NONVERBAL COMMUNICATION BETWEEN VETERINARIAN AND FARMER DURING ROUTINE CONSULTATIONS ON UK DAIRY FARMS

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Abstract

Research objective: To explore whether nonverbal communication between veterinarians and farmers can be measured through analysis of video recordings of routine consultations on farm.

Background: Communication, an essential component of effective veterinary practice, comprises verbal, paraverbal and nonverbal elements. Research exploring nonverbal communication in veterinary practice is currently in its infancy. An evidence-based understanding of nonverbal communication and its effect on veterinary-client interactions could support veterinarians in cultivating better, more effective client consultations. This novel study considers which aspects of nonverbal communication can be measured within the farm veterinary context using action camera recordings.

Methods: Veterinarian and farmer interactions during routine consultations (n=11) were recorded using an action camera strapped to the chest of an observer. Data were analysed to establish the potential to measure elements of nonverbal communication.

Results: Various aspects of nonverbal communication were able to be measured, including nonverbal behaviours such as interpersonal distance, head, body and limb position, and use of gestures. Use of an ultrasound scanner during the fertility examination process appeared to influence certain nonverbal behaviours displayed by both parties.

Practical implications:

These data offer the first insights into measuring nonverbal communication within farm consultations, providing a foundation for future research into how nonverbal communication impacts aspects of farmer-veterinarian relationships. Raising awareness of nonverbal communication in the context of farm animal consultations could increase confidence and improve communication skills.

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A massive thank you must also go to my husband, David, for being there always.

Abbreviations used

CCM: Calgary-Cambridge model

GAR: Global affect rating

GVCCM: Guide to the veterinary consultation based on the Calgary-Cambridge model

HHM: Herd health management

HHP: Herd health plan

HHPM: Herd health and production management

MI: Motivational interviewing

MITI: Motivational interviewing treatment integrity

NVC: Nonverbal communication

NVB: Nonverbal behaviour

OSCE: Objective structured clinical examination

RCVS: Royal college of veterinary surgeons

RIAS: Roter interaction analysis system

TBI: Task-based interval

TRUS: Transrectal ultrasonography

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1 Introduction and Literature Review

1.1 Role of communication in the medical and veterinary professions

Within human healthcare, communication has been the subject of extensive research over the past 50 years, with clear indications that the quality and style of communication has an impact on patient outcomes, such as patient satisfaction, understanding and compliance, and reductions in malpractice (Stewart *et al.*, 2006). Medical students receive communication skills training as part of their core curriculum, in response to recommendations made in a 1993 report by the General Medical Council that medical education should focus on development of communication skills (Gordon and Garrud, 2011). One model used widely for communication skills training of medical undergraduates is the Calgary-Cambridge model, or CCM (Kurtz and Silverman, 1996).

Communication has also been recognised as an essential skill for those working in the veterinary profession (Shaw, 2006), although research in this field began more recently, with significant activity noted from the year 2000 onwards (Pun, 2020). Many of the findings from human healthcare have offered transferrable application to veterinarian-client interactions, with some modification and adaptation made to accommodate the unique aspects of veterinary work. For example, the CCM has been adapted for veterinary undergraduates and is called the Guide to Veterinary Consultation based on the CCM, or GVCCCM (Radford *et al.*, 2006). Among the list of communication skills assessed through the CCM and GVCCCM are the ability to demonstrate empathy and to build rapport.

Communication skills should be a key focus for veterinary students and practitioners alongside the development of clinical knowledge and skills (Adams and Kurtz, 2006; Radford *et al.*, 2006; Petrovski and McArthur, 2015). A recent review of studies of veterinary student and practitioner communication, published between 2000 and 2018, indicated that veterinarians could benefit from communication skills training, to address a lack of skills in this area. Such training could support their interactions with clients and colleagues (Pun, 2020).

Encouragingly, teaching communication skills to veterinary students resulted in significant improvements, as measured using an Objective Structured Clinical Examination (OSCE) (Artemiou *et al.*, 2013). Recipients of communication skills training have also expressed their increased level of confidence in clinical skill after completing a dedicated course on the subject (Haldane *et al.*, 2017). Research in veterinary communication continues to grow, enabling critical analysis of the impact this clinical skill has on other aspects of veterinary practice, such as veterinarian-client relationships.

1.1.1 Communication style matters

If we consider a shared objective of veterinarian and farmer – to improve the health and welfare of cattle on farm (Hall and Wapenaar, 2012; Bard *et al.*, 2017) – it falls upon the veterinarian to acquire relevant knowledge and expertise in this area, then to effectively communicate with the farmer to

encourage behaviour change that will enable implementation of management practices and strategies to deliver the objective.

Physicians and practicing veterinarians commonly adopt a directive or persuasive style of communication (Shaw, 2006; Bard *et al.*, 2017), where the veterinarian dominates the interaction, setting the agenda and goals with minimal client involvement. Adopting a persuasive approach when discussing behaviour change has been shown to evoke a negative response in clients or patients, called psychological reactance.

The study of psychological reactance, a phenomenon first identified by Brehm (1966), suggests that attempts to persuade people using forceful messages are likely to motivate people to generate counterarguments against the messages. Forceful messages can imply to the recipient that a failure to implement certain behaviour changes would have negative consequences for that person, i.e. “if you fail to do X, then Y (something undesirable) will happen”. This is a cognitive-reflective process experienced by the recipient of the forceful message and the resulting negative attitudes toward the message leads recipients towards being inclined to resist making the proposed changes (Steindl *et al*, 2015). So, using persuasive messages or advice can ultimately counteract the desired outcome the veterinarian would hope to achieve; to encourage the adoption of their recommendations (Svensson *et al.*, 2020). When exploring communication patterns, findings indicated that veterinarians focused more on ‘doing’ than on

‘understanding’, leading to a possible lack of empathy for the client (McDermott *et al.*, 2019).

Adopting a ‘client-centred’ or ‘relationship-centred’ approach has been shown to promote better outcomes, both in physician-patient and veterinarian-client relationships (Shaw, 2006; Lam *et al.*, 2011). With this approach, both interact as partners, with the physician/veterinarian in the role of advisor, with shared decision making and a balance between physician paternalism and patient autonomy. The CCG was structured to facilitate this approach and encourage students to develop effective communication skills. Client motivation towards change, and engagement in the process, is far higher when a collaborative style of communication is used (Miller and Rollnick, 2013).

The demonstrated benefits of effective communication skills, that facilitate a relationship-centred approach with clients, include improved client satisfaction (Dysart *et al*., 2011) and client adherence to recommendations made by the veterinarian was far greater when veterinarians assumed a relationship-centred care approach with their clients (Kanji *et al.*, 2012). Motivational Interviewing (MI) is an example of a collaborative, person-centred approach to communication. It was first developed within the field of clinical psychology and subsequently has been successfully applied across diverse fields, such as dentistry, healthcare and education (Miller and Moyers, 2017). In recent years, MI has been introduced to cattle veterinary practice (Bard, 2018), with a growing number of studies that

demonstrate improvement in communication skills of practitioner recipients of MI training, with specific regard to herd health management discussions (Svensson *et al.*, 2020).

1.1.2 Communication and farm animal practice

Veterinarians working in farm animal practice are responsible for the welfare of animals under their care and have moved away from treating individual sick animals to a holistic, whole herd approach, to prevent disease and improve productivity (Leblanc *et al.*, 2006). This often means that they need to motivate change on farm and influence farmer behaviour.

Since it was first recommended over 30 years ago (Radostits, 1987), dairy veterinarians have aspired to make herd health and productivity consultancy a major component of their business. Herd health plans (HHPs) were developed to facilitate this approach, however, veterinarian and farmer perception of their value is mixed (Hall and Wapenaar, 2012). A possible reason for this could be poor communication between parties, leading to different expectations for what HHPs can achieve (Ritter *et al.*, 2019). Farmers might expect their veterinarian to discuss welfare issues with them, yet practitioners may feel uncomfortable doing so, preferring to focus on their clinical skills and to avoid having difficult conversations (Croyle *et al.,* 2019). Veterinarians with increasing number of years' experience may be more likely to adopt a directive approach; there is scope to improve communication skills, adopting a client-centred communication style such as MI for veterinarians engaged in HHPs (Svensson *et al.*, 2019).

Poor communication skills used by veterinarians was listed as one reason for a lack of trust between farmer and veterinarian, with farmers less likely to engage their veterinarian in herd health preventive measures on their farm (Svensson *et al.*, 2018). Poor veterinary communication was also implicated as an important factor for lack of uptake of veterinary herd health management (HHM) programmes amongst Swedish farmers (Svensson *et al.*, 2018).

Improving communication skills to enhance the development of a strong sense of trust, through empathy, could increase the uptake of advisory services offered to farmers by their veterinarians. It could also facilitate more effective conversations with farmers such that they can better understand the benefits of engaging in HHM programmes. One study highlighted the increased levels of client satisfaction reported when veterinarians demonstrated empathy towards them (Mcarthur and Fitzgerald, 2013).

Improving the ability to communicate effectively could help in the process of knowledge exchange; there is a suggestion that the issue is not a lack of clinical knowledge and skill, rather it is an issue in translating knowledge into something that is meaningful to the farmer (Leblanc *et al.*, 2006; Jansen *et al.*, 2010). Farmer satisfaction and preparedness to adopt advice were influenced by effective communication by their veterinarian during farm visits (Ritter *et al.*, 2019).

1.2 Communication - more than words

A two-way process, communication is the exchange of ideas, information and feelings (MacGillivray *et al.*, 2020). It involves verbal - the most explored aspect of communication in medical and veterinary fields, paraverbal and nonverbal elements. Paraverbal communication is the term used to describe how verbal communication is delivered, for example through tone of voice, pitch and pace. Nonverbal communication (NVC) is the exchange of messages without the use of spoken or written word. NVC can reveal one's attitude, affect and emotion. Nonverbal behaviours are the expression of emotions through facial and bodily movement that generally occurs unintentionally (Argyle, 1988). NVC can be used to complement verbal communication but may also convey opposing or contradicting messages (Ekman and Friesen, 1969).

1.2.1 Seeing what is said

As previously stated, much of the research into communication in human healthcare and veterinary medicine focuses on verbal communication and the use of spoken language. However, Matsumoto and others (2013) reviewed a wide range of NVC studies and reported that between 65 – 95% of total messages conveyed were through nonverbal channels. Verbal communication is mostly intentional whilst a greater proportion of NVC is unintentional (Ekman, 1985).

Nonverbal behaviours can reflect how someone feels emotionally about a situation, conversation or person. It is possible to verbally communicate a

message yet nonverbally contradict that message, a concept often referred to as “actions speak louder than words”. This has been demonstrated in studies considering whether different information is conveyed by the face and the body (NVBs) compared to verbal communication content, a concept known as ‘nonverbal leakage’ (Ekman and Friesen, 1969). It is not unreasonable to consider that, during farm visits, NVC between farmer and veterinarian could become particularly significant if the conversation is about challenging issues that may require behaviour change, such as herd health planning.

1.3 Defining nonverbal communication

The components of NVC can be divided into two classification schemes: static and dynamic cues. Static cues include clothing and hairstyle choice and use of equipment (e.g. computers, ultrasound scanners). Dynamic cues are expressions of the face, body and voice and are more commonly referred to as nonverbal behaviours (NVBs).

NVBs are often categorised into groups, such as proxemics, haptics, oculesics and kinesics, and this categorisation can facilitate research into NVC. Humans, referred to in research as ‘interactants’, process NVBs as a gestalt that translates into a global perception of what is being communicated and research has established links between certain NVBs 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 one person interacting with another (Pally, 2001).

Proxemics is the term used to describe the use of space during interpersonal interactions (Hall *et al.*, 1968). Hall suggested that a relationship is defined by the interpersonal distance between both parties; closer distances have been linked to feelings of greater warmth, friendship and agreement. Distance is influenced not only by stance but also by body lean; forward lean decreases the distance between interactants. Body orientation has also been studied in relation to involvement, with face-to-face positions associated with greater levels of interest and availability (Coker and Burgoon, 1987).

Oculesics is the term used to describe behaviours such as eye gaze and eye contact. Both have been shown to signal interest, involvement and connection between interactants. Moderate levels of eye contact are associated with more positive perceptions (Burgoon *et al.*, 1985) .

Kinesics is a term used to describe body movements, such as nodding, body posture, use of gestures and facial expressiveness. Increased gesturing, smiling and nodding have been associated with an increased sense of involvement and warmth (Andersen and Andersen, 2004). Body position can suggest an interactant's attitude and degree of affiliation (Harrigan, 2013). Gestures can be classed as:

1) adaptors - touching behaviours that may indicate an individual's level of anxiety or arousal
2) emblems - gestures with widely agreed meanings, such as thumbs up
3) illustrators - gestures used alongside the verbal messages they accompany

Adaptors can involve the use of objects (object-adaptors) or be directed to the self (self-adaptors). For example, rubbing one's arms or face can be a manifestation of wishing to soothe oneself (Andersen and Andersen, 2004). Generally, people are aware of their use of an emblem, they may be slightly less aware of their use of illustrators in comparison, and self-adaptors are usually performed subconsciously and without intended communicative purpose (Ekman, P. and Friesen, 1974).

Interpersonal touch, termed **haptics** in nonverbal research, is believed to be the most basic form of communication, providing an effective means of influencing people's social behaviour, such as their tendency to comply with requests and influencing attitudes towards certain services. It can be used to communicate emotion and has been shown to enhance empathy (Gallace and Spence, 2010).

1.3.1 NVC in human healthcare

Demonstration by healthcare professionals of appropriate NVC skills has been linked to improved patient satisfaction, with a reduction in malpractice

litigation and non-compliance with treatment plans (DiMatteo, 1980; Roter *et al.*, 2006; Kraft-Todd *et al.*, 2017). In recognition of the significance of NVC during patient-physician interactions, researchers developed a tool for physicians to evaluate nonverbal dimensions and thus enable them to facilitate the structure of kinesic dimensions (Gorawara-Bhat *et al.*, 2007).

1.3.2 NVC in veterinary practice

Veterinary graduates are expected to possess a range of knowledge, skills and attributes to prepare them for their first role in the profession, laid out in the document 'Day One Competences' created by The Royal College of Veterinary Surgeons (RCVS, 2020). Details within this document refer to the need for graduates to possess effective communication skills, specifically 'active listening and responding appropriately, both verbally and non-verbally'.

The importance of NVC has been recognised in companion animal practice; it was listed as one of the 'four core communication skills' that companion animal veterinarians should focus on to enhance clinical outcomes (Shaw, 2006). In this article, the author highlighted the fact that nonverbal messages flow in both directions, encouraging clinicians to develop skills to increase their sensitivity to detecting nonverbal messages from clients and enhance their awareness of their own nonverbal messages towards clients.

1.3.3 NVC in farm animal practice

At present, there is a dearth of research on farm veterinarian perspectives of NVC in practice. When veterinarians (n=4) were asked to comment on their use of NVC during farm visits, most felt that it was important to make eye contact during interactions with their farmers, with recognition that items such as equipment and animals could act as a physical barrier to achieving this (MacGillivray *et al.*, 2020). There was an appreciation that it was important to be able to 'read the body language' of farmers in order to understand what was being communicated but that farm animal veterinarians might face greater difficulty in having the opportunity to focus on NVC compared to companion animal veterinarians. Reasons cited included a requirement to examine multiple animals whilst engaged in conversation with the farmer, and the distraction of attending to multiple 'other tasks' simultaneously (MacGillivray *et al.*, 2020). A unanimous desire was expressed to learn more about NVC, particularly if it could help increase client trust and satisfaction and improve communication efficacy in general. There was a feeling that NVC should be examined specifically in the context of farm work to establish how the environmental elements and clinical work unique to cattle practice interact and influence NVC between farmer and veterinarian (MacGillivray *et al.*, 2020).

The use of video cameras to record and analyse interactions between physician and patient during medical encounters is an established practice for NVC evaluation (Pawlikowska *et al.*, 2012). This approach has also been adopted for interactions between veterinarian and client during companion animal consultations (Corah, 2019). However, unlike medical and

companion animal consultations, where both parties remain in a single location, routine farm consultations take place in several locations on the farm, with different tasks performed throughout the consultation (Ritter *et al.*, 2021). Action cameras (e.g. GoPro cameras) offer a practical solution to those challenges specific to the farm environment (Ritter *et al*, 2018).

Communication between farmer and veterinarian, captured by action cameras, has been studied using the Roter Interaction Analysis System (RIAS), to explore communication patterns and use of empathy statements. The RIAS and MI Treatment Integrity (MITI) coding system (Moyers *et al.*, 2016), have also been used to analyse communication on farm (Svensson *et al.*, 2020), provide global ratings and focus on verbal and paraverbal components of communication. However, the MITI does not include analysis of NVBs (Svensson *et al.*, 2019) and the RIAS coding of NVC is limited to global affect ratings based on the emotional tone of the speaker (Agha *et al*., 2009). McArthur and Fitzgerald (2016) noted the limitations of the RIAS in this regard, stating that it is 'limited to verbal utterances' and did not afford the opportunity to assess visual NVC.

Veterinarians and farmers may have differing perceptions of how the farmer would like the veterinarian to present themselves; veterinarians feel that 'friend of the farmer' is most appropriate, yet farmers prefer the veterinarian to adopt the persona of a proactive person able to advise (Hall and Wapenaar, 2012). A veterinarian's self-presentation, communicated through attitude and static cues, could influence the farmers perception of

their veterinarian's role. Having an understanding and appreciation of how NVC may influence this could help veterinarians to be perceived as advisers.

Starting to build a picture of NVC, using both static and dynamic elements (NVBs), on farm could help expand the knowledge base of veterinarian-farmer interactions, especially by understanding if and how both dynamic and static components might influence overall communication and relationships.

1.4 The purpose of this research

This review has highlighted some clear gaps when considering NVC in routine farm consultations. The purpose of this research was to establish which elements of static and dynamic NVC could be measured from video recordings of routine farm consultations made using action cameras.

2 Materials and Methods

2.1 Description of sample

The present study is a secondary analysis of 11 digital video recordings of routine consultations between farm veterinarians and their clients. This subset was taken from a total of 13 consultations that had been recorded in 2018 as part of another research project. In the original project (Appendix I), participants were recorded during a farm visit using up to three separate cameras, worn by the veterinarian, farmer and undergraduate student, described as the 'observer' for the purposes of this research.

Six farm animal veterinarians, working in four different veterinary practices across England, were recruited through convenience sampling. The veterinarians were asked to select farmer clients who would be willing to be filmed during the farm visit.

For this project, the objective was to measure NVC between veterinarian and farmer during a 'typical' routine consultation on a farm. A significant proportion of such consultations is typically devoted to the examination of the reproductive tract, generally referred to as fertility work (Breen, J., *et al*, 2009). Two inclusion criteria were used to assess whether the content of each recording constituted a 'typical' routine consultation:

- Did the veterinarian undertake fertility work on at least one animal?
- Did the visit take place on a farm?

From the original set of recordings, a purposive sample of 11 consultations satisfied the criteria for a routine consultation; two of the original recorded consultations did not and were excluded from this research.

2.1.1 Digital Recordings

Consultation data were recorded at routine farm consultations ($n \geq 1$ per veterinarian) completed in May and June 2018. The digital video recordings were captured using GoPro cameras (Hero 4 or Hero 5; GoPro Inc., San Mateo, CA). Each camera was situated on the chest of the person wearing it, affixed using an adjustable chest harness specifically designed to hold the camera in place in the position shown in Figure 2.



Figure 2: GoPro camera worn on the chest using an adjustable harness (eBay)

In nine of the 11 consultations, a camera was worn by the farmer, the veterinarian and the observer, creating three different views of the consultation. In one of these consultations, the camera that had been worn

by the farmer was removed and placed on the table, around which all three people were seated during part of the consultation. In the remaining two consultations, the farmer did not wear a camera at any time.

Generally, the cameras were switched-on as the veterinarian and observer arrived on the farm, having stepped out of the veterinarian's vehicle to gather equipment needed for the visit. The cameras were generally switched-off at or towards the end of the visit when the veterinarian and observer were engaged in cleaning their equipment on the farm or when they had walked back to the veterinarian's vehicle. All recordings captured audio and visual footage obtained through the cameras without additional devices.

The analysis was performed using the visual footage captured by the camera that recorded both farmer and veterinary surgeon in the same frame. Generally this was obtained using the observer camera, as this offered the greatest opportunity to observe veterinarian-farmer interaction for most of the consultations. However, in one consultation, the recording obtained by the camera worn by the farmer offered superior visibility of veterinarian-farmer interactions and was therefore used for analysis.

2.1.2 Data familiarisation

Recordings were viewed using the QuickTime media player (Apple Inc). Initially, each recording was viewed up to five times to understand what content had been obtained and how well each camera view had captured

the interactions between farmer and veterinarian. NVC was not recorded or measured at that time; the sole purpose of this stage of the research process was for this author to become familiar with the content and understand the flow of the consultations, to facilitate subsequent selection of appropriate data for analysis. The speed of playback was increased to twice the normal speed to enhance detection of body movements and gestures displayed by veterinarian and farmer (Navarro, 2020).

2.2 Data analysis

The coding of interactions was conducted through a visual review of the digital recordings with the volume muted throughout. This is an approach that was used in research that explored NVC during physician-patient consultations (Gorawara-Bhat *et al*., 2007).

2.2.1 Defining the structure of the routine farm consultation

There were four phases or intervals identified within the consultations, which in this research were classified as 'task-based intervals' (TBIs). These intervals, described in more detail in Table 1, were named "Introduction", "Fertility Examination", "Discussion" and "Closing". This is an approach similar to that described in the literature by Gorawara-Bhat *et al*. (2007), where medical encounters were classified into different phases ("opening", "middle", "closing") to capture the variation in nonverbal attributes over the duration of encounters analysed in the research. For each consultation, the TBIs were analysed with the recording played back in real time during which static and dynamic (NVBs) cues for veterinarian and farmer were recorded.

Table 1: Defining the structure of a routine consultation using task-based intervals (TBIs)

Task-Based Interval	Description
Introduction	Veterinarian and farmer interacted for the first time on farm, moving to the location where animals were examined.
Fertility Examination	Veterinarian and farmer interacted with one group or several groups of cows and possibly other people (farm staff, veterinary students). Veterinarian used transrectal ultrasonography (TRUS) to examine cattle.
Discussion	Veterinarian and farmer interaction occurred in a location away from cattle, often in a farm office or kitchen. One or both used a physical paper document(s) and/or a personal computer at some point.
Closing	Veterinarian and farmer interaction that followed either the Fertility Examination - if a Discussion did not take place - or the Discussion interval. Veterinarian took leave of (walked away from/turned away from) the farmer.

2.2.2 Data recording

For each consultation, the presence or absence of TBIs was recorded, then the NVC between veterinarian and farmer during each TBI was recorded in a spreadsheet (Microsoft® Excel for Mac 2018).

2.3 Static and dynamic attributes

In addition to recording dynamic attributes (NVBs) displayed by veterinarian and farmer, details of static attributes were recorded and coded (

Table 2). Static attributes for the veterinarian were clothing and symbolic items (in this case a stethoscope) worn, and the type and use of ultrasound scanning equipment. For the farmer, the static attributes recorded were use of a notebook or clipboard during the Fertility Examination. Additional dynamic attributes not classified as NVBs were also recorded; these attributes were whether the farmer greeted the veterinarian beside their vehicle, and how both parties moved from their initial interaction to the location of the Fertility Examination.

Table 2: Static and dynamic attributes of veterinarians and farmers

Veterinarian static attributes	
Clothing	Branded (yes/no), Formal or casual
Symbolic item	Stethoscope worn around the neck
Method of ultrasound scanner use	Goggles
	Held or worn by veterinarian (strapped to the body)
	Other (held by the observer/ placed on a surface)
Veterinarian and farmer dynamic attribute	
Travel between Introduction and Fertility Examination	Farmer walked ahead
	Veterinarian walked ahead
	Both walked side by side
Farmer static and dynamic attributes	
Clipboard or notebook used during the Fertility Examination	
Greeted veterinarian at vehicle	

Regarding the classification of clothing worn by the veterinarians, ‘branded’ referred to items that displayed visual reference to a veterinary practice or group of practices, ‘casual’ was used to describe polo shirts and shorts, ‘formal’ was used to describe button-down shirts (worn with or without a tie) and long trousers. Where it was not possible to code the interaction - due to an absence of information captured on the observer camera feed - the code ‘unknown’ was assigned.

Farmer and veterinarian NVBs were coded and measured using the three categories proxemics, oculesics and kinesics, as shown in Table 3. Behaviours were measured as an estimated proportion of time spent during farmer and veterinarian interactions for each TBI within the consultation; “infrequent” and “mainly away from” described up to 30% of the time spent displaying the behaviour, “moderate” and “moderately towards” between 30-60% of the time and “frequent” and “frequently towards” described a behaviour observed for more than 60% of the interaction interval.

Trunk lean refers to the position of the torso relative to the interactant and is determined by assessing the angle between the torso and the hips. Limb position was classed as closed if arms and or legs were crossed, neutral if arms and or legs were uncrossed but held closely by the sides or pressed together, open if arms and or legs were relaxed, uncrossed and not held tightly together. In this research, the term “gestures” denotes the use of hands during conversation, a practice also known as speech illustrators; movements directly tied to speech and used to highlight what is being said.

Examples of self- and object-adaptor behaviours included touching, rubbing and scratching own hair and face, manipulating a pen and folding and unfolding a pair of glasses that were being held.

Table 3: Coding of nonverbal behaviours displayed by veterinarian and farmer during their interactions

Proxemic NVBs	**Measurement**
Distance between veterinarian and farmer based on average arm's length* apart	>4 arm lengths 2–4 arm lengths 1-2 arm lengths
Body position relative to interactant	Side on Angled up to 180 degrees Face on
Height of interaction of both parties	Seated throughout Standing throughout Mixture of both
Trunk lean	Away from Neutral Towards
Oculesic NVBs	
Head position relative to interactant during conversation	Mainly away from Moderately towards Frequently towards
Kinesic NVBs	
Limb (arm) position when standing	Hand/s on hips Loose by sides Holding equipment
Limb (arm and leg) position when seated	Closed Neutral Open
Gestures	Infrequent Moderate Frequent
Self/object-adaptors	Infrequent Moderate Frequent

**Note: one arm's length = 0.55m (0.50 – 0.64m)* (Annandale *et al.*, 2020)

2.4 Research team and reflexivity

This research was conducted by a female veterinarian with experience working in farm animal clinical practice, in technical services for animal health pharmaceutical companies and, at the time of this research, in consultancy offering marketing services to the animal health and veterinary sectors as well as communication skills training for clinical farm veterinarians.

There was no relationship between the lead researcher of this study and the original researcher who collected the video recordings, nor between the researcher and the subjects within each recording.

To minimise potential bias, the lead researcher took the opportunity to benefit from the insights of the experienced team of supervisors through discussions at each stage of the project design and data analysis.

3 Results

3.1 Sample characteristics

Only a limited number of demographic characteristics of veterinarians and farmers were available having been determined from the recordings; the original study did not capture additional information, such as age, number of years in practice (veterinarian), role on the farm (e.g. owner, herdsman) within the consent form.

There was an equal split between female (three) and male (three) veterinarians. Most farmers were male (10) and two farmers were female; during one consultation, that involved a female veterinarian, the Introduction and Fertility Examination were conducted with a male farmer then the Discussion was conducted with a female farmer. All farmers and veterinarians were white.

A summary of the descriptive data of the consultations can be found in Table 4. The median duration of the 11 recorded consultations was 70 minutes and ranged from 32 to 154 minutes. Of the 11 consultations used, three contained the complete set of TBIs: Introduction, Fertility Examination, Discussion and Closing. For one of the consultations, it was not possible to establish whether Discussion and Closing intervals took place, as the camera was switched off immediately following the completion of the Fertility Examination interval.

Table 4: Descriptive data of routine farm consultations (n = 11)

Number of recorded consultations included in the analysis	11
Duration of consultation in minutes Median [range]	70 [32 – 154]
Duration of consultation comprising all task-based intervals in minutes: Introduction, Fertility Examination, Discussion and Closing (n = 3) Mean [range]	79 [64 – 154]

It was possible to capture nonverbal information about each veterinarian's self-presentation (aspects of clothing, presence or absence of stethoscope) for most of the consultations (

Table 5). Of the seven consultations where the veterinarian wore branded clothing items, four wore a casual style and three wore a formal style of clothing. In three consultations where the veterinarian did not wear branded items, their clothing style was formal.

Table 5: Static nonverbal elements of veterinarians

Nonverbal element	**Number of consultations**		
	Yes	**No**	**Unknown**
Branded clothing	7	3	1
Stethoscope around neck	1	8	2

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).

3.2 NVC measured during the Introduction task-based interval

An Introduction interval that took place and was captured by the action camera was noted in seven of the 11 consultations. However, of the seven recorded consultations, it was not possible to measure NVBs from three of them. This was due to poor positioning of the camera; the camera was switched on but located on a seat inside the vehicle or was being held rather than strapped onto the observer's body, such that only the feet and lower limbs of interactants were visible. Despite this, it was possible to establish that an initial interaction between farmer and veterinarian, the Introduction interval, was indeed taking place.

The Introduction, which clearly would have taken place prior to the Fertility Examination, was not captured for the remaining four consultations, as the camera worn by the observer was not switched on in time.

The NVBs that were measured during the Introduction interval were distance between veterinarian and farmer, head position and body orientation of each party relative to the other, arm position and frequency of gestures used by both parties (Table 6).

Table 6: Nonverbal behaviours of farmer and veterinarian observed during the Introduction interval (n = 4)

Nonverbal behaviour	Measurement score	Number of consultations
Distance between farmer and veterinarian	>4 arm lengths apart	0
	2–4 arm lengths apart	2
	1-2 arm lengths apart	1
Body orientation of farmer	Side on	1
	Angled up to 180 degrees	0
	Face on	3
Body orientation of veterinarian	Side on	1
	Angled up to 180 degrees	1
	Face on	2
Head position of farmer	Mainly away from veterinarian	1
	Moderately towards	1
	Frequently towards	2
Head position of veterinarian	Mainly away from farmer	1
	Moderately towards	1
	Frequently towards	2
Arm position of farmer	Hand/s on hips	2
	Loose by Sides	0
	Holding equipment	1
	Other - Behind back	1
Arm position of veterinarian	Hands on hips	0
	Loose by Sides	2
	Holding equipment	2
Gestures displayed by farmer	Infrequent	3
	Moderate	1
	Frequent	0
Gestures displayed by veterinarian	Infrequent	1
	Moderate	3
	Frequent	0

Immediately after the Introduction interval, in six of the seven consultations that captured an Introduction interval on camera, it was possible to observe how the veterinarian and farmer moved from their initial meeting point to the location of the Fertility Examination (Table 7). The camera captured both parties travelling between their initial point of interaction to their next destination - the location at which the cattle were examined – in four of the consultations. For two consultations, only one party could be observed during their journey to the fertility examination. The final consultation recording that had included an Introduction failed to capture either the farmer or veterinarian during their travel from one location to the next.

Table 7: Summary of dynamic nonverbal element: how farmer and veterinarian walked from Introduction to Fertility Examination location (n = 7)

Nonverbal element	Number of consultations			
	Yes	No	Unknown	Further detail
Farmer and veterinarian walked from Introduction to Fertility Examination	4	2	1	Farmer ahead = 2 Veterinarian ahead = 1 Side by side = 1

3.3 NVC measured during the Fertility Examination TBI

The Fertility Examination was a common feature of each consultation, where between three and 59 cows were examined by the veterinarian. Three different types of cattle handling facility were observed during this interval:

- Individually held animals in a cattle crush or cubicle

- Individually held animals standing side by side in an abreast parlour or in artificial insemination stalls
- Multiple animals standing side by side along the length of a race

3.3.1 Static elements measured

An ultrasound scanner was used in all 11 consultations, with three different methods of use identified across the consultations (Table 8).

Table 8: Summary of static nonverbal elements displayed by the veterinarian during the Fertility Examination interval (n = 11)

Nonverbal element		Number of consultations
Method of ultrasound scanner use	Goggles	3
	Held/ worn by veterinarian	3
	Other (held by observer/ on a surface)	5

In eight consultations, the farmer held a notebook or clipboard (Table 9) and appeared to refer to the contents during this interval.

Table 9: Summary of static nonverbal elements displayed by the farmer during the Fertility Examination interval (n = 11)

Nonverbal element	Number of consultations	
	Yes	No
Clipboard/ notebook held	8	3

3.3.2 Dynamic elements measured

All measurements of dynamic NVBs of farmers and veterinarians during the Fertility Examination were made specifically during the periods when the veterinarian was examining cattle; starting immediately prior to the veterinarian inserting their arm transrectally until TRUS had been completed. The rationale for this was that, during TRUS, the veterinarian must prioritise their proximity and orientation to the animal being examined.

3.3.3 Farmer NVBs

It was noted during this time that the farmer appeared to have a greater opportunity to influence interpersonal distance, head position and body orientation relative to the veterinarian (Table 10), who was as a matter of course physically restricted from influencing interpersonal distance.

Table 10: Nonverbal behaviours of the farmer measured during the Fertility Examination interval (n = 11)

Nonverbal behaviour	Measurement	Number of consultations
Distance between farmer and veterinarian	> 4 arm lengths apart	2
	2–4 arm lengths apart	3
	1-2 arm lengths apart	6
Body orientation relative to veterinarian	Side on	1
	Angled up to 180 degrees	2
	Face on	8
Head position relative to veterinarian	Mainly away from	0
	Moderately towards	3
	Frequently towards	8

3.3.4 Veterinarian NVBs measured

It was apparent that modification of the veterinarian's body orientation relative to the farmer was possible during TRUS such that the front of the veterinarian's body had greater exposure to the farmer during the TRUS period. Head position relative to the farmer was also measured during this period (Table 11).

Table 11: Nonverbal behaviours of the veterinarian measured during the Fertility Examination interval (n = 11)

Ultrasound scanner		**Used with goggles (n=3)**	**Worn by veterinarian (n=3)**	**Held by other (n=5)**
Nonverbal behaviour	**Measurement**	**Number of consultations**		
Body orientation	Mainly away from	3	0	5
	Moderately towards	0	2	0
	Frequently towards	0	1	0
Head position	Mainly away from	1	0	5
	Moderately towards	2	1	0
	Frequently towards	0	2	0

3.4 NVC measured during the Discussion TBI

Four consultations included a Discussion interval, six did not and in one consultation the recording ended immediately after the Fertility Examination.

During this interval, both parties referred to computers and paper documents; these were recorded as static nonverbal elements (Table 12).

In the consultations where both veterinarian and farmer used a computer during their discussion (n=2), each invited the other to view the contents of their device during their conversations, i.e. there was reciprocal use of the computer to share information.

The veterinarian used paper documents in two of the four consultations that included a discussion, while the farmer did not use paper documents during this time. In each case, there did not appear to be any attempt by the veterinarian to share the contents of the paperwork with the farmer. When both the veterinarian and farmer used paper documents, the veterinarian appeared to share the contents with the farmer, who in turn appeared only to use their documents for their own reference, without visibly sharing contents with the veterinarian. Where a computer and paperwork were used by both the veterinarian and farmer, as was the case for two consultations, it was possible to discern that each person shared the contents of their computer screens with the other.

Table 12: Static nonverbal elements used by the veterinarian and farmer during the Discussion interval (n = 4)

Nonverbal element		**Number of consultations**
Computer	Used by farmer only	0
	Used by veterinarian only	0
	Used by both	2
Paper documents	Used by farmer only	0
	Used by veterinarian only	2
	Used by both	2

Of the four consultations that contained a recorded Discussion, three took place with both parties seated throughout the interval and 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.

Compared to the previous TBIs, it was possible to measure several additional NVBs during the Discussion (Table 13) since the veterinarian and farmer could focus on each other without the need to examine or move cattle. These included trunk lean, self and object adaptors and limb position, which often included both arms and legs when the camera was positioned in such a way to capture this detail.

Table 13: Nonverbal behaviours of farmer and veterinarian measured during the Discussion interval (n = 4)

Nonverbal behaviour	Measurement score	Number of consultations
Proxemics		
Height of interaction	Seated Standing Mixture of both	3 0 1
Distance between farmer and veterinarian when both seated (n = 3)	> 4 arm's length apart 2–4 arm's length apart 1-2 arm's length apart	0 1 3
Distance between farmer and veterinarian when both standing (n = 1)	> 4 arm's length apart 2–4 arm's length apart 1-2 arm's length apart	1 0 0
Body orientation of farmer	Side on Angled up to 180 degrees Face on	1 2 1
Body orientation of veterinarian	Side on Angled up to 180 degrees Face on	1 2 1
Body lean of farmer	Away from Neutral Towards Could not be determined	1 1 1 1
Body lean of veterinarian	Away from Neutral Towards Cannot determine	0 1 2 1
Oculesics		
Head position of farmer	Mainly away from Moderately towards Frequently towards	0 2 2

Head position of veterinarian	Mainly away from Moderately towards Frequently towards	0 1 3
Kinesics		
Limb position of farmer	Closed Neutral Open	1 1 2
Limb position of veterinarian	Closed Neutral Open	0 1 3
Gestures displayed by farmer	Infrequent Moderate Frequent	1 3 0
Gestures displayed by veterinarian	Infrequent Moderate Frequent	1 3 0
Self/object adaptors by farmer, e.g., touching face, manipulating pen	Infrequent Moderate Frequent	0 3 1
Self/object adaptors by veterinarian, e.g., touching face, manipulating pen	Infrequent Moderate Frequent	0 2 2

3.5 NVC was not measured during the Closing TBI

A Closing interval was observed in five consultations. In the remaining six recorded consultations, the camera had been switched off before the veterinarian left the farm or had not been positioned in such a way to capture veterinarian-farmer interactions during this interval.

Of the five Closing intervals that had been recorded, the predominant interactions that took place during the Closing interval were between the observer and farmer; the camera that the farmer had been wearing was removed by the observer or handed back to the observer after the farmer had removed it and the observer handed over paperwork for the farmer and veterinarian to complete. As there was minimal interaction during this interval between farmer and veterinarian, NVC was not measured.

4 Discussion

4.1 Synopsis of key findings

This field study demonstrates the ability to measure static and dynamic elements of NVC between veterinarians and farmers taking place on farms, using one camera worn on the chest of an observer. During the initial interaction, four static and two dynamic attributes were measured, the latter observing whether the farmer greeted the veterinarian beside their vehicle and how both parties moved between the first (Introduction) and second (Fertility Examination) locations on farm. A total of nine NVBs were measured across the categories of proxemics, oculesics and kinesics. The range of NVBs that were measured from the consultation recordings was dependent on the TBI, defined by the main activity taking place and the location on farm in which it occurred (Table 14). This approach of segmenting the routine consultation into TBIs could help when designing future research projects, whose purpose is to explore and establish the significance of NVC in the context of successful routine consultations on farm.

Table 14: Nonverbal behaviours that were measurable according to Task Based Interval

Category	Nonverbal behaviour	Task-based interval
Proxemics	Distance between veterinarian and farmer	Introduction, Fertility Examination, Discussion
	Body position relative to interactant	Introduction, Fertility Examination, Discussion
	Height of interaction of both parties	Discussion
	Body lean	Discussion
Kinesics	Limb position when standing	Introduction and Discussion
	Limb position when seated	Discussion
	Gestures (illustrators) - use of hands during conversation	Introduction and Discussion
	Self/ object-adaptors	Introduction and Discussion
Oculesics	Head position relative to interactant during conversation	Introduction, Fertility Examination, Discussion

This study provides a method to analyse NVC in a novel setting on farm between veterinarians and farmers and begins to explore aspects of veterinarian and farmer communication that have previously not been investigated.

4.2 Study design

4.2.1 Defining the structure of the routine consultation

The consultations selected for inclusion in this study represented a ‘typical’ routine consultation, with a significant proportion of the visit devoted to the Fertility Examination. The TBIs described in this research (Table 1) provide details of veterinarian and farmer activities during the consultation, which, by nature of the selection process for this research, centred around fertility work.

A previous study of veterinarian and farmer communication during herd health and production management (HHPM) visits had focused on the verbal content during their interactions and, through thematic analysis, determined that the consultation process followed an iterative approach rather than a linear pattern (Bard *et al.*, 2017). Descriptions of and percentage timing for the activities that comprised HHPM visits on Canadian dairy cattle farms provide further details of how such visits are structured, with transrectal pregnancy and fertility diagnostics representing the predominant activity during the visit (Ritter *et al.*, 2021). The structure of the visits was determined through a combination of verbal content analysis and activities observed on video recordings. Results showed that, while the majority of farm visits prioritised pregnancy and fertility diagnostics as the first activity after ‘preparation’, there were several visits where the herd performance review took place in advance of the group pregnancy and fertility examination activity.

In this research, the structure of the consultation was segmented based on the focus of activity or interaction and the location on farm in which this

occurred. The linear flow of Introduction to Fertility Examination as the initial two segments of a routine consultation are a logical and consistent feature, since the priority is the examination of a group of cattle specifically gathered for this purpose, with optional Discussion and inevitable Closing intervals proceeding to complete a routine consultation. It may be possible that the Discussion interval might occur before the Fertility Examination and one needs to be aware of this possibility when examining recordings of a routine consultation, although this was not observed during the consultations available for analysis in this research.

The segmentation of consultations into intervals is an approach consistent with studies that considered NVC between doctor and patient, where medical encounters were segmented into phases called “opening”, “middle” and “closing” (Robinson, 1998; Gorawara-Bhat *et al*., 2007). The approach adopted in the Modified Calgary-Cambridge guide also reflects this temporal segmentation, where management of the consultation is broken down into several components, such as preparation, initiation of the session and gathering information (Petrovski and Arthur, 2015). By segmenting the consultation, it was possible to identify and record which aspects of NVC could be measured within each interval, improving the consistency of the analysis process. This may be an important consideration for future studies examining NVC in the veterinary realm when selecting which NVC elements to measure. For example, opportunities to measure NVC elements were reduced during the fertility examination; cattle were moved in and out of handling facilities and the farmer and veterinarian were often moving around

to access equipment, hence the decision to determine which NVC parameters could be measured at a point when at least one of the interactants was forced to remain in one position.

The different environmental features on each farm could influence the ability to measure NVC, such as the type of handling facilities used, where individual holding pens or stalls improved the opportunity to measure NVC compared to cattle held in a race with a narrow passageway along which the veterinarian and farmer needed to move. Having an awareness of the focus for each task-based interval and possible environmental layout could help future study design, such that the observer could better position themself to capture both farmer and veterinarian during their interactions.

4.2.2 Measurement of static and dynamic elements

The static elements recorded during the Introduction interval included details of attire worn by veterinarians; the majority wore branded clothing, which provides a clear display of group membership and may be considered to be a type of uniform (Argyle, 1988). The choice of formal or casual items of clothing (eg shorts versus long trousers) may be influenced by practice culture or left to individuals to decide and may influence the impressions formed by observers (Argyle, 1988). Some veterinarians in this study additionally carried a stethoscope around their neck, which for doctor-patient relationships is suggested to be linked to a strategy to construct a sense of power (Rees *et al*., 2013) or to help define identity (Rice, 2010).

With regards to communication effects, with a larger study sample with sufficient variation in veterinarian presentations, it would be possible to examine whether specific static elements (e.g. a stethoscope) may be associated with any specific veterinarian communication proclivities (e.g. greater use of specific verbal /non-verbal behaviours, or a specific gestalt 'style' of delivery, such as client-centred or paternalistic approach) and/or farmer responses (e.g. aspects of verbal/non-verbal engagement). Having an awareness of how one's choice of clothing, known as 'self-presentation', can influence others perception of them might be useful if veterinarians are keen to form a certain impression on their clients. Self-presentation is likely to be linked to the sense of identity of the veterinarian, which is a topic currently being examined in the context of mental health, job satisfaction and curriculum design for veterinary undergraduates; this aspect of NVC could compliment ongoing research into professional identity (Armitage-Chan, 2019; Armitage-Chan and May, 2019).

The initial interaction between farmer and veterinarian occurred either beside the veterinarian's vehicle or elsewhere on the farm, directed by the farm client (i.e., either arriving to greet the veterinarian or waiting elsewhere). This farmer-led environment is a unique feature of the farm animal consultation; in medical and companion animal practice, the patient or client are invited into the consultation room, where the environment is controlled by the doctor and veterinarian.

In this study, measurements of dynamic NVC parameters, also referred to as NVBs, were made using estimations and this approach is consistent with previous research in NVC, in both social science and medical settings. At present, there are no universally adopted methods for precisely measuring proxemic variables (Harrigan, 2013) where unequivocal measurement would be highly intrusive and impractical. Some studies have used environmental features, such as floor tiles (Harrigan *et* al., 1985), in an attempt to establish more accurate measures of interactional distance.

When considering how to measure NVBs such as interpersonal distance consistently across each interval, the use of multiples of an arm's length as an estimate offered a practical solution, given the fact there were no universal 'markers' (such as floor tiles) of distance in the analysed recordings. Further studies may benefit from using this approach in the farm veterinary context and consider how interpersonal distance might influence the outcome of routine consultations; for example, if the veterinarian and farmer generally maintain closer distances throughout the consultation, are they more likely to discuss topics relevant to herd health planning with constructive outcomes? Research in proxemics suggests that the most dominant factor that determines interpersonal distance is the relationship of the interactants, with the specific content of the interaction being the second most important (Matsumoto *et al*., 2013).

4.2.3 NVBs during the Introduction and Discussion intervals

Several NVBs measured during the Introduction and Discussion intervals were comparable and therefore will be discussed in combination in this section. In both intervals, the veterinarian and farmer were directly interacting with each other, without cattle present.

Interpersonal distances of veterinarian and farmer during both intervals were maintained within four arm lengths apart (one arm's length approximated at 0.55m (Annandale *et al.*, 2020)), which places these interactions into what is commonly termed the 'social' proximity zone (1.2–3.3m), defined as the distance where acquaintances interact with one another (Hall, 1966).

The body orientation of each person matched that of the other during the Discussion interval, when both were seated. Vertical height differences were not observed in this study, which may positively influence the consultation, as when the veterinarian is positioned higher than the client during companion animal consultations, the client could feel intimidated (Carson, 2007). During the Introduction interval, when veterinarian and farmer were standing, they tended to position themselves face on to each other.

The orientation of trunk lean - towards, away from or neutral - was an additional proxemic parameter that could be measured during three of the four recorded Discussions; the positioning of the camera in the fourth consultation prevented accurate measurement of body lean for both

interactants. This NVB has been linked with physician expressiveness, where more time spent in a forward lean position alongside decreased time spent reading medical records and more gazing appeared to be linked with higher levels of patient satisfaction (Mast, 2007). Therefore, this parameter may offer useful insights in future studies examining the links between veterinarian communication and patient outcomes. It would be imperative therefore to ensure that camera positioning was optimal prior to recording the interaction during this interval, with the observer assuming a position facing the interactants, that allows clear observation of both parties, instead of being positioned sideways on to them, where partial or complete obstruction of one person's torso by the other could restrict visibility for the camera recording.

In both the Introduction and Discussion intervals, head position during conversation was moderately or frequently toward the other person. This is an important measure of NVC, given that gaze can be used to express or reveal interest, emotion and attitude (Kendon, 1967) and thus significantly effect a communication partner. One study (Tuisku *et al.*, 2018) considered the emotional effects of veterinary behaviours on companion animal clients; the results suggested that direct body orientation and gaze could elicit a higher degree of 'pleasantness' experienced by clients, compared to interactions where veterinarians averted their gaze and body direction.

Face-directed gaze, described in the present study as head position relative to the interactant (veterinarian or farmer), offers a solution to the difficulties

that can be encountered by trying to measure ‘eye gaze’, which, in the recorded consultations, could not easily be done precisely. Since a person moves their head when redirecting their gaze, and interactants generally look well away or at each other (Kendon, 1967), it has been suggested that the precise determination of eye contact is less critical than head direction in relation to the interactant. Also, validity estimates of face-directed gaze are greater than for eye-directed gaze (Harrigan, 2013), so head position relative to the interactant was the measure chosen to establish ‘gaze’ between veterinarian and farmer.

Although only an approximation of true eye contact or gaze, the measurement of head position offers a practical method to assess visual interaction in field studies such as the on-farm consultation. This could be improved by placing action cameras positioned on the head of each interactant to capture face-directed gaze during interactions. Cameras positioned closer to the location of the eyes, compared to those worn on the chest, could capture recorded footage that offers a clearer picture of eye contact. However, the position of the cameras may be more obvious to the interactants, increasing their awareness of being observed, which in turn could result in modification of their behaviour, a phenomenon known as the Hawthorne effect (McCambridge *et al.*, 2014).

In recognition of the significance of gaze during physician-patient interactions, Gorawara-Bhat *et al*., (2007) considered the relationship between gaze (eye contact) and patient-centred communication and

suggested that eye contact is an integral component of patient-centred communication during the clinical visit.

During the initial interaction period, most farmers displayed infrequent use of gestures during conversation, while veterinarians tended to use gestures more frequently. When not carrying handheld equipment, half the farmers held their arms akimbo with hands on their hips, a position not assumed by any of the veterinarians in this study, who instead held their arms loose by their sides, whether they were holding equipment in their hand/s or not. Research indicates that holding the arms by the sides tends to communicate a more open and positive attitude, while placing hands on hips generally accompanies a more negative attitude (Matsumoto *et al*., 2013); this posture has been associated with displays of dominance and status, where the body is positioned to increase apparent size (Argyle, 1988).

Analysis of NVBs during the Discussion interval revealed that both farmer and veterinarian displayed moderate amounts of gesturing and limb position was predominantly recorded as open or neutral. However, one farmer frequently assumed closed limb positions during this interval, crossing both the arms and legs. Carson (2007) discussed the significance of limb position displayed by companion animal clients, with uncrossed arms and legs reflecting their feelings of safety during the consultation. The suggestion was made that clients are more likely to share their concerns and fears during the consultation when they feel safe with the veterinarian; clients

presenting with crossed arms and legs, who do not appear to feel safe, are less receptive to educational conversations with their veterinarian.

Being able to recognise open and closed postures during interactions could potentially help veterinarians explore possible reasons for the farmer's behaviour. For example, by asking how the farmer feels about what is being discussed or whether they have any questions or concerns on the topic, this allows the farmer an opportunity to express concerns if the body position being assumed might be suggestive of internal conflict, with arms and/or legs crossed during the discussion. It might even be useful for the veterinarian to reflect back to the farmer that they notice there might be some reservations about what is being discussed and ask the farmer to share their feelings or concerns about this. This variability in gesture may be meaningful and larger studies, able to explore associations between gesture and other aspects of the farm veterinary encounter (e.g. client satisfaction, change outcomes), may offer useful insights to veterinarians aiming to enhance their client's experience.

Several additional NVBs could be measured during the Discussion interval; trunk lean and self/object adaptor behaviours. Lean, the angle between the trunk and the hips, shapes the space between interactants. Forward lean displayed by physicians was noted as one aspect of NVC associated with greater patient satisfaction (Roter *et al.*, 2006), and doctors adopting a forward leaning position were rated as having higher levels of rapport with their patients (Harrigan *et al*., 1985). Leaning away from an interactant and

crossing the arms and/or legs have been associated with feelings of dislike or disengagement (Argyle and Dean, 1965).

The significance of the use of self and object adaptors by medical students, during communication skills training and assessment showed that a reduction in these behaviours, also termed ‘un-purposive movements’, resulted in improved perceived communication by the assessors (Collins *et al.*, 2011; Park and Park, 2018). The researchers suggested that medical students might benefit from training to help them avoid such behaviours whilst encouraging them to engage in positive facial expression and affirmative gestures to build patient trust. It has been proposed that a plausible explanation for more frequent self-touching is that the person is experiencing anxiety, tension and preoccupation, leading to accompanying poor quality verbal communication (Ishikawa *et al.*, 2006). Incorporating NVC assessments into communication skills training for veterinary students and practicing farm veterinarians could evaluate whether ‘un-purposive movements’ evoke similar reactions in assessors and/or clients, as seen in medical practice.

During the Discussion interval, the veterinarian and farmer considered information, in the form of data, reports and records, to help formulate plans and consider ideas that impact the health of the farmer’s herd. Both computers and paperwork were used by both farmer and veterinarian. In medical practice, the use of computers and paperwork, to refer to patient records, during the consultation and impact on patient satisfaction has been

considered, to evaluate the impact this can have on maintaining eye-contact between doctor and patient (Esslemont, 2010; Silverman and Kinnersley, 2010). Research into the impact of computer use by doctors during patient consultations indicated that patient-centred communication was negatively correlated with screen gaze; physicians asked fewer psychosocial questions and demonstrated a reduced response to emotional aspects provided by patients (Margalit *et al.*, 2006; Vogel *et al*., 2018).

Carson (2007) suggested that veterinarians in companion animal consultations might choose to adjust the computer screen 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. Creating this connection with the client should help to develop a sense of rapport. In the present study, collaborative use of computers and paperwork was observed during the Discussion interval, reciprocated by both the veterinarian and farmer when they used their own computer and/or paperwork.

4.2.4 Observed relationship between static and dynamic elements during the Fertility Examination interval

During the fertility examination interval, the method of ultrasound scanner use appeared to influence the behaviours of veterinarian and farmer. The influence of static elements on dynamic behaviours has previously been noted; a study observing doctor-patient interactions during consultations described how use of static attributes, such as the physician's desk and

chair, influenced the manifestation of behaviours, particularly interaction distance and angle of interaction (Gorawara-Bhat *et al*., 2007). If the scanner and ultrasound screen were strapped to the veterinarian's body, this appeared to offer the greatest opportunity to position their body and head towards the farmer, even when the farmer was standing directly behind the veterinarian during transrectal ultrasonography. In contrast, when goggles were used to view an ultrasound display, the veterinarian appeared to spend less time with head and body positioned towards the farmer. The use of goggles could therefore be perceived as a barrier to interaction; the farmer unable to view the screen and the veterinarian immersed in the visual content before their eyes.

When measuring their use of space relative to the farmer, it was observed that some veterinarians appeared to intentionally position themselves in such a way to increase engagement, by moving their head and torso towards the farmer. This could be significant, as patients rate physicians more positively when the latter direct their gaze and body orientation towards their patients; a stronger establishment of rapport and a link to perceived clinical empathy have been reported (Harrigan *et al*., 1985; Brugel *et al*., 2015; Vogel *et al*. 2018).

This research suggests that it is important to record the presence of an additional person/s and their involvement in the examination of animals, as it appeared to influence the NVBs displayed by the veterinarian; in three of the four consultations where an additional person was examining cattle, the

farmer increased their distance from the veterinarian to over four arm lengths. In the fourth consultation, the farmer appeared more comfortable reducing the interpersonal distance with the veterinarian, moving to between two and four arm lengths. This could reflect a stronger relationship between farmer and veterinarian, such that the presence of an additional person had little effect on the farmers NVBs. The significance of this relates to findings that show interactants holding conversations in closer proximity are more likely to have greater levels of trust and rapport, leading to more meaningful conversations (Harrigan *et al*., 1985).

4.2.5 Environmental influences

Different holding facilities (crush, individual pens, race) are often used to restrain cattle for the purpose of fertility examination. In this study, the physical dimensions imposed by these holding facilities may have influenced the ability of farmer and veterinarian to communicate nonverbally. Gorawara-Bhat *et al* (2007) researched NVC in doctor-patient interactions, where they considered how the spatial configuration of the consultation room could influence their subsequent nonverbal behaviours, such as interpersonal distance and angle of interaction. They were able to demonstrate that certain aspects of the spatial configurations could facilitate expressions of patient-centredness, such as increased eye contact and optimal interpersonal distance. Future research in the farm animal veterinary field should consider how different holding facilities shape physical dimensions of consultation spaces and influence subsequent NVBs of both farmer and veterinarian. This knowledge could be useful for veterinarians to understand how they might adapt their own communication

according to the environment in which they are working, to achieve more effective interactions with farmers.

Whilst the significance of the NVC elements recorded in this study may not yet be known, it is useful to confirm the ability to measure them, for future research in NVC. For example, does the farmer use a notebook or clipboard, held during the fertility examination, as a barrier? What is the significance of how the farmer and veterinarian move from the initial greeting location to the location of the fertility examination? By including quantitative measures alongside qualitative insights, studies can begin to demonstrate the relevance of these elements of communication and thus inform and focus training to veterinarians on how to enhance their engagement with farm clients.

4.3 Study limitations

Some of the limitations of this study are associated with the material captured on the observer camera; firstly, inconsistencies in the recording of initial and final interactions on farm, that resulted in fewer TBIs available for analysis per consultation. Secondly, due to the positioning of the camera such that some of the NVBs of veterinarian and farmer could not be measured. The reasons for this were that the camera was not always turned on prior to the initial contact between farmer and veterinarian, the camera was not always positioned such that it would capture both farmer and veterinarian interacting in the same frame and did not always allow for

optimal visualisation of NVBs occurring for both veterinarian and farmer, such as trunk lean and head position.

In previous research that analysed camera recordings of herd health visits (Ritter *et al*., 2018), the issue of failing to capture the entire visit on camera was also noted as a difficulty, and the authors deemed this to be out of their control given the absence of a researcher on farm to ensure a complete recording was made. The activity observed during the Closing interval – removal of the camera and attention to the observer's paperwork - appeared to minimise the interactions between farmer and veterinarian, so it is possible that NVC that would normally have occurred during this interval did not.

The small sample size might have restricted the ability to collect the full range of NVC that takes place during routine consultations on farm. However, as this was a field study, it is more likely that legitimate responses and authentic behaviours took place between veterinarian and farmer consistent with those occurring during a 'typical' routine consultation.

The possibility that farmer and veterinarian behaviour might be altered because of their awareness of being recorded, a phenomenon referred to as the Hawthorne effect (McCambridge *et al*., 2014), is worth noting. This was a discussion point raised by Ritter *et al* (2018) in their research that demonstrated the suitability of recorded material for (verbal) communication analysis, captured through action cameras used on farm. They suggested

that veterinarians who had received communication skills training might have applied those skills during the recordings, thus giving a greater sense of competence than would be the case during day-to-day, unrecorded interactions.

The authors of another study that explored concerns about the 'observer effect', this time in the field of health professional education (Paradis and Sutkin 2017), considered that it was unlikely that significant alteration of behaviour occurred in many research contexts. Without data to help support whether an 'observer effect' might influence interactions between veterinarian and farmer during a recorded consultation, it is not possible to comment on the significance of this. However, the details included on the information and consent forms for both veterinarian and farmer (Appendices II and III) did not specify that analysis of NVC would take place. As such, anticipation of NVC assessment – and NVC adjustments as a result – are unlikely to have been a factor in participants' response to being filmed. Therefore, the likelihood that either party altered their NVC during the consultation is small.

Another limitation of this research lies in the fact that the routine consultations took place in a limited number of regions within the UK, so the data might not be representative of farmer and veterinarian interactions that take place during a routine consultation in different regions of the UK or indeed in other countries where routine consultations take place. This may

also be the case regarding the structure of the routine consultation, described here as task-based intervals.

Observation of other types of farm animal practice consultations, such as poultry, camelid and sheep, may reveal differences in the NVC between farmer and veterinarian; this research was confined to the observation of routine consultations that consistently included the fertility examination of cattle.

There might also be cultural differences between the NVC observed in this research and that which might occur during routine consultations elsewhere. A number of studies have shown that aspects of NVC, such as gaze, use of gestures and interpersonal distance, do vary between cultures: for example, Latin Americans and Southern Europeans stand closer and look at each other more compared to Northern Europeans and North Americans (Argyle, 1988).

4.4 Recommendations for future research

This study opens up many avenues for further research; most importantly it should seek to establish which NVC parameters are most relevant to record when assessing the outcomes of routine consultations. This might be done through analysing NVB as the independent variable from which various outcomes can be predicted, such as farmer satisfaction and successful implementation of herd health programmes.

It is important to explore how several elements of NVC, eg proxemics (interpersonal distance, body lean), oculesics (head position) and kinesics (body orientation), exhibited during routine consultations might help to influence or increase positive outcomes. This has been achieved in the medical field, where it has been proposed that the most beneficial practitioner to client orientation behaviours, in terms of demonstrating a greater sense of empathy and immediacy, would involve maintaining a distance of approximately 4ft (1.2m), using a forward lean, adopting an open arm posture and using a moderate amount of hand gestures (Hall *et al*., 1995). It would be useful to explore whether the same veterinarian to farmer NVBs would achieve comparable results, i.e. increased sense of empathy and immediacy. This would offer further insight into how veterinarians might strengthen their ability to adopt a client-centred approach, as the same NVBs have been shown to play a role in the expression of patient-centred communication in the medical interaction (Gorawara-Bhat and Cook, 2011).

Additional application of studies to examine NVC between farmer and veterinarian could involve closer scrutiny of the Fertility Examination interval, especially as this may be the main opportunity for interaction during the routine consultation (fewer than half the consultations in this research included a Discussion interval). For example, this could present the veterinarian with a chance to increase farmer engagement if both were able to view the ultrasound scanner screen during TRUS. Future research could investigate whether the method of scanner use makes a difference to the farmer; might there be an increased level of satisfaction and adherence to

herd health programmes if the farmer felt a greater sense of inclusion during this interval?

The impact that the use of electronic health records by physicians might have on their patients has been examined and strategies to help improve physicians' communication skills suggested. These include sharing of the screen to keep patients engaged and changes in focus of gaze, to facilitate a relationship-centred model for the interaction of physician-patient and computer, which can be used to enhance the biopsychosocial element of the interaction (Duke *et al*., 2013). 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? NVBs to measure during this interval would be interpersonal distance and head position, alongside asking each party to rate their sense of engagement and immediacy during the Fertility Examination.

The consultations examined in this study had been recorded using up to three cameras worn by veterinarian, farmer and observer. Only one camera view (observer) was analysed as the second and third views did not capture sufficient information of the interactions taking place between farmer and veterinarian in the same frame. To capture interactions between both parties in the same frame, it is recommended that a single camera should be worn by the observer.

As described by Argyle (1988), when observing interactions to record NVC, the camera angle and distance need to be set to capture as much information as possible in the greatest detail. To maximise the quality of the material captured on the camera for subsequent analysis of NVC, the observer should be clear in their role to optimise their positioning during each task-based interval of the routine consultation, positioning themselves in the most direct location to visualise the farmer and veterinarian interacting. The camera should consistently be switched on prior to the Introduction and after the Closing TBI. To address the difficulty of capturing sufficient information during the TBIs to enable measurement of NVBs, it is crucial that the person wearing the camera has the singular role during the consultation of positioning themselves in the most direct location to visualise the farmer and veterinarian interacting.

This novel research sought to establish whether NVC in the farm environment could be measured from pre-recorded videos of routine farm consultations, thus providing a foundation for future work to build on our understanding of this aspect of communication. Although inter-coder reliability was not included in development of the methodology, the method employed to generate coding of the NVC was based on existing literature (Gorawara-Bhat *et al.*, 2007), which included the muting of sound to allow total focus on NVC. The primary objective was to assess if measuring NVC in farm animal consultations was possible using in the field technology; now this has been confirmed, further studies should include multiple coders or

repetitive coding by one coder to confirm reliability and robustness of the analysis.

The original study design (Appendix I), from which the data for this research on NVC was drawn, did not include the collection of detailed demographics on participants. There were two reasons for this decision; it was deemed that requesting participants to provide this information could reduce the motivation of veterinarians and farmers to participate, and such detail was not required to answer the main objective of the study, which was stated as 'attempting to define what a good veterinary consultation looks like in a farm animal setting'. Capturing more demographic information of participants, such as gender and age, along with professional information, such as number of years working in practice, level of experience in farm practice and percentage time spent working in farm animal practice from veterinarians, and from farmers, professional information about their role and responsibilities on the farm, would help interpret results derived from future studies, which will subsequently help define key areas to improve.

4.5 Application of NVC

Ishikawa *et al.* (2006) and Park and Park (2018) reported that medical students were able to improve their NVC as a result of communication skill training; their use of NVBs could be adapted to increase their use of open body position and decrease their use of non-purposeful movement. A call for medical education to include specific training in empathy, in order to facilitate greater understanding and awareness of NVC, was made by Riess

and Kraft-Todd (2014), who developed a tool – '**E.M.P.A.T.H.Y.**' (E: eye contact; M: muscles of facial expression; P: posture; A: affect; T: tone of voice; H: hearing the whole patient; Y: your response) - to enhance NVC between clinicians and patients. The tool was designed to offer a consistent approach in the education of physicians in the field of NVC, in the context of the medical encounter, and to assess their skills in this form of communication.

In veterinary education, NVC has been recognised as an important component of effective communication skills training, on the basis that it forms 'one of the building blocks of a therapeutic relationship' between veterinarian and client (McArthur and Fitzgerald, 2016). It may be useful to incorporate details of NVC into veterinary student and practitioner communication skills education courses, to improve the detection and understanding of a farmer's emotions through their use of NVBs, in a similar approach to that used in the E.M.P.A.T.H.Y. tool discussed above.

Limited research into veterinarian-farmer communication includes the interpretation of some aspects of NVC, as part of the global affect rating (GAR) made by coders using the RIAS (Ritter *et al*, 2018). The validity and reliability of GAR assessment has been called into question (Corah, 2019) due its subjectivity. By linking the NVBs measured in this study, one may understand why these elements are important to effective communication, by considering which discrete nonverbal cues convey overall impressions

such as warmth, caring, immediacy and rapport in the context of a client-practitioner interaction.

Incorporating an awareness of the significance of NVC alongside 'traditional' approaches to communication skills training, to help veterinarians understand how their use of NVBs can support their overall communication skills, could subsequently influence positive farmer outcomes. This approach is consistent with that promoted by research of physicians' NVC skills; training physicians and other health care workers in the 'art of care' was a recommendation made by DiMatteo (1980), who discovered that the NVC skills of physicians could predict patient satisfaction.

The concept used in that research was that two dimensions of patient satisfaction exist – 'the art of care' and 'the technical quality of care'. The former relies on a physicians' ability to successfully encode and decode the NVC of their patients. Doctors who could more accurately decode their patient's emotional response to an advised treatment regime would be able to recognise discomfort, providing them the opportunity to clarify any problems and thus reduce the chances of noncompliance.

5 Conclusion

This study confirms it is possible to measure NVC on farm using a single action camera worn by an observer, with 15 different aspects of NVC described within routine consultations. It has demonstrated that these routine consultations on farm could best be analysed by segmenting the observation it into four 'Task-Based Intervals', defined by the focus of activity for farmer and veterinarian within the overall consultation.

Static elements of NVC included those that offered information on veterinarian self-presentation, such as clothing items worn and use of equipment (e.g. ultrasound scanner), and the presence or absence of the farmer beside the veterinarian's vehicle during the initial interaction on farm. Dynamic NVC, expressed as veterinarian and farmer behaviours, included measurable elements belonging to the categories of proxemics, oculesics and kinesics. The number of NVBs that could be analysed in each Task-Based Interval differed: this was due to camera positioning and the activities performed by farmer and veterinarian throughout.

Recording, measuring and analysing NVC in a farm context and using these insights to foster a greater understanding of communication between farmers and veterinarians – through both training and research - will help support veterinarians and their clients, as NVC forms a significant part of overall communication. Nonverbal messages often convey the emotions experienced by interactants. Discussions about the care of animals can often evoke emotional responses, especially when owners face the

prospect of making changes to their own behaviour and management practises; nonverbal messages often convey the emotions experienced by interactants. Having a deeper understanding of NVC during such discussions could therefore help veterinarians to more effectively gauge, interpret and respond to farmer/client emotional responses, encouraging more effective conversations and ultimately, a sense of increased satisfaction from their veterinary interactions for both advisor and client.

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Appendices

Appendix I: Background on the creation of recorded consultations

All camera recordings used in this research were created during an undergraduate project, entitled ‘Defining the “good” consultation in a farm animal setting: what does it look like and how do we measure this?’. A description of the original project is provided here for background.

Study design

The student who conducted the project was Nurmo Atabayev (NA), from the University of Calgary, Canada and his supervisors were Louise Corah and Wendela Wapenaar (University of Nottingham) and Caroline Ritter and Herman Barkema (University of Calgary). The study was conducted in May and June 2018 through the School of Veterinary Medicine and Science (SVMS), University of Nottingham. Ethical approval had been granted by the Research Ethics Committee at the School of Veterinary Medicine ahead of the project’s commencement.

Materials and methods

Participant recruitment

Six farm animal veterinarians, working in four different veterinary practices across England, were recruited through convenience sampling. The veterinarians were asked to select the farmer clients who would be willing to be filmed during the routine farm visit. An information sheet (see appendix II) was provided to all potential participants in advance of the

visit. The researcher gained consent from veterinarian and farmer for each visit (see appendix III). On arrival at each farm, the project was explained by NA and all participants were given the opportunity to ask questions.

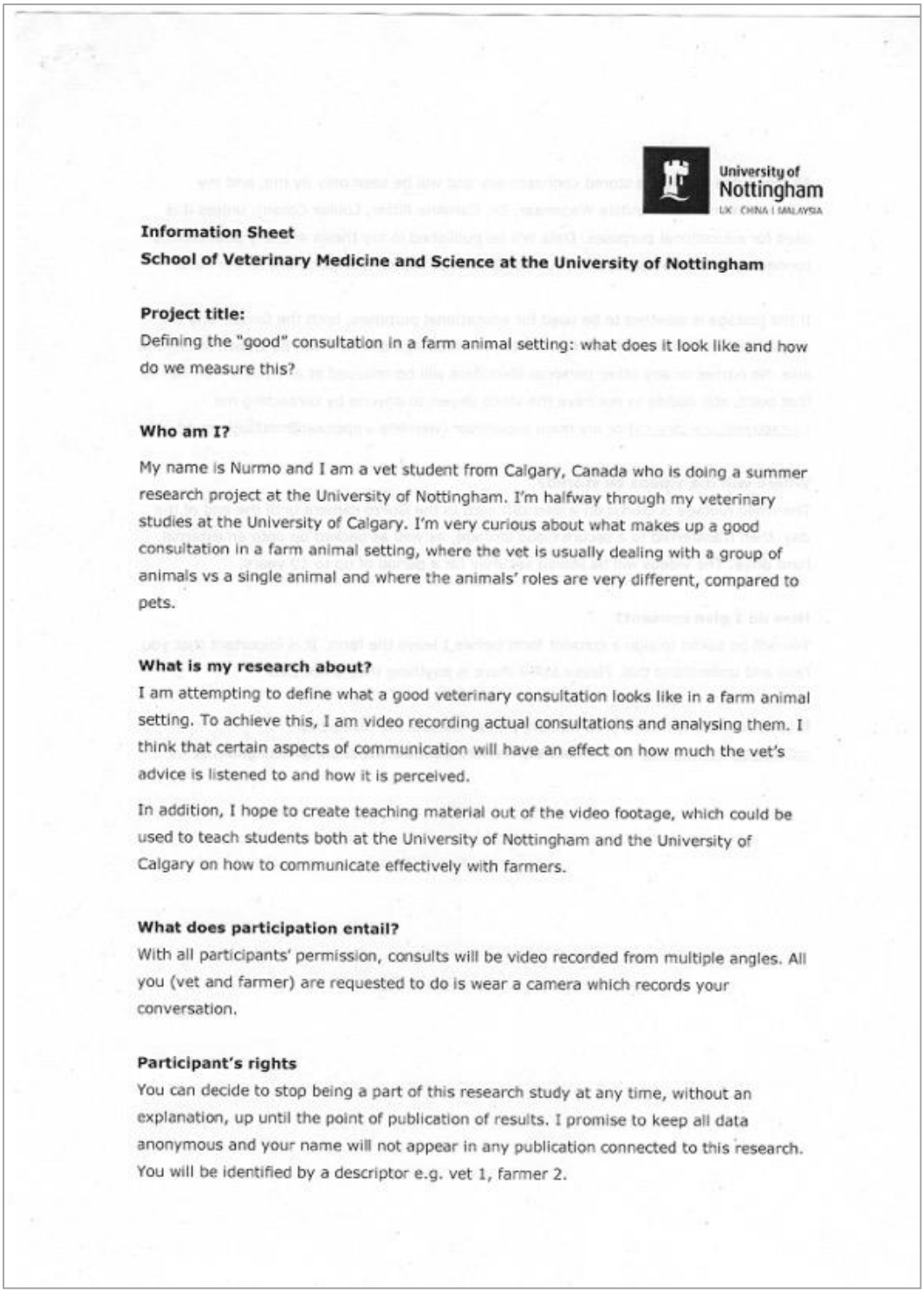
Digital Recordings

Consultation data were recorded at 13 farms visits ($n \geq 1$ per veterinarian). Video footage was collected by recording the interaction with GoPro cameras (Hero 4 Silver or Hero 5 Black) from three points of view: the veterinarian, the farmer and the observer (NA). The cameras were strapped to the person's chest using a chest harness (GoPro Genuine chest harness) and recorded both audio and video. Video recording quality was set to a resolution of 1080p and a frame rate of 30 fps.

Five batteries (three genuine GoPro Hero 4 and two compatible Smartree) were used with the two Hero 4 Silver GoPros. Average battery life was around two hours (newer batteries a bit more than older ones), with a BacPac (Hero 4 compatible) the battery life extended to just over 3 hours.

Footage was recorded in a series of approximately 3.7 GB files, each one representing 17:43 minutes of footage on microSD cards and copied to an external hard drive after each recording. The files were not combined into one video, as this made the combined file too large, making it difficult for playback, cloud and compression applications.

Appendix II: Information sheet



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Information Sheet
School of Veterinary Medicine and Science at the University of Nottingham

Project title:
Defining the "good" consultation in a farm animal setting: what does it look like and how do we measure this?

Who am I?

My name is Nurmo and I am a vet student from Calgary, Canada who is doing a summer research project at the University of Nottingham. I'm halfway through my veterinary studies at the University of Calgary. I'm very curious about what makes up a good consultation in a farm animal setting, where the vet is usually dealing with a group of animals vs a single animal and where the animals' roles are very different, compared to pets.

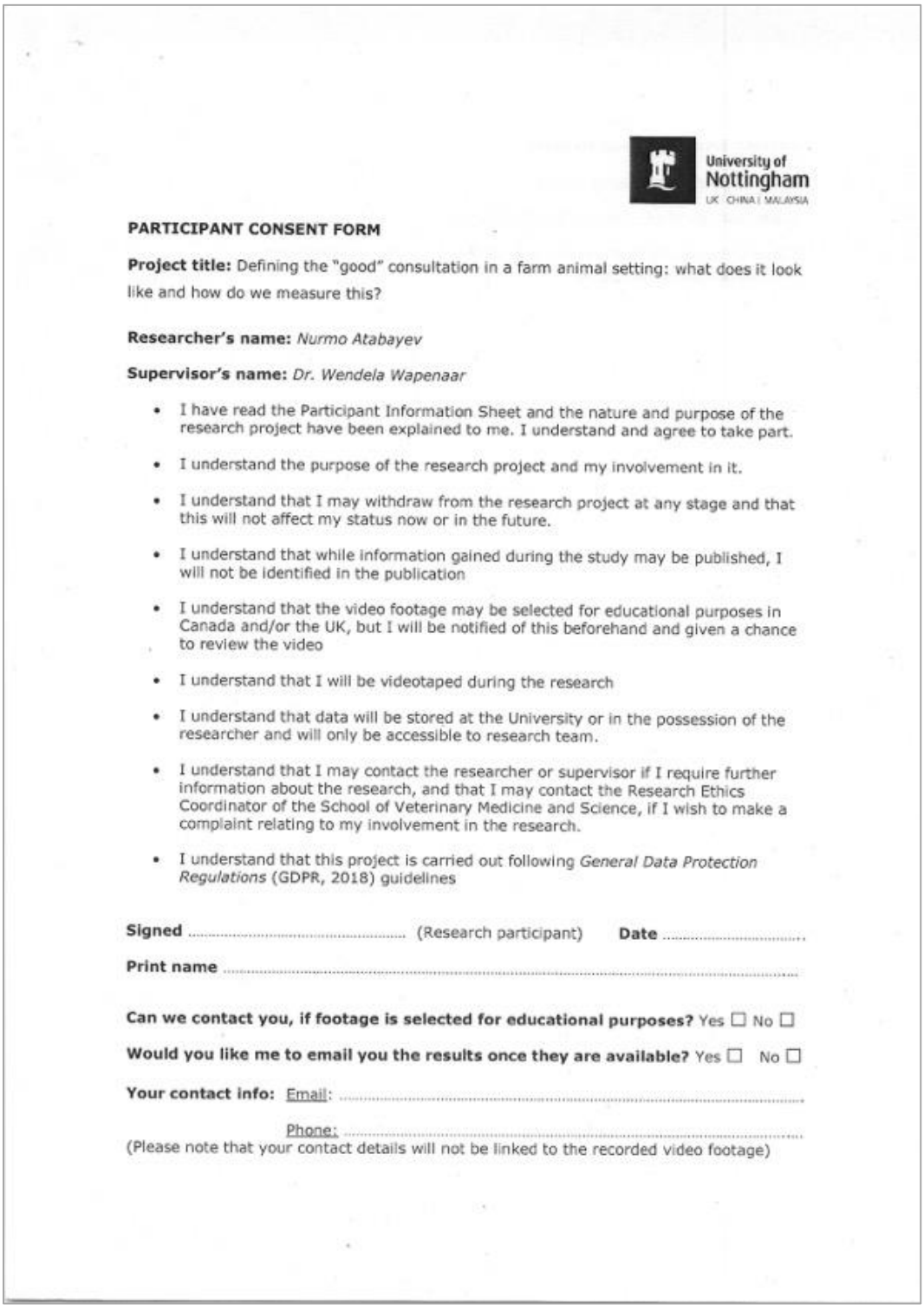
What is my research about?
I am attempting to define what a good veterinary consultation looks like in a farm animal setting. To achieve this, I am video recording actual consultations and analysing them. I think that certain aspects of communication will have an effect on how much the vet's advice is listened to and how it is perceived.

In addition, I hope to create teaching material out of the video footage, which could be used to teach students both at the University of Nottingham and the University of Calgary on how to communicate effectively with farmers.

What does participation entail?
With all participants' permission, consults will be video recorded from multiple angles. All you (vet and farmer) are requested to do is wear a camera which records your conversation.

Participant's rights
You can decide to stop being a part of this research study at any time, without an explanation, up until the point of publication of results. I promise to keep all data anonymous and your name will not appear in any publication connected to this research. You will be identified by a descriptor e.g. vet 1, farmer 2.

Appendix III: Participant consent form



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PARTICIPANT CONSENT FORM

Project title: Defining the "good" consultation in a farm animal setting: what does it look like and how do we measure this?

Researcher's name: *Nurmo Atabayev*

Supervisor's name: *Dr. Wendela Wapenaar*

- I have read the Participant Information Sheet and the nature and purpose of the research project have been explained to me. I understand and agree to take part.
- I understand the purpose of the research project and my involvement in it.
- I understand that I may withdraw from the research project at any stage and that this will not affect my status now or in the future.
- I understand that while information gained during the study may be published, I will not be identified in the publication
- I understand that the video footage may be selected for educational purposes in Canada and/or the UK, but I will be notified of this beforehand and given a chance to review the video
- I understand that I will be videotaped during the research
- I understand that data will be stored at the University or in the possession of the researcher and will only be accessible to research team.
- I understand that I may contact the researcher or supervisor if I require further information about the research, and that I may contact the Research Ethics Coordinator of the School of Veterinary Medicine and Science, if I wish to make a complaint relating to my involvement in the research.
- I understand that this project is carried out following *General Data Protection Regulations* (GDPR, 2018) guidelines

Signed ..... (Research participant) **Date** .....

Print name .....

Can we contact you, if footage is selected for educational purposes? Yes ☐ No ☐

Would you like me to email you the results once they are available? Yes ☐ No ☐

Your contact info: Email: .....

Phone: .....

(Please note that your contact details will not be linked to the recorded video footage)