Communicating without words: Measuring nonverbal communication between veterinarians and farmers during routine herd health consultations

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ABSTRACT

Uptake of advice and the ability to facilitate change on-farm are key elements for successful veterinary practice. However, having the necessary clinical skills and knowledge is not enough to achieve this: effective communication skills are essential for veterinarians to realize their advisory role by exploring and understanding the farmer’s worldview. Research of verbal aspects of veterinarian communication supports the use of a relationship-centered communication style; we next need to study how veterinarian-farmer nonverbal communication (NVC) can influence interactions and their outcomes, which has been examined in medical and companion animal practice. In this study, we considered which aspects of NVC should be measured, and how, to provide an essential first step toward understanding the significance of NVC for veterinarians working in dairy practice, which should be of interest to researchers, veterinary educators, and practitioners. Eleven video recordings of routine consultations in the UK were analyzed for farmer and veterinarian NVC. The NVC attributes with established links to positive patient and client outcomes from medical and social science studies were chosen, and a methodology developed for their measurement, by adapting measures typically used in NVC research. Each consultation was segmented into intervals defined by the main activity and location on farm: introduction, fertility examination, discussion, and closing. This approach allowed us to analyze the content more consistently, establish which aspects of NVC featured within each interval, and whether the activity and location influenced the observed NVC. We measured 12 NVC attributes, including body orientation, interpersonal distance, head position, and body lean, which have been shown to influence empathy, rapport, and trust: key components of relationship-centered communication. Future research should seek to establish the significance of NVC in effective communication between veterinarian and farmer, building on our findings that show it is possible to measure nonverbal attributes. Veterinarians may benefit from becoming skilled nonverbal communicators and have more effective conversations during routine consultations, motivating farmers to make changes and improve herd health.

Key words: communication, nonverbal communication, empathy, herd health, effective communication

INTRODUCTION

Veterinarians have moved away from treating individual animals to a whole-herd approach to prevent disease and improve productivity (LeBlanc et al., 2006): herd health plans (HHP) were developed to facilitate this approach. HHP offer veterinarians the chance to engage in constructive conversations about health and welfare planning (Ritter et al., 2021). However, veterinarian and farmer perception of the value of HHP is mixed (Hall and Wapenaar, 2012), and improvements in herd performance parameters and farmer involvement in veterinary herd health management (VHHM) advisory discussions on these parameters do not appear to be linked (Derks et al., 2014). A possible reason for this mixed reception to HHP could be poor communication, with different expectations for what HHP can achieve (Ritter et al., 2019). Svensson et al. (2018) showed a lack of uptake of VHHM programs by farmers who felt their veterinarian had poor communication skills.

Becoming more effective communicators, with the ability to translate clinical knowledge into something that is meaningful to the farmer, could help in the process of knowledge exchange (LeBlanc et al., 2006; Jansen et al., 2010) and influence farmer satisfaction.
and preparedness to adopt advice (Ritter et al., 2019). Regular veterinary visits, also known as routine consultations, are identified as an important opportunity for veterinarians to have constructive conversations with their farmer (Ritter et al., 2021).

Our understanding of how communication can influence farmer responses has been significantly improved through recent quantitative research using the Roter Interaction Analysis System (RIAS) and Motivational Interviewing Treatment Integrity (MITI) coding systems (Ritter et al., 2018; Svensson et al., 2019). In-depth analyses of this kind have indicated that adopting a directive or dominant style of communication, with minimal client involvement in goal setting, has been shown to reduce uptake of advice and sense of satisfaction (Shaw, 2006; Bard et al., 2017; Ritter et al., 2019). Conversely, the use of empathic communication skills can lead to a strong sense of trust and increased levels of client satisfaction (McArthur and Fitzgerald, 2013).

Both the RIAS and MITI coding systems use recordings of verbal content to measure the use of relationship-centered communication skills during veterinarian consultations. The MITI assesses the clinicians’ use of verbal utterances where the focus is discussion of behavioral change; RIAS coders analyze verbal content and tone of voice. Neither includes analysis of visual nonverbal content, and McArthur and Fitzgerald (2016) noted the limitations of the RIAS in this regard, stating that it is “limited to verbal utterances” (p. 121) and did not afford the opportunity to assess visual nonverbal communication (NVC).

Between 65 and 95% of total messages are conveyed through nonverbal channels (Matsumoto et al., 2013). Nonverbal communication can be classified into static and dynamic attributes. Static attributes are those aspects that don’t change during an interaction, such as clothing and hairstyle choices and use of equipment (computers, ultrasound scanners). Choice of clothing can communicate social meaning, both to the observer and to the person wearing the clothes (Argyle, 1988). For example, veterinarians may show their affiliation with an organization or a practice if their clothing displays a logo or display items synonymous with activities associated with their profession, such as wearing a stethoscope around their neck. Conversely, dynamic attributes do change during interactions and include nonverbal behaviors (NVB) that express emotions through facial and bodily movement.

Nonverbal behaviors mostly occur without intention and can reflect the way someone feels about a situation, conversation, or person (Ekman, 1985). The breadth and nuance of these measurements suggest that dominant coding paradigms (MITI, RIAS) within empirical study of veterinary communication are not necessarily sufficient, with predominantly verbal behaviors, to capture and assess both the full complexity of veterinary communication and the relational effect thereof.

Several NVB have been shown to influence patient and client outcomes when studied by NVC researchers (Table 1). Interpersonal distance, body lean, and body orientation describe the use of space during interpersonal interactions and is influenced by stance and body lean, where forward lean reduces the distance between interactants. Eye contact has been shown to signal interest, involvement, and connection between interactants. Gestures can be classed as adapters, emblems, and illustrators. Adapters are touching behaviors that indicate an individual’s level of anxiety or arousal and can involve the use of objects (object-adapters) or be directed to the self (self-adapters). Emblems are gestures with widely agreed meanings, such as thumbs up, and illustrators are gestures used alongside the verbal messages they accompany. People tend to, comparably, be aware of their use of emblems, may be slightly less aware of their use of illustrators, and may be unaware of their use of self-adapters, which are usually performed subconsciously and without intended communicative purpose (Harrigan et al., 1987).

Understanding that NVB can be a manifestation of emotional states could be helpful for veterinarians to be aware of during HHP, particularly if behavioral change

Table 1. Nonverbal behaviors and their associated influence on patient-client outcomes

<table>
<thead>
<tr>
<th>Nonverbal behavior</th>
<th>Research findings</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpersonal distance and body lean</td>
<td>Closer distances linked to feelings of greater warmth, friendship, and agreement, and it has been suggested that a relationship is defined by the interpersonal distance between both parties</td>
<td>Hall et al., 1968</td>
</tr>
<tr>
<td>Body orientation</td>
<td>Face-to-face positions associated with greater levels of interest and availability</td>
<td>Coker and Burgoon, 1987</td>
</tr>
<tr>
<td>Eye contact</td>
<td>Moderate levels of eye contact or eye gaze are associated with more positive perceptions</td>
<td>Burgoon et al., 1985</td>
</tr>
<tr>
<td>Body position</td>
<td>Can suggest an interactant’s attitude and degree of affiliation</td>
<td>Harrigan, 2013</td>
</tr>
<tr>
<td>Gestures</td>
<td>Increased gesturing, smiling, and nodding have been associated with an increased sense of involvement and warmth</td>
<td>Andersen and Andersen, 2004</td>
</tr>
<tr>
<td>Adapters</td>
<td>Rubbing one’s arms or face can be a manifestation of wishing to soothe oneself</td>
<td></td>
</tr>
</tbody>
</table>
(e.g., implementation of management practices) is a
discussion point. For example, a farmer might respond
to a proposed course of action with positive verbal mes-
ages, yet nonverbally the respondent may demonstrate
concerns or a lack of agreement, demonstrated through
a lack of eye contact or increased use of self-adapters.
Such contradictory messaging is termed “nonverbal
leakage” (Ekman and Friesen, 1969). Becoming a skilled
reader of NVC could help veterinarians recognize when
a farmer is unconvinced about or disengaged from a
discussion topic, despite giving positive verbal mes-
ages. Recognizing this and then exploring (verbally)
the reasons for possible negative feelings or concerns
can improve mutual understanding of viewpoints and
achieve more effective conversations.

In this study, we wanted to establish whether video
recordings of routine consultations could provide suf-
icient material to define measurements of those aspects
of NVC that we felt would be most likely to have re-
levance for veterinarian and farmer interactions. The
objectives of this study were to

1. Identify perceived relevant NVB based on other
literature and the authors’ evaluation of the record-
ings,
2. Assess the practicality of measuring these, and
3. Reflect on current coding protocols and how
NVB may act to enhance or diminish these.

**MATERIALS AND METHODS**

**Description of Sample**

This study is a secondary analysis of 11 video record-
ings of routine dairy herd consultations. Our objective
was to measure NVC between veterinarians and farmers
during a “typical” routine consultation on-farm, where
“farmer” denoted the principal interactant with the vet-
erinarian during the consultation. The recordings we
selected for analysis came from a total of 13 farm visits
that had been recorded in a separate study designed
to observe veterinarian interactions with their clients
(unpublished research, 2018: N. Atabayev, Abbotsford
Veterinary Clinic, British Columbia, Canada; L. Corah,
School of Veterinary Medicine and Science, University
of Nottingham, United Kingdom; C. Ritter, Atlantic
Veterinary College, University of Prince Edward Island,
Canada; H. Barkema, Faculty of Veterinary Medicine,
University of Calgary, Canada; W. Wapenaar, Elanco
Animal Health, Monheim am Rhein, Germany).

A significant proportion of routine consultations are
typically devoted to the examination of the reproduc-
tive tract, generally referred to as fertility work (Breen
et al., 2009). We set 2 inclusion criteria to establish if
the recording was of a typical routine consultation: (1)
the veterinarian performed fertility work on at least
1 animal, and (2) the visit took place on a farm. On
this basis, 11 consultations satisfied these criteria; 2 of
the original 13 recorded consultations did not and were
excluded from this research.

For the original study, ethical approval was granted
by the Research Ethics Committee at the (School of
Veterinary Medicine and Science, University of Not-
ttingham) ahead of the project’s commencement (ref
2266 180412). Veterinarians from 4 UK practices,
based in the midlands and southwest of England, had
been recruited through convenience sampling, and they
selected those farmer clients that were willing to be
filmed during their routine consultation. The farms on
which the consultations took place were in the mid-
lands and southwest of England. Before data collection,
all participating veterinarians and farmers received an
information sheet detailing the aims of the research and
provided their written consent to be recorded. Due to
concerns about potential barriers to participation, the
original study design did not seek to capture additional
data outside that which was recorded in the videos.

Data were captured using GoPro cameras (Hero 4 or
Hero 5, GoPro Inc.) that were generally worn on the
chest by the veterinarian, farmer, and undergraduate
student, henceforth called the “observer,” creating 3 dif-
cerent views of the consultation. In 1 consultation, the
camera was positioned on a table during the conversa-
tion between farmer and veterinarian. All recordings
captured audio and video footage obtained through
the cameras without additional devices. Cameras were
generally switched on as the veterinarian and observer
arrived on-farm, i.e., when they had exited the vehicle
and were gathering equipment for the visit from inside
the vehicle. Cameras were switched off generally at or
toward the end of the visit, i.e., when the veterinar-
ian and observer were cleaning their equipment or had
walked back to the veterinarian’s vehicle.

**Data Analysis**

To enable measurement of NVC between the farmer
and veterinarian, we chose to analyze only those record-
ings that captured both parties within the same frame:
these data were mainly obtained from the camera worn
by the observer. Content was analyzed and coded with
the volume muted throughout to enhance the focus on
nonverbal attributes.

To facilitate consistent analysis and measurement
within and between consultations, we chose to segment
each consultation into 4 main intervals: introduction,
fertility examination, discussion and closing, defined by
the main activity taking place and its location on-farm
Due to some inconsistencies between data captured on the recordings, the presence or absence of each interval was noted for each consultation. We then measured NVC within the intervals to facilitate identification of nonverbal attributes in the context of each interval (Tables 3, 4, 5, and 6).

Features of the consultations were recorded and included average duration, presence of the defined intervals (introduction, fertility examination, discussion, closing) within the consultation, and details of individual veterinarians and farmers, where “farmer” denoted the principal interactant with the veterinarian during the consultation. In accordance with the objective of this study, only those nonverbal interactions between the veterinarian and farmer were measured.

In the absence of pre-established criteria for measuring NVC during routine farm consultations, we adapted findings from research to develop a methodology for measuring NVC between veterinarian and farmer. We chose to measure those NVB that had established links with positive client-patient outcomes, based on a review of the evidence base surrounding NVB assessment in human health care and social science, as described in the introduction. We categorized NVC into static and dynamic attributes for both veterinarian and farmer (Figure 1) and recorded this in a spreadsheet (Microsoft Excel for Mac 2018).

**Measuring NVC: Description of the Coding System**

**Static Attributes.** Clothing was coded as “branded” if items displayed visual reference to a veterinary practice or group of practices (e.g., a logo); “casual” described polo shirts and shorts; and “formal” described button-down shirts (with or without a tie) and long trousers.

### Table 2. Description of discrete intervals within the routine consultation

<table>
<thead>
<tr>
<th>Interval</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>Veterinarian and farmer interact for the first time on-farm</td>
</tr>
<tr>
<td>Fertility exam</td>
<td>Veterinarian uses transrectal ultrasonography to examine 1 or more groups of cows; veterinarian and farmer interact with each other and possibly other people (e.g., farm staff, veterinary students)</td>
</tr>
<tr>
<td>Discussion</td>
<td>Veterinarian and farmer interact in a location away from cattle, often in a farm office or kitchen; paper and electronic documentation may be used</td>
</tr>
<tr>
<td>Closing</td>
<td>Veterinarian and farmer interact for the last time on-farm</td>
</tr>
</tbody>
</table>

### Table 3. Nonverbal behaviors of veterinarians and farmers measured during the introduction interval (n = 4)

<table>
<thead>
<tr>
<th>Nonverbal behavior</th>
<th>Measurement score</th>
<th>Number of consultations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance between farmer and veterinarian</td>
<td>&gt;4 arm lengths apart</td>
<td>0</td>
</tr>
<tr>
<td>Body orientation of farmer</td>
<td>2-4 arm lengths apart</td>
<td>2</td>
</tr>
<tr>
<td>Face orientation of farmer</td>
<td>1-2 arm lengths apart</td>
<td>2</td>
</tr>
<tr>
<td>Face orientation of veterinarian</td>
<td>Side on</td>
<td>1</td>
</tr>
<tr>
<td>Face orientation of veterinarian</td>
<td>Angled up to 180 degrees</td>
<td>0</td>
</tr>
<tr>
<td>Face orientation of veterinarian</td>
<td>Face on</td>
<td>3</td>
</tr>
<tr>
<td>Head position of farmer</td>
<td>Mainly away from veterinarian</td>
<td>1</td>
</tr>
<tr>
<td>Head position of veterinarian</td>
<td>Moderately toward</td>
<td>1</td>
</tr>
<tr>
<td>Head position of veterinarian</td>
<td>Frequently toward</td>
<td>2</td>
</tr>
<tr>
<td>Arm position of farmer</td>
<td>Hand(s) on hips</td>
<td>2</td>
</tr>
<tr>
<td>Arm position of veterinarian</td>
<td>Loose by sides</td>
<td>0</td>
</tr>
<tr>
<td>Arm position of veterinarian</td>
<td>Holding equipment</td>
<td>1</td>
</tr>
<tr>
<td>Arm position of veterinarian</td>
<td>Other—behind back</td>
<td>1</td>
</tr>
<tr>
<td>Gestures displayed by farmer</td>
<td>Infrequent</td>
<td>3</td>
</tr>
<tr>
<td>Gestures displayed by veterinarian</td>
<td>Moderate</td>
<td>1</td>
</tr>
<tr>
<td>Gestures displayed by veterinarian</td>
<td>Frequent</td>
<td>0</td>
</tr>
<tr>
<td>Gestures displayed by farmer</td>
<td>Infrequent</td>
<td>1</td>
</tr>
<tr>
<td>Gestures displayed by veterinarian</td>
<td>Moderate</td>
<td>3</td>
</tr>
<tr>
<td>Gestures displayed by veterinarian</td>
<td>Frequent</td>
<td>0</td>
</tr>
</tbody>
</table>
The method of ultrasound scanner use was recorded: screen worn by the veterinarian, screen held by other or placed on a surface, or image viewed using goggles. Use of electronic and paper documentation during the discussion interval was noted.

**Dynamic Attributes.** The NVB measured were interpersonal distance, body orientation, body lean, height difference, head position, limb position, use of gestures, and use of adapters (Tables 3–6). Each attribute was measured independently during observation of the interactions within each interval.

Interpersonal distance was visually estimated in multiples of arm lengths between both parties. Body orientation was the front torso-to-torso position relative to the interactant. Body lean was determined by visually estimating the angle between the torso and the hips. Height difference was the vertical difference during interaction (standing or seated).

Head position was the position relative to the interactant during conversation and was used to estimate the amount of eye contact. Limb position was coded as closed if arms or legs were crossed; neutral if arms and legs were uncrossed but held close to the body or pressed together; and open if arms and legs were relaxed, uncrossed, and not held tightly together. Gestures referred to the use of hands during conversation, when directly tied to speech and used to highlight what was being said.

Object- or self-adapters identified behaviors included touching, rubbing, and scratching one’s own hair and face, manipulating a pen, or folding and unfolding a pair of glasses that were being held.

Farmer and veterinarian nonverbals were measured as an estimated proportion of time spent during their interactions within the intervals of the consultation; “infrequent” and “mainly away from” described up to 30% of the time spent displaying the behavior, “moderate” and “moderately toward” for behavior displayed between 30 and 60% of the time, and “frequent” and “frequently toward” described a behavior observed for more than 60% of the interaction interval.

In addition to measurement of NVB, movement between locations was recorded: whether the farmer greeted the veterinarian beside their vehicle, and how both parties moved from the site of their initial interaction to the location of the fertility examination.

**RESULTS**

The results for static and dynamic attributes for farmer and veterinarian are presented as they were measured within each interval (introduction, fertility examination, and discussion). A general description of the setting and environment where each interval took place is also provided to add context.

**Sample Characteristics**

The consultations (n ≥ 1 per veterinarian) were conducted by 6 veterinarians: 3 female and 3 male. Most
farmers were male (n = 10) and 2 farmers were female; 1 consultation took place with a male farmer during the introduction and fertility examination intervals, and then a female farmer completed the consultation in the discussion interval. It was not possible to measure NVC in all introduction intervals nor in any of the closing intervals due to poor camera positioning and inconsistencies between switching the camera on and off.

The median duration of consultations was 70 min and ranged from 32 to 154 min. An introduction interval was recorded for 7 consultations, but it was only possible to measure nonverbal attributes in 4 of these. All consultations included a fertility examination interval, and nonverbal attributes could be measured in all of these. Four consultations included a discussion interval with content suitable for analysis. The predominant interactions captured on camera during closing were not between farmer and veterinarian; footage showed the camera being removed and handed back to the observer and paperwork being exchanged between the farmer and observer. For this reason, NVC was not measured during the closing interval.

During the fertility examination interval, farmer and veterinarian interactions were frequently interrupted.
by the need to move cattle, retrieve equipment, and administer medicines. Therefore, for the purposes of this study, NVC measurements for both farmer and veterinarian were taken only during those periods when the veterinarian was stationary and engaged in the examination of cattle; starting immediately before the veterinarian inserted their arm transrectally and until the transrectal ultrasound examination (TRUS) had been completed.

**Introduction Interval**

The farmer either greeted the veterinarian beside their vehicle after arriving on-farm or the veterinarian greeted the farmer after walking to location of the farmer.

**Static Attributes.** Four veterinarians wore branded clothing (7 consultations), 1 did not (3 consultations), and it was not possible to code for 1 veterinarian as waterproof clothing was already in place when the camera was switched on (1 consultation). All female veterinarians wore branded and casual clothing; 1 male veterinarian wore branded and formal clothing; and 1 male wore nonbranded and formal clothing.

**Dynamic Attributes.** Nonverbals measured for both veterinarian and farmer are shown in Table 3.

After each veterinarian arrived on-farm in a vehicle, the farmer either greeted the veterinarian at this location (n = 4), did not greet the veterinarian at this location (n = 3), or the recording did not include this information (n = 4).

In 4 consultations, the recordings showed how the farmer and veterinarian moved from their initial point of contact to the location of the fertility examination: both walked side by side (n = 1), the farmer walked ahead (n = 2), or the veterinarian walked ahead (n = 1).

**Fertility Examination Interval**

The facilities where cattle were restrained for examination were the milking parlor, individual pens (AI stalls and yolks), a race, and a crush housed within a barn.

**Static Attributes.** All veterinarians used an ultrasound scanner and 3 different methods of use were identified. Two veterinarians wore the ultrasound screen on their body, using a strap to hold it in place (3 consultations), 2 used goggles with their scanner (3 consultations), and 2 used a screen held either by the observer or placed on a surface (5 consultations).

**Dynamic Attributes.** Compared with the other intervals, fewer NVB could be measured, which was due to the interactions with animals by both farmer and veterinarian (Tables 4 and 5). The farmer appeared to have more opportunity to influence interpersonal distance compared with the veterinarian, who was restricted by the act of physical examination of the cow.

**Discussion Interval**

Three of the discussions took place in what appeared to be the farm office, which was separate from the cattle and contained at least 1 table plus more than 1 chair. The fourth took place in what appeared to be the farm kitchen, which contained 1 table and more than 1 chair seated at the table.

**Static Attributes.** A computer was used by both veterinarian and farmer in 2 of the 4 consultations, and each invited the other to view the contents of their device during conversation. Paper documents were used in all 4 of the consultations. In 2 of them, only the veterinarian used paperwork and, in each case, no attempt appeared to be made to share the contents with the farmer. Both the veterinarian and farmer used paper documents in the remaining 2 consultations: in each case, the veterinarian appeared to share the contents with the farmer, who did not appear to reciprocate.

**Dynamic Attributes.** It was possible to measure the widest range of nonverbals during the discussion interval compared with the other intervals (Table 6). Both veterinarian and farmer were seated throughout 3 of the consultations. In the fourth, the farmer and veterinarian took turns standing and moving to a different location within the room, for the purpose of accessing the farmer’s computer.
DISCUSSION

Why Study NVC: Potential Learnings for Veterinarians

In this novel study, we demonstrated that NVC attributes—previously found to be significant for effective communication between physicians, health-care workers, and companion animal veterinarians and their clients—could be measured using video recordings of veterinarian-farmer interactions during routine consultations on-farm. Veterinarians can use the findings of this study in their practice, as many aspects of NVC are likely to influence their ability to effect change on-farm. To emphasize potential learnings for veterinarians, we provide details relevant to each discrete interval within the consultation. A better understanding of measuring NVC attributes should also be useful for those in veterinary education who deliver communication skills training.

Based on our observations, the introduction interval represents a typical dyadic meeting: neither party is distracted by the presence of cattle or the need to use equipment. This is likely to represent typical engagement when meeting on-farm for the first time. Data suggest that this period might offer the veterinarian a chance to foster a sense of rapport through engaging in positive behaviors such as eye contact and open body posture and to consider how the farmer’s behaviors might help them initiate conversation regarding possible issues and areas of concern that might be useful to address during their time on-farm. This approach is similar to that proposed by Petrovski and McArthur (2015) as they considered how to apply the modified Calgary-Cambridge Guide to bovine consultations.

During the fertility examination, data suggest that opportunities to engage in open body position and eye contact can be restricted by the focus on performing TRUS (Table 5). When using goggles, the veterinarian appeared to spend less time with their head and body positioned toward the farmer. The use of goggles could be perceived as a barrier to interaction. Carson (2007) highlighted a similar challenge faced by companion animal veterinarians when using electronic health records: the location of the computer could cause the veterinarian to face directly away from the client, creating a barrier that reduces eye contact.

With the screen strapped to the body, we observed that veterinarians adapted their body orientation and head position toward the farmer. Adopting an open posture and improving the amount of eye contact was a key recommendation by Gorawara-Bhat et al. (2007), who surmised that physicians were better able to make and maintain eye contact through less engagement with patient records, which encouraged more conversation and positive affect. Medical studies (Margalit et al., 2006; Street et al., 2014) that explored the effect of computer screen use by physicians on patient-centered communication found that too much visual attention was taken away from the patient, leading to conversational dead space; these researchers also noted that patients may regard the physician’s engrossment in screen use as disinterest, and patients seemed to disengage from the interaction during such periods. A solution to this suggested by Asan et al. (2015) was to invite patients to view the computer screen to help avoid silence or disengagement and enhance patient interaction and sense of inclusion in the activity. In recognition of the benefit gained by increased use of eye contact during computer use, Carson (2007) suggested that veterinarians could look over their shoulder from time to time toward the client.

Data suggest that the discussion interval may present an opportunity for veterinarians to engage in positive NVB and to observe farmer behaviors. These intervals often occurred in a separate location to the fertility examination, with veterinarians and farmers mainly engaged in conversation while seated, which established specific distances and angles that were maintained for the duration of the interval (i.e., interpersonal distance of between 1 and 4 arm lengths and angled or directly facing each other). Limb position was predominantly recorded as being open or neutral. However, in consultation, the farmer frequently assumed closed limb positions, crossing both the arms and legs. It is useful to be aware of the potential significance of open and closed postures; Carson (2007) suggested that a client’s uncrossed arms and legs reflected feelings of safety during the consultation, and that clients are more likely to share their concerns and fears when they feel safe with the veterinarian.

Veterinarians assumed either a neutral or forward body lean, as did most of the farmers, although in consultation the farmer mainly assumed a negative lean (away from the veterinarian). This was the same consultation where the farmer moved further away from the veterinarian after standing; previously, the farmer sat with a closed body posture (crossed arms and legs). Leaning away from an interactant and crossing the arms or legs has been associated with patient feelings of dislike or disengagement (Argyle and Dean, 1965). By recognizing closed postures and negative body lean, particularly during discussions involving potentially emotive topics that might involve change, veterinarians might choose to explore possible reasons for these behaviors by asking whether the farmer has any questions or concerns, allowing the farmer an opportunity to express them verbally.
Good levels of eye contact were observed for most consultations, with head position frequently or moderately toward each other. Collaborative use of computers and paperwork was observed, which is likely to enhance a sense of engagement in both parties. In medical settings, however, patient-centered communication was negatively correlated with screen gaze; physicians asked fewer psychosocial questions and demonstrated a reduced response to patients’ emotions (Margalit et al., 2006; Vogel et al., 2018). The links between computer use and client engagement have also been considered in companion animal practice, where veterinarians were encouraged to adjust the computer screen to allow them to maintain more eye contact with the client and to position paperwork in direct line of vision for both veterinarian and client to enhance the sense of collaboration between both parties (Carson, 2007). We recommend therefore that veterinarians are aware of this and try to use computers or paperwork collaboratively or ensure sufficient eye contact is made during their use.

Both farmers and veterinarians displayed moderate to frequent use of adapters (e.g., touching the face or head, manipulating a pen). Adapters are touching behaviors that may indicate an individual’s level of anxiety or arousal. It might be useful to become more conscious of such behaviors if veterinarians wish to project higher levels of confidence: avoidance of such behaviors while engaging in positive facial expressions and affirmative gestures could help build trust in situations where a strong farmer-veterinarian relationship has not yet been established. In 1 study, observers advised medical students that a reduction of their use of adapters would improve their overall communication (Collins et al., 2011; Park and Park, 2018).

**Research Perspectives**

For practical purposes, it proved useful to define distinct intervals within the consultation that enabled measurement of NVB within the context of those intervals (Figure 2). This approach is comparable to that described by Gorawara-Bhat et al. (2007), where medical encounters were classified into different phases (opening, middle, and closing to capture the variation in nonverbal attributes over the duration of encounters analyzed in the research. The measures of NVC we used during farmer-veterinarian interactions were developed based on approaches to nonverbal measurements established in NVC research. They offer a practical, meaningful and evidence-based (Gorawara-Bhat et al., 2007) approach to studying NVC. We feel it is useful to explain the rationale behind setting the measurement parameters for interpersonal distance and eye contact.

Interpersonal distance was estimated using multiples of an arm’s length (shoulder to fingertips). Some studies use environmental features such as floor tiles (Harrigan et al., 1985) to make measurements. Given there were no universal “markers” of distance on the farms, we felt that our methodological choice offered a practical solution and consistent approach for all consultations. We chose to use head position as an indirect measure of eye contact. Research shows that a person moves their head when redirecting their gaze and that interactants generally look well away or at each other, so eye contact can be accurately determined through measurement of head direction in relation to the interactant (Kendon, 1967). Placing action cameras on the heads of farmers and veterinarians could improve the accuracy of gaze measurement, but this would likely increase their awareness of being observed and could result in modification of their behavior. We therefore suggest that head position offers a practical way to measure eye contact in this situation and the data recorded could be improved through instruction to the observer to position themselves, and therefore the camera, so that both farmer and veterinarian can be plainly observed during interactions as much as possible.

Farmer and veterinarian behavior might have been altered through their awareness of being recorded, a phenomenon termed the “Hawthorne effect” (McCambridge et al., 2014). However, as the goal of this study was to develop a methodology to measure NVC and provide a framework for future research of NVC, rather than identify the significance of this NVC within and between these consultations, any behavioral variability induced by the Hawthorne effect is unlikely to have meaningfully impeded or affected this study goal. Although intercoder reliability was not included in development of the methodology, our method used to code NVC was based on existing literature (Gorawara-Bhat et al., 2007). The primary objective of this research was to assess whether it was possible to measure NVC during consultations using in-the-field technology; now that this has been confirmed, further studies should include multiple coders or repetitive coding by 1 coder to confirm the reliability and robustness of the analysis. A small sample size might have restricted the ability to collect the full range of NVC that takes place during routine consultations. However, as this was a field study, it is more likely that legitimate responses and authentic behaviors took place between veterinarian and farmer consistent with those occurring during a typical routine consultation. Poor camera positioning sometimes limited the opportunity to measure certain NVB; without the veterinarian and farmer in the same frame; it was not possible to measure body lean and
head position relative to the other. NVC during the closing interval was not measured as the main interactions occurred between farmer and observer, and the camera worn by the farmer was being returned. This could be eliminated by using a single camera, worn by an observer, for recordings.

**Which Criteria Should Be Used, How To Measure Them, and Advice to Future Researchers**

The results of this study provide a framework for future research to explore which aspects of NVC are most relevant when assessing the outcomes of routine consultations, such as farmer satisfaction and successful implementation of HHP. In medical settings, certain nonverbal—interpersonal distance, body orientation, and eye contact—have been linked to feelings of greater warmth, friendship, and agreement (Hall et al., 1968); associated with greater levels of interest and availability (Coker and Burgoon, 1987); and can signal interest, involvement, and connection between interactants (Burgoon et al., 1985).

Rather than attempting to interpret interactions using a broad range of NVB, we felt it was important to identify and measure individual behaviors observed from video recordings, particularly as NVC has not been studied on-farm before. However, we encourage future research to use the range of behaviors recorded in this study to help establish links between NVC and empathy, farmer satisfaction, and veterinarian advice uptake. Humans process NVB as a gestalt that translates into a global perception of what is being communicated, and research has established links between certain NVB and global perceptions, such as immediacy (Andersen and Andersen, 2004), rapport (Harrigan et al., 1985; Grahe and Bernieri, 1999), attitudes (Mehrabian and Ferris, 1967), and the general affect experienced by 1 person interacting with another (Pally, 2001).

By segmenting the consultation into intervals, it is possible to set expectations of what can or cannot be measured for future studies of NVC. For example, during TRUS, interpersonal distance is influenced by the farmer only, although the veterinarian can adapt their body orientation and head position toward the farmer.

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We felt it would be useful to record the choice of clothing worn by the veterinarian, classified as a static attribute. Self-presentation is likely to be linked to a sense of (professional) identity for veterinarians, which may in turn be linked to job satisfaction and mental health (Armitage-Chan and May, 2019; Armitage-Chan, 2020). Branded clothing provides a clear display of group membership and may be considered to be a type of uniform (Argyle, 1988). Practice culture may influence the choice to wear formal or casual clothing. Observers form impressions based on clothing (Argyle, 1988) and having an awareness of how such self-presentation can influence others’ perception of them might be useful if veterinarians are keen to cultivate a certain impression on their clients. It would be interesting to explore this further to understand if and how the choice of clothing might influence the relationship between farmer and veterinarian and if and how farm veterinarians use clothing to support their sense of professional identity.

Closer scrutiny of NVC during the fertility examination interval would be warranted, as this may be a key opportunity to increase veterinarian-farmer engagement: fewer than half of the consultations in this research included a discussion interval, but the fertility examination interval was a consistent feature, forming a significant component of time spent on-farm. It would be useful to investigate whether the method of scanner use makes a difference to the farmer: is a sense of inclusion and engagement fostered, leading to increased levels of farmer satisfaction, if both parties could view the ultrasound scanner screen during TRUS? It would also be useful to explore how veterinarians are affected by their use of an ultrasound scanner: would their sense of satisfaction change if they had a greater opportunity to engage with the farmer during this time, through eye contact, proximity, and body orientation?

Having established that video recordings can be used to measure NVC, we advise future research project design to consider how those recordings are made to ensure better consistency in the material captured for subsequent analysis and encourage the use of our coding tool, the Easy Veterinary Nonverbal communication Tool (EVeNT; see Appendix). We recommend that a single camera is worn by a third party, the observer, to capture interactions between both parties in the same frame and that the camera can record the entire consultation wherever possible, being switched on before the initial interaction and off after the final interaction.

This study focused on human-human nonverbal interactions in the herd health paradigm, based on the strength of the evidence base underpinning research in the field of human psychology and behavior. Future research may benefit from widening this analytical frame to explore veterinarian-animal and farmer-animal nonverbal interactions. However, due to the positioning of cattle during TRUS (i.e., the rear of the animal facing the veterinarian) this may be of more relevance to other clinical scenarios and species interactions than to those that occur during the routine farm consultation.

The farms on which the consultations took place were in the midlands and southwest of England. It is possible that farming practices may vary across the UK and that this may affect NVC between the farmer and veterinarian. Future studies may benefit from exploring this by recruiting a broader geographical spread of farms on which to record routine consultations.

CONCLUSIONS

This study confirmed the practical ability to measure NVC during the routine consultation. Routine consultations provide veterinarians with a regular opportunity to discuss herd health planning with their farmers. Future researchers can use the framework we developed to establish the significance of the nonverbal attributes recorded in this study. Learning more about NVC, through further research and training of practitioners and students in NVC skills, could help veterinarians to recognize and respond to farmers’ emotional responses and subsequently lead to more effective conversations and an increased sense of satisfaction for both parties.

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REFERENCES


APPENDIX

The Easy Veterinary Nonverbal communication Tool for use on Farm, or EVeNT(F), is intended for use by researchers involved in recording and coding nonverbal communication on farm.

Pre-Coding Instructions

Observe each recording with the sound on mute and identify the presence of intervals within each consultation according to the following definitions:

**Introduction:** The period when veterinarian and farmer interact for the first time. This could occur beside the veterinarian’s vehicle, inside the farm office or at a location on the farm separate to the location of the fertility examination.

**Fertility Examination:** The period during which the veterinarian uses transrectal ultrasonography (TRUS) to examine one or more groups of cows. It is possible that the veterinarian and farmer will also interact with other people (e.g. farm staff, veterinary students) during this interval.

**Discussion:** The period when veterinarian and farmer interact in a location where cattle are not present, often indoors in the farm office or farmhouse.

**Closing:** The period when veterinarian and farmer interact for the last time before the veterinarian leaves the farm in their vehicle. This might include cleansing of TRUS equipment and protective clothing or the farmer participating in conversation beside the veterinarian’s vehicle. It is also possible that the closing interval follows immediately after the discussion interval, as the veterinarian takes leave of the farmer before returning to the vehicle.

**Note:** If an interval is captured (i.e. it took place) but the recorded content does not allow measurement of NVC within, record this by ticking the interval and adding ‘NUC’ which denotes ‘non-useful content’.

**Timings:** Record the start and end times for each interval.

Coding Instructions

Record the static and dynamic attributes for the veterinarian and farmer within each interval on the form as directed.

**Static Attributes**

- **Clothing** worn by the veterinarian is coded as ‘branded’ if items displayed visual reference to a veterinary practice/group of practices (e.g. a logo); ‘casual’ described polo shirts and shorts; ‘formal’ described button-down shirts (with or without a tie) and long trousers.
- **Use of ultrasound scanner screen** is defined as being worn by the veterinarian, held by the farmer, placed on a surface, or the image viewed using goggles.
- **Use of electronic and/or paper documentation** refers to the use of laptop or desktop computers and printed or handwritten paperwork.

**Dynamic Attributes**

- **Interpersonal distance** is the shoulder-to-shoulder space estimated in multiples of arm lengths apart.
- **Body orientation** is the front torso-to-torso position relative to the interactant.
- **Head position** is that position relative to the interactant during conversation.
- **Arm/limb position** is classed as closed if arms and or legs were crossed, neutral if arms and or legs were uncrossed but held close to the body or pressed together, and open if arms and or legs were relaxed, uncrossed, and not held tightly together. It may not be possible to view the legs/feet if the person is seated at a table.
Use of gestures refers to the movement of hands during conversation, directly tied to speech and used to highlight what was being said.

Body lean is estimated as the angle between the torso and the hips when seated.

Use of object/self-adaptors refers to those behaviors displayed during interactions that include touching, rubbing, and scratching, for example their own hair and face, manipulating a pen or folding and unfolding a pair of glasses that are held.

Estimate each NVB as the proportion of time spent during their interactions within each interval of the consultation, using “infrequent” and “mainly away from” to describe up to 30% of the time spent displaying the behavior, “moderate” and “moderately towards” between 30-60% of the time and “frequent” and “frequently towards” to describe a behavior observed for more than 60% of the interaction interval.

**EVeNT(F): Easy Veterinary Nonverbal communication Tool for use on Farm**

Tick which intervals clearly show veterinarian-farmer interactions:

<table>
<thead>
<tr>
<th>Introduction</th>
<th>Fertility Exam</th>
<th>Discussion</th>
<th>Closing</th>
</tr>
</thead>
</table>

Record the start and end times for:

<table>
<thead>
<tr>
<th>Introduction</th>
<th>Fertility Exam</th>
<th>Discussion</th>
<th>Closing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start</td>
<td>Start</td>
<td>Start</td>
<td>Start</td>
</tr>
<tr>
<td>End</td>
<td>End</td>
<td>End</td>
<td>End</td>
</tr>
</tbody>
</table>

Record static and dynamic attributes for each interval. Other than interpersonal distance, nonverbal behaviors (NVBs) should be recorded separately for farmer and veterinarian by recording V (veterinarian) and F (farmer) beside the appropriate measurement within the tables.

**Introduction**

Record details of the location.

Beside the veterinarian’s vehicle ____, Inside the farm office ____,

Other (provide brief description) _______________________

**Static Attributes**

Clothing worn by veterinarian.

<table>
<thead>
<tr>
<th>branded</th>
<th>non-branded</th>
<th>formal (N/A)</th>
<th>casual (N/A)</th>
</tr>
</thead>
</table>

**Dynamic Attributes**

<table>
<thead>
<tr>
<th>Farmer greets veterinarian beside their vehicle</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>(record how they move to the fertility examination in the boxes below)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>side by side</th>
<th>farmer leads</th>
<th>veterinarian leads</th>
</tr>
</thead>
</table>
Fertility Examination

Record details of the environmental features regarding cattle handling.

<table>
<thead>
<tr>
<th>Individual pens</th>
<th>Race</th>
<th>Crush</th>
<th>Parlor</th>
<th>Other (describe)</th>
</tr>
</thead>
</table>

**Static Attributes**

Record method of ultrasound scanner screen use by veterinarian.

<table>
<thead>
<tr>
<th>Goggles</th>
<th>Strapped to body</th>
<th>Held by farmer</th>
<th>On a table/ object</th>
<th>Other (describe)</th>
</tr>
</thead>
</table>

**Dynamic Attributes**

Measured for the FARMER:

<table>
<thead>
<tr>
<th>Interpersonal distance</th>
<th>&gt;4 arm lengths</th>
<th>2-4 arm lengths</th>
<th>1-2 arm lengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body orientation</td>
<td>side on</td>
<td>angled up to 180°</td>
<td>face on</td>
</tr>
<tr>
<td>Head position</td>
<td>mainly away from</td>
<td>moderately towards</td>
<td>frequently towards</td>
</tr>
</tbody>
</table>

Measured for the VETERINARIAN:

| Body orientation       | side on        | angled up to 180° | face on          |
| Head position          | mainly away from | moderately towards | frequently towards |

**Discussion**

Record details of the environmental features:

<table>
<thead>
<tr>
<th>Office</th>
<th>Farm kitchen/dining room</th>
<th>Other (describe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chairs Y/N</td>
<td>Chairs Y/N</td>
<td>Chairs Y/N</td>
</tr>
<tr>
<td>Table Y/N</td>
<td>Table Y/N</td>
<td>Table Y/N</td>
</tr>
</tbody>
</table>
**Static Attributes**

Use of computer:

<table>
<thead>
<tr>
<th>Farmer Y/N</th>
<th>If Y is this shared/visible to the veterinarian? Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veterinarian Y/N</td>
<td>If Y is this shared/visible to the farmer? Y/N</td>
</tr>
</tbody>
</table>

Use of paperwork:

<table>
<thead>
<tr>
<th>Farmer Y/N</th>
<th>If Y is this shared/visible to the veterinarian? Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veterinarian Y/N</td>
<td>If Y is this shared/visible to the farmer? Y/N</td>
</tr>
</tbody>
</table>

**Dynamic Attributes**

<table>
<thead>
<tr>
<th>Interpersonal distance</th>
<th>&gt;4 arm lengths</th>
<th>2-4 arm lengths</th>
<th>1-2 arm lengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical height difference</td>
<td>both seated</td>
<td>both standing</td>
<td>mixture of both</td>
</tr>
<tr>
<td>Body orientation</td>
<td>side on</td>
<td>angled up to 180°</td>
<td>face on</td>
</tr>
<tr>
<td>Body lean</td>
<td>towards</td>
<td>away</td>
<td>neutral</td>
</tr>
<tr>
<td>Head position</td>
<td>mainly away from</td>
<td>moderately towards</td>
<td>frequently towards</td>
</tr>
<tr>
<td>Arm/limb position</td>
<td>closed</td>
<td>neutral</td>
<td>open</td>
</tr>
<tr>
<td>Use of gestures</td>
<td>infrequent</td>
<td>moderate</td>
<td>frequent</td>
</tr>
<tr>
<td>Use of object/ self-adaptors</td>
<td>infrequent</td>
<td>moderate</td>
<td>frequent</td>
</tr>
</tbody>
</table>

**Closing**

Record details of the location:
Beside the veterinarian’s vehicle ____, Inside the farm office ____,
Other (provide brief description) ______________