveline shields were properly maintained, but that PTO shielding is not important.

In addition to the three Kelman categories and the non-Kelman category, some participants were not able to be classified. This occurred in instances when the study team was unable to determine either behavior or attitude due to blank or incorrectly answered questions. In cases in which these types of responses were collected via paper survey, the calling protocol was implemented to attempt to follow-up with these individuals.

POI indicators

In addition to measuring Kelman scores, the presence of specific POI strategies in each county were assessed at both baseline and follow-up. In taking the average score for each POI (between one and 10), a lower score indicates limited presence of the POI, while a higher score indicates a greater presence of the POI. At baseline, these questions confirmed that the POI strategies were not fully present in the counties prior to implementation of the interventions for this study. Second these questions confirmed if the interventions being tested reached the populations (indicated by an increased POI score in the post-condition).

Data analysis

The most important goal of the survey data was to estimate the relationship between changes in the six impact scores and changes in the four behavioral endpoints using Pearson's correlation and regression modeling. In order to be useful for intervention purposes, the correlation of an impact change with a change in a behavioral outcome was required to be at least .33 (explaining 10% of the variability in the outcome). Using a two-tailed alpha of .05, and testing the correlation for significance using Fisher's Z transformation, a sample of 70 surveys within each agricultural community provided power of .80 for these hypothesis tests.

Although it would have been ideal to have a separate control group within each of the seven counties, this was completely beyond the budgetary constraints of the study. Therefore, in order for the control group to be equally representative of the seven counties as a whole, an equal number of subjects was drawn from each county to comprise this group.

The frequencies of the four Kelman levels were summarized for both the pre- and post- conditions. This summary included the baseline values for subjects who were lost to follow-up. The mean reported presence of each POI were also calculated for both the pre- and post- conditions, aggregated across all study respondents. The mean pre- to post- change in the presence of each POI was also calculated for each country and the control region. The test of the null hypothesis that the mean of these difference scores was equal to zero was performed using Wilcoxon Signed Rank Test.

Two separate analyses were performed to compare the pre-to-post difference scores in both Kelman levels and the presence of the seven POIs between treatment and controls groups. This included only the 403 subjects who completed both the pre- and post- surveys. The first of these analyses compared the aggregate of the seven intervention counties combined versus the control group using the Wilcoxon Rank-Sum Test. The second analysis compared the non-aggregated data of the seven counties versus the control groups using one-by-eight Kruskal-Wallis tests.

The two separate analyses that were performed to compare the pre-to-post difference scores were designed to answer two different questions. The first analysis was used to assess whether or not the entire aggregated intervention group differed from the control group. The second analysis, the one by eight Kruskal-Wallis test, was used to provide

a comparison of each intervention separately to the others as well as to the control group. If a significant overall result had been obtained in this second analysis, it would have provided the necessary justification to perform post-hoc pairwise comparisons to identify which specific groups differed from each other.

Ethics

This study was approved by the Mary Imogene Bassett Hospital Institutional Review Board.

Results

A total of 2,952 farmers were contacted for participation in this study. Of these, 185 (6%) individuals explicitly refused participation, 299 (10%) were ineligible, 1,841 (62.4%) could not be reached. The remaining 627 (21.2%) completed the baseline survey. Of the 627 participants, 403 (64.3%) also responded to the follow-up survey. Table 3 shows response rates by county for the baseline and follow-up surveys. Among respondents, the following commodities were reported: dairy (33.7%), hay (25.1%), livestock (23.4%), crop (16.8%), fruit (5.4%), vegetable (4.1%), and other (9.0%). Participants were able to select multiple commodities.

Table 4 shows the frequencies of each Kelman level at baseline and follow-up, with the majority classified at either end of the Kelman levels (non-Kelman or internalization) and relatively fewer

Table 3. Survey response rates by county.

			Baseline		Follow-Up	
	County	Time	Surveys Distributed	Response Rate	Surveys Distributed	Response Rate
Intervention	Cayuga	Baseline	400	19.0%	78	75.6%
	Chautauqua	Baseline	415	16.4%	70	55.7%
	Oneida	Baseline	305	26.2%	81	65.4%
	Otsego	Baseline	240	35.8%	86	59.3%
	Steuben	Baseline	325	24.9%	81	67.9%
	St. Lawrence	Baseline	432	14.6%	64	68.9%
	Washington	Baseline	345	20.6%	75	61.3%
Control	Cattaraugus	Baseline	70	12.9%	9	55.6%
	Erie	Baseline	70	11.4%	8	62.5%
	Jefferson	Baseline	70	20.0%	14	65.0%
	Madison	Baseline	70	22.9%	17	58.8%
	Ontario	Baseline	70	24.3%	18	44.4%
	Wayne	Baseline	70	15.7%	11	72.7%
	Yates	Baseline	70	21.4%	15	80.0%

Table 4. Number of survey respondents classified into each Kelman stage at baseline and follow-up by county. A total of 14 individuals at baseline were unable to be classified based on their survey responses and are excluded from the totals presented in the table. All but two participants at follow-up could be classified.

County	Time	Non-Kelman[a]	Compliance[a]	Identification[a]	Internalization[a]
Cayuga	Baseline (n = 76)	28 *(36.8%)*	4 *(5.3%)*	1 *(1.3%)*	43 *(56.6%)*
	Follow-up (n = 59)	20 *(33.9%)*	9 *(15.3%)*	3 *(5.1%)*	27 *(45.8%)*
Chautauqua	Baseline (n = 68)	22 *(32.4%)*	12 *(17.6%)*	1 *(1.5%)*	33 *(48.5%)*
	Follow-up (n = 39)	13 *(33.3%)*	5 *(12.8%)*	1 *(2.6%)*	20 *(51.3%)*
Oneida	Baseline (n = 80)	24 *(30%)*	13 *(16.3%)*	1 *(1.3%)*	42 *(52.5%)*
	Follow-up (n = 53)	19 *(35.8%)*	6 *(11.3%)*	0 *(0%)*	28 *(52.8%)*
Otsego	Baseline (n = 86)	36 *(41.9%)*	11 *(12.8%)*	3 *(3.5%)*	36 *(41.9%)*
	Follow-up (n = 51)	21 *(41.2%)*	7 *(13.7%)*	0 *(0%)*	23 *(45.1%)*
Steuben	Baseline (n = 81)	23 *(28.4%)*	10 *(12.3%)*	4 *(4.9%)*	44 *(54.3%)*
	Follow-up (n = 55)	12 *(21.8%)*	12 *(21.8%)*	0 *(0%)*	31 *(56.4%)*
St. Lawrence	Baseline (n = 63)	21 *(33.3%)*	5 *(7.9%)*	0 *(0%)*	37 *(58.7%)*
	Follow-up (n = 44)	19 *(43.2%)*	1 *(2.3%)*	2 *(4.5%)*	22 *(50%)*
Washington	Baseline (n = 71)	28 *(39.4%)*	8 *(11.3%)*	2 *(2.8%)*	33 *(46.5%)*
	Follow-up (n = 46)	15 *(32.6%)*	10 *(21.7%)*	2 *(4.3%)*	19 *(41.3%)*
Control	Baseline (n = 88)	37 *(42.0%)*	8 *(9.1%)*	1 *(1.1%)*	42 *(47.7%)*
	Follow-up (n = 56)	13 *(23.2%)*	11 *(19.6%)*	2 *(3.6%)*	30 *(53.6%)*

[a]All data are shown as "n *(row percent)*"

subjects in the middle levels (compliance and identification).

Of those who were classified as non-Kelman (n = 219 at baseline and 132 at follow-up), an average of 98.6% (n = 261, range 95.8% – 100%) at baseline and 99.2% (n = 131, range 94.7% – 100%) at follow-up were classified as such because they did not engage in PTO shielding behaviors. Eight of these individuals at baseline and three at follow-up also reported that PTO shielding was not important – a second factor qualifying individuals for the non-Kelman classification. Two individuals at baseline and one at follow-up reported proper PTO shielding but indicated that shielding is not important to them while just one individual at baseline could not be classified into a Kelman category based on their reasons for believing PTO shielding was important.

The aggregated reported presence of the seven POIs in the pre- and post- conditions are shown in Table 5. These data appear to show a dichotomy with social proof, liking, and authority being relatively higher on the 10-point scales and reciprocity, consistency, and scarcity having lower levels.

When considering the seven intervention counties together versus the control region, there were no significant differences in the pre-to-post changes in the reported presences of the seven POIs or Kelman Levels. When considered as seven individual interventions and a control, there were significant overall Kruskall-Wallis results for both reciprocity and scarcity. However, in neither case was this result in congruence with the individual interventions (i.e. the significant differences from the control counties were in not in the counties in which the respective interventions were implemented).

Table 5. Presence of each POI at baseline and follow-up. A score of 1 means that the POI is non-existent in the community while a score of 10 indicates that the POI is heavily present in the community.

Presence of POI Strategy		
	Baseline	Follow-up
Authority	6.843	6.923
Reciprocity	2.609	3.336
Consistency	2.67	3.691
Social Proof	7.207	7.567
Scarcity	2.344	3.185
Liking	7.191	7.293

POI, Principles of Influence

Table 6 shows the mean change in POI strategy measures and Kelman scores for those completing both the baseline and follow-up survey by county (n = 403). Greyed boxes indicate the change in the POI strategy measure for the specific POI strategy implemented in the county. St. Lawrence County was not assigned a specific POI; however, the intervention (using networks of farm wives to encourage the uptake of PTO shields) was reflective of both the liking and social proof strategies, thus both are considered. Though there was some statistically significant increases in POI strategy presence in several counties, only Steuben County saw a statistically significant increase in the POI strategy implemented in the county through this study (scarcity). Oneida County also saw a nearly significant increase in the reported presence of its matched POI strategy (consistency). There were no statistically significant shifts in Kelman scores in any of the intervention counties. However, there was a significant shift in Kelman scores in the control group (mean change = 0.426, p = 0.035).

Discussion

The intent of this study was to build on prior social marketing efforts to increase the proper guarding of PTO drivelines on New York State farms. The strategies trialed in this study included seven distinct interventions developed based on six POIs and impact was measured based on Kelman's processes of change. Assignment into one of the Kelman levels (compliance, identification, and internalization) allows for two initial assumptions. First, to be assigned to a Kelman level, the individual must be participating in the behavior. Thus, those not engaged in the behavior are classified as "non-Kelman." Second, advancement through the Kelman levels result in more sustainable behaviors over time. Thus, even if a participant was participating in the behavior ahead of time, movement from compliance-related behaviors to internalization of behaviors is interpreted as a positive shift. Unfortunately, the results of this study demonstrated little overall change in attitudes, behaviors, and the reported presence of POIs from baseline to follow-up. Similarly, there was no impact on Kelman stages based on the aligned POIs (e.g.

Table 6. Mean change in the presence of each POI and Kelman scores, by county. Greyed boxes indicate the POI(s) applied in each county through the interventions implemented in this study.

			Mean Change in Presence of POI Strategies, by County					
County	Strategy	Mean Change in Kelman Scores	Authority	Reciprocity	Consistency	Social Proof	Scarcity	Liking
Cayuga	Authority	0.140	−0.036	0.614	1.228[a]	0.310	0.790	0.088
Chautauqua	Reciprocity	−0.114	0.410	−0.463	0.513	0.615	−0.744	0.650
Oneida	Consistency	0.019	0.094	1.157	1.231[d]	0.528	1.745[b]	0.434
Otsego	Social Proof	0.078	−0.542	1.830 [c]	1.146[a]	0.061	1.532[b]	−0.510
Steuben	Scarcity	0.164	0.423	0.655	1.268[a]	−0.556	1.161[b]	0.192
St. Lawrence	Miscellaneous	−0.233	0.333	0.196	0.022	0.205	0.289	−0.159
Washington	Liking	−0.143	0.023	0.111	0.178	0.622	0.614	−0.600
Controls	N/A	0.426[a]	0.107	0.509	−0.035	0.482	−0.036	0.179

[a]Significant at p = 0.05
[b]Significant at p = 0.005
[c]Significant at p = 0.001
[d]Nearly significant at p = 0.06

POI, Principles of Influence

"Liking" POI strategies resulting in farmers transitioning from Kelman's Compliance stage to the Identification stage) These findings could suggest several possibilities.

First, it is likely that the POI interventions were not provided in high or diverse enough doses to be recognized, remembered, and acted upon by target populations. Given the scope of this project combined with its limited budget, interventions were largely limited to single mailings or word-of-mouth interventions. Prior research indicates that a number of exposures to promotions, in a variety of message mediums (magazine ads, press releases, billboards for example) is needed for individuals to engage with the content of a message.[14]

Alternatively, it is possible that either the specific interventions, or the POI strategies in general, are not effective in changing attitudes and behaviors related to PTO shielding. As is shown in Table 4, three POIs (authority, social proof, and liking) appeared to be strongly present across the board at both baseline and follow-up. This suggests that if these strategies impact attitudes and behaviors related to PTO shielding, they were likely already having their effect. Thus, even in the counties in which these three POIs were specifically used, additional influence may not be possible.

Though no changes were noted in the intervention counties, the control counties did see a significant increase in Kelman classifications (mean change = 0.42, p = 0.03). Unfortunately, this study was not able to capture the cause of this shift and no known influences could be identified, particularly since participants within the intervention region reside in multiple counties and regions of the state.

Two distinct Kelman classifications stood out in the data. First, approximately half of all participants were classified in internalization, meaning that they both engaged in PTO shielding and reported that the behavior was intrinsically important to them. While it is entirely possible that this is the case, this may also indicate that some individuals are unable to distinguish between reasons for believing in the importance of something. This is particularly true when comparing internalization to identification. Where internalization truly reflects the value that the individual places on the behavior, identification instead reflects the value that the individual placed on their relationship with another individual who believes in the behavior. This distinction may be difficult for some individuals to make when directly asked; instead, it may be that such a distinction requires open-ended responses and discussions to surface.

In addition, another third of participants were classified as non-Kelman. Almost all of these individuals reported that PTO shielding is important but did not engage in the behavior. Prior studies have indicated two potential explanations for this. First, it is possible that while PTO shielding is important, other competing priorities take precedence. For farmers, this means distinguishing between spending time and money on production activities versus safety initiatives that do not directly impact productivity, income, and farm survival.[15] Similarly, important behaviors, such as

PTO shielding, may be neglected due to other barriers. In regard to PTO shielding, cost, time to install, durability, and minimal perceptions of self-risk have been reported as prominent barriers to installing and maintaining PTO shields.[5]

Limitations

There are several limitations to this study. First, the data is solely self-reported, thus creating possible selection, self-report, and social desirability biases. Prior studies have demonstrated that surveys regarding PTO shielding behaviors resulted in an overestimate of properly guarded drivelines.[13] Though true, the questions used in this survey were developed to encourage more critical thinking related to shielding behaviors and resulted in estimates more similar to those produced by visual inspections of PTO driveline shields.[13] Thus, we believe it less likely that these types of biases played a significant role in this study. While an extensive psychometric measures assessment was not conducted with survey questions, the questions with farmers to ensure that they were clear and would capture the data we were seeking.

Second, though pilot-tested with a group of farmers prior to use, the survey instrument proved to be difficult or confusing to many respondents. In some instances, the questions specifically related to behavior resulted in unexpected responses. For example, the research team anticipated that if a farmer reported not having checked their driveline shields then they also would not have replaced any. However, upon receipt of the surveys, this was not always the case; some would report that though they had not intentionally checked their shields, they did replace them. In addition, many participants had difficulties answering the question related to motivation for PTO shielding. In these cases, project staff followed up with participants over the phone whenever possible to clarify responses.

Finally, as discussed previously, time and financial constraints prevented the interventions trialed as part of this study from being implemented robustly and completely. This is a significant limitation to this study, in that adequate resources would have likely improved the practical outcomes of this study (i.e. increasing PTO shield use and reducing injuries and fatalities from PTO entanglements). Further, it is possible that without such constraints the specific interventions could have been designed in different ways and resulted in different outcomes. Thus, the results of this study are limited only to the specific interventions trialed here, and should not be considered indicative of the overall impact of any intervention developed based on these POIs.

Conclusions

Unfortunately, this study did not result in an increase in PTO shielding behaviors among the target population. This reinforces the difficulty that agricultural safety professionals have often faced in tackling this particular safety hazard. Though true, the inherent financial and time constraints of the interventions explored in this study are likely to have limited any potential impacts of the interventions. Thus, in future efforts, it could be useful to bolster interventions to increase the reach and dose.

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