

DISSERTATION

ASSESSING ASSOCIATIONS BETWEEN EMPATHY, ATTITUDES TOWARDS ANIMAL  
WELFARE, AND STRESS IN DAIRY FARM WORKERS

Submitted by

Hannah Curcio

Department of Psychology

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Colorado State University

Fort Collins, Colorado

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Doctoral Committee:

Advisor: Lorann Stallones

Catie Cramer

Bryan Dik

Dan Graham

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## ABSTRACT

### ASSESSING ASSOCIATIONS BETWEEN EMPATHY, ATTITUDES TOWARDS ANIMAL WELFARE, AND STRESS IN DAIRY FARM WORKERS

Livestock farmers face job-specific stressors that increase their overall risk of stress-related diseases and deaths. While the literature suggests a relationship between farm workers' levels of empathy, their own well-being, and the welfare of their livestock animals, little research has adequately investigated these potential associations. Furthermore, empathy towards animals has been linked to attitudes about and indicators of animal welfare, but no previous research had assessed levels of empathy in dairy workers specifically towards their dairy cattle. The present study, thus, assessed the relationships between empathy towards dairy cattle, attitudes towards animal welfare, stress related to the welfare of cattle, and stress pileup in dairy farm workers. Specifically, I hypothesized that dairy workers' levels of empathy towards dairy cattle would be positively correlated with their attitudes towards animal welfare; dairy workers' levels of stress related to the welfare of cattle would be negatively correlated with their levels of empathy towards dairy cattle and their attitudes towards animal welfare; and, dairy workers' stress pileup (as measured by the number of stressors participants reported often caused them stress) would be negatively correlated with their levels of empathy towards dairy cattle and their attitudes towards animal welfare.

As hypothesized, dairy workers' stress pileup was negatively correlated with levels of empathy towards dairy cattle. No evidence was found in support of the other hypotheses. However, additional exploratory analyses found relationships between empathy and the

following variables: a positive relationship with years working in production livestock, a negative relationship with size of herd, primary language (such that participants with English as their primary language had significantly higher empathy for dairy cattle scores than those with Spanish as their primary language), and birth country (such participants born in the United States had significantly higher empathy for dairy cattle scores than participants born in Mexico). While limited, the results highlight the ways in which the well-being of farm workers and the welfare of their livestock are interconnected and posits that empathy may play a crucial role.

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## INTRODUCTION

At least 78 billion land animals are raised for human consumption globally every year (Dawkins, 2023). The world's per capita animal product consumption has been increasing since the 1960s – with the U.N.'s Food and Agriculture Organization (2020) predicting an increase in livestock product demand by 2050 – and production has gotten increasingly industrial as a result (Tilman et al., 2002). Global demand for dairy products, specifically, has seen a steady increase, which has led not only to an increase in production, but also to a shift towards larger-scale operations, with the U.S. leading in dairy herd size (Doughrate et al., 2013; OECD-FAO, 2020). In the U.S., as of the 2017 Census of Agriculture, there were more than 17 million cows being raised for milk production (U.S. Department of Agriculture, 2017). This trend has coincided with a rise in public concern for animal welfare (Cornish et al., 2016; McEachern et al., 2007). Perhaps as important as the broader public's concern for the welfare of livestock animals are the views held by livestock producers and workers themselves, as they are the individuals most directly able to improve animal welfare. Across the U.S., in 2023, there are nearly 7,000 dairy cattle farm establishments employing more than 100,000 workers (Bureau of Labor Statistics, 2023). Compared to some other types of livestock production, dairy production is exceedingly labor-intensive, as milk is produced daily and both producing and harvesting milk requires a higher degree of husbandry (Doughrate et al., 2013). This makes dairy farms and their workers a particularly interesting environment to study animal and worker well-being.

### ***One Welfare Framework***

The present study was developed under One Welfare, a framework that highlights the interconnectedness of animal welfare, human well-being, and the environment (Pinillos et al.,

2016). One Welfare's broad aim is to improve outcomes for all three by acknowledging their interdependence and by taking a more integrated approach in science and policy. The concept stems from the One Health framework, which focuses more specifically on health (e.g., healthcare and disease) (Lebov et al., 2017). In Pinillos et al. (2016), the One Welfare framework highlights several specific outcomes that would benefit from such an approach, but of relevance to the present topic is the link between improved animal and dairy worker welfare. Animal welfare improvements directly and indirectly benefit human well-being and our environment, and vice versa.

For example, animal welfare indicators can be used as a sign of a farmer being successful or failing to cope, and could be used to detect poor farmer health/wellbeing. Equally, poor farmer wellbeing detected by a medical practitioner could indicate a risk of poor animal welfare on the farm. (Pinillos et al., 2016, p. 4)

Additionally, animal welfare and farm worker well-being are associated with greater farm productivity and are factors of sustainable food production (Kauppinen et al., 2013; Pinillos et al., 2016; One Welfare Phoenix Advisory Board, 2020). Thus, the present study operates under this approach, explicitly acknowledging and researching the interconnectedness of animals, dairy workers, and their environments.

### ***Animal Welfare***

Addressing the welfare of animals raised for food is complicated. Some define animal welfare to be the prevention of negative states, often summarized as the Five Freedoms: freedom from hunger and thirst; freedom from discomfort; freedom from pain; injury and disease; freedom to express normal behavior; and freedom from fear and distress (Webster, 2001). Others argue that welfare should be more about the promotion of positive states, including positive

emotions and experiences (Yeates & Main, 2008). Frameworks for animal welfare now typically incorporate both the absence of negative states and the presence of positive states as indicators of welfare (Farm Animal Welfare Council, 2009; Mellor & Beausoleil, 2015).

While much of the literature on animal welfare focuses on consumers' attitudes on the topic, research has also investigated farm workers' views. According to this research, livestock farm workers most commonly point to physical health and productivity as indicators of welfare (Cornish et al., 2016; Kauppinen et al., 2010). In a qualitative study conducted in the Netherlands, when asked specifically about animal welfare in semi-structured interviews, most farm workers focused on the physical health of their livestock (Te Velde et al., 2002). The interviewed workers felt positively about the welfare of their animals, under the assumption that the animals' physical health and growth were clear indicators of their welfare. This was in contrast with the views of interviewed consumers, who all had an overall negative perception of livestock animals' welfare and who brought up things like freedom to move and freedom to fulfill natural desires. A qualitative study conducted in Finland had similar findings, but researchers specifically noted that the interviewed farm workers discussed measuring animal welfare in four practical ways: providing animals with a favorable environment; taking care of the animals' health; treating the animals humanely; and taking care of the farmer's own well-being at work (Kauppinen et al., 2010). When asked in a survey to rank the four categories of welfare measures that emerged from the interviews, Finnish farm workers ranked taking care of the animals' health and taking care of their own well-being as the two most important components. Importantly, many of the farm workers specifically stressed that their own well-being and the welfare of their animals were highly linked.

A more recent literature review conducted a thematic analysis of research on farm workers' views on farm animal welfare since 1989, spanning many countries and disciplines (Balzani & Hanlon, 2020). Balzani & Hanlon (2020) identified three categories of farm workers in terms of their views on animal welfare: the majority fell into the category of focusing on the biological function of the animal as an indication of welfare. The second and third most popular viewpoint, respectively, were focusing on the affective state of the animal and the ability of the animal to engage in natural behaviors.

Balzani & Hanlon (2020) found that these perspectives on farm animal welfare appeared consistently in the research, across methodologies and species. Notably, however, the research did show differences across species specifically when it came to the human-animal relationship (i.e., farm workers ability to bond with their livestock), with proximity to the livestock (i.e., frequent handling of the animals) likely playing a role.

### ***Empathy Towards Animals***

In addition to investigating farm workers' views on animal welfare, Balzani & Hanlon's (2020) thematic analysis also identified specific characteristics of farm workers that influenced these views. The first most recurring characteristic that influenced views towards improvement in farm animal welfare was having greater knowledge of welfare practices, and the second was having higher levels of animal-directed empathy. The literature suggests that empathetic workers are more able to "appreciate the natural behavior, assess the likely affective state of livestock and provide for the biological needs of their animals" (Balzani and Hanlon, 2020, p. 17).

Keilland et al. (2010) provide a quantitative example in their study, which utilized a pain assessment instrument to measure cattle farmers' levels of empathy. Farmers were asked how much they agree with the statement "animals experience physical pain as humans do" and then

asked to rate the perceived pain level of 21 different cows pictured with various painful conditions. The researchers found a higher prevalence of skin lesions on cattle owned by farmers who disagreed with the physical pain statement, compared to those who agreed with the statement. They also found that the median pain assessment rating decreased by 2 points (on a scale of 10) when comparing farmers who disagreed with the statement to those who agreed.

More generally, empathy and attitudes towards animals impact livestock handlers' behavior towards animals and, in turn, the human-animal relationship (Ceballos et al., 2018; Hemsworth & Coleman, 2011; Leon et al., 2020). A study conducted on cattle and their handlers specifically at a livestock market in Colombia found that handlers who scored negatively on an attitudes and empathy towards animals scale were more likely to engage in negative interactions with their cattle (including prodding, shouting, and, at a lower frequency, tail-twisting) (Leon et al., 2020). Researchers observing these cattle-handler interactions noted that a high proportion of steers exhibited fear in response to these negative interactions (indicated by the cattle freezing, running, and/or reversing). On the other hand, handlers who scored positively on the attitude and empathy towards animals questionnaire were more likely to engage in visual interactions (as opposed to tactile or auditory) such as the handler raising their hands in front of the animal, which is a widely accepted practice because it is non-invasive to the cattle. Additionally, a study in Japan on dairy cows found a similar pattern, but also found that negative attitudes and empathy towards animals were associated with lower job satisfaction (Fukasawa et al., 2017).

Empathy has also been shown to correlate positively with farmed animals' productivity (as measured by milk yield in dairy cows, weight gain in veal calves, and reproductive health of female swine) (Breuer et al., 2000; Fukasawa et al., 2017; Hanna et al., 2009; Hemsworth et al., 1989). It is possible that this link between empathy and productivity is mediated by handlers'

positive interactions with their animals (and/or lack of negative interactions that cause fear in the animal) (Breuer et al., 2000; Hemsworth et al., 1989; Lensink et al., 2000).

Outside of the farm population, empathy (both generally and specifically towards animals) has been linked to welfare-related issues and constructs. For example, a study conducted among university students found that higher scores on empathetic concern significantly predicted attitudes towards the use of animals in research (Furnham et al., 2003). Another study looked at whether a course covering animal welfare and ethical concerns changed veterinary students' attitudes towards animals and found that attitudes towards animals (specifically animals used for profit) significantly increased after the course (Hazel et al., 2011). More generally, empathy has been linked to pro-social behavior, such as animal conservation efforts (Young et al., 2018). Because workers on dairy farms work closely with individual cows in their herds, dairy workers make a particularly interesting population to study empathy among.

Furthermore, empathy towards animals has been empirically shown to be distinct from empathy that humans feel towards other humans, though the two constructs are certainly linked (Paul, 2000). One study specifically found that empathy mediates the relationship between individuals' attitudes towards human rights and attitudes towards animal rights (Stone, 2022). Additionally, empathy towards animals is partially predicted by currently having or previously having had pets/companion animals (Gómez-Leal et al., 2021; Paul, 2000). Age and gender (comparing men and women) are also significant predictors of empathy towards animals, with higher levels of empathy in younger individuals and women (Gómez-Leal et al., 2021). Even though empathy for animals has proven to be distinct from human-human empathy (such that it should be measured separately), these two types of empathy appear to develop in humans in the same way (Young et al., 2018).

Methods utilized in the literature on empathy and/or animal welfare include measures on empathy generally (i.e., human-to-human empathy), a measure on empathy towards animals (e.g., towards various species and uses of animals), attitudes towards animals, and observational methods (e.g., treatment towards animals) (Hazel et al., 2011; Herzog et al., 2015; Keilland et al., 2010; Paul, 2000). However, no research has considered empathy towards farm animals specifically, despite research that has shown that attitudes towards animals differ across type of animal (e.g., animals perceived as pests, animals treated as pets, and animals raised for profit) and that parameters noted as important for animal welfare also differ across various animal categories (e.g., agricultural animals, pets, research animals, and wildlife) (Sullivan et al., 2022; Taylor & Signal, 2009). While the literature suggests a link between empathy (specifically empathy for animals) and animal welfare, no single study has quantified a link between measures of empathy and animal welfare in livestock workers. Additionally, because research suggests a link between gender and overall empathy, the present study tested whether gender and/or other characteristics of the workers significantly predicted levels of empathy (Balzani & Hanlon, 2020; Colombo et al., 2017; Robbins et al., 2016).

### ***Livestock workers and stress***

Farm workers are at higher risk of stress-related diseases and deaths compared to other occupations due to a unique set of stressors ranging from economic pressures to disease and weather to dangerous tasks and more (Chengane et al., 2021; El Khayat et al., 2022; Daghigh Yazd et al., 2019). On dairy farms particularly, increases in herd sizes and overall production has also increased concerns about workers' occupational health and safety (Doughrate et al., 2013; Lunner Kolstrup et al., 2013). Additionally, there is indication in the literature that in agriculture, empathy for and connections with animals may play a role in farm stress. For example,

ethnographic research on Scottish livestock production found that producers face a tension between the roles they play as both economic producers and empathetic caretakers (Wilkie, 2005). It seems that, at times, focusing on productivity while caring about the animals' welfare can create conflicting emotions for workers (Balzani & Hanlon, 2020). Psychologically, this may create cognitive dissonance – psychological discomfort caused by two beliefs and/or behaviors that are in conflict with each other – in the agricultural workers (Balzani & Hanlon, 2020; Harmon-Jones & Mills, 2019).

One study on dairy farms in Sweden also found associations between the physical and psychosocial health of dairy workers and the health of the cows (Lunner Kolstrup & Hultgren, 2011). Specifically, the dairy workers reported being exposed to more negative psychosocial factors (including increased need to work very fast and decreased meaning of work) when the dairy herds had higher disease incidence rates; higher exposure to negative psychosocial factors was also associated with symptoms such as irritation, fatigue, and headache. One explanation for these findings is an increase in stress due to the increased physical and mental workload required of the workers when caring for unhealthy cows, but a second explanation is that the workers' levels of empathy for the cows leads to negative feelings and greater stress when the cows are ill (Lunner Kolstrup & Hultgren, 2011).

However, no research has specifically investigated whether empathy towards animals significantly predicts stress in workers. Due to the higher risk that farm workers face, it is also critical to understand and quantify the extent to which having higher levels of empathy is associated with greater stress in the workers related to the welfare of the animals and, similarly, whether facing more stressors is associated with lower levels of empathy.

### ***Present Study***

Despite its presumed importance in the discussion of farm animal welfare (and productivity), the literature has not adequately assessed levels of empathy specifically in dairy workers, nor fully established and quantified the relationship between empathy for animals and attitudes towards animal welfare. The present study, thus, sought to determine overall levels of empathy in dairy workers, and to explore the associations between empathy, attitudes towards welfare, and stress related to animal welfare. Specifically, I hypothesized:

1. Dairy workers' levels of empathy towards dairy cattle will be positively correlated with their attitudes towards animal welfare.
2. Dairy workers' levels of stress related to the welfare of cattle will be positively correlated with...
  - a. Levels of empathy towards dairy cattle
  - b. Attitudes towards animal welfare
3. Dairy workers' stress pileup (as measured by the number of stressors participants reported) will be positively correlated with...
  - a. Levels of empathy towards dairy cattle
  - b. Attitudes towards animal welfare

Additionally, I explored whether the following characteristics of the workers were significantly correlated to levels of empathy, attitudes towards animal welfare, levels of stress related to animal welfare, or overall stress pileup: gender, age, race, primary language, birth country, length of time working in production livestock, and size of herd.

## METHOD

### *Overview*

The present study explored the relationships between empathy, attitudes towards welfare, and stress in workers in the dairy industry. Relationships between these variables and demographic variables were also assessed. The study was conducted via an online survey developed in Qualtrics and, prior to collecting data, the study was reviewed and approved by the Colorado State University Institutional Review Board (protocol #5299).

### *Participants*

Participants were recruited via listservs of extension programs at universities and directly through dairy farms, both within and outside of the U.S. Participants who do not speak Spanish or English were excluded. All participants provided informed consent before taking the survey.

A sample size calculation was conducted for a small effect size ( $r = 0.3$ ). For correlational analyses, a sample size of 85 was needed to reach a power of 0.8 (Kohn & Senyak, 2024). The final sample was exactly 85 participants.

### *Measures*

**Empathy for dairy cattle.** To measure dairy workers' levels of empathy towards dairy cattle, I modified Paul (2000)'s Animal Empathy Scale to apply to dairy cattle. Paul (2000) created the Animal Empathy Scale based on Mehrabian & Epstein (1972)'s Measure of Emotional Empathy, a validated measure of individuals' empathetic tendencies with strong internal reliability (Cronbach's  $\alpha = 0.78$ ). The Animal Empathy Scale asks individuals the extent to which they agree with twenty-two statements about events and/or emotions regarding familiar animals, including zoo animals, dogs, birds, and cats (Paul, 2000).

Because the population of the present study is dairy workers, the Animal Empathy Scale was edited to apply to dairy cattle. Subject matter experts – including researchers in animal science/agricultural health, extension, and partners of livestock producers – were consulted to make the questionnaire most applicable to the dairy industry as well as ensure the survey was sensitive to the agricultural population.

For instance, the original statement, “Many people are over-affectionate towards their pets,” was amended to read, “Many dairy workers/producers are overly attached to their cattle.” Additionally, six of the original statements in the Animal Empathy Scale were excluded because they were not applicable to livestock workers nor livestock (for example, “It upsets me to see animals being chased and killed by lions in wildlife programs on TV”).

The final instrument consisted of sixteen statements that participants were asked to indicate the degree to which each represented their view (on a 7-point Likert scale from “Strongly disagree” to “Strongly agree”). The final questionnaire used in the present study can be found in Appendix A. Paul’s (2000) original measure of Animal Empathy Scale showed good internal reliability (Cronbach's alpha = 0.78), but because the scale was largely changed, Cronbach's alpha was calculated for the sixteen questions. The internal reliability of the modified Animal Empathy Scale was relatively low (Cronbach's alpha = 0.43).

**Qualitative empathy question.** Participants were also asked one open-ended question regarding a time in which they felt upset while working with livestock animals. Responses to this question were analyzed and a list of recurring themes were identified, to supplement the questionnaire and more fully capture how empathy towards dairy cattle is experienced. The purpose of this question was to inform the measurement of a concept that has not be thoroughly studied in previous literature (empathy towards dairy cattle).

**Attitudes towards animal welfare.** A previously established measure assessed animal science students' attitudes towards animal welfare (Sullivan et al., 2022). Specifically, participants were asked to rate the importance (extremely important, very important, moderately important, slightly important, or not at all important) of twelve different welfare parameters of animals raised for food and fiber, representing the Five Freedoms (Webster, 2001). Parameters included "Freedom from injury and disease," "Room to move around freely," and "Having positive interactions with humans." Two additional statements regarding productivity (e.g., "Maintaining normal growth") were added to assess perceptions of how productivity fits into animal welfare.

**Specific stressors & stress pileup.** Participants were asked how often specific stressors led them to experience stress within the last year. A list of 24 specific stressors was compiled from a previous study assessing sources of stress in Western agricultural producers and from suggestions by subject matter experts in the dairy industry (Grocke-Dewey et al., 2023). Examples of stressors included were "financial worries (loans, debts, bank pressure, etc.)," "livestock disease," "physical injury of self," and "weather." Participants were asked to rank how often each stressor led them to experience stress from 1 (never) to 5 (very often), or 0 (not applicable). After data collection, stress pileup was represented by the number of stressors for which a participant selected "often" or "very often," such that a higher stress pileup score indicated a greater number of high-stress stressors.

**Stress related to animal welfare.** In addition to how *often* different stressors caused participants stress, I also gathered data regarding the severity of stress caused specifically by issues related to animal welfare. Thus, participants were asked how stressful they found it when the following occurred on the farm: livestock disease, livestock injury, livestock reproductive

issues, and euthanasia. Wording and response options for these four questions were pulled from a previously established stress questionnaire (Byrne et al., 1995). Participants ranked each welfare-related stressor from 1 (not at all stressful) to 5 (very stressful).

**Demographics/Characteristics.** Finally, participants were asked seven questions regarding their age, gender, race, primary language, birth country, size of farm/production (as measured by number of livestock), and months of experience working on livestock farms.

### ***Survey Testing***

Because new survey questions were developed for this study and because the population is specifically of dairy workers, the survey (including the altered empathy questions and the attitudes towards welfare) was tested among a general population as well as with subject matter experts.

**Pilot survey.** In early Fall 2023, the survey was piloted in Colorado State University's research pool which consists of undergraduate psychology students. Participants were asked to answer the updated empathy for animals questions, the attitudes towards welfare, and some demographic questions (age, gender, and race). An additional, optional question asked participants to note any comments or concerns about the survey's questions. While not the target population of the present study, this pilot sample was used to test for general readability and comprehension. As such, data from this pilot informed a few changes to the terminology that participants reported were confusing.

**Subject matter experts.** To ensure the survey was applicable to the specific population of dairy workers, and to ensure a level of sensitivity to the population, five subject matter experts were consulted before finalizing the survey. Among these individuals were researchers in animal science/agricultural health and partners of livestock producers across different universities (e.g.,

Colorado State University, Utah State University, Texas A&M University) as well as the Chief Agricultural Officer of a large, organic dairy farm operation.

**Spanish Translation.** To increase participation and ensure a representative sample of dairy workers, the final survey was translated to Spanish. Two fluent Spanish speakers assisted in the translation, both of which have experience with the agricultural industry: one translated the survey directly from English to Spanish; the second back translated the Spanish version, to ensure adequate translation.

## RESULTS

### *Descriptive Statistics*

Descriptive statistics – including measures of central tendency and variability – were calculated to summarize scores across each variable. To do so, and for subsequent analyses, variables were recoded as necessary. Responses to all items related to empathy towards dairy cattle were recoded from -3 to 3 and eight items were reverse coded. Similarly, responses to all attitudes towards welfare items were recoded from 0 to 4; responses to all stressors, included welfare-related stressors, were recoded from 0 to 5. A summary of this information can be found in the attached codebook in Appendix B.

An individual score (an average of all responses to each scale's items) was calculated for each participant to represent their level of empathy towards dairy cattle, their attitudes towards welfare, and levels of welfare-related stress. Each participant also received a “stress pileup” score, calculated by accumulating all stressors that each participant selected “fairly often” or “very often” (ranging from 0 to 23).

Of the demographic variables, age, size of farm/production, and months/years of experience were treated as continuous. All other demographic variables (gender, race, birth country, primary language) were treated as categorical. Race was collapsed into a single variable, such that if a participant selected more than one race, it was recoded as “Two or more races.”

**Participant characteristics.** Most participants were male, white, and spoke Spanish as their primary language (see Table 1 for breakdowns of these variables). Participants' birth year ranged from 1964 to 2003. At least eight different birth countries were represented in the sample,

with most participants from Mexico (38.8%) or the United States (27.1%) – other birth countries were Canada, Colombia, Finland, Guatemala, Honduras, and Scotland.

Most participants worked on farms in the United States (74.1%), but other represented countries were Canada, Finland, Scotland, and New Zealand. Of the participants’ whose farms were located within the United States, 10 different states were represented, but most participants worked on operations in Texas (40.0%) or Colorado (12.9%). The mean herd size that participants worked on was 6,643 cattle (median = 2,500; SD = 8,176), with the largest herd size at 40,000 cattle. Participants’ mean years of experience was 8.96 years (median = 3.50; SD = 10.53).

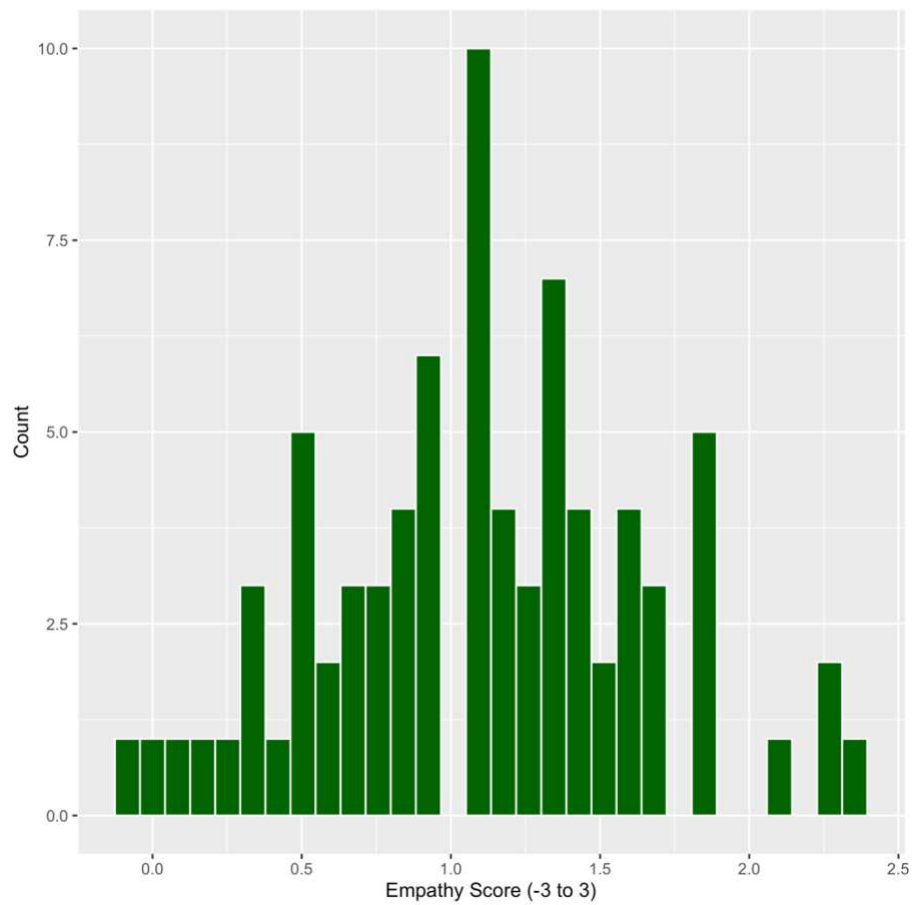
**Table 1**  
*Breakdown of participants by gender, race, and primary language.*

Variable	<i>n</i>	Percentage of sample
<b>Gender</b>		
Male	42	56.0
Female	31	41.3
Prefer not to say	2	2.7
<b>Race</b>		
White	41	48.2
Native	6	7.1
Black	1	1.2
Two or more races	3	3.5
Other*	11	12.9
Prefer not to say	23	27.1
<b>Primary language</b>		
English	30	40.0
Spanish	44	58.7
Finnish	1	1.33

*\*Most participants who selected “Other” wrote in that they identified as Hispanic or Latinx*

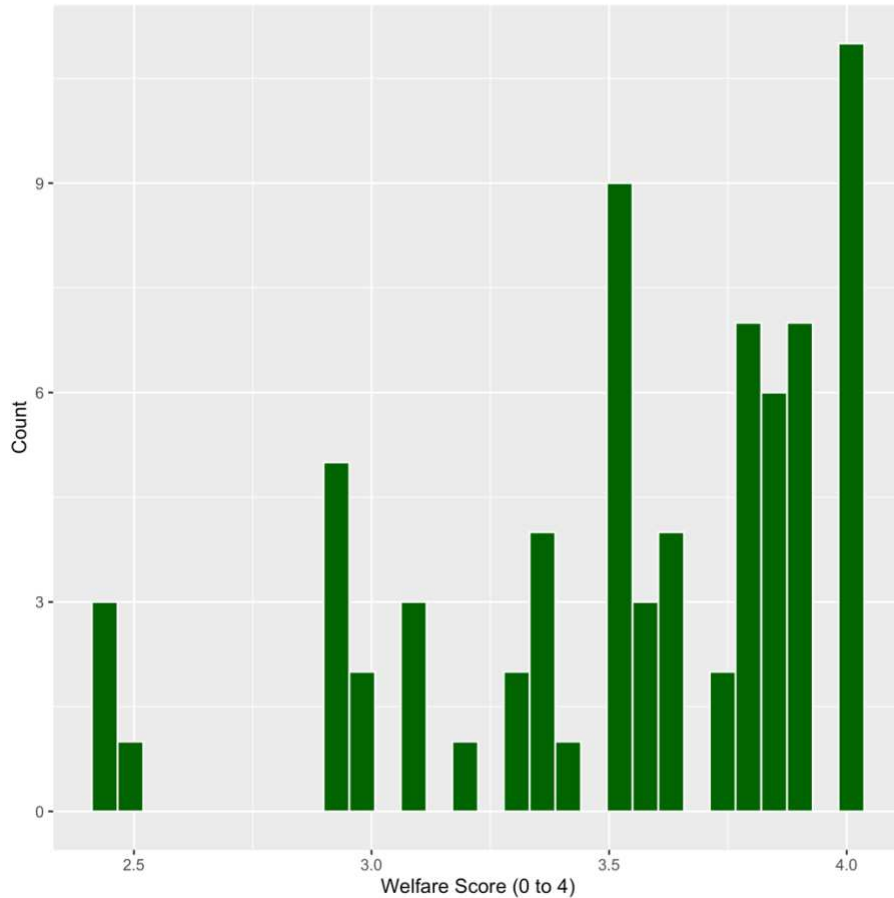
**Empathy towards dairy cattle.** The mean level of empathy towards dairy cattle, which ranged from -3 to 3, was 1.10 (SD = 0.54). The distribution of empathy towards dairy cattle is

shown in Figure 1.



**Figure 1**  
*Distribution of Empathy Towards Dairy Cattle Scores*

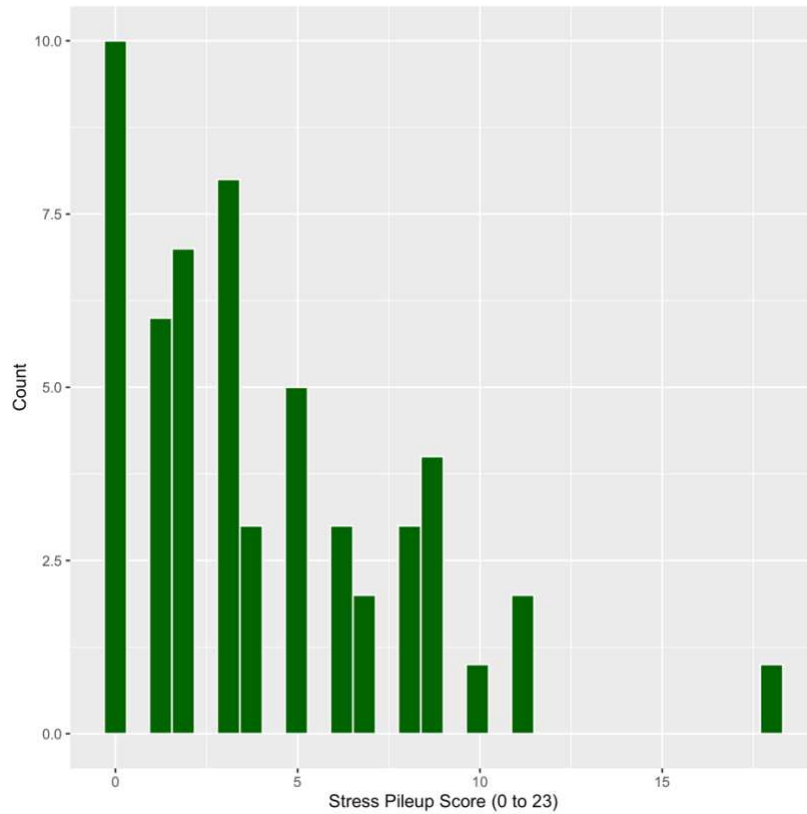
**Attitudes towards animal welfare.** The mean score of attitudes towards animal welfare, which ranged from 0 to 4, was 3.54 (SD = 0.43). The distribution of attitudes towards animal welfare is shown in Figure 2.



**Figure 2**  
*Distribution of Attitudes Towards Animal Welfare Scores*

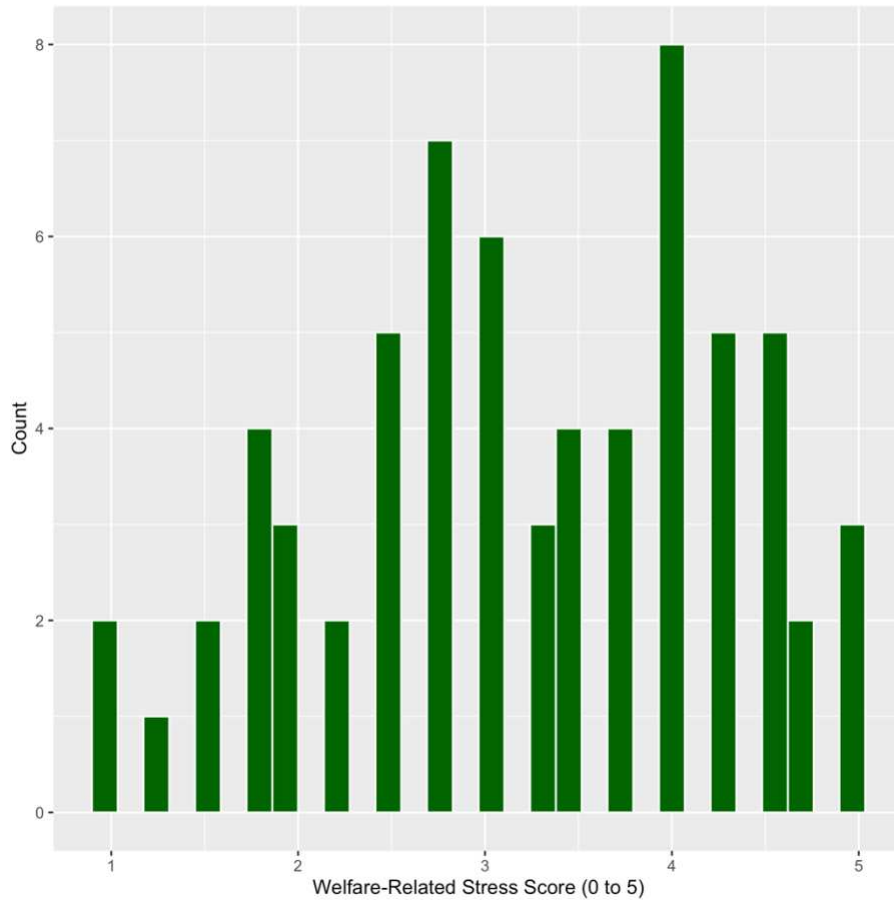
**Specific stressors & stress pileup.** Participants rated individual stressors from 1 (never) to 5 (very often), or 0 (not applicable). The stressors that participants rated, on average, as most frequently stressful were weather (mean = 3.40, SD = 0.96), work/family balance (mean = 3.25, SD = 1.38), lack of time (mean = 3.16, SD = 1.24), workload (mean = 3.09, SD = 1.32), and equipment breakdown (mean = 3.04, SD = 1.19), all of which were rated as, on average, at least sometimes stressful. The stressors that participants rated as least frequently stressful on average were physical injury of worker/co-worker (mean = 2.15, SD = 0.95), physical injury of self (mean = 2.12, SD = 1.07), grief (mean = 2.11, SD = 1.11), veterinary shortage (mean = 2.04, SD = 1.04), and physical disability (mean = 1.53, SD = 0.88).

The mean stress pileup score (the number of stressors between 0 and 23 for which a participant selects “often” or “very often”) was 4.05 (SD = 3.76). The distribution of stress pileup is shown in Figure 3.



**Figure 3**  
*Distribution of Stress Pileup*

**Welfare-related stress.** The mean welfare-related stress score, which ranged from 0 to 5, was 3.22 (SD = 1.06). The distribution of welfare-related stress is shown in Figure 4.



**Figure 4**  
*Distribution of Welfare-Related Stress*

### ***Hypothesis testing***

To investigate hypotheses 1-3, correlation coefficients measured the associations between empathy towards dairy cattle, attitudes towards animal welfare, stress related to animal welfare, and overall stress pileup. The Shapiro-Wilk test of normality was used to test whether data from the variables of interest followed a normal distribution. Because the distributions of attitudes towards animal welfare and stress pileup were both skewed (i.e., not normally distributed), Spearman's rho statistic was used to measure all associations, since it is less sensitive to skewness than Pearson's correlation coefficient (De Winter et al., 2016). Table 2 shows the Spearman's correlation results across the four variables of interest.

**Table 2***Spearman's correlations across empathy, welfare, welfare-related stress, and stress pileup*

	Empathy	Welfare	Welfare-related stress	Stress pileup
Empathy	1	0.048	0.130	<b>0.349**</b>
Welfare	0.048	1	0.212	-0.037
Welfare-related stress	0.130	0.212	1	0.276*
Stress pileup	<b>0.349**</b>	-0.037	0.276*	1

\**p-value <0.1*; \*\**p-value <0.05*; \*\*\**p-value <0.01*

Empathy towards dairy cattle and stress pileup were significantly correlated with each other ( $r = 0.349$ ,  $p\text{-value} = 0.011$ ), which is in support of hypothesis 3a, but no other variables were significantly correlated with each other.

***Exploratory analyses***

Associations between participant characteristic continuous variables (birth year, years working in production livestock, and size of herd) and levels of empathy, attitudes towards animal welfare, levels of stress related to animal welfare, or overall stress pileup were also tested using Spearman's rho statistic, given that most variables of interest had skewed distributions.

Associations between these variables can be found in Table 3.

**Table 3***Spearman's correlations between empathy, welfare, welfare-related stress, and stress pileup and birth year, years working in production livestock, and size of herd*

	Empathy	Welfare	Welfare-related stress	Stress pileup
Birth year	0.117	-0.025	-0.141	-0.125
Years working in production livestock	<b>0.294**</b>	-0.056	0.208	0.250*
Size of herd	<b>-0.246**</b>	0.215*	-0.154	<b>-0.414***</b>

\**p-value <0.1*; \*\**p-value <0.05*; \*\*\**p-value <0.01*

Empathy towards dairy cattle was significantly, positively correlated with years working in production livestock, such that more years working in production livestock were associated

with an increased level of empathy towards dairy cattle. Size of herd was significantly, negatively correlated with both empathy towards dairy cattle and stress pileup, such that participants working on/with larger farms/herds had lower levels of empathy towards dairy cattle and fewer stressors.

Differences between participant characteristic categorical variables (gender, primary language, race, and birth country across levels of empathy) across levels of empathy, attitudes towards animal welfare, levels of stress related to animal welfare, and overall stress pileup were tested using individual one-way analyses of variance (ANOVA) (see Tables 4a-d).

**Table 4a**  
*Results from one-way ANOVAs predicting empathy towards dairy cattle*

Model	SS	F	$\eta^2$
Empathy ~ Gender	0.760	0.872	0.034
Empathy ~ Primary language	3.673	<b>4.871***</b>	0.165
Empathy ~ Race	0.725	0.485	0.033
Empathy ~ Birth country	6.839	<b>3.348***</b>	0.307

\*\*\**p*-value < 0.01

In separate one-way ANOVAs, both primary language and birth country were significantly associated with empathy towards dairy cattle. Tukey’s HSD post-hoc test showed that participants with English as their primary language (M = 1.379, SD = 0.554) had significantly higher empathy for dairy cattle scores than those with Spanish as their primary language (M = 0.931, SD = 0.483) ( $p < 0.01$ ). An additional Tukey’s HSD post-hoc test showed that participants born in the United States (M = 1.481, SD = 0.498) had significantly higher empathy for dairy cattle scores than participants born in Mexico (M = 0.875, SD = 0.474) ( $p < 0.001$ ).

**Table 4b**  
*Results from one-way ANOVAs predicting attitudes towards animal welfare*

Model	SS	F	$\eta^2$
Welfare ~ Gender	0.402	0.724	0.031
Welfare ~ Primary language	0.138	0.242	0.011
Welfare ~ Race	0.730	0.786	0.057
Welfare ~ Birth country	1.191	0.795	0.093

**Table 4c**

*Results from one-way ANOVAs predicting welfare-related stress*

Model	SS	F	$\eta^2$
Welfare-related stress ~ Gender	8.450	2.702	0.116
Welfare-related stress ~ Primary language	4.630	1.397	0.063
Welfare-related stress ~ Race	15.860	<b>3.326**</b>	0.217
Welfare-related stress ~ Birth country	6.920	0.745	0.095

*\*\*p-value < 0.05*

Race was significantly associated with welfare-related stress and a Tukey's HSD post-hoc test showed that white participants ( $M = 3.606$ ,  $SD = 0.760$ ) had significantly higher levels of welfare-related stress than participants who selected "Other" when asked their race ( $M = 2.375$ ,  $SD = 0.719$ ) ( $p < 0.05$ ). Notably, most (90%) participants who selected "Other" when asked their race wrote in that they identified as Hispanic or Latinx.

**Table 4d**

*Results from one-way ANOVAs predicting welfare-related stress*

Model	SS	F	$\eta^2$
Stress pileup ~ Gender	54.000	1.295	0.071
Stress pileup ~ Primary language	119.500	<b>3.159**</b>	0.157
Stress pileup ~ Race	66.100	0.929	0.866
Stress pileup ~ Birth country	138.5	1.489	0.194

*\*\*p-value < 0.05*

Finally, while primary language significantly predicted stress pileup in an ANOVA (as seen in Table 4d), a Tukey's HSD post-hoc test did not detect differences against any two groups, so no conclusion can be drawn about which primary languages differ from each other.

### ***Qualitative analysis***

One open-ended question asked participants to "Tell us about a time when you were upset while working with dairy cattle. (What was going on with the cattle at the time and how did you feel?)" 23 participants did not answer the question, leaving 62 open-ended responses to analyze. 37 responses were translated from Spanish to English for analysis. Responses to this open-ended empathy question were analyzed for recurring conceptual themes using thematic analysis. Specifically, because the purpose of the data from this question was to inform the measurement of a concept that has not been thoroughly studied in previous literature (empathy towards dairy cattle), an inductive approach to thematic analysis was utilized. Braun & Clarke (2006) call inductive analysis a "data-driven" form of thematic analysis, because it is driven from the bottom up by the participants' responses alone, rather than by coding responses onto previously determined themes informed by existing theory (p. 12).

By coding each response and then sorting codes into broader themes, I identified six key themes regarding how participants experience empathy towards dairy cattle (see Table 5). Only one response did not fit into one of the six themes, and several responses (40.32%) fit into multiple themes. For example, the following response counted for the themes *Cattle injury/illness/discomfort* and *Other workers' or producers' behaviors/decisions*: "When a calf was suffering, and they did not give authorization for euthanasia. The animals do not speak, but you can see from their faces how they express what they feel."

**Table 5**  
*Themes found in open-ended empathy question*

Theme	Example responses
Cattle injury/illness/discomfort	<p data-bbox="620 281 1414 344"><i>“When they have no shelter when there is snow, it bothers me and makes me sad.”*</i></p> <p data-bbox="620 390 1414 533"><i>“Just any time my cows are hurting. If they aren't feeling well or have a problem with a hoof I feel terrible. I do everything I can to help them, [their] health is most important and they usually get some extra love and treats”</i></p>
Other workers’ or producers’ behaviors/decisions	<p data-bbox="620 617 1414 646"><i>“They were twisting a cow’s tail and it bother[ed] me a lot.”*</i></p> <p data-bbox="620 688 1414 793"><i>“...Some people working in dairy farms lack basic cow sense (which I don't think can be taught) and/or basic cattle behavior knowledge (flight zones, etc which can be taught)”</i></p>
Uncontrollable cattle behavior	<p data-bbox="620 926 1414 955"><i>“The cow kicked me and I felt bothered and frustrated” *</i></p> <p data-bbox="620 997 1414 1102"><i>“Sometimes the cows do not want to walk, it is better to leave them for a while and then they will want to walk on their own again.”*</i></p>
Working conditions	<p data-bbox="620 1262 1414 1367"><i>“Only get upset when something preventable impacts the cow's wellbeing and/or productivity, ie poor [management] or workers cutting corners.”</i></p> <p data-bbox="620 1409 1414 1619"><i>“I was moving the cattle to the milking parlor and... they ran back to their corral and I had to start the work again. I felt a little upset because although this is part of the job, there is no one there who usually help and you fall behind in your responsibility, because there isn't longer time to complete your routine.”</i></p>
Death	<p data-bbox="620 1759 1373 1829"><i>“Have to euthanize a down cow, messing it up and making her suffer. I was very upset.”</i></p>

I don't get upset

*“I have not been bothered when I have worked with livestock” \**

*\*translated from Spanish*

The most frequently recurring theme, relating to nearly half of the responses, had to do with cattle being ill, in pain, or otherwise experiencing discomfort. The least frequently recurring theme, still representing almost 10% of responses, was participants stating that they have not felt upset when working with their dairy cattle.

## DISCUSSION

The present study's purpose was to better understand the relationships between the well-being of dairy workers and the welfare of dairy cows, a key outcome presented in the One Welfare framework, and how empathy may be playing a crucial role in this relationship. Specifically, this research evaluated the associations between dairy workers' empathy towards dairy welfare, attitudes towards animal welfare, stress related to the welfare of cattle, and overall stress pileup. Additionally, the study assessed whether individual characteristics of dairy workers were associated with those variables of interest.

### *Findings & implications*

Higher levels of empathy towards dairy cattle were associated with a greater number of stressors causing stress often or very often. Empathy was not, however, significantly associated with attitudes towards animal welfare nor levels of welfare-related stress. These findings suggest that having higher levels of empathy towards dairy cattle may be impacting dairy workers' stress more broadly, rather than impacting how they cope with animal welfare issues. Alternatively, facing a wide variety of stressors beyond animal welfare issues may lead to higher levels of empathy felt towards dairy cattle. Either way, this finding highlights the importance of approaching the dairy industry and research related to it within a framework like One Welfare. Situated within the One Welfare framework, the results of the present study strengthen the argument that animal and worker welfare are interconnected constructs and should be researched and treated as such in studies of agricultural safety and health among dairy workers. The present study also further posits that empathy may play a crucial role and, thus, should be researched

further within the specific context of livestock workers, particularly considering their attitudes *towards* and experiences *with* their livestock.

Several characteristics of dairy workers were also significantly associated with empathy towards dairy cattle. Two of these were primary language and birth country, such that participants with English as their primary language and participants who were born in the United States had higher levels of empathy for dairy cattle. While causal statements about these variables' relationships with empathy cannot be made, future research should investigate why such a relationship might exist. In general, it is known that cultural differences – including religion and social tradition – impact not only the importance given to an issue like animal welfare, but also the way that welfare is perceived (Koknaroglu & Akunal, 2013). According to the literature, improvements in economic development and education can impact how cultures consider and perceive animal welfare (Koknaroglu & Akunal, 2013; Vargas-Bello-Pérez et al., 2017). Thus, it is likely that the present study did not measure more proximal variables (such as economic and education levels) that may better account for these differences in empathy towards dairy cattle. Future research should confirm these findings, and further investigate the mechanisms behind the relationships between primary language/birth country and empathy towards dairy cattle.

The size of herd that participants work with was also significantly associated with empathy towards dairy cattle such that participants working with larger herds had lower levels of empathy towards dairy cattle. Though the literature is not conclusive, previous research has indicated a relationship between herd size and animal welfare. Possible mechanisms that could play a role in animal welfare include attention and sensitivity given to cattle health indicators, and ability to emotionally connect to cattle (Balzani & Hanlon, 2020; Campler et al., 2018;

Shortall et al., 2018; Wikman et al., 2016). In the same way that the relationship between empathy and productivity may be mediated by livestock workers' positive interactions with their animals, it is posited that interactions between workers and animals may be more frequent and of higher quality on smaller farms, which may then be associated with higher levels of empathy felt towards the animals (Breuer et al., 2000; Hemsworth et al., 1989; Lensink et al., 2000). That said, the ways in which herd size and animal welfare are connected are nuanced, as other factors allow larger operations to pay more attention to welfare than smaller operations, such as more specialized and professional care given to cattle (Robbins et al., 2016). Importantly, the present study's sample did skew towards very large dairies: the mean herd size that participants worked on was 6,643 cattle (median = 2,500; SD = 8,176), while only 0.3% of dairy farms across the world have more than 100 cows (Doupbrate et al., 2013). Most participants working on dairies at the tail end of the global dairy farm size distribution could have influenced these results. Future research should further investigate the link between herd size and empathy towards dairy cattle, particularly with a more representative sample in terms of herd size, which may require more targeted recruitment strategies. Furthermore, directionality of the relationship cannot be established due to the cross-sectional nature of the present study, and, so, it is also important to consider reverse causation. It is possible that individuals with higher levels of empathy may be driven to work at smaller operations compared to larger operations. It is also possible that herd size is a proxy for other variables related to the dairy farm itself. For example, most smaller farms (with herd sizes less than 100 cows), are family farms, where most work is done by family members and the farm's goal is to sustain that family financially, which may mean key differences in how dairy workers on small, family farms approach their work compared to dairy workers that are hired labor on larger operations (Doupbrate et al., 2013). Again, future research

should consider, and measure, variables that may be better able to account for such a relationship, in this case, such as dairy workers' motivations for working at their current farm.

Finally, participants who had more years of experience working in livestock production had higher levels of empathy toward dairy cattle, which suggests that empathy for dairy cattle may not be a static construct, but rather one that changes and perhaps increases over time. Additional studies are needed to confirm this finding, but such a finding could greatly impact how we conceptualize and measure empathy towards dairy cattle and animals broadly.

Because the specific construct of empathy towards dairy cattle had not been previously measured, it was important to supplement the amended Animal Empathy Scale with an open-ended question. The responses to this question helped to augment the quantitative data with qualitative data wherein dairy workers shared their experiences with empathy in the dairy industry *in their own words*. Participants experienced feeling empathetic towards dairy cattle specifically when a cow was in pain or feeling discomfort or when a cow was mistreated or impacted by another human's behavior. The qualitative findings identified factors negatively impacting the well-being of dairy workers. Several participants noted that, while working with dairy cattle, they felt upset at factors that were out of their control, such as cattle behaviors that they could expect but not change (e.g., getting kicked while milking) or issues related to their workplace (e.g., being on a tight timeline and feeling overworked). Sources of stress such as overwork and time pressures have been documented in numerous studies among agricultural workers, but less has been published on the role of animal behavior as a source of stress (Chengane et al., 2021; Daghigh Yazd et al., 2019).

Given the higher risk of stress-related diseases and deaths that farm workers face, and the pressures put on dairy workers to increase production, understanding not only the levels of stress

that dairy workers feel, but also the complex factors that may be contributing to their stress balance is a critical area of research (Daghagh Yazd et al., 2019; Douphrate et al., 2013; Lunner Kolstrup et al., 2013). The present study also found that participants working with larger herds faced fewer high-stress stressors, which implies that larger operations may have protective factors against frequent stress that have not been identified. Further research should focus on identifying factors that protect against high stress in livestock farmers and workers.

### ***Limitations & future directions***

The biggest challenge this study faced were two issues related to data collection. First, dairy workers are a difficult population to reach directly. Instead, most of the participants had to be recruited indirectly, through other researchers or through their employers. In addition, the topic of animal welfare, even when accompanied by worker well-being, is controversial in the dairy industry. This may have led to dairy workers' and producers' reluctance to participate in research related to animal welfare. While the present study met the minimum sample size we had aimed for, the sample size did not provide sufficient power for more sophisticated statistical analyses beyond correlations and ANOVAs.

Thus, researchers with access to this population more widely should investigate research questions related to empathy towards dairy cattle, attitudes towards animal welfare, and stress further, to confirm the present study's findings and to further understand how empathy towards dairy cattle and dairy worker stress exist and interact with each other in the dairy industry. Moreover, future research should also investigate perceptions about animal welfare research as a topic in the dairy industry. I also recommend a future direction for research beyond the dairy industry into other livestock industries, as we know that welfare perspectives differ across different livestock species (Balzani & Hanlon, 2020).

Another challenge this study faced was measuring the specific construct of empathy towards dairy cattle. To measure the construct, I adapted the validated Animal Empathy Scale by consulting with various subject matter experts in the research field of dairy farming (Paul, 2000). I also supplemented the resulting scale with an open-ended question, the responses to which further informed how individuals experience empathy towards dairy cattle. For the sake of the present study, however, the resulting scale had low internal reliability, which suggests that the measure is not systematically measuring empathy in the way it should. While further psychometrics and scale development are outside the scope of the present study, future studies should continue to investigate how empathy towards dairy cattle and other livestock can be operationalized and measured.

Another limitation of the present study's method is that data was collected at a single point in time, which limits the conclusions that can be drawn from the results. Namely, a cross-sectional, non-experimental study cannot make causal or directional conclusions about the relationships revealed in data analyses. However, the present study's aim was exploratory in nature, looking to determine what relationships exist between empathy towards dairy cattle, attitudes about animal welfare, worker stress, and characteristics of dairy workers. While causal and directional statements cannot be made, the study's findings still establish evidence for the connections between these variables and, thus, emphasize the importance of continued research to link empathy, animal welfare, and worker well-being.

Finally, a common limitation with qualitative analyses like the one performed on the present study's open-ended empathy question has to do with the decisions that a researcher makes during thematic analysis (Braun & Clarke, 2006). In this case, a single coder coded the open-ended responses and sorted them into the six resulting themes. The construct of empathy

towards dairy cattle has not been thoroughly studied in previous literature and, thus, the theoretical framework of the construct is limited. It is because of this that an inductive approach to thematic analysis (wherein the data drives the codes and themes, rather than being driven by theory) was used. This does not, however, mean that I as the qualitative coder did not bring my knowledge of previous literature into the analysis. In doing so, I was able to speculate on how empathy towards dairy cattle fits into the broader literatures (both of animal welfare and of empathy), but it also may have introduced certain biases into my coding.

### ***Conclusion***

While the present study's findings were somewhat limited, the significant findings are important contributions to the literature on both animal welfare and worker well-being. This study highlights the interconnectedness of dairy cow welfare and workers' feelings of empathy towards their cattle and their own well-being (stress), as well as other characteristics (primary language, birth country, years of experience, and size of herd). Such findings fit well within the One Welfare framework and further stress the importance of taking a One Welfare approach to research among livestock workers beyond dairy workers. Furthermore, such findings emphasize the importance of considering empathy in studies focused on stress and well-being of agricultural workers, though future research is needed to understand the direction of causation and mechanisms within the relationships between empathy, animal welfare, and stress.

## REFERENCES

- Balzani, A., & Hanlon, A. (2020). Factors that Influence Farmers' Views on Farm Animal Welfare: A Semi-Systematic Review and Thematic Analysis. *Animals*, 10(9), 1524. <https://doi.org/10.3390/ani10091524>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Breuer, K., Hemsworth, P. H., Barnett, J. L., Matthews, L. R., & Coleman, G. J. (2000). Behavioural response to humans and the productivity of commercial dairy cows. *Applied Animal Behaviour Science*, 66(4), 273–288. [https://doi.org/10.1016/S0168-1591\(99\)00097-0](https://doi.org/10.1016/S0168-1591(99)00097-0)
- Bureau of Labor Statistics, Department of Labor. (2023). Quarterly Census of Employment and Wages [query based on U.S. totals, NAICS codes 112112]. Retrieved October 3, 2023 from <https://www.bls.gov/cew/>
- Byrne, D. G., Byrne, A. E., & Reinhart, M. I. (1995). Personality, stress and the decision to commence cigarette smoking in adolescence. *Journal of Psychosomatic Research*, 39(1), 53–62. [https://doi.org/10.1016/0022-3999\(94\)00074-F](https://doi.org/10.1016/0022-3999(94)00074-F)
- Campler, M. R., Pairis-Garcia, M. D., Rault, J.-L., Coleman, G., & Arruda, A. G. (2018). Caretaker attitudes toward swine euthanasia. *Translational Animal Science*, 2(3), 254–262. <https://doi.org/10.1093/tas/txy015>
- Ceballos, M. C., Sant'Anna, A. C., Boivin, X., Costa, F. de O., Carvalhal, M. V. de L., & Paranhos da Costa, M. J. R. (2018). Impact of good practices of handling training on beef cattle welfare and stockpeople attitudes and behaviors. *Livestock Science*, 216, 24–31. <https://doi.org/10.1016/j.livsci.2018.06.019>

- Chengane, S., Beseler, C. L., Duysen, E. G., & Rautiainen, R. H. (2021). Occupational stress among farm and ranch operators in the midwestern United States. *BMC Public Health*, 21(1), 2076. <https://doi.org/10.1186/s12889-021-12053-4>
- Colombo, E. S., Crippa, F., Calderari, T., & Prato-Previde, E. (2017). Empathy toward animals and people: The role of gender and length of service in a sample of Italian veterinarians. *Journal of Veterinary Behavior*, 17, 32–37. <https://doi.org/10.1016/j.jveb.2016.10.010>
- Colorado Department of Agriculture. (2020). *The Economic Contribution of Agriculture to Colorado's Economy*.  
[https://drive.google.com/file/d/1ZJm\\_G8ng\\_1csUQvZw\\_iiMsn6DYSDjm\\_X/view](https://drive.google.com/file/d/1ZJm_G8ng_1csUQvZw_iiMsn6DYSDjm_X/view)
- Colligan, M. J., Smith, M. J., & Hurrell, J. J. (1977). Occupational incidence rates of mental health disorders. *Journal of Human Stress*, 3(3), 34–39.  
<https://doi.org/10.1080/0097840x.1977.9936090>
- Cornish, A., Raubenheimer, D., & McGreevy, P. (2016). What We Know about the Public's Level of Concern for Farm Animal Welfare in Food Production in Developed Countries. *Animals*, 6(11), 74. <https://doi.org/10.3390/ani6110074>
- Daghagh Yazd, S., Wheeler, S. A., & Zuo, A. (2019). Key Risk Factors Affecting Farmers' Mental Health: A Systematic Review. *International Journal of Environmental Research and Public Health*, 16(23), 4849. <https://doi.org/10.3390/ijerph16234849>
- Dawkins, M. S. (2023). Farm animal welfare: Beyond “natural” behavior. *Science*, 379(6630), 326–328. <https://doi.org/10.1126/science.ade5437>
- De Winter, J. C. F., Gosling, S. D., & Potter, J. (2016). Comparing the Pearson and Spearman correlation coefficients across distributions and sample sizes: A tutorial using simulations

and empirical data. *Psychological Methods*, 21(3), 273–290.

<https://doi.org/10.1037/met0000079>

Douphrate, D. I., Hagevoort, G. R., Nonnenmann, M. W., Lunner Kolstrup, C., Reynolds, S. J., Jakob, M., & Kinsel, M. (2013). The Dairy Industry: A Brief Description of Production Practices, Trends, and Farm Characteristics Around the World. *Journal of Agromedicine*, 18(3), 187–197. <https://doi.org/10.1080/1059924X.2013.796901>

El Khayat, M., Halwani, D. A., Hneiny, L., Alameddine, I., Haidar, M. A., & Habib, R. R. (2022). Impacts of Climate Change and Heat Stress on Farmworkers' Health: A Scoping Review. *Frontiers in Public Health*, 10, 782811.

<https://doi.org/10.3389/fpubh.2022.782811>

Farm Animal Welfare Council. (2009). *Farm Animal Welfare in Great Britain Past Present and Future*.

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/319292/Farm\\_Animal\\_Welfare\\_in\\_Great\\_Britain\\_-\\_Past\\_Present\\_and\\_Future.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/319292/Farm_Animal_Welfare_in_Great_Britain_-_Past_Present_and_Future.pdf)

Furnham, A., McManus, C., & Scott, D. (2003). Personality, empathy and attitudes to animal welfare. *Anthrozoös*, 16(2), 135–146. <https://doi.org/10.2752/089279303786992260>

Food and Agriculture Organization of the United Nations. (2020). *Sustainable small-scale livestock production*. ([Fraser et al., 2005](#))

Franz, A., Deimel, I., & Spiller, A. (2012). Concerns about animal welfare: A cluster analysis of German pig farmers. *British Food Journal*, 114(10), 1445–1462.

<https://doi.org/10.1108/00070701211263019>

- Fraser, C. E., Smith, K. B., Judd, F., Humphreys, J. S., Fragar, L. J., & Henderson, A. (2005). Farming and Mental Health Problems and Mental Illness. *International Journal of Social Psychiatry*, 51(4), 340–349. <https://doi.org/10.1177/0020764005060844>
- Fukasawa, M., Kawahata, M., Higashiyama, Y., & Komatsu, T. (2017). Relationship between the stockperson's attitudes and dairy productivity in Japan: Farmer's Attitude and Dairy Productivity. *Animal Science Journal*, 88(2), 394–400. <https://doi.org/10.1111/asj.12652>
- Gómez-Leal, R., Costa, A., Megías-Robles, A., Fernández-Berrocal, P., & Faria, L. (2021). Relationship between emotional intelligence and empathy towards humans and animals. *PeerJ*, 9, e11274. <https://doi.org/10.7717/peerj.11274>
- Grocke-Dewey, M., Brennan, A., Freeman, B., Weas, H., Gutheil, J., Stallones, L., & McMoran, D. (2023). Perceived stress, stressors, and preferred stress management strategies among western agricultural producers. *Journal of Rural Mental Health*, 47(3), 152–162. <https://doi.org/10.1037/rmh0000233>
- Hanna, D., Sneddon, I. A., & Beattie, V. E. (2009). The relationship between the stockperson's personality and attitudes and the productivity of dairy cows. *Animal*, 3(5), 737–743. <https://doi.org/10.1017/S1751731109003991>
- Harmon-Jones, E., & Mills, J. (2019). An introduction to cognitive dissonance theory and an overview of current perspectives on the theory. In E. Harmon-Jones (Ed.), *Cognitive dissonance: Reexamining a pivotal theory in psychology* (2nd ed.). (pp. 3–24). American Psychological Association. <https://doi.org/10.1037/0000135-001>
- Hazel, S. J., Signal, T. D., & Taylor, N. (2011). Can Teaching Veterinary and Animal-Science Students about Animal Welfare Affect Their Attitude toward Animals and Human-

Related Empathy? *Journal of Veterinary Medical Education*, 38(1), 74–83.

<https://doi.org/10.3138/jvme.38.1.74>

Hemsworth, P. H., Barnett, J. L., Coleman, G. J., & Hansen, C. (1989). A study of the relationships between the attitudinal and behavioural profiles of stockpersons and the level of fear of humans and reproductive performance of commercial pigs. *Applied Animal Behaviour Science*, 23(4), 301–314. [https://doi.org/10.1016/0168-1591\(89\)90099-3](https://doi.org/10.1016/0168-1591(89)90099-3)

Hemsworth, P. H. (2003). Human–animal interactions in livestock production. *Applied Animal Behaviour Science*, 81(3), 185–198. [https://doi.org/10.1016/S0168-1591\(02\)00280-0](https://doi.org/10.1016/S0168-1591(02)00280-0)

Hemsworth, P. & Coleman, G. *Human-Livestock Interactions: The Stockperson and the Productivity and Welfare of Intensively Farmed Animals*, 2nd ed.; CAB International: Wallingford, UK, 2011.

J. A. Robbins, M. A. G. von Keyserlingk, D. Fraser, D. M. Weary, INVITED REVIEW: Farm size and animal welfare, *Journal of Animal Science*, Volume 94, Issue 12, December 2016, Pages 5439–5455, <https://doi.org/10.2527/jas.2016-0805>

Kauppinen, T., Vainio, A., Valros, A., Rita, H., & Vesala, K. (2010). Improving animal welfare: Qualitative and quantitative methodology in the study of farmers' attitudes. *Animal Welfare*, 19(4), 523–536. <https://doi.org/10.1017/S0962728600001998>

Kauppinen, T., Valros, A., & Vesala, K. M. (2013). Attitudes of Dairy Farmers toward Cow Welfare in Relation to Housing, Management and Productivity. *Anthrozoös*, 26(3), 405–420. <https://doi.org/10.2752/175303713X13697429463718>

- Kielland, C., Skjerve, E., Østerås, O., & Zanella, A. J. (2010). Dairy farmer attitudes and empathy toward animals are associated with animal welfare indicators. *Journal of Dairy Science*, 93(7), 2998–3006. <https://doi.org/10.3168/jds.2009-2899>
- Kohn M.A., Senyak J. Sample Size Calculators [website]. UCSF CTSI. 12 June 2024. <https://www.sample-size.net/>
- Koknaroglu, H., & Akunal, T. (2013). Animal welfare: An animal science approach. *Meat Science*, 95(4), 821–827. <https://doi.org/10.1016/j.meatsci.2013.04.030>
- Lebov, J., Grieger, K., Womack, D., Zaccaro, D., Whitehead, N., Kowalczyk, B., & MacDonald, P. D. M. (2017). A framework for One Health research. *One Health*, 3, 44–50. <https://doi.org/10.1016/j.onehlt.2017.03.004>
- Lensink, J., Boissy, A., & Veissier, I. (2000). The relationship between farmers' attitude and behaviour towards calves, and productivity of veal units. *Annales de Zootechnie*, 49(4), 313–327. <https://doi.org/10.1051/animres:2000122>
- Leon, A. F., Sanchez, J. A., & Romero, M. H. (2020). Association between Attitude and Empathy with the Quality of Human-Livestock Interactions. *Animals*, 10(8), 1304. <https://doi.org/10.3390/ani10081304>
- Lunner Kolstrup, C. & Hultgren, J. (2011). Perceived Physical and Psychosocial Exposure and Health Symptoms of Dairy Farm Staff and Possible Associations with Dairy Cow Health. *Journal of Agricultural Safety and Health*, 17(2), 111–125. <https://doi.org/10.13031/2013.36496>
- Lunner Kolstrup, C., Kallioniemi, M., Lundqvist, P., Kymäläinen, H.-R., Stallones, L., & Brumby, S. (2013). International Perspectives on Psychosocial Working Conditions,

- Mental Health, and Stress of Dairy Farm Operators. *Journal of Agromedicine*, 18(3), 244–255. <https://doi.org/10.1080/1059924X.2013.796903>
- McEachern, M. G., Schröder, M. J. A., Willock, J., Whitelock, J., & Mason, R. (2007). Exploring ethical brand extensions and consumer buying behaviour: The RSPCA and the “Freedom Food” brand. *Journal of Product & Brand Management*, 16(3), 168–177. <https://doi.org/10.1108/10610420710751546>
- Mehrabian, A., & Epstein, N. (1972). A measure of emotional empathy. *Journal of Personality*, 40(4), 525–543. <https://doi.org/10.1111/j.1467-6494.1972.tb00078.x>
- Mellor, D., & Beausoleil, N. (2015). Extending the ‘Five Domains’ model for animal welfare assessment to incorporate positive welfare states. *Animal Welfare*, 24(3), 241–253. <https://doi.org/10.7120/09627286.24.3.241>
- OECD-FAO. (2020). OECD-FAO Agricultural Outlook 2020-2029. OECD Publishing. <https://doi.org/10.1787/1112c23b-en>
- One Welfare Phoenix Advisory Board. (2020). One Welfare Phoenix – supporting the dairy industry to recognise the interconnections between animal and human abuse and neglect. 2020 IDF Animal Health Report, 14. <https://www.onewelfareworld.org/uploads/9/7/5/4/97544760/idf-english - animal-health-report-2020-web-corrected.pdf>
- Parry, J., Barnes, H., Lindsey, R., & Taylor, R. (2005). Farmers, farm workers and work-related stress. HSE Books.
- Paul, E. S. (2000). Empathy with Animals and with Humans: Are They Linked? *Anthrozoös*, 13(4), 194–202. <https://doi.org/10.2752/089279300786999699>

- Pinillos, R. G., Appleby, M. C., Manteca, X., Scott-Park, F., Smith, C., & Velarde, A. (2016). One Welfare – a platform for improving human and animal welfare. *Veterinary Record*, 179(16), 412–413. <https://doi.org/10.1136/vr.i5470>
- Robbins, J. A., von Keyserlingk, M. A. G., Fraser, D., & Weary, D. M. (2016). Farm size and animal welfare. *Journal of Animal Science*, 94(12), 5439–5455. <https://doi.org/10.2527/jas.2016-0805>
- Shortall, O., Sutherland, L., Ruston, A., & Kaler, J. (2018). True Cowmen and Commercial Farmers: Exploring Vets’ and Dairy Farmers’ Contrasting Views of ‘Good Farming’ in Relation to Biosecurity. *Sociologia Ruralis*, 58(3), 583–603. <https://doi.org/10.1111/soru.12205>
- Stone, A. (2022). The relationship between attitudes to human rights and to animal rights is partially mediated by empathy. *The Journal of Social Psychology*, 1–14. <https://doi.org/10.1080/00224545.2022.2140024>
- Sullivan, P., Mijares, S., Davis, M., Oselinsky, K., Cramer, C., Román-Muñiz, N., Stallones, L., & Edwards-Callaway, L. (2022). A Nationwide Survey of Animal Science Students’ Perceptions of Animal Welfare across Different Animal Categories at Institutions in the United States. *Animals*, 12(17), 2294. <https://doi.org/10.3390/ani12172294>
- Taylor, N., & Signal, T. D. (2009). Pet, Pest, Profit: Isolating Differences in Attitudes towards the Treatment of Animals. *Anthrozoös*, 22(2), 129–135. <https://doi.org/10.2752/175303709X434158>
- Te Velde, H., Aarts, N., & Van Woerkum, C. (2002). Dealing with Ambivalence: Farmers’ and Consumers’ Perceptions of Animal Welfare in Livestock Breeding. *Journal of*

Agricultural and Environmental Ethics, 15(2), 203–219.

<https://doi.org/10.1023/A:1015012403331>

Tilman, D., Cassman, K. G., Matson, P. A., Naylor, R., & Polasky, S. (2002). Agricultural sustainability and intensive production practices. *Nature*, 418(6898), 671–677.

<https://doi.org/10.1038/nature01014>

Tuytens, F., Vanhonacker, F., & Verbeke, W. (2014). Broiler production in Flanders, Belgium: Current situation and producers' opinions about animal welfare. *World's Poultry Science Journal*, 70(2), 343–354. <https://doi.org/10.1017/S004393391400035X>

U.S. Department of Agriculture (n.d.). Farm Labor. USDA Economic Research Service.

<https://www.ers.usda.gov/topics/farm-economy/farm-labor/>

U.S. Department of Agriculture (2017). Census of Agriculture. Retrieved October 2, 2023, from

<https://www.nass.usda.gov/Publications/AgCensus/2017/index.php>

U.S. Department of Agriculture, National Agricultural Statistics Service. (2022a). Cattle.

Retrieved August 22, 2023, from <https://downloads.usda.library.cornell.edu/usda-esmis/files/h702q636h/tq57pz24k/cz30r103f/cat10722.pdf>

U.S. Department of Agriculture, National Agricultural Statistics Service. (2022b). Poultry.

Retrieved August 22, 2023, from <https://downloads.usda.library.cornell.edu/usda-esmis/files/m039k491c/dr2703010/v405tf48t/plva0422.pdf>

U.S. Department of Agriculture, National Agricultural Statistics Service. (2022c). Sheep and

Goats. Retrieved August 22, 2023, from <https://downloads.usda.library.cornell.edu/usda-esmis/files/000000018/pv63h240d/9880wt403/shep0122.pdf>

- U.S. Department of Agriculture, National Agricultural Statistics Service. (2022d). Hogs and Pigs. Retrieved August 22, 2023, from <https://downloads.usda.library.cornell.edu/usda-esmis/files/rj430453j/37721p56r/rn302c239/hgpg1222.pdf>
- U.S. Department of Agriculture, National Agricultural Statistics Service. (2022e). *Milk Production*. Retrieved October 2, 2023, from <https://downloads.usda.library.cornell.edu/usda-esmis/files/h989r321c/sb398t09v/w0893v44q/mkpr0923.pdf>
- Vargas-Bello-Pérez, E., Miranda-de La Lama, G. C., Teixeira, D. L., Enríquez-Hidalgo, D., Tadich, T., & Lensink, J. (2017). Farm Animal Welfare Influences on Markets and Consumer Attitudes in Latin America: The Cases of Mexico, Chile and Brazil. *Journal of Agricultural and Environmental Ethics*, 30(5), 697–713. <https://doi.org/10.1007/s10806-017-9695-2>
- Webster, A. J. F. (2001). Farm Animal Welfare: The Five Freedoms and the Free Market. *The Veterinary Journal*, 161(3), 229–237. <https://doi.org/10.1053/tvj.2000.0563>
- Wikman, I., Hokkanen, A.-H., Pastell, M., Kauppinen, T., Valros, A., & Hänninen, L. (2016). Attitudes of beef producers to disbudding and perception of pain in cattle. *Animal Welfare*, 25(4), 429–438. doi:10.7120/09627286.25.4.429
- Wilkie, R. (2005). Sentient commodities and productive paradoxes: The ambiguous nature of human–livestock relations in Northeast Scotland. *Journal of Rural Studies*, 21(2), 213–230. <https://doi.org/10.1016/j.jrurstud.2004.10.002>
- Yeates, J. W., & Main, D. C. J. (2008). Assessment of positive welfare: A review. *The Veterinary Journal*, 175(3), 293–300. <https://doi.org/10.1016/j.tvjl.2007.05.009>

Young, A., Khalil, K. A., & Wharton, J. (2018). Empathy for Animals: A Review of the Existing Literature. *Curator: The Museum Journal*, 61(2), 327–343.

<https://doi.org/10.1111/cura.12257>

## APPENDIX A

### *Survey Questions*

#### **SECTION A**

**INTRO TEXT:** This set of questions asks you to consider your views towards dairy cattle.

Indicate the degree to which each statement represents your view.

**RESPONSE OPTIONS:** 7-point Likert scale: strongly disagree / disagree / somewhat disagree / neither agree nor disagree / somewhat agree / agree / strongly agree

#### **QUESTIONS:**

1. Often dairy cattle will vocalize for food even when they are not really hungry.
2. Dairy cattle deserve to be treated harshly when they're not behaving properly.
3. I get annoyed when dairy cattle vocalize when they're separated from their group.
4. People who pamper their dairy cattle excessively annoy me.
5. Seeing content dairy cattle almost always cheers me up.
6. I feel upset when I see non-productive dairy cattle.
7. Dairy cattle sometimes complain through vocalization for no real reason.
8. Many dairy workers/producers are overly attached to their cattle.
9. Separating a newborn calf from its dam often leaves me feeling upset.
10. I get angry when I see dairy cattle being poorly treated.
11. It is silly to become too attached to your dairy cattle.
12. I hate to see dairy cattle in a barn where there is no room for them to move about.
13. I feel sad when I see lame dairy cattle.
14. I am upset when dairy cattle have to be euthanized.
15. Seeing dairy cattle in pain upsets me.
16. Dairy workers often make too much of the feelings of dairy cattle.
  
17. Tell us about a time when you were upset while working with dairy cattle. (What was going on with the cattle at the time and how did you feel?)

*[Text box for open-ended response]*

## **SECTION B**

What is your assessment of the importance of each of these parameters for dairy cattle?

**RESPONSE OPTIONS:** 5-point Likert scale: Extremely important / Very important / Moderately important / Slightly important / Not at all important

### **QUESTIONS:**

1. Room to move around freely
2. Freedom to express normal behaviors
3. Having a sufficient and comfortable area to lie down
4. Freedom from fear and distress
5. Having positive interactions with humans
6. Freedom from injury and disease
7. Freedom from hunger  
\*\*Please select “Slightly important” for this statement
8. Freedom from thirst
9. Freedom from pain and discomfort
10. A painless death
11. Having a life worth living
12. Ability for choice and control in their environment
13. Maintaining normal growth
14. Maintaining productivity (e.g., milk production)

## **SECTION C (STRESSORS)**

Please indicate how often the following led you to experience stress within the last year:

**RESPONSE OPTIONS:** 1 – never, 2 - almost never, 3 – sometimes, 4 - fairly often, 5 - very often, not applicable

### **QUESTIONS:**

1. Financial worries (loans, debts, bank pressure, etc.)
2. Grief (death of a loved one or community member)
3. Lack of time (no time to rest, complete tasks well, etc.)

4. Livestock disease
5. Livestock injury
6. Livestock reproductive issues
7. Euthanasia
8. Veterinary shortage
9. Pests
10. Physical disability
11. Physical injury of self
12. Physical injury of worker/co-worker
13. Physical isolation (lack of nearby services, healthcare, etc.)
14. Social isolation
15. Changes in equipment
16. Changes in work processes
17. Equipment breakdown
18. Work/family balance
19. Workload
20. Interpersonal issues with family
21. Interpersonal issues with friends
22. Interpersonal issues with co-workers
23. Weather
24. Other [fill in blank] \*optional

#### **SECTION D**

How stressful do you find it when...

**RESPONSE OPTIONS:** 1 - not at all stressful, 2 - a little stressful, 3 - moderately stressful, 4 - quite stressful, 5 - very stressful

#### **QUESTIONS:**

1. Livestock *disease* occurs on your farm/production.
2. Livestock *injury* occurs on your farm/production.
3. Livestock reproductive issues occur on your farm/production.

4. Euthanasia occurs on your farm/production.

**SECTION E (Demographics)**

1. In what year were you born? (Use the drop-down menu to select your birth year)
2. What is your gender?
  - Male
  - Female
  - Prefer not to answer
3. What is your primary language?
  - English
  - Spanish
  - K'iche'
  - Other [fill in blank]
4. Choose one or more races that you consider yourself to be
  - White or Caucasian
  - Black or African American
  - American Indian/Native American or Alaska Native
  - Asian
  - Native Hawaiian or Other Pacific Islander
  - Other [fill in blank]
  - Prefer not to say
5. In what country were you born?
  - United States
  - Mexico
  - Guatemala
  - El Salvador
  - Nicaragua
  - Costa Rica
  - Honduras
  - Panama

- Puerto Rico
- Cuba
- Peru
- Colombia
- Venezuela
- Other [fill in blank]

6. How large is your farm/production (as measured by number of livestock)? (An approximation is fine.)

[Fill in blank]

7. How many months or years of experience do you have working on livestock farms (total, this location and others)?

[fill in blank] months

[fill in blank] years

8. In what state is your farm/production located?

- Colorado
- Texas
- Montana
- Other [fill in blank]

APPENDIX B

Item name	Item	Response options	Recoding	Reverse score?
<i>Composite empathy towards dairy cattle</i>	<i>Mean across 16 items calculated for each participant</i>	NA	(-3 to 3)	NA
<b>empathy_1</b>	Often dairy cattle will vocalize for food even when they are not really hungry.	strongly disagree / disagree / somewhat disagree / neither agree nor disagree / somewhat agree / agree / strongly agree	-3 to 3	Y
<b>empathy_2</b>	Dairy cattle deserve to be treated harshly when they're not behaving properly.	strongly disagree / disagree / somewhat disagree / neither agree nor disagree / somewhat agree / agree / strongly agree	-3 to 3	Y
<b>empathy_3</b>	I get annoyed when dairy cattle vocalize when they're separated from their group.	strongly disagree / disagree / somewhat disagree / neither agree nor disagree / somewhat agree / agree / strongly agree	-3 to 3	Y
<b>empathy_4</b>	People who pamper their dairy cattle excessively annoy me.	strongly disagree / disagree / somewhat disagree / neither agree nor disagree / somewhat agree / agree / strongly agree	-3 to 3	Y

<b>empathy_5</b>	Seeing content dairy cattle almost always cheers me up.	strongly disagree / disagree / somewhat disagree / neither agree nor disagree / somewhat agree / agree / strongly agree	-3 to 3	N
<b>empathy_6</b>	I feel upset when I see non-productive dairy cattle.	strongly disagree / disagree / somewhat disagree / neither agree nor disagree / somewhat agree / agree / strongly agree	-3 to 3	N
<b>empathy_7</b>	Dairy cattle sometimes complain through vocalization for no real reason.	strongly disagree / disagree / somewhat disagree / neither agree nor disagree / somewhat agree / agree / strongly agree	-3 to 3	Y
<b>empathy_8</b>	Many dairy workers/producers are overly attached to their cattle.	strongly disagree / disagree / somewhat disagree / neither agree nor disagree / somewhat agree / agree / strongly agree	-3 to 3	Y
<b>empathy_9</b>	Separating a newborn calf from its dam often leaves me feeling upset.	strongly disagree / disagree / somewhat disagree / neither agree nor disagree / somewhat agree / agree / strongly agree	-3 to 3	N

<b>empathy_10</b>	I get angry when I see dairy cattle being poorly treated.	strongly disagree / disagree / somewhat disagree / neither agree nor disagree / somewhat agree / agree / strongly agree	-3 to 3	N
<b>empathy_11</b>	It is silly to become too attached to your dairy cattle.	strongly disagree / disagree / somewhat disagree / neither agree nor disagree / somewhat agree / agree / strongly agree	-3 to 3	Y
<b>empathy_12</b>	I hate to see dairy cattle in a barn where there is no room for them to move about.	strongly disagree / disagree / somewhat disagree / neither agree nor disagree / somewhat agree / agree / strongly agree	-3 to 3	N
<b>empathy_13</b>	I feel sad when I see lame dairy cattle.	strongly disagree / disagree / somewhat disagree / neither agree nor disagree / somewhat agree / agree / strongly agree	-3 to 3	N
<b>empathy_14</b>	I am upset when dairy cattle have to be euthanized.	strongly disagree / disagree / somewhat disagree / neither agree nor disagree / somewhat agree / agree / strongly agree	-3 to 3	N

		strongly disagree / disagree / somewhat disagree / neither agree nor disagree / somewhat agree / agree / strongly agree	-3 to 3	N
<b>empathy_15</b>	Seeing dairy cattle in pain upsets me.			
		strongly disagree / disagree / somewhat disagree / neither agree nor disagree / somewhat agree / agree / strongly agree	-3 to 3	Y
<b>empathy_16</b>	Dairy workers often make too much of the feelings of dairy cattle.			
	Tell us about a time when you were upset while working with dairy cattle. (What was going on with the cattle at the time and how did you feel?)	[open-ended]	NA	NA
<b>empathy_qual</b>				
<i>Composite attitudes towards welfare</i>	<i>Mean across 14 items calculated for each participant</i>		<i>0 to 4</i>	
		not at all important / slightly important / moderately important / very important / extremely important	0 to 4	N
<b>welfare_room</b>	Room to move around freely			
	Freedom to express normal behaviors	not at all important / slightly important / moderately important / very important /	0 to 4	N
<b>welfare_normal</b>				

		extremely important		
		not at all important / slightly important / moderately important / very important / extremely important		
<b>welfare_lie</b>	Having a sufficient and comfortable area to lie down	extremely important	0 to 4	N
		not at all important / slightly important / moderately important / very important / extremely important		
<b>welfare_fear</b>	Freedom from fear and distress	extremely important	0 to 4	N
		not at all important / slightly important / moderately important / very important / extremely important		
<b>welfare_interactions</b>	Having positive interactions with humans	extremely important	0 to 4	N
		not at all important / slightly important / moderately important / very important / extremely important		
<b>welfare_injury</b>	Freedom from injury and disease	extremely important	0 to 4	N
		not at all important / slightly important / moderately important / very important / extremely important		
<b>welfare_hunger</b>	Freedom from hunger	extremely important /	0 to 4	N

		extremely important		
<b>welfare_thirst</b>	Freedom from thirst	not at all important / slightly important / moderately important / very important / extremely important	0 to 4	N
<b>welfare_pain</b>	Freedom from pain and discomfort	not at all important / slightly important / moderately important / very important / extremely important	0 to 4	N
<b>welfare_death</b>	A painless death	not at all important / slightly important / moderately important / very important / extremely important	0 to 4	N
<b>welfare_life</b>	Having a life worth living	not at all important / slightly important / moderately important / very important / extremely important	0 to 4	N
<b>welfare_choice</b>	Ability for choice and control in their environment	not at all important / slightly important / moderately important / very important / extremely important	0 to 4	N

		extremely important		
		not at all important / slightly important / moderately important / very important / extremely important		
<b>welfare_growth</b>	Maintaining normal growth	extremely important	0 to 4	N
		not at all important / slightly important / moderately important / very important / extremely important		
<b>welfare_productivity</b>	Maintaining productivity (e.g., milk production)	extremely important	0 to 4	N
<b>Composite stress pileup</b>	<i># of stressors for which a participant selected "often" or "very often"</i>		<b>0 to 24</b>	
		never / almost never / sometimes / fairly often / very often / not applicable		
<b>stressors_finance</b>	Financial worries (loans, debts, bank pressure, etc.)	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
		never / almost never / sometimes / fairly often / very often / not applicable		
<b>stressors_grief</b>	Grief (death of a loved one or community member)	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
		never / almost never / sometimes / fairly often / very often / not applicable		
<b>stressors_time</b>	Lack of time (no time to rest, complete tasks well, etc.)	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N

<b>stressors_disease</b>	Livestock disease	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>stressors_injury</b>	Livestock injury	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>stressors_reproductive</b>	Livestock reproductive issues	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>stressors_euthanasia</b>	Euthanasia	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>stressors_vetshortage</b>	Veterinary shortage	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>stressors_pests</b>	Pests	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>stressors_disability</b>	Physical disability	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>stressors_injury_self</b>	Physical injury of self	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N

		often / not applicable		
<b>stressors_injury_co worker</b>	Physical injury of worker/co-worker	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>stressors_isolation_ phys</b>	Physical isolation (lack of nearby services, healthcare, etc.)	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>stressors_isolation_s ocial</b>	Social isolation	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>stressors equip_ cha nges</b>	Changes in equipment	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>stressors_workproce ss</b>	Changes in work processes	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>stressors equip_ bre akdown</b>	Equipment breakdown	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>stressors_balance</b>	Work/family balance	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N

<b>stressors_workload</b>	Workload	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>stressors_family</b>	Interpersonal issues with family	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>stressors_friends</b>	Interpersonal issues with friends	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>stressors_coworkers</b>	Interpersonal issues with co-workers	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>stressors_weather</b>	Weather	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>stressors_other</b>	Other	never / almost never / sometimes / fairly often / very often / not applicable	0 to 5	N
<b>Composite welfare- related stress</b>	<i>Mean across 14 items calculated for each participant</i>		<b>0 to 5</b>	
<b>welfare_stress_disease</b>	Livestock <i>disease</i> occurs on your farm/production.	not at all stressful / a little stressful / moderately stressful / quite stressful / very	0 to 5	N

		stressful / not applicable		
<b>welfare_stress_injury</b>	Livestock <i>injury</i> occurs on your farm/production	not at all stressful / a little stressful / moderately stressful / quite stressful / very stressful / not applicable	0 to 5	N
<b>welfare_stress_reproductive</b>	Livestock reproductive issues occur on your farm/production.	not at all stressful / a little stressful / moderately stressful / quite stressful / very stressful / not applicable	0 to 5	N
<b>welfare_stress_euthanasia</b>	Euthanasia occurs on your farm/production	not at all stressful / a little stressful / moderately stressful / quite stressful / very stressful / not applicable	0 to 5	N
<b>birth_year</b>	In what year were you born?	1920 to 2007	NA	NA
<b>gender</b>	What is your gender?	male / female / non-binary/third gender / genderqueer / other / prefer not to say	NA	NA
<b>language</b>	What is your primary language?	English / Spanish / K'iche' / Other	NA	NA
<b>race</b>	Choose one or more races that you consider yourself to be *select all that apply	white or caucasian / black or african american / american indian/native american or alaska native / asian / native	NA	NA

		hawaiian or other pacific islander / other / prefer not to say		
		United States / Mexico / Guatemala / El Salvador / Nicaragua / Costa Rica / Honduras / Panama / Puerto Rico / Cuba / Peru / Colombia / Venezuela /		
<b>country_born</b>	In which country were you born?	Other	NA	NA
<b>farmsize</b>	How large is your farm/production (as measured by number of livestock)? (An approximation is fine.)	open-ended	NA	NA
<b>years_2</b> <b>years_3</b>	How many months or years of experience do you have working on livestock farms (total, this location and others)?	Years [open- ended] Months [open- ended]	NA	NA
<b>country_farm</b>	In which country is your farm/production located?	United States / Canada / England / Scotland / Wales / Northern Ireland / Ireland / Sweden / Finland / Spain / Other	NA	NA
<b>State</b>	In which state is your farm/production located?	Colorado / Texas / Montana / Other	NA	NA