2-7-2018

How Does Video Outreach Impact Pork Consumption?

Jo Anderson
Faunalytics

An Experimental Investigation of the Impact of Video Media on Pork Consumption

Produced for Animal Equality by Faunalytics

November 9, 2017

Author:

Jo Anderson, Faunalytics

Research team:

Jo Anderson, Kathryn Asher, and Che Green from Faunalytics led this research project, with support from Statistics Without Borders volunteers Keith Goldfeld, Samantha Chiu, and Nina Sabarre. Faunalytics volunteer Carolyn Peake provided support on the initial research design. Animal Equality point people included Sharon Nunez, Dane Charbeneau, and Jose Valle.

Table of Contents

List of Tables

List of Figures

1 Executive Summary

1.1 Background

Faunalytics, with support from Statistics Without Borders, conducted a longitudinal research project examining the effectiveness of Animal Equality's 360-degree and 2D video outreach.

The main research questions for this study were:

1. Which of two video media (360-degree virtual reality or a 2D experience) results in greater change in self-reported pork consumption and, secondarily, attitudes toward pork and pigs?
2. Do these video media result in greater change in self-reported diet and, secondarily, attitudes toward pork and pigs than a control condition?

The study employed an experimental (i.e., randomized controlled trial) design with three conditions: a 360-degree virtual reality condition, a 2D flat-screen condition, and an inactive (i.e., no treatment) control condition.

1.2 Central Results

The results described in Section 4.2 present a consistent picture of the two video media (360 and 2D) as effective advocacy tools: Relative to the control condition, they improved participants' pork-related attitudes immediately after watching and, importantly, one month later. Most crucially, watching a video (in either medium) reduced participants' pork consumption relative to the control condition.

That said, there was also a consistent lack of evidence for a difference between the two media. Across the five outcome variables, the 360 and 2D conditions performed very similarly, with none of the differences approaching significance. In short, the 360 medium does not appear to be any more effective in changing attitudes or behaviour than the 2D medium.

Although the evidence is not definitive due to the nature of the study, the results support a likely process by which Animal Equality's videos produce behaviour change over the subsequent month: namely, that watching a video about farmed pigs has the immediate effect of making the average person's attitudes more anti-pork, and that those changes in attitudes lead them to reduce their pork consumption over the following month.

1.3 Demographic Results

Demographic analyses indicate that the Animal Equality videos may have been more effective in producing diet change on the west than the east coast, though they cannot determine the reason.

Analyses also demonstrated that the videos' effect is weaker for low baseline pork consumers, who have the least room to decrease their consumption. This finding confirms that people who already consume little or no pork are, almost by definition, not the ideal target for this intervention.

It is worth noting that participants' gender and age had no impact on the effectiveness of the videos. Women and older[1] participants ate less pork on average than men and younger participants (see Appendix A), but this did not differ by condition.

The impact of the videos on attitudes was not meaningfully influenced by any of the demographic variables (coast, baseline consumption, gender, or age). In other words, the videos were equally impactful on attitudes regardless of demographic group.

1.4 Limitations

There are some important limitations to consider when interpreting this study's findings (see Section 5), including differential attrition, possible secondary effects of the intervention, overrepresentation of vegans and vegetarians in the sample, factors that reduce generalizability, and possibly inaccurate self-reporting. Some of these factors may make the effect appear larger than it is, others smaller. They are common in survey research generally, and field studies specifically, but should still be taken into consideration.

1.5 Conclusion

The results of this study support the effectiveness of Animal Equality's video outreach for shifting attitudes and pork consumption behaviour, but do not find strong evidence of an advantage for one type of outreach over the other. Nonetheless, the novelty of the 360 video may draw in more people than the 2D video, giving it more potential effectiveness until that novelty wears off (although it is unknown how people enticed by the technology might differ from others). A difference in the potential draw of the two types of video is something that could be easily quantified during regular Animal Equality outreach.

Overall, the results of this study support the usefulness of Animal Equality videos—in either medium—as an outreach tool. The results demonstrate their ability to improve attitudes and reduce pork consumption behaviour, thereby potentially reducing the number of pigs raised and killed for food. While the current study and video focused on pigs, it seems plausible that a similar approach could also be effective to reduce the consumption of other species.

[1] Within the very limited range of ages observed in this study, which was conducted on college campuses.

2 Background[2]

International animal protection organization Animal Equality's iAnimal campaign is a virtual reality project that creates a 360-degree, immersive experience to give viewers a look into the day-to-day life of animals raised for food in factory farms and slaughterhouses. Animal Equality contracted Faunalytics to assess the impact of 360-degree video compared to their traditional 2D video outreach. Faunalytics, with support from Statistics without Borders, conducted a longitudinal research project with U.S. participants to help Animal Equality make informed decisions about their current video outreach. The information may also be shared with the wider animal protection movement to help determine whether they should consider adopting the 360 technology for their video outreach.

The main research questions for this study were:

1. Which of two video media (360-degree virtual reality or a 2D experience) results in greater change in self-reported pork consumption and, secondarily, attitudes toward pork and pigs?

2. Do these video media result in greater change in self-reported diet and, secondarily, attitudes toward pork and pigs than a control condition?

The study employed an experimental (i.e., randomized controlled trial) design with three conditions: a 360-degree virtual reality condition, a 2D flat-screen condition, and an inactive (i.e., no treatment) control condition.[3] In the two treatment conditions, participants watched a video about pigs in animal agriculture. In the 360 condition, they wore Samsung headsets, which allow viewers to pan in any direction for the duration of each frame, whereas in the 2D condition, they watched a near-replica of the 360 video on a tablet. In the control condition, participants completed the measures without watching a video.

In an experimental design, participants are typically randomly assigned to condition, a procedure that ensures there are "no systematic differences between intervention groups in factors, known and unknown, that may affect outcome."[4] However, a fundamental assumption of experimental design is that the individuals in the study are completely independent. In this study, we anticipated that spillover effects might present an issue if participants in the different conditions discuss the treatments. This is of particular concern given the graphic nature of the video—participants are likely to want to discuss it with others. Thus, to limit spillover effects, we used a clustered design, such that random assignment to condition was done at the level of day. Although the condition to

[2] For more detail on the study background, pilot testing, and other considerations, please consult the comprehensive research design document, which was compiled and posted to the Open Science Framework before data collection for the main study began.

[3] Although control participants were not exposed to a video, it was not a truly inactive control condition, in that the canopy used for the study was covered in graphic images of farm animals. Therefore, our ability to find differences between the control and treatment conditions may have been somewhat reduced, in that control participants essentially received a much weaker version of the manipulation.

[4] Sibbald, B., & Roland, M. (1998). Understanding controlled trials: Why are randomised controlled trials important? *British Medical Journal*, *316*, 201.

be administered on a given day was determined randomly, all individuals on one campus who participated that day were assigned to the same condition.

On campus, participants completed demographic questions and a baseline measure of pork consumption, watched a video (except in the control condition) and completed measures of attitudes toward pigs and pork consumption. This session is referred to as Time 1 (T1). Approximately one month after T1, participants were invited to complete the follow-up survey online. This session is referred to as Time 2 (T2). If participants did not respond to the initial email invitation, up to 7 additional email reminders and 6 text message reminders were sent over a 3-week period. Thus, depending on when the participant responded, T2 responses were collected between 4 and 7 weeks post-intervention. The follow-up survey included the primary dependent variable (self-reported pork consumption) and repeated the measures of attitudes toward pigs and pork consumption.

3 Study and Sample Characteristics

Table 1 summarizes the study design.

Table 1: Study Design Characteristics.

Design Characteristic	Outcome
Campuses	
West Coast[5]	21
East Coast[6]	14
Total	*35*
Conditions per campus	3 run on 22 campuses 2 run on 7 campuses 1 run on 6 campuses
Total study days	86
Average participants per study day	36
Total T1 participants	3068
Total T2 participants*	1782
Follow-up rate	58%

*This includes only T2 responses with data that could be matched to a T1 response. Matching was done using participants' email addresses, but in 80 cases, participants entered email addresses at T2 that differed from the ones provided at T1. Some of these were likely duplicates of successfully matched cases.

Table 2 provides a breakdown of the sample by condition and demographic group, first for all T1 participants, then for the final sample of participants who provided data at T1 and T2. Differences between participants who did and did not complete the T2 follow-up survey are discussed in Section 5.1.

In this report, as much data is retained as possible for each analysis. For analyses including T2 variables, this means that only the sample of participants who provided T1 and T2 data could be used (n = 1782). However, for analyses including T1 variables only, the full T1 sample is used (n = 3068).

[5] West Coast campuses included: Cabrillo College, Cal Poly Pomona, Cal Poly SLO, City College of San Francisco, CSU Fullerton, CSU Long Beach, CSU Northridge, CSU Sacramento, Fullerton College, Glendale CC, Sacramento City College, San Jose City College, San Jose State University, Santa Barbara City College, Stanford University, UC Berkeley, UC Davis, UC Santa Barbara, UC Santa Cruz, UCLA, and USC.

[6] East Coast campuses included: Barnard University, Brown University, Columbia University, Harvard University, John Jay's College, Massachusetts Institute of Technology, Princeton University, Rutgers University, Swarthmore College, University of Delaware, University of Pennsylvania, University of Virginia, West Virginia University, and Yale University.

Table 2: Sample Characteristics.

Characteristic	Time 1 Count	Time 1 Percentage	Time 2 Count	Time 2 Percentage
Condition				
360 Video	923	30.1%	559	31.4%
2D Video	912	29.7%	585	32.8%
Control	1233	40.2%	638	35.8%
Coast				
West	2049	66.8%	1192	66.9%
East	1019	33.2%	590	33.1%
Gender				
Male	1348	43.9%	707	39.7%
Female	1652	53.8%	1033	58.0%
Other*	43	1.4%	29	1.6%
Prefer not to answer**	25	0.8%	13	0.7%
Age				
18 – 19	1095	35.7%	644	36.1%
20 – 21	891	29.0%	504	28.3%
22 or older	1082	35.3%	634	35.6%

*This category was described on the survey as "transgender female, transgender male, genderqueer/gender nonconforming, nonbinary, or other identity."
**These individuals' responses were excluded from all gender-based analyses.

3.1 Outcome Variables

We considered five outcome variables for this report, representing self-reported pork consumption at T2 and two repeated measures of attitudes, at both T1 and T2. These variables are described in Table 3. Note that although pork consumption was also measured at both time points, the initial measure came before the intervention, to provide a baseline. It is therefore not an outcome variable.

Table 3: Outcome Variables.

Outcome Variable	Survey Item	Response Options	Measured At
Pork consumption	"Thinking about your diet over the past 30 DAYS, how often did you eat meals or snacks that contained ANY TYPE OF PORK (bacon, ham, pork chops, spare ribs, bacon bits, etc.)? NOTE: It is important that you report your food consumption as accurately as possible. Examples of meals include breakfast, lunch, dinner, etc. Also tell us about snacks between meals. Think about meals and snacks at home as well as outside the home. Please take your time and carefully consider your answer."	Never 1-3 times per month 1 time per week 2-4 times per week 5-6 times per week 1 or more times per day	Time 2
Attitude toward pork consumption	"It is important to minimize the amount of pork (bacon, ham, pork chops, spare ribs, bacon bits, etc.) a person consumes."	Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree	Times 1 & 2
Attitude toward pig suffering	"Eating pork (bacon, ham, pork chops, spare ribs, bacon bits, etc.) directly contributes to the suffering of pigs."	Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree	Times 1 & 2

4 Results

4.1 Presentation of Results

Throughout this section of the report, we first provide the data as it was actually modelled (i.e., the best way to examine differences between conditions), with significance tests for the primary hypotheses and other differences of interest. Supplementary graphs are also provided (e.g., response distributions by condition, proportion of participants with decreased pork consumption) to aid interpretation of the more complicated analyses. However, these supplementary graphs do not represent the best way of analyzing the data, so statistical tests are not provided for them. Statistics for these additional graphs would not add value because they are redundant with the actual models and would need to be massively corrected for the large number of tests performed. The percentages themselves may be useful, but for questions about differences between groups, the modelled data should be used.

4.2 Central Analyses

In this section, we consider the key research questions regarding the impact of the videos on the outcome variables. Analyses were conducted in two stages. In the first, the impact of being in a video condition (either 360 or 2D) was compared against being in the control condition, to examine whether the treatments had any effect at all on the outcome variables. In the second stage, the 360 and 2D video conditions were compared against each other to see whether one produced a greater effect on the outcome variables than the other.

4.2.1 Is Pork Consumption at T2 Influenced by Watching a Video?[7]

Participants who watched either video ate marginally less pork at T2 than participants in the control condition,[8] which indicates that watching a video caused a reduction in pork consumption over the subsequent month. Figure 1 depicts the cumulative probability of a participant being at or below each level of T2 pork consumption, as a function of whether they watched a video or not. For example, the probability that a participant in the control condition will have eaten pork one to three times a month or less is 59%, whereas the probability that a participant who watched a video will have eaten pork one to three times a month or less is 65%.

A comparison of T2 pork consumption between participants in the 2D and 360 conditions revealed no significant difference,[9] as shown in Figure 2. Although the figure appears to show a slight

[7] The statistics reported in this section apply to the analyses in which only condition-based differences in pork consumption were considered (i.e., our central, pre-registered analysis). However, we also ran these analyses controlling for social desirability scores. Social desirability score was a significant predictor of self-reported pork consumption at T2, β = -0.07 (*SE* = 0.02), z = -4.37, p < .001, but controlling for it did not produce a substantive difference in the results. In short, participants tend to report less pork consumption to the extent that they care more about "looking good" to the researchers, but this tendency does not account for the condition difference observed.

[8] β = -0.18 (*SE* = 0.10), z = -1.88, p = .06

[9] β = -0.06 (*SE* = 0.11), z = -0.59, p = .55

advantage of 360 over 2D, the difference is very small and far from significant. This finding suggests that video medium has no effect on pork consumption over the subsequent month.[10]

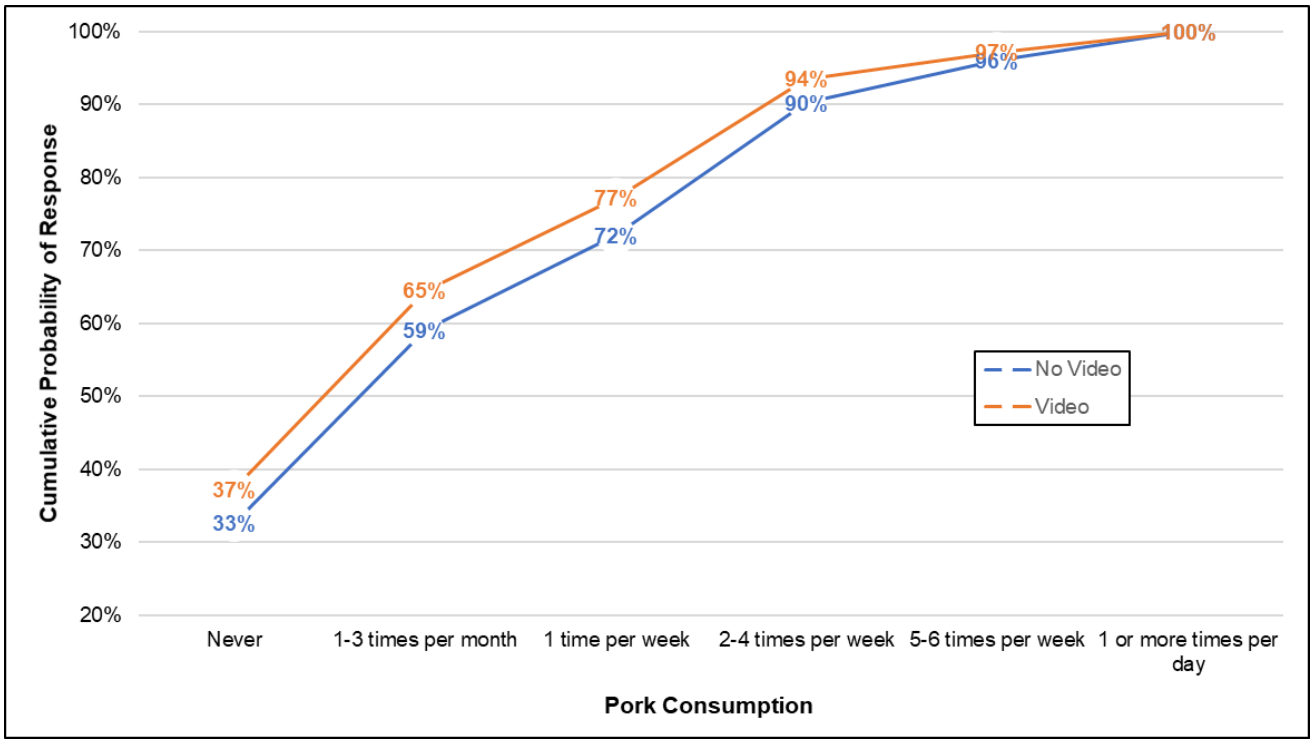

Figure 1: Cumulative Probability of Pork Consumption: Video vs. No Video.

[10] In terms of the difference between each individual video intervention and the control, the 360 video was significantly different from control (p = .033), whereas the 2D video was not (p = .113h this is most easily seen in Figure 3). However, this should not be taken as especially meaningful because the most important difference, between the 2D and 360 conditions, was very small and not close to significant. In short, the 360-control and 2D-control differences were very similar and close to the traditional significance cut-off, but happened to fall on opposite sides of it.

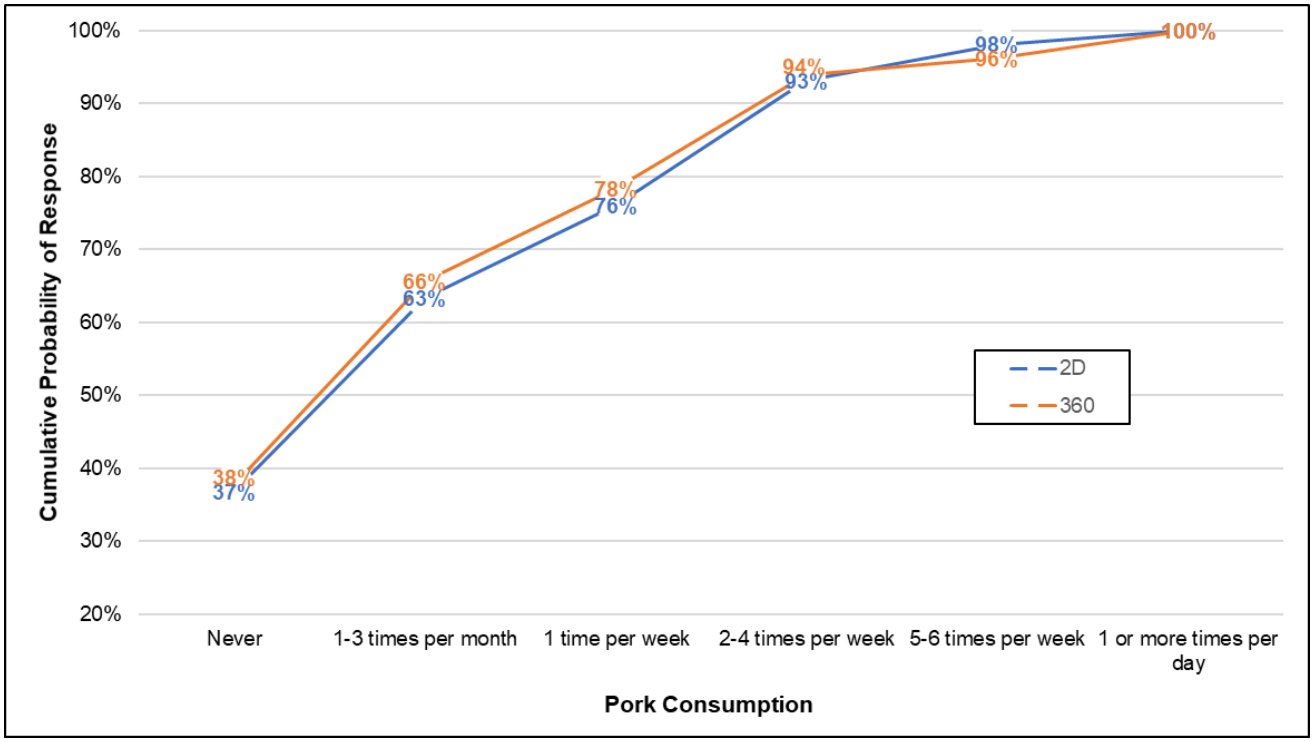

Figure 2: Cumulative Probability of Pork Consumption: 360 vs. 2D Video.

4.2.1.1 Additional Graphs

Figure 3 is provided to aid interpretation of the results described above. It depicts the proportion of participants in a condition reporting each level of T2 pork consumption.

Figure 4 provides an additional aid to interpretation. It depicts the proportion of participants whose pork consumption increased, decreased, or stayed the same, as a function of their experimental condition.

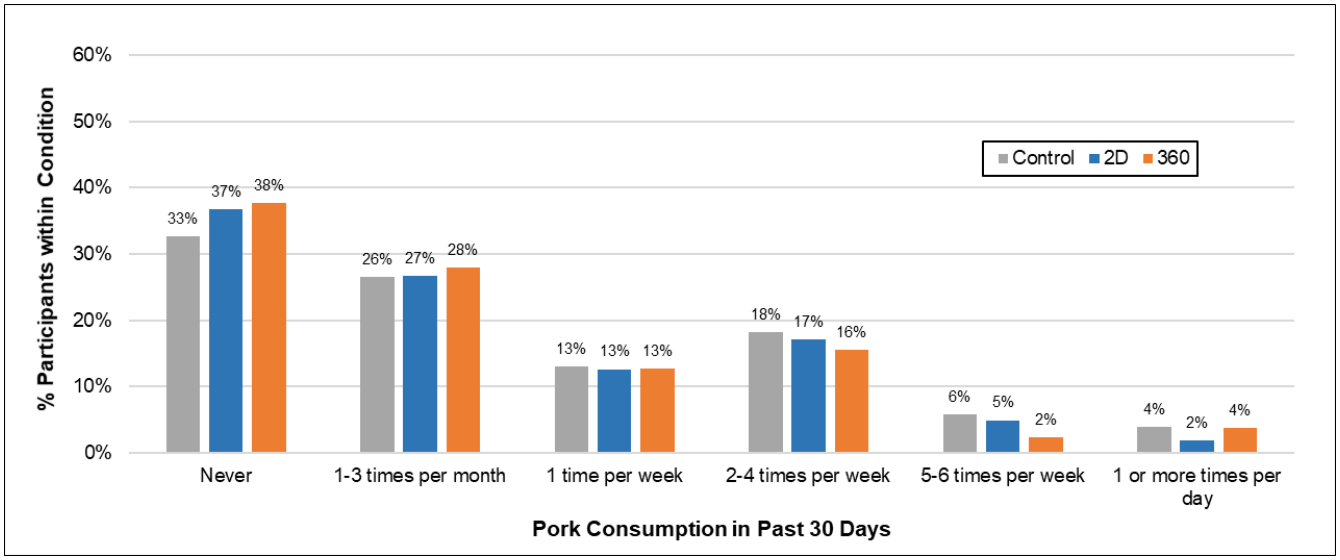

Figure 3: T2 Pork Consumption by Condition.

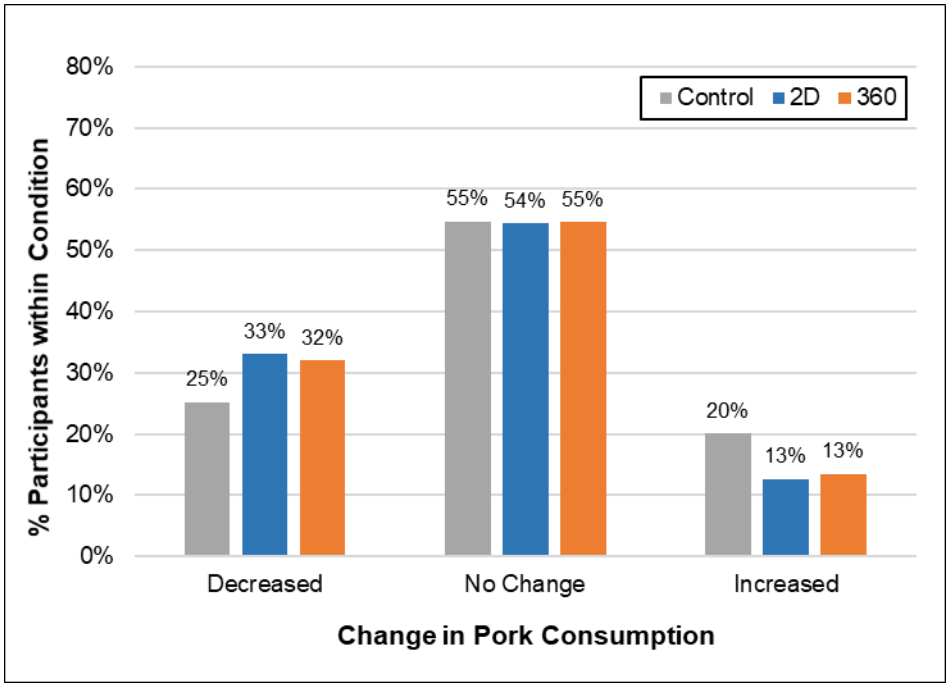

Figure 4: Change in Pork Consumption by Condition.

4.2.2 Are Attitudes Influenced by Watching a Video?[11]

4.2.2.2 Immediate (T1) Attitudes

This analysis examined how attitudes toward pork consumption and attitudes toward pig suffering were impacted immediately after watching the video. The results showed that participants who watched either video felt more strongly (relative to the control condition) that it was important to minimize pork consumption[12] and that eating pork directly contributes to pigs' suffering.[13] This indicates that watching a video caused an immediate shift in pork-related attitudes.

Figure 5 depicts the modelled results for attitude toward pork consumption[14]: the cumulative probability of a participant falling at or below each level of agreement, as a function of their assignment to video versus no video. For example, the probability that a participant in the control condition will strongly disagree or disagree that it is important to minimize pork consumption is 13%, whereas the probability that a participant who watched a video will strongly disagree or disagree is only 9%.

Again, the difference between the 2D and 360 conditions revealed no significant difference,[15] as shown in Figure 6. This finding suggests that video medium has no immediate effect on attitudes.

[11] All attitudes analyses controlled for social desirability score. However, it was not a significant predictor of any of the attitudes items (all *p*s > .09).
[12] β = 0.59 (*SE* = 0.08), *z* = 7.82, *p* < .001. Individually, each of the 360 and 2D conditions were also significantly different from the control condition (both *p*s < .001).
[13] β = 0.60 (*SE* = 0.07), *z* = 8.09, *p* < .001. Individually, each of the 360 and 2D conditions were also significantly different from the control condition (both *p*s < .001).
[14] Due to a strong correlation between the two items (*r* = .64, *p* < .001 at both time points), attitude toward pig suffering showed the same pattern of results as attitude toward pork consumption in all analyses. Thus, for simplicity, only the results for attitudes toward pork consumption are shown in the body of the report. The graphs for attitudes toward pig suffering can be found in Appendix B.
[15] For attitude toward pork consumption: β = -0.08 (*SE* = 0.09), *z* = -0.92, *p* = .36; for attitude toward pig suffering: β = 0.03 (*SE* = 0.09), *z* = 0.30, *p* = .76

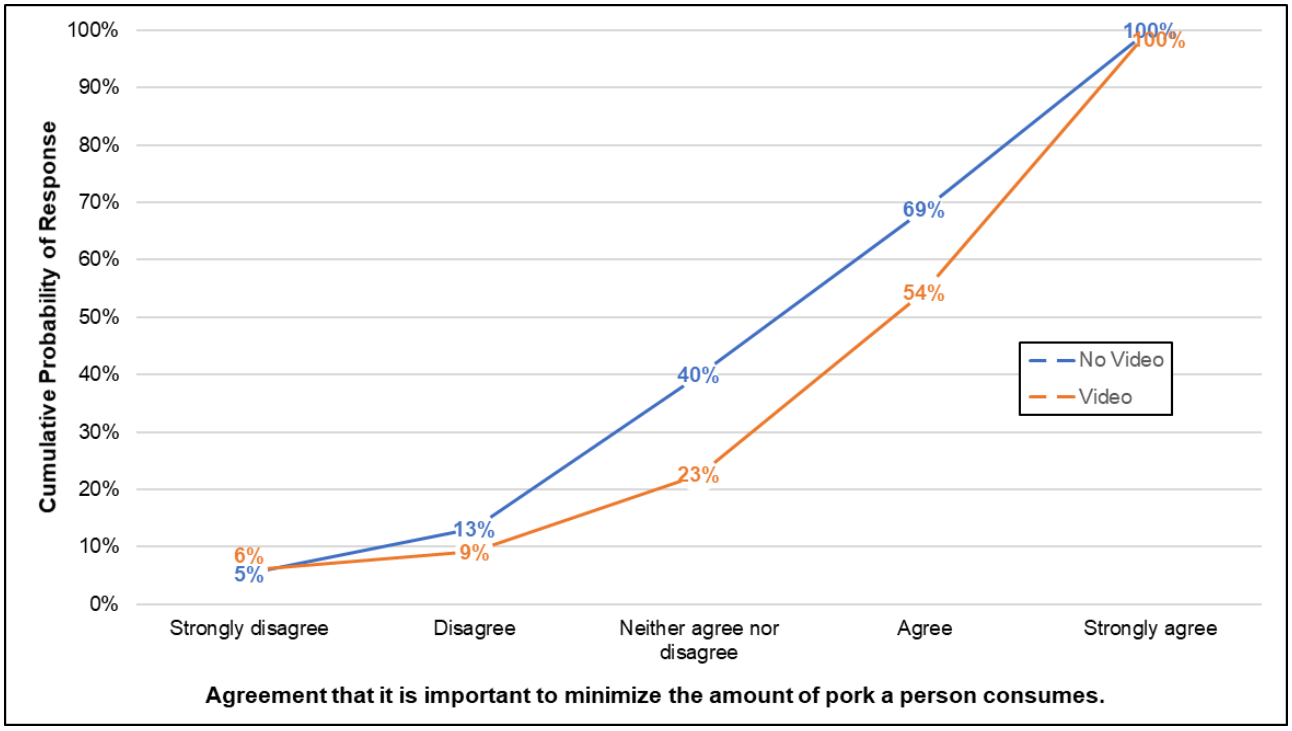

Figure 5: Attitudes toward Pork Consumption at T1: Video vs. No Video.

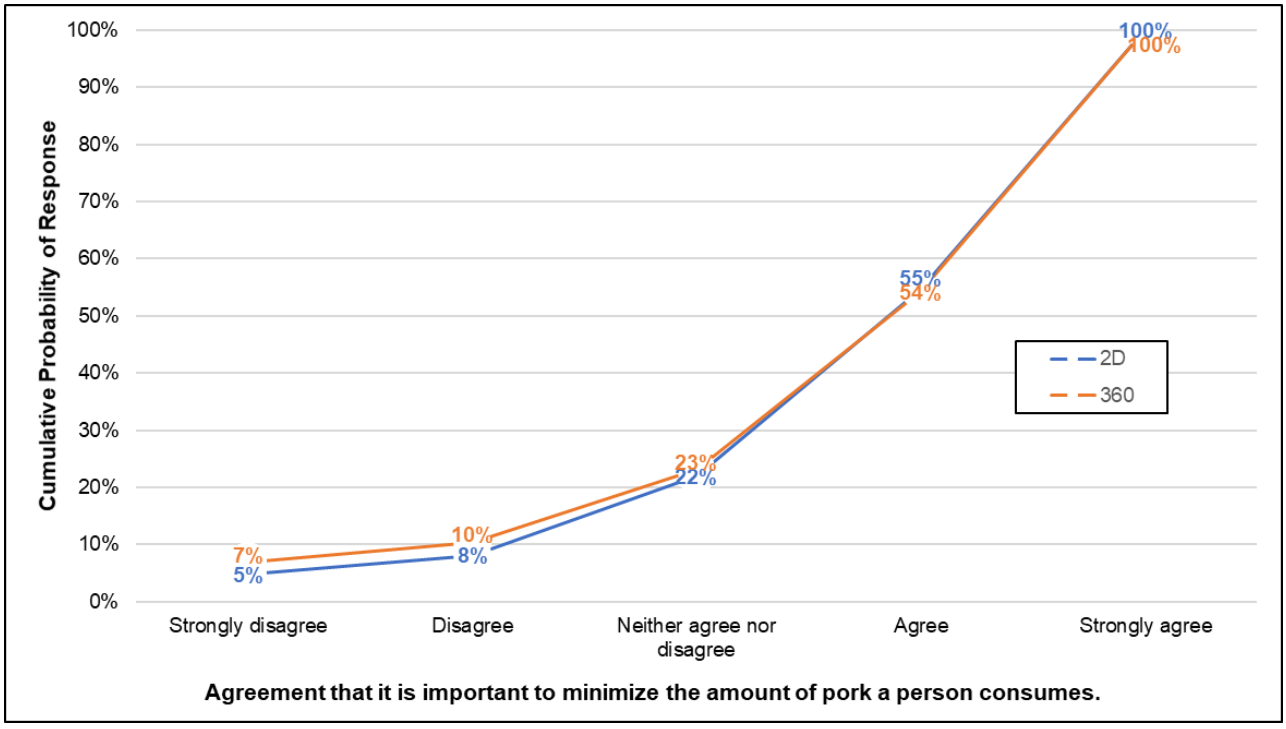

Figure 6: Attitudes toward Pork Consumption at T1: 360 vs. 2D Video.

4.2.2.3 Attitudes One Month Later (T2)

This analysis examined how attitudes toward pork consumption and attitudes toward pig suffering were affected one month after watching the video. The results showed that, similar to T1, participants who watched either video still felt more strongly (relative to the control condition) that it was important to minimize pork consumption[16] and that eating pork directly contributes to pigs' suffering.[17] This indicates that the effect of watching a video on pork-related attitudes persists one month later. Figure 7 depicts the modelled results for attitude toward pork consumption: the cumulative probability of a participant falling at or below each level of agreement, as a function of their assignment to video versus no video. For example, at T2, the probability that a participant in the control condition will strongly disagree or disagree that it is important to minimize pork consumption is 9%, whereas the probability that a participant who watched a video will strongly disagree or disagree is only 6%.

Again, the difference between the 2D and 360 conditions was not significant,[18] as shown in Figure 8. This finding suggests that video medium continues to have no discernable impact on attitudes over the longer (one month) term.

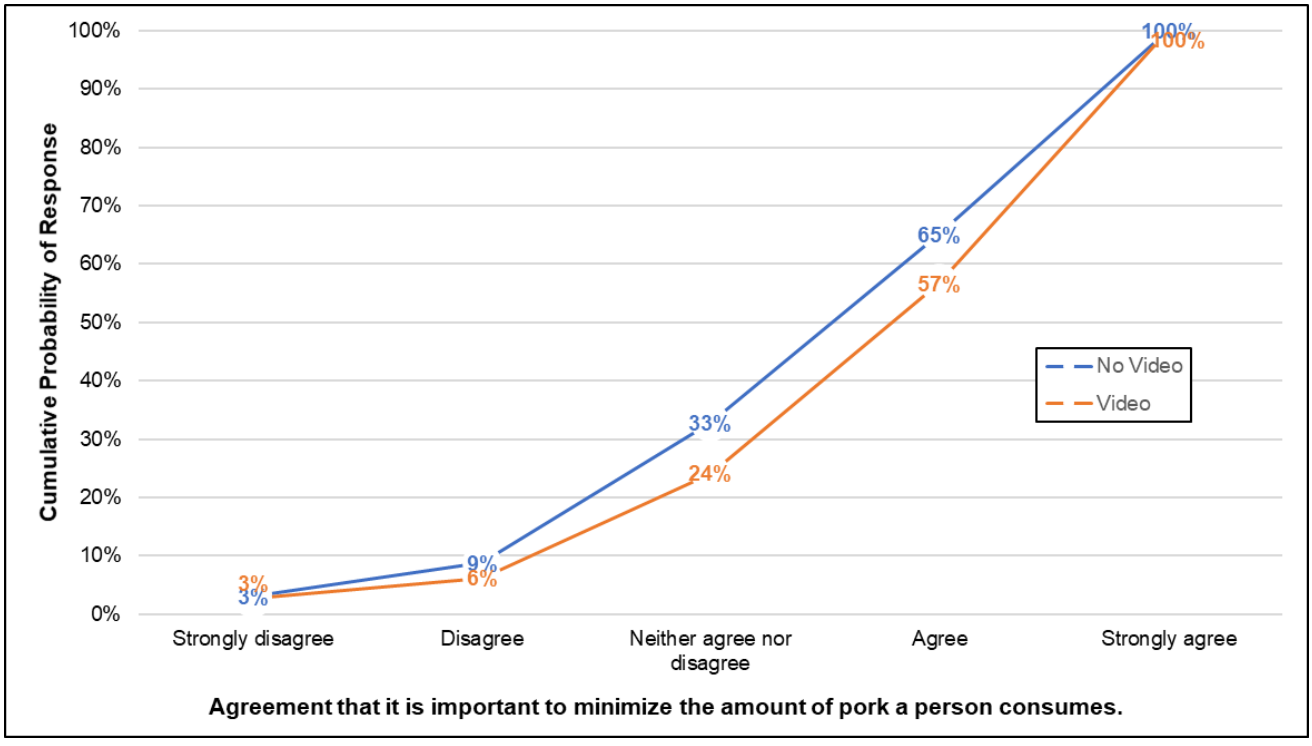

Figure 7: Attitudes toward Pork Consumption at T2: Video vs. No Video.

[16] $\beta = 0.34$ ($SE = 0.10$), $z = 3.41$, $p < .001$
[17] $\beta = 0.33$ ($SE = 0.10$), $z = 3.37$, $p < .001$
[18] For attitude toward pork consumption: $\beta = 0.004$ ($SE = 0.12$), $z = 0.03$, $p = .97$; for attitude toward pig suffering: $\beta = 0.13$ ($SE = 0.12$), $z = 1.12$, $p = .26$

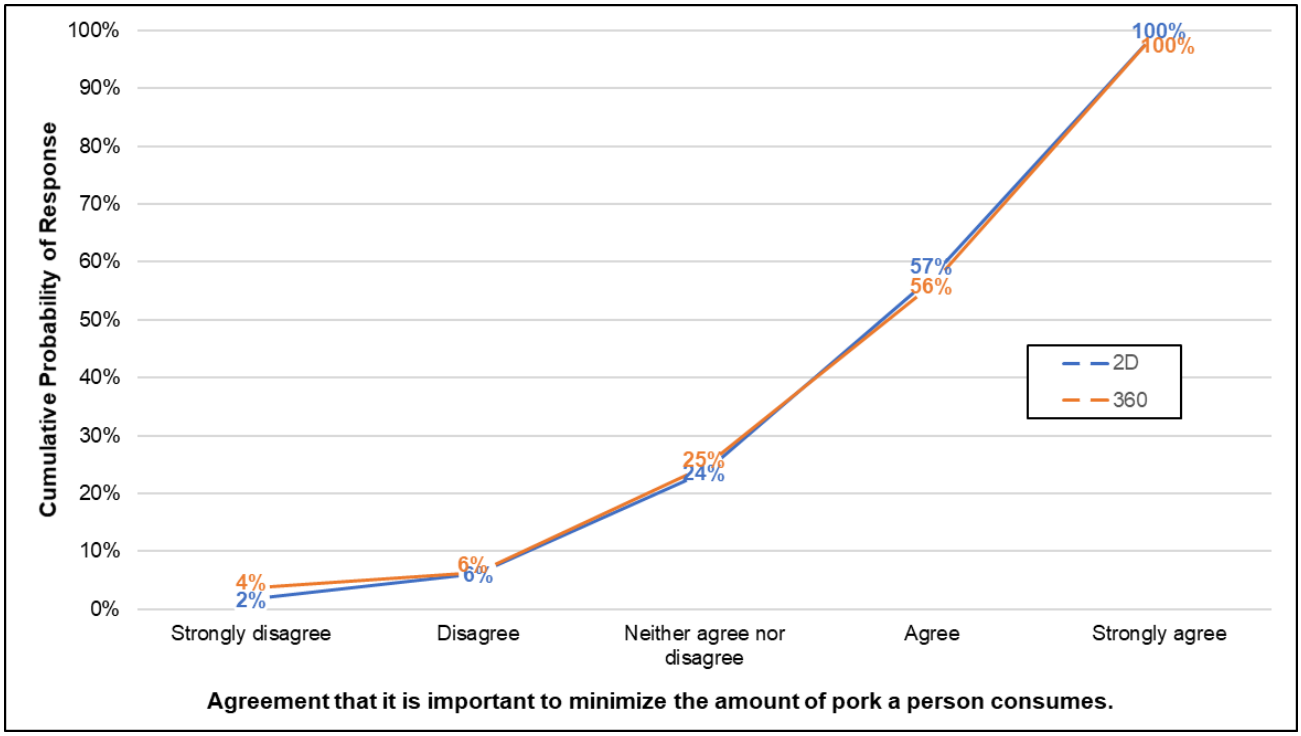

Figure 8: Attitudes toward Pork Consumption at T2: 360 vs. 2D Video.

4.2.2.4 Additional Graphs

Figure 9 and Figure 10 are provided to aid interpretation of the results described above. They show the proportion of participants in a condition reporting each level of agreement with the attitude item at T1 (Figure 9) and T2 (Figure 10). Note that it is evident from these graphs (and those above) that the difference between the video and control conditions was smaller at T2 than T1. Although it is not surprising to see the effect of the manipulation decreasing over time, this is important to bear in mind, as we do not have data about the longer-term effects of this intervention.

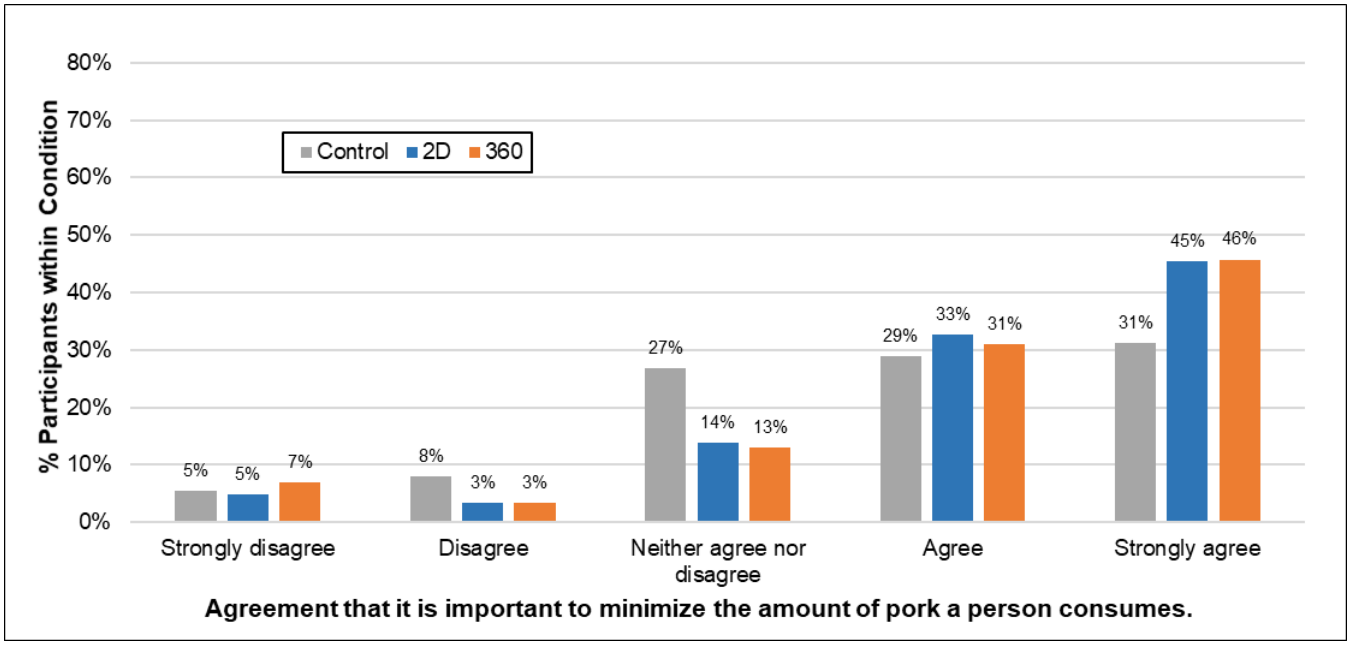

Figure 9: T1 Attitudes toward Pork Consumption by Condition.

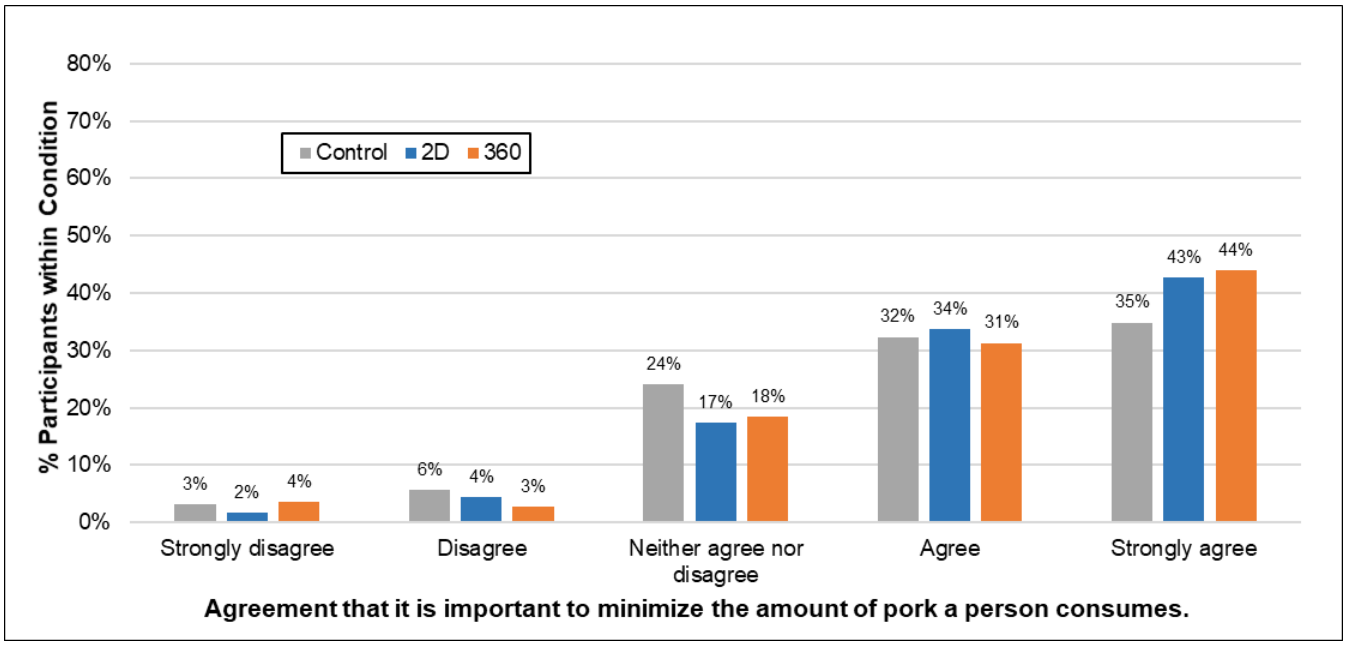

Figure 10: T2 Attitudes toward Pork Consumption by Condition.

4.2.3 Summary of Central Analyses

The results described in Section 4.2 present a consistent picture of the two video media (360 and 2D) as effective advocacy tools: Relative to the control condition, they improved participants' pork-related attitudes immediately after watching and, importantly, one month later. Most crucially, watching a video (in either medium) reduced participants' pork consumption relative to the control condition.

That said, there was also a consistent lack of evidence for a difference between the two media. Across the five outcome variables, the 360 and 2D conditions performed very similarly, with none of the differences approaching significance. In short, the 360 video does not appear to be any more effective in changing attitudes or behaviour than the 2D video.

4.3 Association of Attitudes and Pork Consumption[19]

4.3.1 Do T1 Attitudes Impact T2 Pork Consumption?

As described above, participants' pork-related attitudes were immediately shifted by watching a video (Section 4.2.2.2). Presumably, that attitude shift is what drives the reduction in pork consumption observed at T2 (Section 4.2.1). To test this hypothesis, we examined the impact of T1 attitudes on T2 pork consumption.

This analysis showed that stronger anti-pork attitudes[20] at T1, following the manipulation, were predictive of lower pork consumption at T2.[21] That is, the more participants agreed at T1 that it is important to minimize pork consumption and that eating pork directly contributes to the suffering of pigs, the less pork they reported eating at T2.

Figure 11 is provided to aid interpretation of this result. It depicts the proportion of participants who reported each level of T2 pork consumption as a function of their T1 attitude toward pork consumption. For example, 43% of people who agreed that it is important to minimize pork consumption reported at T2 that they had not eaten pork in the past 30 days, versus only 14% of people who did not agree with that statement.

[19] For all subsequent analyses of the diet outcome variable, multiple factors were considered simultaneously. However, the proportional odds model is not appropriate for such cases, so we dichotomized the outcome variable for these analyses, such that *low pork consumption* = never or 1-3 times per month; *high pork consumption* = at least once a week. The model included the following predictors: condition, coast, gender, age, social desirability score, and T1 attitude toward pork consumption. The latter was also dichotomized, as *agree* (agree or strongly agree) versus *not agree* (neither agree nor disagree, disagree, or strongly disagree). In addition, the model included baseline pork consumption, meaning that any baseline variance in consumption between conditions is removed from consideration. This is very similar to directly examining diet change.

[20] That is, stronger agreement with statements that it is important to minimize pork consumption and that eating pork directly contributes to the suffering of pigs.

[21] For attitude toward pork consumption: $\beta = 0.51$ ($SE = 0.06$), $z = 8.58$, $p < .001$; for attitude toward pig suffering: $\beta = 0.35$ ($SE = 0.06$), $z = 5.94$, $p < .001$

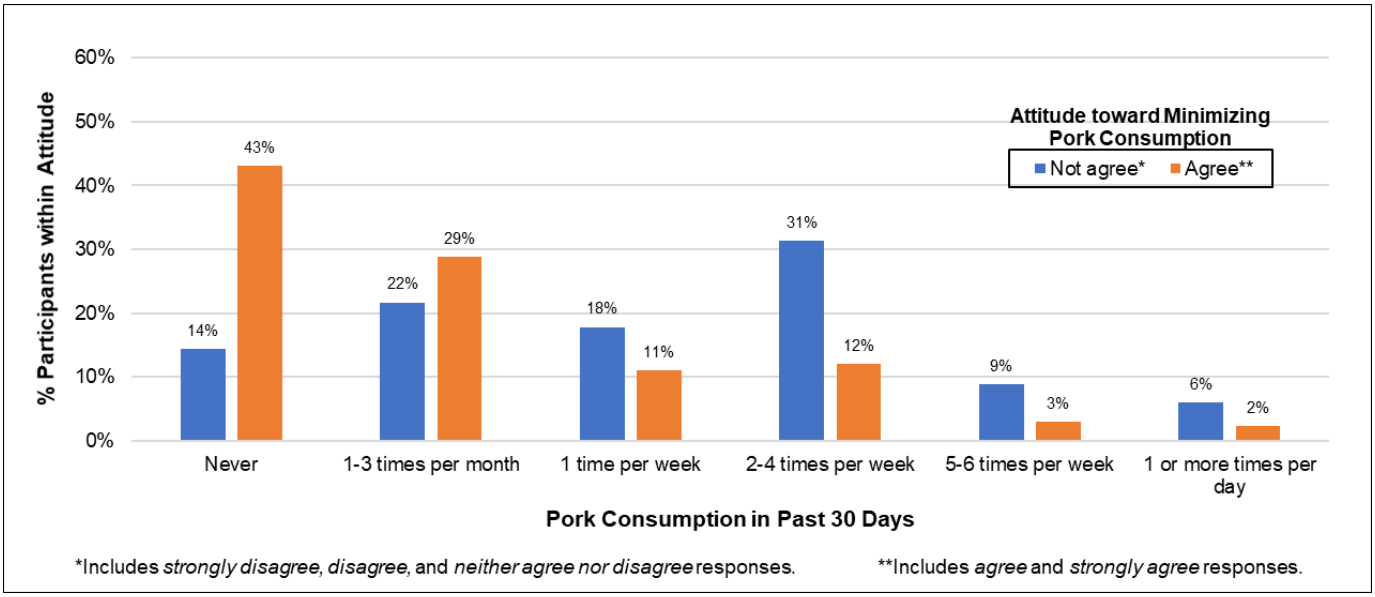

Figure 11: T2 Pork Consumption as a Function of T1 Attitudes.

4.3.2 Implications of Attitude-Consumption Association

These findings are consistent with the hypothesis that watching a video creates attitude change, and that that attitude change in turn leads people to reduce their pork consumption over the following month. Figure 12 provides a visual representation[22] of this process.

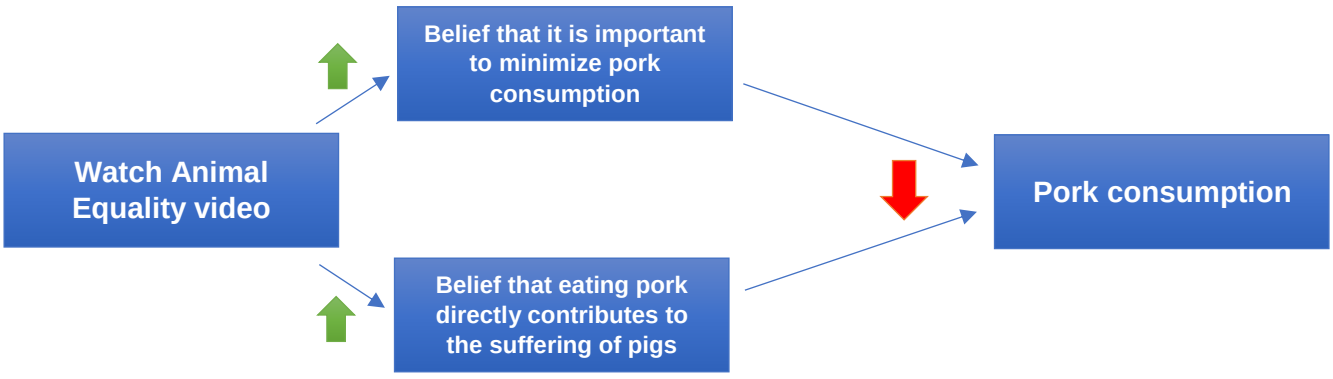

Figure 12: A Representation of the Proposed Process by which Behaviour Change Occurs.

[22] Please note that this diagram is a visual aid only, not a statistical model. This study was not designed to formally test mediation (i.e., the statistical significance of attitudes as an intermediate step between watching a video and eating less pork), so although this is a reasonable interpretation, it should not be considered a definitive explanation of the process of behaviour change.

4.3.3 Summary of Attitude-Consumption Association

Although the evidence is not definitive due to the nature of the study, the results presented in this section support a likely process by which Animal Equality's videos produce behaviour change over the subsequent month: namely, that watching a video about farmed pigs has the immediate effect of making the average person's attitudes more anti-pork, and that those attitudes, over the following month, lead them to reduce their pork consumption.

4.4 Differences in Video Impact by Demographics

4.4.1 Does Watching a Video Have Different Impact on Pork Consumption for Different Demographic Groups?[23]

The effect of watching a video on T2 diet differed slightly depending on participants' coast,[24,25] as shown in Figure 13. On the west coast, more participants in the video conditions reported low pork consumption at T2 than in the control condition, whereas on the east coast, slightly more participants in the control condition reported low pork consumption at T2 than in the video conditions.

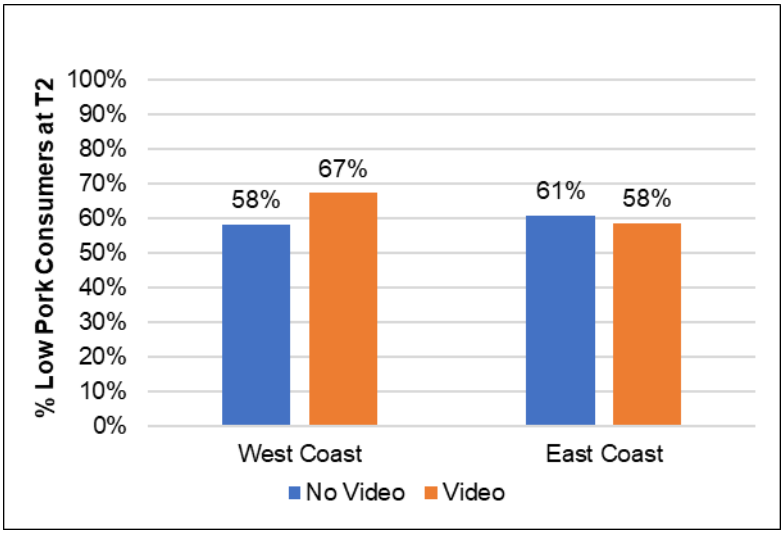

Figure 13: Proportion of Low Pork Consumers at T2 by Video and Coast.

[23] Demographic analyses of the 2D versus 360 conditions were not conducted because of the consistent null effects found in previous sections. Any differences found in subsequent analyses would likely be spurious, resulting from the high number of comparisons performed. That said, note that the supplementary graphs in the following pages provide data for all three conditions individually.

[24] Video × Coast interaction: β = -0.84 (*SE* = 0.28), z = -3.04, p = .002

[25] The effect of video also differed by baseline consumption, β = 0.85 (*SE* = 0.27), z = 3.16, p = .002, such that the difference between the video and no-video conditions was larger for low baseline consumers (91% and 83%, respectively) than high baseline consumers (33% and 31%). However, this effect is largely attributable to the fact that consumers at the higher end of the scale can decrease their consumption substantially (e.g., from daily to weekly) without becoming a low consumer as defined here. Thus, this difference between high and low consumers should not be considered especially meaningful. The difference among low baseline consumers supports the overall effectiveness of the video, and the lesser difference among high baseline consumers does not detract from it.

These findings suggest that the Animal Equality videos may have been somewhat more effective on the west than the east coast. However, it is important not to read too much meaning into the apparent reversal for the east coast. There is substantial error variance when the data is broken down this far, and due to the number of comparisons being considered, a few spurious differences are inevitable. Another study would be needed to see whether these results can be replicated before drawing any strong conclusions.

4.4.1.5 Additional Graph

Figure 14 and Figure 15 are provided to aid interpretation of the results described above. First, Figure 14 depicts decreases in pork consumption as a function of condition and coast. Note that this provides a different perspective than the analysis above: for example, a person's pork consumption could decrease from T1 to T2 while they remain in the high-consumption group.

Similar to Figure 13, Figure 14 suggests that the videos may be somewhat more effective in decreasing pork consumption on the west coast. Note, however, that no reversal is apparent in the east coast data, which supports an interpretation of the reversal in Figure 13 as likely spurious.

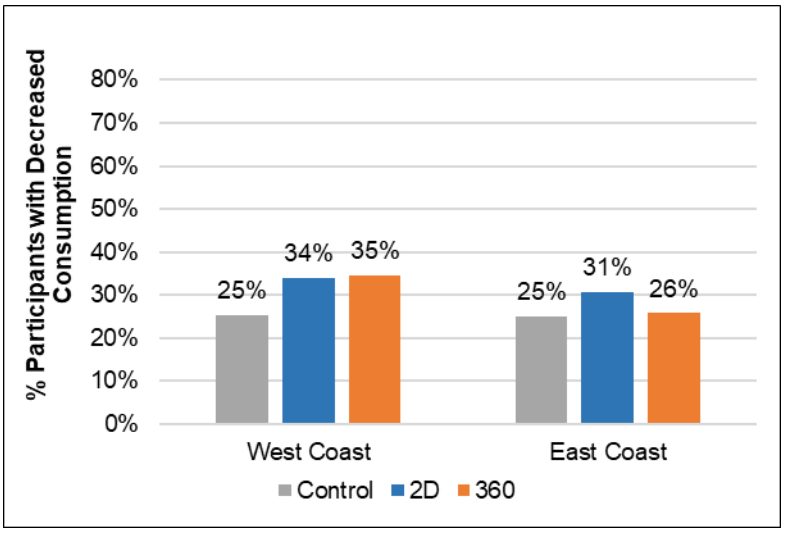

Figure 14: Decreased Pork Consumption by Condition and Coast.

Figure 15 shows that the videos more frequently produced a decrease in pork consumption among high baseline consumers than low baseline consumers. This difference should not be surprising, in that those who rarely or never eat pork have little or no room to decrease their consumption further. This graph confirms that people who already consume little or no pork are, almost by definition, not the ideal target for this intervention.

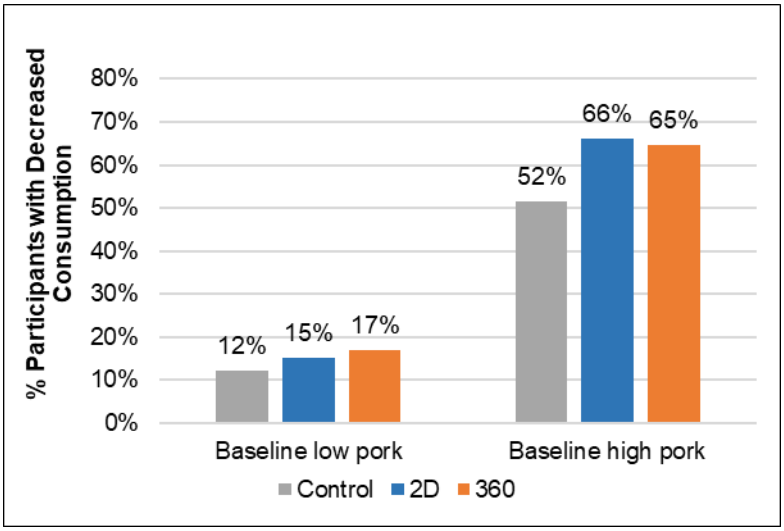

Figure 15: Decreased Pork Consumption by Condition and Baseline Pork Consumption.

4.4.1.6 Other Demographics

The impact of the Animal Equality videos on pork consumption did not differ for participants of different genders[26] or ages.[27] To review the baseline differences for these demographic variables, see Appendix A.

4.4.2 Does Watching a Video Have Different Impact on Attitudes for Different Demographic Groups?

In these analyses, we examined whether the impact of watching a video on each of the two attitudes items at T1 and T2 differed as a function of participant demographics. None of the demographic factors consistently moderated the videos' impact on either attitude variable.[28]

4.4.3 Summary of Demographic Analyses

These demographic analyses indicate that the Animal Equality videos may have been somewhat more effective in producing diet change on the west than the east coast, though they cannot determine the reason. East coast participants could differ in some meaningful way from west coast participants, but it is at least as likely that because the study was administered by different

[26] β = -0.16 (*SE* = 0.27), *z* = -0.58, *p* = .56
[27] β = 0.03 (*SE* = 0.02), *z* = 1.30, *p* = .19
[28] Statistically, age slightly moderated the impact of watching a video on T1 attitudes toward pork consumption, such that older age was associated with more agreement in the control condition but not in the video conditions. However, we have not presented this finding in detail because: a) a few data points were overly influential, b) it did not replicate at T2, and c) it did not replicate for attitudes toward pig suffering at either time point, despite the strong correlation between the two attitudes measures. It is recommended that this finding be ignored as probably spurious.

teams on the two coasts, small differences in procedure could have affected the impact of the intervention.

Apart from coast, participants' baseline level of pork consumption showed evidence of moderating the videos' effectiveness in a predictable way. Specifically, the results for decreased consumption are consistent with the central finding (Section 4.2.1) that the videos effectively reduce pork consumption—the effect is simply weaker for those participants with the least room to decrease (i.e., low baseline pork consumers).

It is worth noting that participants' gender and age had no impact on the effectiveness of the videos. Women and older participants ate less pork on average than men and younger participants (see Appendix A), but this did not differ by condition.

The impact of the videos on attitudes was not meaningfully influenced by any of the demographic variables (coast, baseline consumption, gender, or age): The videos were equally impactful on attitudes regardless of demographic group.

5 Study Limitations

5.1 Differential Attrition

As with any longitudinal study, perhaps the most important limitation is participant attrition. Although the follow-up rate of 58% is better than many longitudinal studies attain, the follow-up rates differed as a function of diet and condition. Specifically, people with lower baseline pork consumption were more likely to complete the T2 survey, as were people in either video condition (vs. control). See Appendix C for details.

The effect of differential attrition on the results is unknown. Participants who did not follow up may have been eating systematically more or less pork.

5.2 Unknown Secondary Effects

This study was designed to maximize our ability to find an effect of Animal Equality's videos—which in this study focused on pigs—on the most important and relevant outcome, pork consumption. However, that exclusive focus means that the study did not measure other meat or animal product consumption. Thus, it is important to acknowledge the potential for unknown secondary effects, like participants compensating for a reduction in pork by eating more of other types of meat (e.g., chicken). Ideally, future research would examine a fuller spectrum of effects on participants' diet and related behaviours (e.g., wearing leather).

5.3 Overrepresentation of Vegans and Vegetarians

We did not include a question in this study about participants' overall diet, only their pork consumption, so we do not know the rate of vegan and vegetarian (together, *veg*n*) participation. However, anecdotally, the teams conducting the study noted that many participants spontaneously mentioned that they were veg*n. From the frequency of those mentions, it seems likely that veg*ns were substantially overrepresented in this sample relative to the general population. If anything, this likely makes the study more conservative, limiting our ability to find a significant difference between conditions (because veg*ns provide no variance on the pork consumption measures, they "water down" the effective sample). At the same time, the representation of veg*ns in Animal Equality's usual outreach is also unknown. They may well be overrepresented at all times because veg*ns may be more drawn to an animal advocacy booth than meat-eaters. Thus, it is possible (but again, uncertain) that the watered-down sample is representative of the group to whom these interventions would typically be administered.

5.4 Limitations to Generalizability of Findings

Several decisions were made for practical reasons or in the interest of internal validity (ensuring that conditions are as consistent as possible, apart from the video). The latter is crucial for drawing causal conclusions about the treatments' effectiveness. However, these decisions have the potential to limit the generalizability of the findings to different populations or circumstances.

First, although an effort was made to select a range of campuses from the east and west coasts for this study, the colleges selected may not be representative of Animal Equality's entire outreach population. That lack of representation may limit the generalizability of the findings to similar campuses.

In addition, the use of a generic recruitment script and canopies to hide the study condition somewhat decrease the generalizability of the findings because they were not reflective of Animal Equality's typical outreach strategy. When outreach is performed under normal conditions, different types of people may participate (e.g., people interested in the headsets vs. people interested in animals). This study does not provide any information about which of those people may be more or less affected by the videos.

5.5 Inaccurate Self-Reporting

Self-reported attitudes and behaviour are susceptible to both errors and deliberate misrepresentation. Errors of memory are certainly possible in this study, but, we think they represent a relatively minor limitation in that they should introduce error variance consistently across the three conditions.

Deliberate misrepresentation of one's attitudes or pork consumption are a greater concern, because socially desirable responding is relatively common when the socially prescribed attitude or behaviour is known to participants. In this study, run by an animal advocacy group, the prescribed responses would have been quite clear to participants.

To examine and control for social desirability bias, we administered the Marlowe-Crowne scale (Reynolds's Form C) to participants at T1. Scores on this scale did not significantly predict any of the attitudes items. However, they did predict reported pork consumption at T2. This suggests that participants prone to socially desirable responding were more likely to present themselves positively by underreporting their consumption.

Crucially, however, the impact of video on pork consumption was marginally significant even when we controlled for these social desirability scores, indicating that the key results were not caused by participants deliberately misreporting their consumption.

6 Conclusion

The results of this study support the effectiveness of Animal Equality's video outreach for shifting attitudes and pork consumption behaviour, but do not find strong evidence of an advantage for one type of outreach over the other (360 vs. 2D).

Nonetheless, the novelty of the 360 video may draw in more people than the 2D video—a difference that could be easily quantified in the course of regular Animal Equality outreach—giving it more potential effectiveness until that novelty wears off (although it is unknown how people enticed by the technology might differ from others).

Overall, the results of this study support the usefulness of Animal Equality videos—in either medium—as an outreach tool. The results demonstrate their ability to improve attitudes and reduce pork consumption behaviour, thereby potentially reducing the number of pigs raised and killed for food. While the current study and video focused on pigs, it seems plausible that a similar approach could also be effective to reduce consumption of other species.

Appendix A: Baseline Pork Consumption by Key Demographic Variables

Gender

At baseline, men ate more pork than women.[29]

Table 4: Pork consumption at T1 by gender.

	Response Frequency		
	Men (*n* = 1348)	Women (*n* = 1652)	Other[1] (*n* = 43)
Never	23.9%	33.5%	41.9%
1-3 times per month	18.8%	24.2%	23.3%
1 time per week	13.4%	12.3%	7.0%
2-4 times per week	23.9%	18.9%	18.6%
5-6 times per week	10.7%	7.0%	4.7%
1 or more times per day	9.3%	4.1%	4.7%

[1]Other gender identities include "Transgender female, transgender male, genderqueer/gender nonconforming, nonbinary, or other identity."

Age

At baseline, younger participants ate more pork than older participants.[30]

Table 5: Pork consumption at T1 by age.

	Response Frequency		
	18-19 years old (*n* = 1095)	20-21 years old (*n* = 891)	22+ years old (*n* = 1082)
Never	27.1%	31.0%	30.7%
1-3 times per month	18.8%	21.1%	25.2%
1 time per week	12.1%	12.7%	13.4%
2-4 times per week	24.5%	19.4%	19.0%
5-6 times per week	9.9%	9.1%	6.7%
1 or more times per day	7.7%	6.7%	4.9%

[29] β = 0.50 (SE = 0.09), z = 5.58, p < .001
[30] β = -0.02 (SE = 0.01), z = -3.21, p = .001

Coast

There was no baseline difference in pork consumption by coast.[31]

Table 6: Pork consumption at T1 by coast.

	Response Frequency	
	West Coast (*n* = 2049)	**East Coast (*n* = 1019)**
Never	28.7%	31.0%
1-3 times per month	22.0%	21.3%
1 time per week	11.9%	14.4%
2-4 times per week	22.4%	18.4%
5-6 times per week	8.7%	8.1%
1 or more times per day	6.2%	6.8%

[31] β = 0.01 (SE = 0.13), z = 0.10, p = .92

Appendix B: Graphs for Attitudes toward Pig Suffering

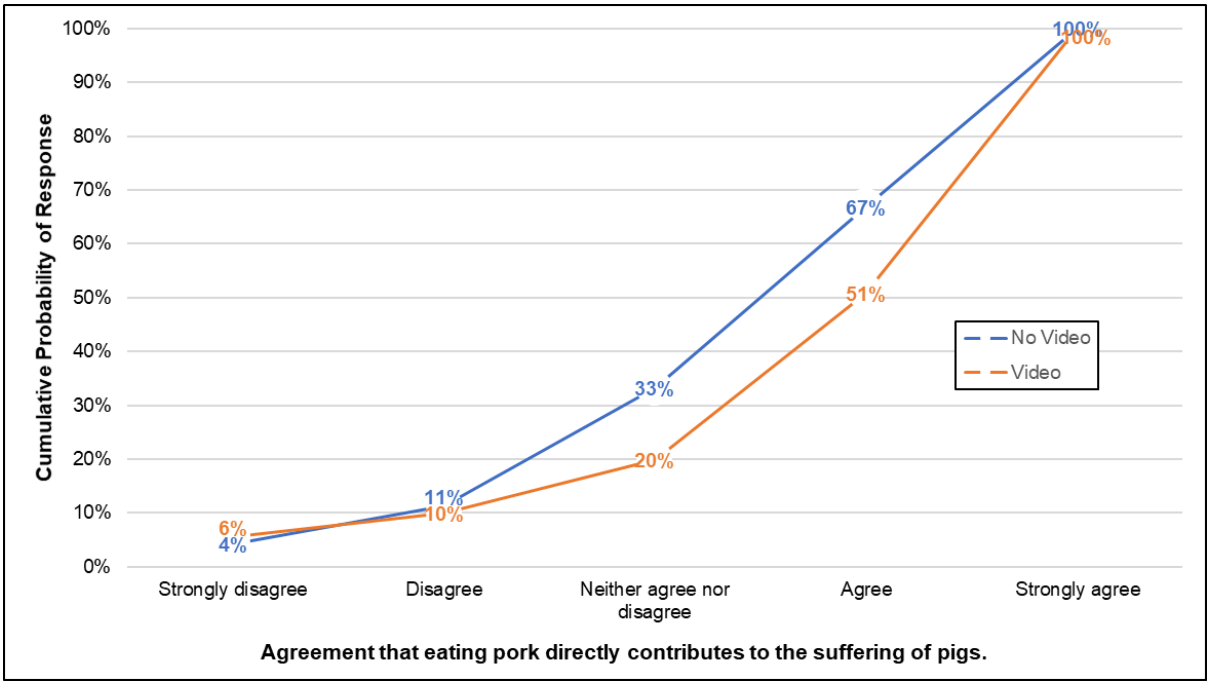

Figure 16: Attitudes toward Pig Suffering at T1: Video vs. No Video (parallel to Figure 5).

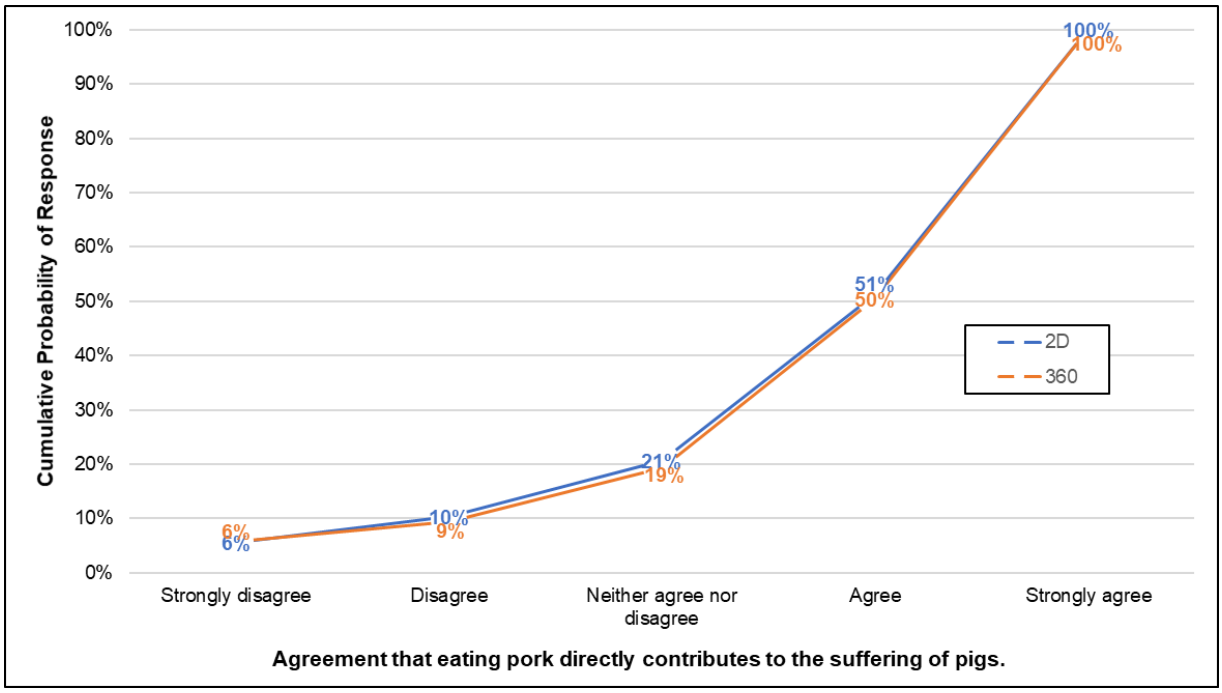

Figure 17: Attitudes toward Pig Suffering at T1: 360 vs. 2D Video (parallel to Figure 6).

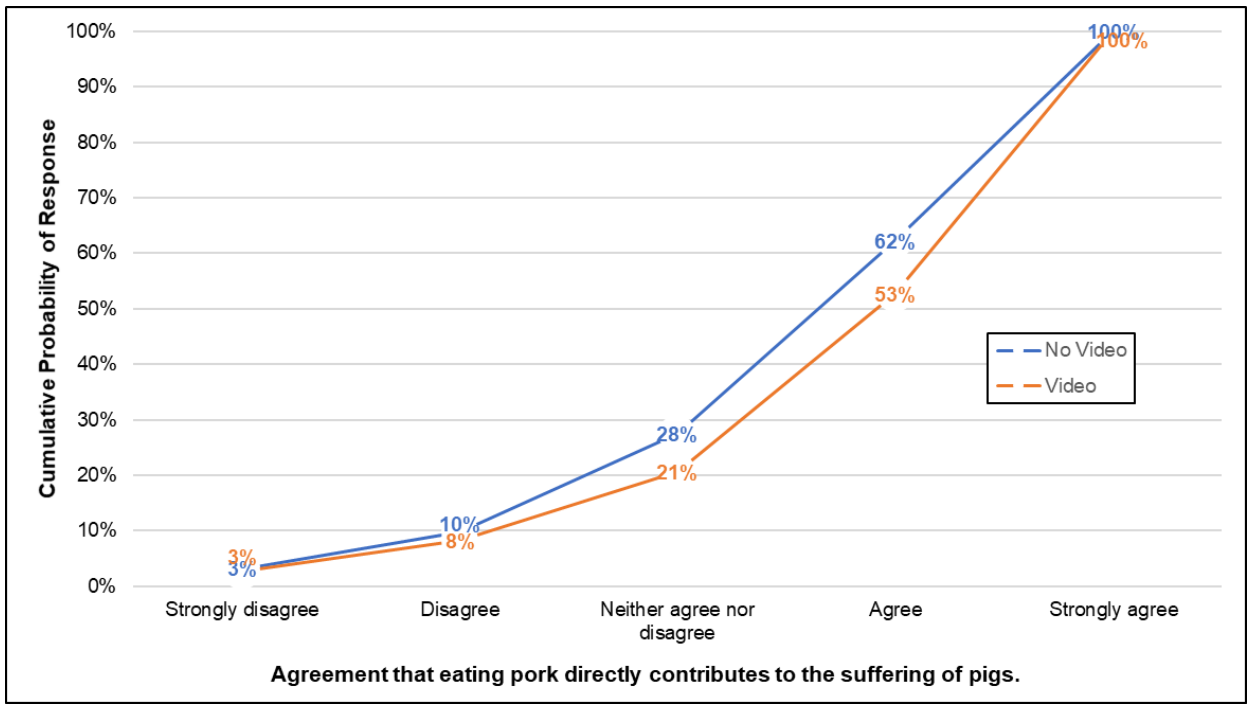

Figure 18: Attitudes toward Pig Suffering at T2: Video vs. No Video (parallel to Figure 7).

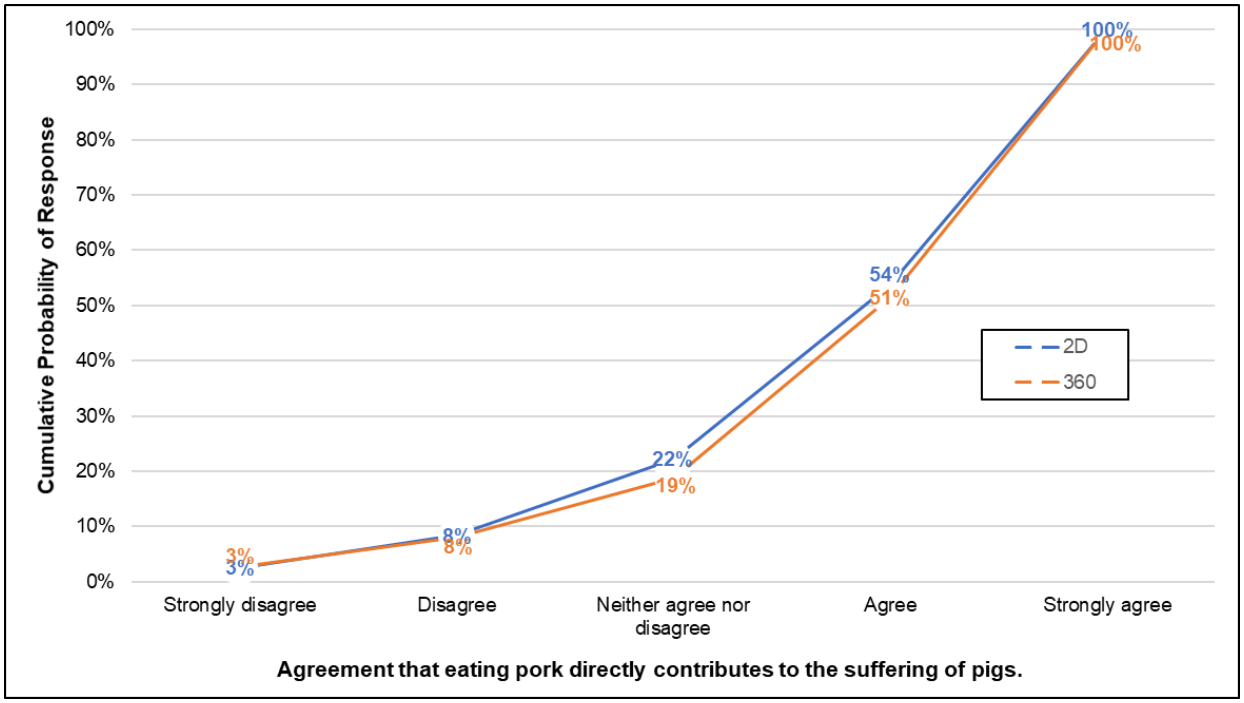

Figure 19: Attitudes toward Pig Suffering at T2: 360 vs. 2D Video (parallel to Figure 8).

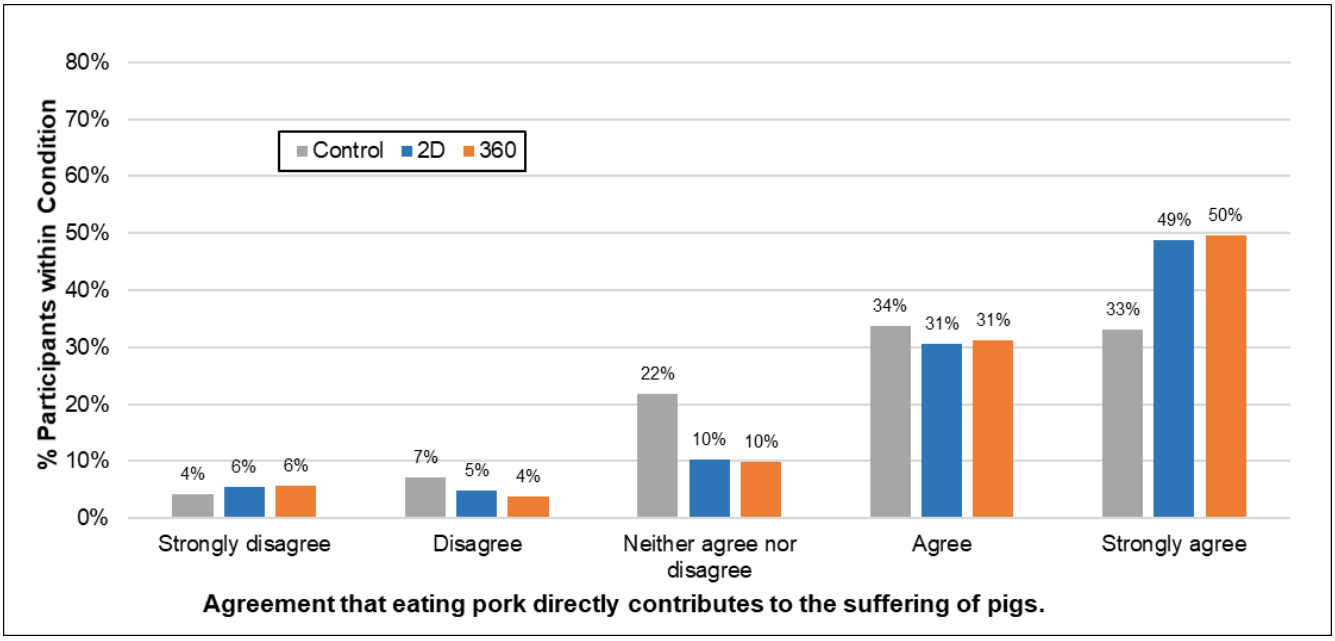

Figure 20: T1 Attitudes toward Pig Suffering by Condition (parallel to Figure 9).

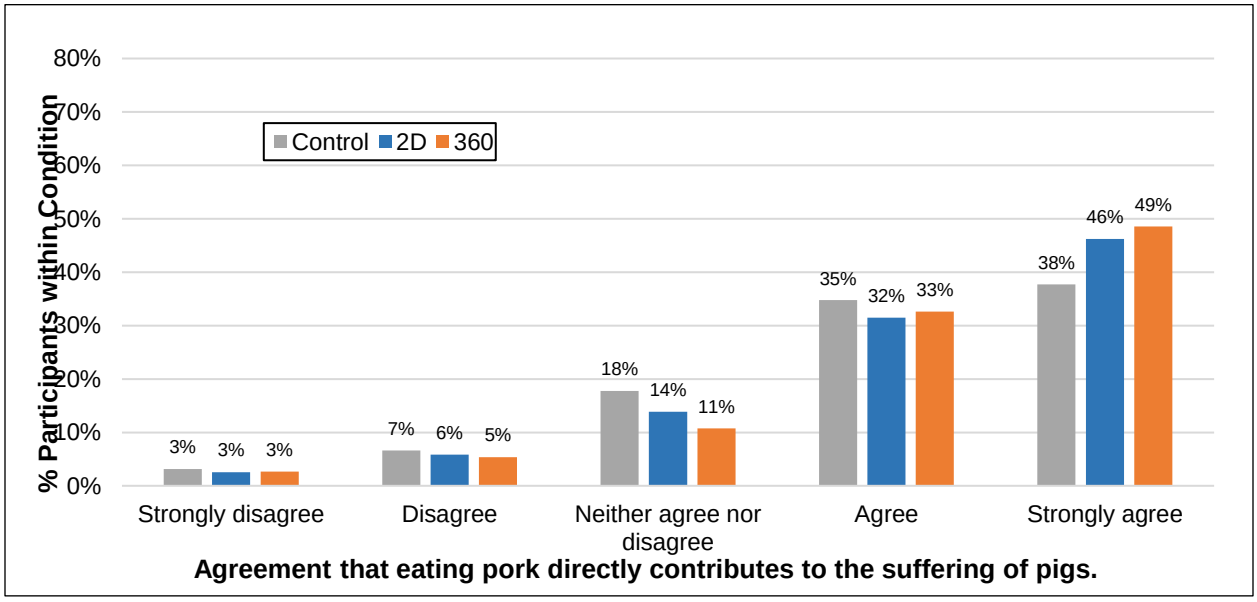

Figure 21: T2 Attitudes toward Pig Suffering by Condition (parallel to Figure 10).

Appendix C: Participant Attrition

Table 7 presents follow-up rates (i.e., the proportion of participants completing the T2 survey) as a function of condition and baseline pork consumption. As the table shows, participants with low (vs. high) baseline consumption were more likely to follow up,[32] as were participants in either video condition (vs. control).[33]

Table 7: T2 Follow-up rates by condition and baseline pork consumption.

	Baseline Pork Consumption	
Condition	**Low**	**High**
Control	56%	45%
2D Video	65%	63%
360 Video	63%	55%

[32] The follow-up rate across conditions was 61% for low baseline consumers versus 53% for high baseline consumers, $\beta = 0.48$ ($SE = 0.12$), $z = 4.09$, $p < .001$.

[33] The follow-up rate across levels of pork consumption was 52% in the control condition. It was significantly higher in the 360 condition (61%), $\beta = 0.37$ ($SE = 0.13$), $z = 2.79$, $p = .005$. It was also significantly higher in the 2D condition (64%) than the control condition, $\beta = 0.73$ ($SE = 0.13$), $z = 5.43$, $p < .001$.