Introduction and Review of Literature

Transparency in the production of food has become increasingly important topic to consumers (Rumble & Irani, 2016). Consumers of animal products want to be assured animals used for food are treated humanely both before and during the slaughter process (Croney & Reynnells, 2008). Increased public demand for transparency in animal production, especially the slaughter process, helps ensure and improve animal welfare of food animals (Abrams, Zimbres, & Carr, 2015; Troy & Kerry, 2010). Due to the strong influence of public opinion regarding agricultural production practices, the agricultural industry must consider the opinions of consumers, and communicators need to determine ways to effectively communicate with the public (Gellynck, Verbeke, & Vermeire, 2006). The public should be provided with accurate information in order to make informed decisions despite the individual attitudes they might hold (Croney & Reynnells, 2008; Vermeir & Verbeke, 2006). However, industry professionals may resist complete transparency in food production due to the potentially graphic content associated with animal slaughter (Rumble & Irani, 2016). Such graphic content may yield a negative emotional response (Leshner, Bolls, & Thomas, 2009), which can run counter to the strategic goals of increased transparency. Thus, the unpleasant details of the slaughter process make it difficult for industry professionals to provide transparent information while maintaining consumer comfort and confidence of the meat industry (Croney & Reynnells, 2008: Rumble & Irani, 2016).

Although consumers may be averse to the unpleasant details of animal production, topics such as food safety outbreaks, meat recalls, and the inhumane treatment of animals often appear within the news media's agenda and end up on ballots as the public votes on policy that directs food animal production (e.g., Kristoff, 2016). Recent examples of this include Proposition 12 in California which brought about cage-free egg production by 2022 and Question 3 in Massachusetts was passed by 78% of voters in 2016 that called for the end of gestation crates in pork production and battery cages in hen production (Brulliard, 2016; Henderson, 2019). Exposure to negative images and stories showcasing the inhumane treatment of animals associated with the food animal production process may lead many consumers to believe this is the norm for the industry (Kovar & Ball, 2013). Further, while consumers and agriculturalists alike have called for more transparency, little research has tested the effects of transparency on consumer response, especially in the agricultural sciences (Rumble & Irani, 2016; Rawlins, 2008), and thus, the impact of understanding the increase of transparency has been minimal.

Transparency

Based on the prior call for the need of transparency, agriculturalists must take an active role in creating and evaluating agricultural literacy and providing information, especially regarding the meat industry. Rawlins (2008) defined transparency as,

> the deliberate attempt to make available all legally releasable information – whether positive or negative in nature – in a manner that is accurate, timely, balanced, and unequivocal, for the purpose of enhancing the reasoning ability of publics and holding organizations accountable for their actions, policies, and practices (p. 75).

Several prior studies have reported the use of transparency in produce packaging and labeling (i.e., Buelens, Broens, Folstar, & Hofstede, 2005; Wognum, Bremmers, Trienekens, van der Vorst, & Bloemhof, 2011), the need to examine the effects of transparency in animal production on consumer response remains. Although Rumble and Irani's (2006) study found that transparent communication about poultry production led to more positive attitudes, it did not specify which message elements yielded this effect. Communication messages are dynamic and

unfold over time. Thus, a more sophisticated measurement approach is needed that can capture the dynamic nature of consumer response as messages unfold (Biocca, David, & West, 1994; Maurer & Reinemann, 2009).

Although little research has analyzed the graphic nature of the slaughter process in transparent communication, the call for greater transparency has resulted in the American Meat Institute's distribution of informational videos depicting the animal slaughter process through the Glass Walls Project (Riley, 2012). This project released videos of the slaughter process via YouTube, for beef, pork, and poultry. Later, a video depicting the lamb slaughter process was released. An animal behaviorist from Colorado State University, Dr. Temple Grandin, serves as the spokesperson for the Glass Walls Project. In order to increase transparency, Grandin provides narration throughout the videos describing the purpose for each step in the video in order to educate the viewer on the animal slaughter process (Riley, 2012). As of Summer 2019, the beef slaughter video had more than 607,000 views, while the hog slaughter video had more than one million views.

Due to the unique and graphic content in educational animal slaughter videos, it is important for researchers to examine how these transparent elements impact viewer comfort with graphic visuals to understand how consumers respond to agricultural literacy efforts. By better understanding consumer response, the meat industry may be able to create more effective consumer education programs to better inform audiences about products and increase consumer acceptance of these processes without triggering message avoidance. One way to measure how these transparent elements impact viewer comfort with graphic visuals is with the use of a continuous response measurement (CRM) system.

Continuous Response Measurement (CRM)

Research in agricultural communications has had a traditional focus on qualitative questioning and quantitative survey research that yields valuable data after an individual interacts with a message. Although these research approaches have provided the agricultural communications field with valuable information, attempts to gauge individual response to messages *after* exposure may fail to chronicle how audiences respond to specific message elements or content that unfolds over time. For example, the aforementioned Glass Walls video focusing on the pork slaughter process is more than 17 minutes in duration. In that time, the video presents many visuals and offers a wealth of information about the slaughter process. A post-message evaluation would yield an overall response to the video based on the totality of video elements. However, it may fail to capture how specific video elements shape that overall response. One means of addressing this challenge is continuous response measurement (CRM).

As Biocca et al. (1994) note, communication is a dynamic process that changes over time, and measurement should reflect and capture those changes. CRM, often referred to as "dial testing" within market research settings, provides a way for communicators to assess audience response to specific message elements over time by collecting "in real time, discrete or continuous introspective self-reports, evaluations, or opinions in response to any stimulus for any duration along any discrete or continuous scale" (Biocca et al., 1994, p. 20). Although this measurement approach may employ various hardware solutions, one common form allows an audience member to continuously register opinions, attitudes, or other self-report measures over time using a small handheld dial. Study participants are then asked to turn the dial throughout viewing to report their response to some measure of interest in a given research context. By continuously capturing this response as a message is viewed, this technique allows researchers to understand how a participant's attitudes, moods, and semantic judgements change or shift

throughout the stimulus allowing for the identification of specific, critical moments during the message that generate strong positive or negative responses.

Although the approach has a long history across other communication contexts (e.g., political messaging, Maurer, 2016; advertising, Baumgartner, Sujan, Padgett, 1997), it has only recently been employed to study agricultural communications. For example, Cummins, Smith, Callison, and Mukhtar (2018) employed CRM to examine how agricultural producers responded to a video message designed to promote environmentally friendly farming practices. In their study, producers watched a 30-minute video and continuously reported their assessment of the video's effectiveness. Through inspection of a graphic visualization of audience response over time, their results identified a series of elements within the videos, or "critical moments," where rated effectiveness shows sharp increases and decreases. Likewise, the present study uses CRM to assess participant response to the various elements presented within the livestock slaughter process.

Elaboration Likelihood Model

The free and widespread distribution of messages aimed at increasing transparency surrounding animal harvesting represents an attempt to affect changes in the public's attitudes regarding animal harvesting. Given the implicitly persuasive goal of such efforts, theories of persuasion via mass communication present a useful theoretical lens to examine how shifts in attitude occur. One such theory, the Elaboration Likelihood Model (ELM, Petty & Cacioppo, 1986), was used to guide this study. Stone, Singletary, and Richmond (1999) have defined attitudes as an "enduring system of positive or negative evaluations, emotional feelings, and pro and con tendencies with respect to a social object" (p. 191). When an individual is exposed to a message, the receiver will create judgments or evaluations on the information to form an attitude (Stone et al., 1999).

This framework showcases the route in which an individual will process a message, elaborate, and form an attitude about a message (Petty & Cacioppo, 1986). The model proposes two cognitive routes of processing: the central processing route and the peripheral processing route. When information is processed through the central route, the ELM suggests the individual carefully considers and systematically processes the information presented; whereas, the peripheral processing route may be engaged when the individual pays less consideration to the message quality and relies on peripheral cues or factors within the message requiring no cognitive effort to process. If processing occurs via the peripheral route, heuristic features within the message such as perceived source credibility or the perceived attractiveness of the message will cause a person to accept or reject what is being presented without considering the actual merits of the message (Frewer, Howard, Hedderly, & Shepard, 1997). Further, graphic or negative information may trigger processing automatically to the peripheral route (Lang, Newhagen, & Reeves, 1996). However, if the receiver of the message is both motivated and has sufficient knowledge to carefully consider the information, the theory holds that processing will take place via the central route and systematic thinking about will occur (Petty & Cacioppo, 1986).

More recent research using the ELM framework has studied the role of emotions in information processing. Emotions can influence both the central and peripheral routes (Morris, Woo, & Singh, 2005). In their study, Morris et al. (2005) found that an increase in positive emotion, pleasure, was higher for individuals who were categorized as cognitive elaborators (i.e. central route processers). However, other evidence supports that systematic processing is decreased by positive emotion (Kuykendall & Keating,1990). Additionally, images or cues that are negative can activate the appetitive motivational system, which increases resource allocation needed for information processing (Lang, Newhagen, & Reeves, 1996; Sarge & Gong, 2019).

With respect to agricultural messages, the role of issue involvement becomes particularly salient. Those with high issue involvement generally process information presented in a message through the central route, while issues where the participant has low or no involvement typically are processed through the peripheral route (Petty & Cacioppo, 1986). Fishbein and Ajzen (1975) found participants with higher involvement generally have more positive attitudes toward a message. Rumble and Irani (2016) found higher levels of perceived transparency had a more positive effect on attitude formation toward agricultural issues. Fischer, Meyers, Cummins, Gibson, and Baker (2017) additionally found that attention to message frames regarding food and agriculture can differ based on issue involvement. Those with low issue involvement tend to focus more on value-oriented messages than those with high issue involvement. This notion of more experience or higher issue involvement was also documented in Ruth and Rumble (2017) as well as King and Baker's (2018) studies regarding ELM. The model has suggested that when personal relevance is high, more systematic processing occurs as individuals make connections to past experiences to develop opinions (Ruth & Rumble, 2017). Further, King and Baker (2018) suggested that higher involvement leads to more careful processing as people draw from their own personal experiences to make inferences and perceptions about the material. Thus, when an individual finds the content they are viewing as motivationally relevant, they are more likely to place more attention on the content (Fischer, et al., 2017). In the context of animal harvest videos, the prior literature suggests those with greater involvement with agriculture should process information more systematically, which may lead to more positive attitudes in general toward transparent messages.

Purpose and Research Questions

The purpose of this study was to determine the over-time comfort level of young adults who vary in their level of personal involvement with agriculture when viewing videos of the cattle and hog slaughter process aimed at increasing transparency surrounding animal harvesting. Based on the prior literature and surrounding theory, the researchers hypothesized the following:

H1a: *Participants with higher levels of agricultural involvement will have higher overall comfort in response to educational videos of the hog slaughter process.*

H1b: *Participants with higher levels of agricultural involvement will have higher overall comfort in response to educational videos of the cattle slaughter process.*

This study also sought to determine key components of the messages that elicited the greatest discomfort to understand how graphic, transparent images influence participant response. Thus, we sought to explore the following research questions to determine the critical moments:

RQ1a: *What specific elements or passages within the educational video of the hog slaughter process elicited greatest viewer discomfort?*

RQ1b: *What specific elements within the educational video of the cattle slaughter process elicited greatest viewer discomfort?*

Methods

A purposive sample of young adults from [university] who systematically varied in their level of agricultural involvement were recruited to participate in a study. They provided continuous ratings of their perceived comfort while viewing two videos from the Glass Walls project describing the animal harvest process. One video displayed the cattle slaughter process, while the other video provided information on the hog slaughter process. The formal design of each test was a 2 (agricultural involvement: high vs. low) x 53 (time segments) mixed-measures design.

Independent Variables

Agricultural involvement. Participants' level of agricultural involvement served as a between-subjects variable and was determined using a pretest where participants were asked to rate their level of agreement with 11 statements 1 = *Strongly Disagree* and 10 = *Strongly Agree*. The scale was adapted from two scales on sport and team identification (Wann & Branscombe, 1993). Agricultural involvement measured how much the participants are connected to agriculture and how much the respondents viewed agriculture as a part of their personal identity. The items included the following: I have rescheduled my work to accommodate agriculture; I am emotionally connected to agriculture; I do not devote much energy to agriculture; I want everyone to know I am connected to agriculture; I would devote all of my time to agriculture if I could; I would be devastated if I were told I could not pursue agriculture; I strongly identify with agriculture; When agriculture is popular I feel great; Agriculture is part of me. Responses were highly consistent (Cronbach's $\alpha = .97$), and participant responses were summed and averaged to develop an agricultural involvement score.

Time segment. To capture the changing nature of viewer comfort throughout the video, time segment served as a within-subjects factor to examine changes over its duration. Raw data was sampled at one-second segments. We resampled the data into two-second intervals yielding 53 discrete, two-second segments where participants indicated their comfort level of the stimuli.

Dependent Variable

The **perceived comfort level** participants reported while watching the videos served as the repeated dependent variable for this study. It was continuously assessed throughout viewing using CRM. In this study, perceived comfort level was derived from the participants' moment-to-moment responses recorded using the Perception Analyzer 8.0 audience response system. While watching the stimuli, participants used wireless handheld dials to continuously report their moment-to-moment agreement with the statement, "I am comfortable with the material I am viewing." Response options ranged from 0 (*extremely uncomfortable*) to 100 (*extremely comfortable*). Participants were instructed to begin with their dials set at the scale midpoint (i.e., 50), and data were transformed offline to compute change scores from that starting point. Thus, positive scores indicate greater comfort while negative scores indicate greater discomfort to the stimulus. Data were resampled to generate 53, two-second averages that corresponded with the aforementioned time periods.

Stimuli

Two video clips, one on cattle harvesting and one on hog harvesting, were sampled from the American Meat Institute's (2012) Glass Walls project. The videos were edited to be 106

seconds in length to encourage participants active engagement. To make the edits, the researchers chose to only contain the footage of the slaughter process. More specifically, the stimuli contained footage of the moment the animal entered the facility to when the animal was stunned and exsanguinated. This selection was chosen as it contains the most graphic aspect of the animal slaughter process. It did not include the introduction to the narrator or the prior information, as this may have caused a priming effect. The videos were selected as they provide a visually transparent tour of the animal slaughtering process while simultaneously providing a narrative explanation of why procedures are conducted in a specific manner. Cattle and hog were chosen because of their popularity on YouTube. The videos were played at uniform volume on a forward-mounted projection screen. To guard against order effects, presentation order of the videos was counterbalanced across viewing sessions, and assigned conditions were randomized to participants (Gravetter & Forzano, 2015).

Participants

A purposive sample of 186 young adult participants was recruited from two colleges within the university where the study was conducted—one communications college and one agricultural college. Data for 17 participants was removed due to non-response during the continuous rating task. Of the 169 completed responses, 45% (n = 76) of the participants identified as male, while 55% identified as female. Further, 12.4% (n = 21) indicated they were freshman, 33.7% (n = 57) sophomores, 36.7% (n = 62) juniors, and 17.2 % (n = 29) indicated they were seniors. Seventy-three participants (43.2%) indicated that they were from the college of agriculture; while 96 (56.8%) of the participants were from outside the agricultural college.

Data Analysis

To perform data analysis, continuous response data were exported from the Perception Analyzer into an Excel spreadsheet. Raw data were recorded at 1 second intervals. Self-reported data, and data were resampled offline into 2-second segments. This data was inputted into SPSS version 24.0.

A median split procedure (Mdn = 4.8) was used to determined participant assignment to high (n = 82) or low (n = 82) agricultural involvement conditions. An independent samples t-test where the continuous involvement score served as the dependent variable confirmed differences between the two groups, $t(162) = -21.47$, $p = .000$, Cohen's d = 3.34. The average agricultural involvement for low involvement participants was 3.09 (SD = .97) and 6.64 (SD = 1.14) for those with higher involvement.

To address the hypothesis, (H1a and H1b) a series of mixed measures ANOVAs were conducted to explore how the two conditions affected perceived comfort levels. The set of research questions sought to understand what parts of the video elicited greater discomfort for the viewers. These points within the video are known as critical moments. To identify the critical moments, a visual inspection process was used. The visual inspections provided the researchers with areas to further explore through a statistical analysis. The purpose of the statistical analysis to illuminate specific passages that elicited strong positive or negative responses via continuous response measurement, and the researchers used a series of paired samples t-tests to identify if differences could be explored. All statistical procedures followed recommendations from Field (2016).

Results

Overall Comfort Level to Animal Slaughter Videos (H1a and H1b)

The first set of hypotheses *predicted that those with higher agricultural involvement would report greater comfort while viewing the educational videos than those with less involvement*.

This hypothesis, as well as the subsequent research questions, was tested by a pair of analogous mixed-measures ANOVAs, where participants' level of involvement served as a between-subjects fixed factor. To examine shifts in comfort throughout the message in the RQ, time segment served as a within-subjects factor. The moment-to-moment comfort scores while viewing the educational videos served as the repeated dependent measure.

Overall Comfort to Hog Slaughter Video (H1a). In the current study, the researchers predicted that (H1a) *participants with higher levels of agricultural involvement will have higher overall comfort in response to educational videos of the hog slaughter process.* In the test examining response to the hog harvest video, Mauchly's test of sphericity indicated that the assumption of sphericity was not met for time, $X^2(1430) = 24553.78$, $p < .05$. As such, the Greenhouse-Geisser conservative correction for degrees of freedom was used since the estimated ε was less than 0.75 (Maxwell & Delaney, 2004). The corrected ε was 0.05. Regarding H1, involvement for agriculture had a significant main effect on participants level of comfort while viewing the hog harvest video, $F(1,162) = 11.45$, $p < .01$, $\eta^2 = .07$ (medium effect). As can be seen in Figure 1, those with greater involvement consistently reported overall higher levels of comfort during the hog slaughter video.

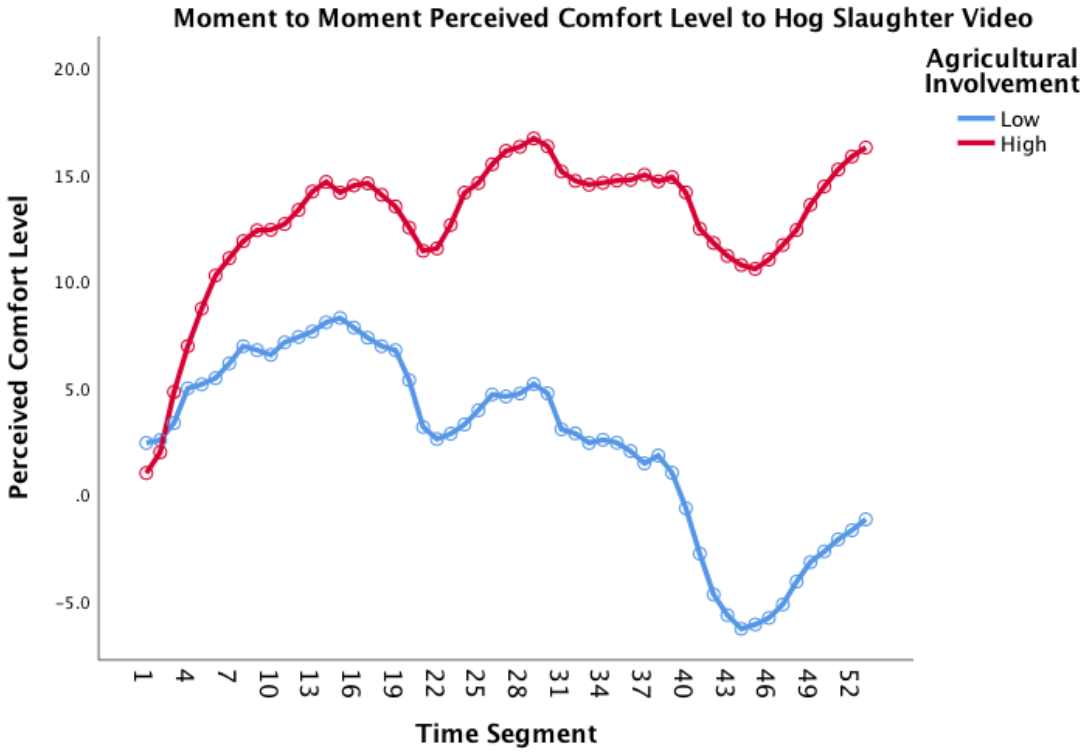

Figure 1. Continuously reported level of comfort over time during the hog slaughter video as a function of agricultural involvement

Overall Comfort to Cattle Slaughter Video (H1b). Additionally, the researchers predicted that (H1b) *participants with higher levels of agricultural involvement will have higher overall comfort in response to educational videos of the cattle slaughter process.* For the cattle harvest video, Mauchly's test of sphericity indicated that the assumption of sphericity was not met for time, $X^2(1430) = 27005.77$, $p < .01$. The Greenhouse-Geisser correction for degrees of

freedom was used since the estimated ε was less than 0.75 (Maxwell & Delaney, 2004). As with the hog harvest video, involvement in agriculture had a significant main effect on participants' level of comfort, $F(1,162) = 18.33$, $p < .01$, partial $\eta^2 = .10$ (medium-to- high effect). Results are visualized in Figure 2, which indicates that those with greater involvement consistently reported greater comfort than those with less involvement. Thus, H1 was supported.

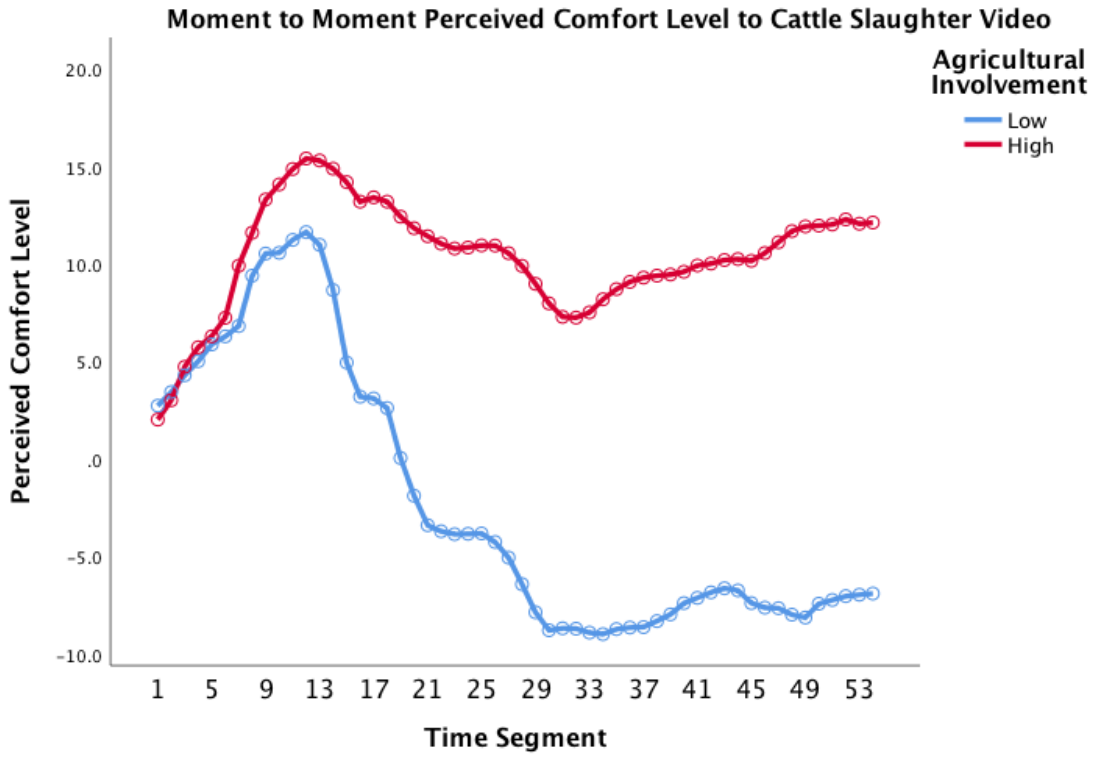

Figure 2. Continuously reported level of comfort over time during the cattle slaughter video as a function of agricultural involvement

What specific elements or passages with the educational videos elicited the greatest viewer discomfort? (RQ1a and RQ1b)

In this research question, we sought to further analyze the relationship between involvement and comfort level by identifying critical moments in the data. To do so, the researchers visually inspected the mean comfort scores to identify critical moments during each video where respondents' comfort levels decreased (e.g., Cummins et al., 2018; Fischer, Cummins, Gilliam, Baker, Burris, & Irlbeck, 2018). Prior literature has suggested that a critical moment is defined as an area of significant decrease (or an increase) from the prior continuous points (e.g., Fischer et al., 2018). Furthermore, once these critical moments were identified, paired samples *t*-tests were used to determine if there were statistically significant differences in self-reported comfort level between the moments immediately prior to and after the critical moments identified through visual inspection.

Critical Moments in Hog Slaughter Video. In RQ1a, we sought to explore what specific elements within the educational video of the hog slaughter process elicited the greatest

viewer discomfort. As seen in Figure 3, the hog slaughter video elicited strong discomfort during segments 16 – 27 and 40-50. In addition to the over-time response depicted in Figure 3, visual depiction and descriptions of the critical moments within the hog harvest video are presented in Table 1.

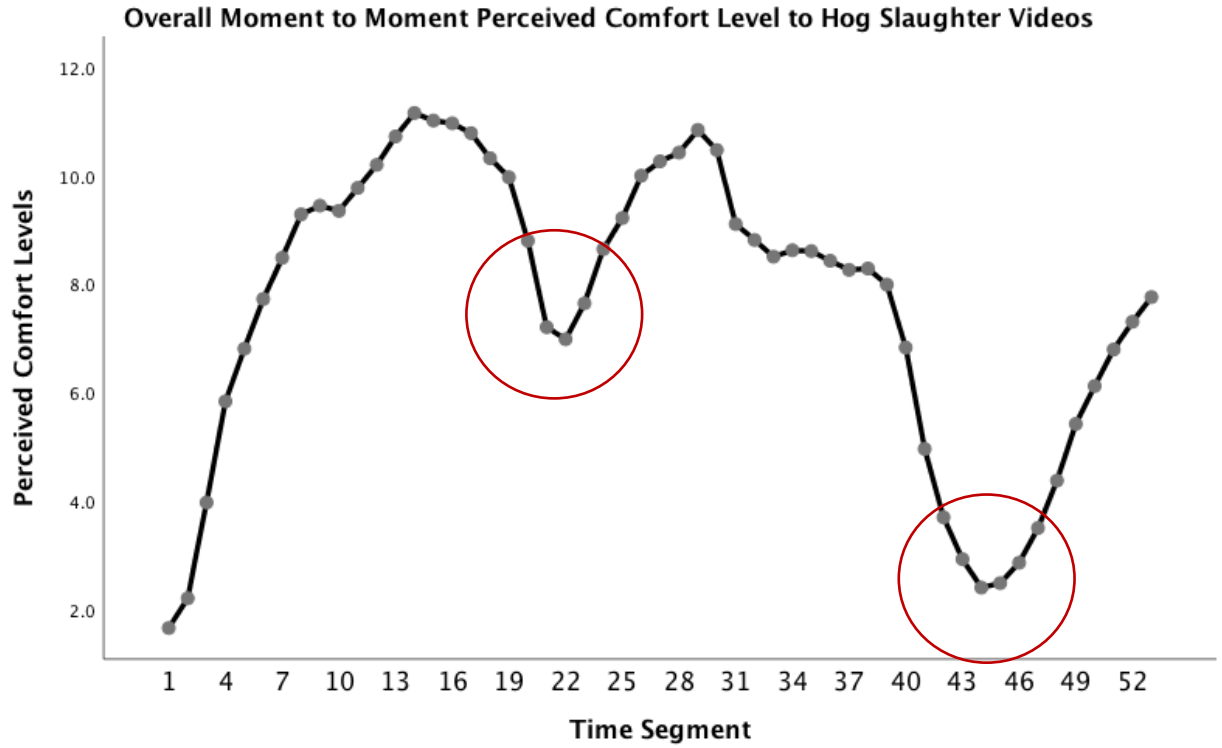

Figure 3. Visual identification of critical moments of discomfort to the hog slaughter video.

Table 1
Description of Critical Moments within the Hog Slaughter Video

Time Segments	Imagery	Narration
Segments 16-27		"And the sliding door shuts down and it is lowered down into the CO2. It goes about 30 feet into the ground with 90% CO2, and then comes back up."
		"And after the pigs are anesthetized they are dumped out."

Segments 40-50		"By law, pigs must be stunned before they are slaughtered. Stunning makes them insensible to pain. And when you use a method, such as CO2 stunning…"
		"This shot right here shows bleeding the pig, really typical bleeding, doing a really good job. It's really important to get a good bleed. This plant employee is doing a really good job."
		"Here you see a plant employee who is doing an internal audit to make sure that all these pigs are being rendered insensible."

Participants reported a significant decrease in comfort level during the 17 seconds (segments 16-27) of the video that featured the sliding door to the CO_2 chamber closing while the narrator discusses how the hogs are anesthetized. Prior to the critical moment, the video participants reported being comfortable with the hogs being moved into the CO_2 chamber (Segments 15) (M = 10.78, SD = 19.26). After the uncomfortable, critical moment, the participants were exposed to a video that then depicts the anesthetized hogs being dumped onto a conveyer belt (M = 9.97, SD = 20.255). This critical moment resulted in a statistically significant change in comfort levels when comparing the 4 seconds prior to the moment $t(168) = 2.612$, $p < .01$.

Regarding the second critical moment, participants reported a significant decrease in comfort level during the 20 seconds (segments 40-50) where participants were exposed to the imagery and discussion of a plant employee bleeding the hogs. During this segment, Grandin explains the importance of the procedure and talks about how the plant employee is performing the task well. The critical moment resulted in a statistically significant decrease in comfort levels when comparing the 4 seconds prior to the moment $t(168) = 2.612$, $p < .0$, when participants were exposed to imagery where the hogs suspended from their hind leg (segments 38-39) (M = 5.69, SD = 28.26). Further, this critical moment resulted in a statistically significant decrease in comfort compared to the four seconds after the critical moment, $t(168) = -2.690$, $p < .05$, when the employee conducts an internal audit to ensure the animal will not return to sensibility (M = 4.14, SD = 27.27).

Critical Moments in Cattle Slaughter Video. In RQ1b, we sought to examine what moments in the cattle slaughter video elicited the most viewer discomfort. A similar process was employed to first, visually identify critical moments during the stimuli where respondents' comfort levels decreased, and second, test for significant differences in shift in reported comfort

level. As seen in Figure 4, the cattle slaughter video elicited discomfort during segments 12-21 and 25-34. Visual depiction and descriptions of the critical moments within the hog harvest video are presented in Table 2.

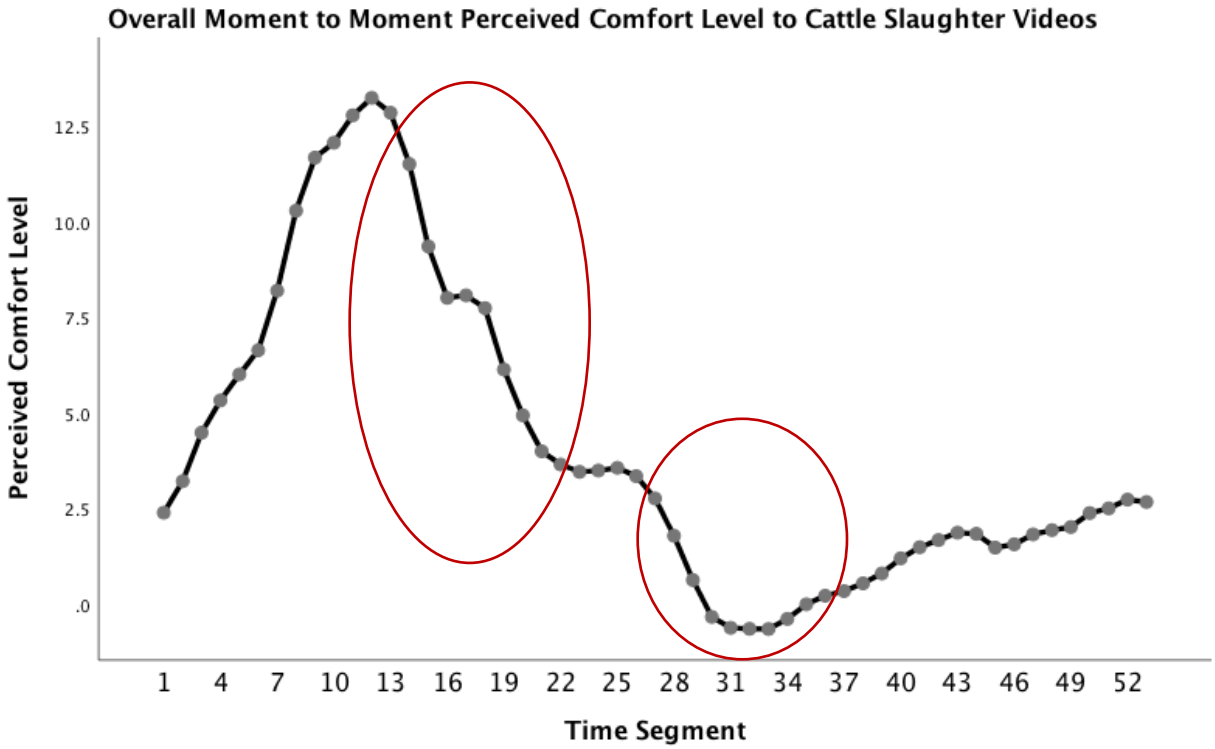

Figure 4. Visual identification of critical moments of discomfort to the cattle slaughter video.

Table 2
Description of Critical Moments within the Cattle Slaughter Video

Time Segment	Imagery	Narration
Segments 12-25	 	"…and the animals just ride along the conveyor, as they ride along they are shot with a captive bolt gun. And that's the reason why you didn't see the animal drop when it was shot. The neumatic gun used in this plant is a very powerful tool, and the animal's brain is destroyed instantly" "After the animal is shot, while it's still held in the center tract conveyer system…"

Segments 24-34

"A chain is looped around its leg, it's on a trolley that goes along on a track."

"And he falls out of the restrainer and goes down onto a take away conveyer. And the trolley goes down into the bottom on an incline conveyer and it is lifted up."

You will usually see some uncoordinated kicking, especially of the free back leg. That's spinal reflexes. Because the circuits for walking are in the spine."

"And when you destroy the brain that walking circuit just gets hyperactive."

Participants expressed a significant decrease in comfort levels during the 19 second segment (12-21) when the plant worker stunned the steer (M = 8.55, SD = 18.38). This uncomfortable, critical moment was statistically significantly lower than the 4 seconds prior to the critical moment, $t(168) = 4.46$, $p < .01$, when the steer was in the restrainer and straddling the conveyer belt (segments 10-11). The identified critical moment (segments 12-21) was also significantly different than the 4 seconds after to the critical moment (segments 22-23), $t(168) = -6.178$, $p < .01$, when participant comfort levels plateaued (M = 3.48, SD = 18.38).

Immediately following the first critical moments, participants reported significant levels of discomfort during the 20 seconds (segments 25-34) describing the transportation of the steers. In this segment, the steers are shown to be placed onto a conveyer belt and multiple steers are seen suspended from their hind leg, exhibiting coordinating kicking (M = .88, SD = 24.73). This critical moment resulted in a significant decrease in reported comfort level, $t(168) = 5.93$, $p < .05$, to the 4 seconds prior to the moment. Prior to this moment, participants were exposed to video footage regarding the steer in the restrainer (M = 3.40, SD = 23.74). Additionally, participants reported no significant change in comfort levels to the segments after the video, Segments 35-36, where (M = .0695, SD = 25.856), $t(168) = 1.733$, $p = .085$.

Conclusions, Discussion, and Recommendations

As these results illustrate, increased transparency regarding animal welfare and processes involving animal slaughter can be a slippery slope for agricultural industry professionals (Croney & Reynnells, 2008). As consumers continue to demand transparency in agricultural production practices (Rumble & Irani, 2016), the Glass Walls project provides messages aimed at increasing transparency surrounding the animal slaughter process. Because the goal of that project was ostensibly to elicit positive attitudes toward animal production practices via increased transparency, the goal of the videos was to elicit a positive response from the public. However, the results of these findings demonstrate that increased transparency of graphic imagery may be met with great discomfort by the viewing audience. Thus, by better understanding what consumers are comfortable with viewing and what specific message features elicit positive attitudes, individuals working within agriculture can better package content for consumers.

The results indicate that content creators need to be selective about the level of transparency they employ when creating animal harvesting videos for the public. Videos should address public concerns over treatment of animals during slaughter without eliciting extreme levels of discomfort. However, our results did showcase that overtime, the participants became more comfortable with the process of animal slaughter. Perhaps this finding is suggestive that continuous exposure to the graphic nature of slaughter may warrant more comfort. As explained in the ELM framework, those with prior knowledge of a topic tend to have more favorable attitudes. Thus, if the participant is continuously exposed to this process, they may be more prone to have higher comfort. This finding may be continued to be explored in future research with exposure to prior education.

Due to the graphic nature of the videos, even those with high levels of agricultural involvement may find the perceived attractiveness of slaughter messages to be low leading to lower levels of perceived comfort or attitude toward the message. Presenting critical information such as, that by law, stunning must induce a state of surgical anesthesia before being bled out, prior to presenting the visual of a hog being bled out may ensure that viewers are not attending to the graphic visual over the information being presented. As seen in the ELM, the presence of graphic imagery may have automatically elicited a strong negative peripheral cue, that led to a quick negative conclusion. Thus, this negatively valanced cue decreased elaboration. A practical suggestion could be to include a trigger, or an aspect of the video that includes information that a graphic part of the video may be coming. This segment could provide the viewers with the prior exposure to prepare for the graphic imagery.

The results suggested higher levels of issue involvement generally played a role in the higher comfort level of those individuals with high involvement in agriculture. Stone et al. (1999) indicated attitudes are formed from a receiver's constant evaluation of a stimuli. Participants who indicated a high level of involvement in agriculture were overall more comfortable than those categorized as having a low involvement in agriculture during both slaughter videos. This finding is consistent with the theoretical framework, ELM, which suggests higher issue involvement with lead to more systematic processing, often lending itself to more positive attitudes (Petty & Cacioppo, 1986). However, results also indicated this greater involvement in agriculture is not without boundaries. Even those who reported a higher level of involvement with agriculture, reported increased discomfort when viewing the reported critical moments. For example, discomfort was elicited when participants were presented with the exsanguination process for a hog, the CO_2 stunning of hogs, the use of the captive bolt gun, and

the transportation of the steer after exsanguination, regardless of level of involvement in agriculture. These findings align with Croney and Reynnell's (2008) findings suggesting consumers might want more transparency regarding animal welfare and processes involving animal slaughter, but do not want to know the graphic details involved in the animal slaughter process. These findings indicate that despite level of agricultural involvement, consumers both within and outside of the agricultural industries find similar aspects of agriculture uncomfortable. As consumers continue to play a greater role in determining agricultural policy decisions, it is important for agricultural communicators to be attune to what consumers find uncomfortable so literacy efforts can be developed to ensure the future of agricultural production (Gellynck et al., 2006). This result is consistent with the ELM as the receiver's perceived attractiveness of a message will impact processing, comfort, and attitude formation (Frewer et al., 1997).

Industry practitioners should realize that these critical moments elicited a cognitive shift and change in comfort level. In order to improve the comfort levels during these critical moments, understanding how viewers allocated cognitive processing regarding the visual aspect, the narration, and the information presentation is important. It is possible that the order of information and sensitive graphic imagery affects what people attend to. These graphic visuals automatically compel cognitive resources (Lang, Newhagen, & Reeves, 1996). According to Sage & Gong (2019), when a message is undesirable to an audience, or in this case uncomfortable, it may be beneficial to provide a positive message element to offset the uncomfortable visuals, thus stimulating central processing. Many scholars have looked at this "balancing act" or coactivation of the appetitive and aversive motivational system (Lee & Lang, 2009; Keene, Lang, & Loof, 2019). Future research could explore the role of coactivation, and its influence on processing agricultural messages that are uncomfortable to audiences. The results of these studies could provide the necessary balance between unpleasant, but transparent messages, and features that are more appealing to audiences. Presenting information on top of a graphic visual may result in the viewer attending to the graphic visual, over the information being presented.

Limitations and Future Research

One limitation to this study is the lack of generalizable results to a broader population due to the use of a purposive sample. However, the explicit purpose of the project (i.e., comparison of populations that vary in agricultural involvement) required the need for recruitment of subjects who satisfy that purpose. These findings provide agricultural communicators with a clearer outline as to what aspects of the animal slaughter process consumers might be the most uncomfortable with. Further qualitative research should be conducted to determine what causes participant discomfort during these critical moments. (e.g., Cummins et al., 2018). Specifically, focus group research could be used to allow consumers to explain what about the imagery concerned them the most and could help researchers better understand how consumers would prefer graphic and uncomfortable topics to be depicted, while being less emotionally charged. This focus group research could seek to further understand the thoughts and attitudes toward this information. For example, participants could be asked questions regarding the following: do they agree with the process; do they understand why it is being done; and their thoughts toward meat production. These questions could help agricultural communicators be more transparent in communicating with targeted audiences about this graphic information.

As a result of the study findings, future research could also investigate how audio information regarding the slaughter process prior to the graphic imagery impacts comfort levels and attitude formation. This future study may allow participants to better understand why these production practice must occur before they view the graphic imagery, thus potentially producing more positive evaluations of the content.

In regard to the Elaboration Likelihood Model, many research avenues could extend the current study. In particular, testing the influence of prior knowledge on the level of comfort and attitudes toward these videos could uncover how transparency and agricultural literacy efforts collide in the public sphere. More specifically, participants could be given a detailed video or print piece about the animal slaughter process (i.e., what is traditionally part of the beginning of the Temple Grandin videos) prior to exposure to the video. Perhaps, the inclusion of prior knowledge or education regarding the topic would reveal more comfort with the process. Moreover, while these videos were more educational than persuasive in nature, the videos could be manipulated based on argument quality. Argument quality has not been studied in great detail within the Journal of Applied Communications, and this could warrant further discussion on how message production leads to changes in attitude. Further, this study dealt with the graphic nature of the animal slaughter process. In the agricultural sciences, many individuals want more transparency about how food is grown. Replicating this study with a variety of topics such as pesticide use or genetically modified foods, could help communicators understand what topics people find the most comfortable as well as how we can produce messages with the correct level of transparency within the agricultural industry.

While continuous response measurement, or moment-to-moment, equipment requires a significant monetary investment or the use of the equipment in another department or college, moment-to-moment studies could be more present in agricultural communications research. Outside of educational videos, moment-to-moment studies could be conducted with interpersonal communications content, public speaking and performance, advertising, film, television, and programming (Biocca et al., 1994). This tool provides agricultural communicators the opportunity to identify which specific elements within a dynamic, video or audio message may elicit a specific response. It provides an opportunity for the agricultural communications industry and researchers to segment and dissect various dynamic messages. In addition to identifying critical moments, this tool could also allow agricultural communicators to identify how different groups of people (i.e., generations, involvement levels), may respond differently to specific elements of a dynamic stimuli.

References

Abrams, K., Zimbres, T., & Carr, C. (2015). Communicating sensitive scientific issues: The interplay between values, attitudes, and euphemisms in communicating livestock slaughter. *Science Communication, 37*(4), 485-505, doi: 10.1177/1075547015588599

Baumgartner, H., Sujan, M., & Padgett, D. (1997). Patterns of affective reactions to advertisements: The integration of moment-to-moment responses into overall judgments. *Journal of Marketing Research, 34*, 219–232. doi: 10.1177/002224379703400203

Beulens, A.J.M., Broens, D., Folstar, P., & Hofstede, G.J. (2005). Food safety and transparency in food chains and networks. Food Control, 16, 481-486. doi: 10.1016/j.foodcont.2003.10.010

Biocca, F., Prabu, D., & West, M. (1994). Continuous response measurement (CRM). A computerized tool for research on the cognitive processing of communication messages. In A. Lang (Ed.), *Measuring psychological responses to media (*15–64). Hillsdale, NJ: Erlbaum.

Brulliard, K. (2016, Nov. 9). Massachusetts voters say no to tight quarters for hens, pigs and calves. *The Washington Post*. Retrieved from https://www.washingtonpost.com/news/animalia/wp/2016/11/09/massachusetts-voters-say-no-to-tight-quarters-for-hens-pigs-and-calves/

Croney, C. C., & Reynnells, R. D. (2008). The ethics of semantics: Do we clarify or obfuscate reality to influence perceptions of farm animal production? *Poultry Science, 87*(2), 387-391. doi: 10.3382/ps.2007-00404

Cummins, R. G., Smith, D.W., Callison, C., & Mukhtar, S. (2018). Continuous response assessment to evaluate effectiveness of extension education products. *Journal of Extension [online], 56*(3), Article 3FEA3. Retrieved from https://www.joe.org/joe/2018june/a3.php

Fishbein, M. & Ajzen, I. (1975). Beliefs, Attitudes. Intentions. and Behaviors. Reading, MA: Addison-Wesley Publishing Company.

Fischer, L. M., Cummins, R. G., Gilliam, K., Baker, M., Burris, S., & Irlbeck, E. (2018). Examining the critical moments in information processing of water conservation videos within young farmers and ranchers: A psychophysiological analysis. *Journal of Agricultural Education, 59*(2), 1-15. doi: 10.5032/jae.2018.02001

Fischer, L. M., Meyers, C., Cummins, R. G., Gibson, C., & Baker, M. (2017). *Examining the role of motivational salience, issue involvement, and pre-existing attitudes on selective attention and attitude strength to advertisements*. Unpublished doctoral dissertation. Texas Tech University, Lubbock, Texas.

Frewer, L. J., Howard, C , Hedderly, D., & Shepard, R. (1997). The elaboration likelihood model and communication about food risks. *Risk Analysis, 17(6),* 759-770. doi: 10.1111/j.1539-6924.1997.tb01281.x

Gellynck, X., Verbeke, W., & Vermeire, B. (2006). Pathways to increase consumer trust in meat as a safe wholesome food. *Meat Science, 74*(1), 161-171. doi:10.1016/j.meatsci.2006.04.013

Gravetter, F.J., & Forzano, L.A.B. (2015). *Research methods for the behavioral sciences* (5th ed.). Stamford, CT: Cengage.

Henderson, G. (2019, Oct. 4). Meat institute seeks end to California's Proposition 12. *Pork Business*. Retrieved from https://www.porkbusiness.com/article/meat-institute-seeks-end-californias-proposition-12

Keene, J. R., Lang, A., & Loof, T. (2019). Text On Screen: Can emotionally incongruent combinations of media frames and messages elicit coactivation in the motivational systems. *Media psychology*, *22*(3), 501-525.

Kovar, K., & Ball, A. (2013). Two decades of agricultural literacy research: A synthesis of the literature. *Journal of Agricultural Education*, *54*(1), 167-178. doi: 10.5032/jae.2013.01167

Kristof, N. (2016, April 16). Animal cruelty or the price of dinner? *The New York Times*. Retrieved from http://www.nytimes.com.

Lang, A. Newhagen, J., & Reeves, B. (1996). Negative video as structure: Emotion, attention, capacity, and memory. *Journal of Broadcasting and Electronic Media*, *40*(4), 460. doi:10.1080/08838159609364369

Lee, S., & Lang, A. (2009). Discrete emotion and motivation: Relative activation in the appetitive and aversive motivational systems as a function of anger, sadness, fear, and joy during televised information campaigns. *Media Psychology*, *12*(2), 148-170.

Leshner, G., Bolls, P., & Thomas, E. (2009). Scare 'em or disgust 'em: The effects of graphic health promotion messages. *Health Communication, 24*(9), 447 – 458, doi: 10.1080/10410230903023493

Maurer, M. (2016). Nonverbal influence during televised debates: Integrating CRM in experimental channel studies. *American Behavioral Scientist, 60*, 1799–1815. doi: 10.1177/0002764216676250

Maurer, M., & Reinemann, C. (2009). RTR measurement in the social sciences: Applications, benefits, and some open questions. In J. Maier, M. Maier, M. Maurer, & C. Reinemann (Eds.), *Real-time response measurement in the social sciences: Methodological perspectives and applications* (pp. 1–13). New York, NY: Peter Lang Publishing.

Maxwell, S. E., & Delaney, H. D. (2004). *Designing experiments and analyzing data: A model comparison perspective*. Mahwah, N.J: Lawrence Erlbaum Associates.

Morris, J. D., Woo, C., & Singh, A. J. (2005). Elaboration likelihood model: A missing intrinsic emotional implication. *Journal of Targeting, Measurement and Analysis for Marketing*, *14*(1), 79-98.

Petty, R.E. & Cacioppo, J.T. (1986). Communication and persuasion: Central and peripheral routes of attitude change. New York: Springer/Verlag.

Rawlins, B. (2008a). Give the emperor a mirror: Toward developing a stakeholder measurement of organizational transparency. Journal of Public Relations Research, 21(1), 71-99. doi: 10.1080/10627260802153421

Riley, J. (2012, August 24). *Glass walls: A look inside a typical large beef plant* [Web log message]. Retrieved from http://blog.meatami.com/2012/08/glass-walls-a- look-inside-a-

typical-large-beef-plant/

Rumble, J. N. & Irani, T. (2016). Opening the doors to agriculture: The effect of transparent communication on attitude. *Journal of Applied Communications, 100*(2), 57 – 72.

Sarge, M. A., & Gong, Z. (2019). Obstructing the cascade: motivational system coactivation dampening defensive reactions to threat and disgust. *Media Psychology, 22*(3), 445-472.

Stone, G., Singletary, M., & Richmond, V. P. (1999). Attitudes and attitude change. In G. Stone, M. Singletary, & V. P. Richmond (Eds.), Clarifying communication theories: A hands-on approach (pp. 190-198). Ames, IA: Iowa State University Press.

Troy, D. J., & Kerry, J. P. (2010). Consumer perception and the role of science in the meat industry. *Meat Science, 86*, 214-226.

Vermeir, I., & Verbeke, W. (2006). Sustainable food consumption: Exploring the consumer attitude – behavioral intention gap. *Journal of Agricultural and Environmental Ethics*, *19*, 169-194.

Wann, D. L., & Branscombe, N. R. (1993). Sports fans: Measuring degree of identification with their team. *International Journal of Sport Psychology, 24*(1), 1-17.

Wognum, P.M., Bremmers, H., Trienekens, J. H., van der Vorst, J. G. A. J., & Bloemhof, J. M. (2011). Systems for sustainability and transparency of food supply chains – Current status and challenges. *Advanced Engineering Informatics, 25*(1), 65-76. doi: 10.1016/j. aei.2010.06.001