Evaluating Outcome Measures in Veterinary Physiotherapy with Particular Reference to the Treatment of Canine and Equine Joint Cases

William Brookes

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Supervisors:

Dr. Richard Payne, Professor Richard Lea

School of Veterinary Medicine and Science

University of Nottingham

CONFLICT OF INTEREST

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Abstract

Background: Veterinary physiotherapists provide postoperative care, rehabilitation, sports maintenance, and aged maintenance for their patients. Outcome measures are extensively used within human medicine, including physiotherapy, but a widely accepted issue in veterinary physiotherapy practice is that outcome measures lack sufficient evaluation with regard to intra- and inter-clinician comparisons. This project aimed to determine the quality of outcome measures being used in canine and equine physiotherapy practice and any disparities external factors cause.

Methods: A structured scoping literature review consolidated current understanding and limitations. This was combined with a survey of qualified veterinary physiotherapists (n=41). Statistical analysis comprised descriptive statistics and Chi Squared analyses.

Results: Key observations generated include (1) a lack of differences in application of outcome measures between veterinary physiotherapists with and without a human physiotherapy background, (2) enhanced utilisation of outcome measures by members of a registration body and (3) an overall skew towards subjective, rather than objective, outcome measure use.

Limitations: Sample size and time for a secondary survey further exploring limitations.

Conclusion: Recommendations on enhancing outcome measures in clinical practice include several technical measures, e.g. goniometers and pain scoring, and profession-wide initiatives, including the introduction of comprehensive CPD resources and reviews of regulatory and education bodies.

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1 INTRODUCTION

1.1 PHYSIOTHERAPY: REGULATIONS AND ITS ROLE WITHIN HUMAN MEDICINE

In the medical sector, Physiotherapists are regarded as key members of the human musculoskeletal, neurological, and cardiorespiratory healthcare teams (Bromiley, 1994) for care concerning prevention, treatment, and rehabilitation. Physiotherapists can act both as a first point of medical professional contact and as referral treatment options by preventing injuries, slowing further deterioration of existing conditions, maximising physical potential, and restoring function and movement when someone is affected by disability, illness, or injury (Sharp, 2008, Chartered Society of Physiotherapy[1], 2021).

Physiotherapist is a designated title of the profession protected by law: anyone wishing to use the title "Physiotherapist" and practice physiotherapy in the UK must be registered with the Health and Care Professions Council[2] [HCPC], the regulatory body for health and care professionals. A Chartered Physiotherapist is also a protected title, bestowed by the King, via the Privy Council, to registered Physiotherapists that have qualified to be members of their professional body, the Chartered Society of Physiotherapy [CSP]. Membership of the CSP requires that the code of member's professional standards is upheld.

Physiotherapists now have a unique, autonomous role in patient assessment and treatment as first contact practitioners, both through the NHS and in private practice. In the UK, people with musculoskeletal conditions can access physiotherapy at the start of their treatment. This reduces the stress on other healthcare services ensuring the patients are appropriately delegated before going through the system but also allows early and continuous management of that patient's case throughout (CSP WEBSITE, 2022), greatly benefiting their healthcare. If necessary the patient could then be referred onwards for further treatment. Comparatively, patients may be referred to physiotherapists for treatment by other healthcare professionals for non-surgical or medical treatments or rehabilitation after procedures, injuries, accidents, or disease (Bromiley, 1994).

1.2 VETERINARY PHYSIOTHERAPY: REGULATIONS AND ITS ROLE WITHIN ANIMAL MEDICINE

Veterinary physiotherapists provide postoperative care, rehabilitation, sports maintenance, and aged maintenance for their patients. Veterinary physiotherapists are often perceived by the general public as an alternative route of therapy for animal patients, however, they can be used in

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[1] www.csp.org.uk/careers-jobs/what-physiotherapy
[2] www.hcpc-uk.org/about-us/who-we-regulate/the-professions/

collaboration with complementary veterinary treatment (Sharp, 2008) to maximise the quality of patient care (BSAVA, 2021). One such example of this is the Tokyo 2020 Equestrian team, representing Team GB [3] at the Olympics, contained multiple veterinary physiotherapists.

The Veterinary Surgery Exemptions Order (2015)[4] allows the manipulative physical treatment of an animal by a person acting under the direction, permission, and knowledge of the consulting veterinarian, after the veterinarian has examined that animal and prescribed the treatment by physiotherapy. At the time of writing, there are no legally mandated regulatory bodies for veterinary physiotherapists, so full responsibility rests with the attending veterinarian and the approval of an individual to carry out an act of physiotherapy on an animal (Sharp, 2008). This act forbade any treatment of an animal given without first having been seen by a vet, a marked difference from the veterinary physiotherapist's counterparts in the human medical industry. A recent update to the Veterinary Surgery Exemptions Order (2020) now means that acts of maintenance do not require veterinary permission.[5] [6] Making a clinical diagnosis, carrying out diagnostic tests and providing medical or surgical treatment were all classified as veterinary acts and so are illegal acts for anyone other than a vet to carry out (Tabor, 2020). If the veterinary physiotherapist finds, or suspects, a new problem during their session, all work on that animal must be stopped and sent back to the referring veterinarian in order to obtain further clinical instruction.

Whilst there are no legally mandated regulatory bodies for veterinary physiotherapists, there are two voluntary registry bodies, the Register of Animal Musculoskeletal Practitioners [7][RAMP] and the Animal Health Professions' Register [8][AHPR]. The purpose of the voluntary registers is to raise the standards in the industry by providing the opportunity for practitioners to hold themselves to a high standard, this then helps vets and owners choose competent professionals for the treatment of their animals. These bodies are not limited to veterinary physiotherapists and also include other musculoskeletal professions including osteopaths and chiropractors.

There are minimal differences in the routes to become a member of each register. According to both the RAMP and AHPR websites, the practitioner's competency must be proven to join their registers. RAMP dictates that the veterinary physiotherapist must hold a qualification from an accredited course, hold proof of other learning of sufficient quality, or must hold a qualification that existed

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[3] www.britishequestrian.org.uk/team/team-staff
[4] www.rcvs.org.uk/setting-standards/advice-and-guidance/code-of-professional-conduct-for-veterinary-surgeons/supporting-guidance/treatment-of-animals-by-unqualified-persons/
[5] www.rcvs.org.uk/setting-standards/advice-and-guidance/code-of-professional-conduct-for-veterinary-surgeons/supporting-guidance/treatment-of-animals-by-unqualified-persons/
[6] www.rcvs.org.uk/news-and-views/news/rcvs-releases-new-guidance-on-delegating-veterinary-work-to/
[7] rampregister.org
[8] ahpr.org.uk

prior to 1st September 2021 (2022). AHPR have a similar process however veterinary physiotherapists that qualified before 1st April 2020 are eligible (2022). Table 1 displays the current list of accredited courses. Continual membership is based on continuing compliance of the Code of Conduct and Standards of Practice, professional indemnity insurance, up to date Continuing Professional Development records, and a registration fee.

Table 1 The current accredited courses for the AHPR and RAMP registers

Institution	Course	Accredited Register
Animal Courses Direct[9]	Level 6 Diploma in Veterinary Physiotherapy with Hydrotherapy	RAMP
Harper Adams University[10]	Veterinary Physiotherapy BSc (Hons).	AHPR
Harper Adams University[11]	Veterinary Physiotherapy PgD / MSc	AHPR
Hartpury University[12]	MSc/PgDip Veterinary Physiotherapy	RAMP
Learn Direct[13]	Level 6 Diploma in Veterinary Physiotherapy with Hydrotherapy	RAMP
Stonebridge Associated Colleges[14]	Level 6 Diploma in Veterinary Physiotherapy with Hydrotherapy	RAMP
The Open College of Equine Studies[15]	Level 6 Diploma in Equine Physiotherapy	RAMP
University of Liverpool[16]	Pg Dip/MSc Veterinary Physiotherapy	RAMP
University of Nottingham[17]	Veterinary Physiotherapy PgDip / MSc	AHPR & RAMP
Warwickshire College University Centre[18]	BSc (Hons) Veterinary Physiotherapy	AHPR
Writtle University College[19]	Integrated Masters (MVetPhys) in Veterinary Physiotherapy	AHPR & RAMP
Writtle University College[20]	Veterinary Physiotherapy PgD / MSc	AHPR

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[9] animalcoursesdirect.co.uk/product/level-6-diploma-in-veterinary-physiotherapy-with-hydrotherapy/

[10] www.harper-adams.ac.uk/courses/undergraduate/201002/veterinary-physiotherapy

[11] www.harper-adams.ac.uk/courses/postgraduate/114/veterinary-physiotherapy

[12] www.hartpury.ac.uk/university/courses/postgraduate/msc-veterinary-physiotherapy

[13] www.learndirect.com/course/veterinary-physiotherapy-level-6-diploma-rqf-part-1

[14] www.stonebridge.uk.com/course/veterinary-physiotherapy-level-6-diploma-rqf-part-1

[15] www.equinestudies.co.uk/courses/diplomas-and-certificates/advanced/equine-physiotherapy-diploma-programme/

[16] www.liverpool.ac.uk/vets/cpd/vet-physio/

[17] www.nottingham.ac.uk/pgstudy/course/taught/Veterinary-Physiotherapy-MSc

[18] wcg.ac.uk/course/d16bfb0a-0772-e711-8111-e0071b6611f1/veterinary-physiotherapy

[19] writtle.ac.uk/MVetPhys-Veterinary-Physiotherapy

[20] writtle.ac.uk/MSc-Veterinary-Physiotherapy

Multiple professional interest groups exist for veterinary physiotherapists. There is an important distinction between registry bodies and professional interest groups. Registry bodies govern and regulate their members, and, in specific cases, the entire profession, such as with the Royal College of Veterinary Surgeons [RCVS] for qualified Veterinary Surgeons. Comparatively, professional interest groups act as forums for support, courses, CPD events, seminars, and training whilst requiring their members to pay a membership fee and to adhere to the professional code of conduct and ethics. Three of the largest professional interest groups are the Association of Chartered Physiotherapists in Animal Therapy [ACPAT][21], the Institute of Registered Veterinary & Animal Physiotherapists [IRVAP][22], and the National Association of Veterinary Physiotherapists [NAVP][23]. ACPAT is the most exclusive of the groups, requiring its members be human Chartered Physiotherapists first, then completing a degree in veterinary physiotherapy at the University of Liverpool or Hartpury University, or the Royal Veterinary College [RVC] course before its discontinuation. The professional interest groups exist to bring people together with common interests to raise the collective standards of the profession and provide opportunities for personal career development.

1.3 OUTCOME MEASURES IN PHYSIOTHERAPY AND VETERINARY PHYSIOTHERAPY

Within rehabilitation and treatments, patient developments are monitored using reliable judgement indicators, outcome measures. For the purposes of this study, the term "outcome measures" refers to tools, tests or scales administered and interpreted by Physiotherapists or veterinary physiotherapists that have been shown to measure accurately a particular attribute of interest and are expected to be influenced by outcome.

Outcome measures are commonly and extensively used within human medicine and surgery, including physiotherapy. The physiotherapy profession has an excellent reputation amongst the public as competent and qualified medical practitioners, in part for their use of evidence-based practice to maintain high standards across the profession (Goff, 2016). The use of evidence-based outcome measures has been fundamentally engrained in human physiotherapy, starting in their initial clinical training, and maintained throughout their career in upholding their professional code of conduct. Standard 12 of the Standards of Proficiency for Physiotherapists (2013)[24] states Physiotherapists named on the register must have assured the quality of their practice and auditing activity. Named Physiotherapists must use outcome measures appropriate to each case by gathering

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[21] www.acpat.org
[22] www.irvap.org.uk
[23] www.navp.co.uk
[24] www.hcpc-uk.org/resources/standards/standards-of-proficiency-physiotherapists/

quantitative and qualitative data to evaluate any necessary interventions based on changes of patient needs and health. Failure to uphold the Physiotherapist standard for proficiency would be disciplined, potentially resulting in being removed from the HCPC register meaning they could no longer practice as a Physiotherapist.

A widely accepted problem in veterinary physiotherapy practice is that outcome measures have not been sufficiently tested and evaluated with regard to intra- and inter-clinician comparisons. Veterinary physiotherapy students are taught about the use of outcome measures, but even so a more expansive investigation into how widely outcome measures are used within clinical veterinary physiotherapy practice is needed. Very little research into the current use and evidence base behind the use of outcome measures in veterinary physiotherapy exists. In one of the studies evaluated (Tabor and Williams, 2018), 6 of the 71 equine veterinary physiotherapist respondents reported that they did not use outcome measures because there were no validated measures available. This project will show that validated and evidence-based objective outcome measures do exist and have the potential to be used more by veterinary physiotherapists in both everyday cases and in specific scenarios. In the context of this study, "subjective" refers to outcome measures that are potentially influenced by inter- and intra- clinician variation. Comparatively, "objective" refers to outcome measures with minimal inter- and intra- clinician variation.

Canine hip dysplasia is the commonest presenting orthopaedic condition for dogs in the UK (Farrell, 2008) and internationally, osteoarthritis affects 20% of the adult dog population in the United States of America (Walton *et al*., 2013). Similarly, orthopaedic disorders in racehorses remain the most frequent reason for loss of performance (McGowan, 2008) and joint diseases specifically are one of the most common issues affecting sport horses (Contino, 2018). With no current medical or surgical cure for these orthopaedic conditions in either species (Farrell, 2008), management to minimise deterioration remains a viable option across canine and equine cases. Canine joint diseases are most often diagnosed through radiography, so monitoring deterioration or post-operative recovery through a similar method would appear logical, however poor correlation has been found between clinical presentation severity and osteophyte size, indicating another evidence-based method of judging the outcome should be used and should be based on the physical limitations of the animal (Dycus *et al.*, 2017). Similarly, the evidence-base for many of the techniques and outcome measures used in equine physical therapy is also lacking (Contino, 2018).

With limited existing research, outcome measures in veterinary physiotherapy are becoming increasingly important and relevant. Joint conditions are some of the most commonly presented

conditions to veterinary physiotherapists, hence the establishment of which outcome measures are most appropriate in this area are likely to have the greatest relevance and impact.

1.4 HYPOTHESIS

Outcome measures are underutilised in the veterinary physiotherapy profession.

1.5 AIMS

- To determine the quality of outcome measures being used in canine and equine veterinary physiotherapy practice
- To identify and investigate any disparity between the use of outcome measures and their perceived effectiveness between canine only, equine only, and multi-species veterinary physiotherapists
- To identify and investigate the effect of external factors, including education and professional groups, on the use of outcome measures by veterinary physiotherapists
- To suggest recommendations for the role and types of outcome measures to be used in joint cases

2 METHOD:

2.1 ETHICS STATEMENT

This study was submitted to, and has ethical approval, from the University of Nottingham Committee for Animal Research and Ethics. Ethical review number (ERN) 3401 210707.

2.2 LITERATURE REVIEW

2.2.1 DATABASE SELECTION

To acquire the relevant papers for the scoping review, multiple databases (Grindlay *et al*., 2012) were initially considered and contracted. These are listed in Table 2.

To avoid excess duplications appearing in the reference list, multiple databases were ruled out due to their contents being accessible under another, larger, database. Databases were also discounted if they included results classed as "grey material", thus avoiding any published research that had not been peer-reviewed. The process of peer-reviewing research material ensures that only research questions with valid and appropriate conclusions are published, reducing the incidence of low-quality papers (Kelly *et al*., 2014) often with inadequate citations (Falagas *et al*., 2008).

The final databases chosen to be used were CAB abstracts, Web of Science, and PubMed. CAB abstracts was chosen due to its highest extensive coverage of journals with significant veterinary and veterinary related content (90.2%) (Grindlay *et al*., 2012). PubMed and Web of Science were included due to their high breadth of coverage of medical and veterinary topics, including covering multiple other databases. Lists of papers produced by these databases were compatible with Endnote, allowing the search results from each database to be collated into a single list for referencing and analysis.

Table 2 The selection and lack of selection of the considered databases

Database	Inclusion/Exclusion of database
BIOSIS Previews[25]	Discounted: database accessible under Web of Science search
CAB abstracts[26]	Included
Current Contents-Agriculture, Biology & Environmental Sciences[27]	Discounted: database accessible under Web of Science search
MEDLINE[28]	Discounted: database accessible under PubMed search
Embase[29]	Discounted: database accessible under Scopus
Google Scholar[30]	Discounted: database includes grey literature
PubMed[31]	Included
Scopus[32]	Originally included, but all results produced were duplicates of CAB abstracts, PubMed, and Web of Science
Science Citation Index Expanded[33]	Discounted: database accessible under Web of Science search
Web of Science[34]	Included
Zoological Record[35]	Discounted: database accessible under Web of Science search

2.2.2 SEARCH TERMS
2.2.2.1 Preliminary selection and refinement of search terms

The objective of the literature review was to investigate how widely cited and utilised outcome measures are in veterinary physiotherapy. Multiple search terms were considered, added, removed, and refined in the process of generating the final search function. The search terms limiting the results to papers mentioning veterinary physiotherapy were removed. Consequently, this enabled the capture of papers analysing the outcome measure usage outside of the veterinary physiotherapist profession. This facilitated the selection of more relevant papers. For example, the objective process of measuring the range of motion of a joint using a goniometer would be equally as valid when used by a veterinarian as by a veterinary physiotherapist. Similarly, the search terms

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[25] www. clarivate.com/webofsciencegroup/solutions/webofscience-biosis-previews/
[26] www.cabi.org/publishing-products/cab-abstracts/
[27] www.wolterskluwer.com/en/solutions/ovid/current-contents---agriculture-biology-and-environmental-science-930
[28] www.nlm.nih.gov/medline/index.html
[29] www.embase.com
[30] scholar.google.co.uk
[31] pubmed.ncbi.nlm.nih.gov
[32] www.scopus.com
[33] clarivate.com/webofsciencegroup/solutions/webofscience-scie/
[34] www.webofscience.com/wos/woscc/basic-search
[35] clarivate.com/webofsciencegroup/solutions/webofscience-zoological-record

limiting the results to studies mentioning synonyms of the phrase "outcome measures" were removed because studies commenting on how effective a specific outcome measure is, whilst not referring to it as an outcome measure, would be missed. Examples of search terms excluded or refined are provided in Table 3.

Table 3 Original formats of search functions that have been discounted or refined

Some of the search terms not included in the final search include:
((Vet OR Veterinary) AND (Physiotherapy OR Physio OR Physiotherapist))
((Outcome OR Result* OR Performance OR Effect OR Success) AND (Measure* OR Achievement* OR Result* OR Indicator* OR Test* OR Criteria*))
Some of the search terms that were refined and then used in the final search include:
((Canine OR Canines OR Dog OR Dogs OR Puppy OR Puppies OR Bitch OR Bitches OR Canis) OR (Horse OR Horses OR Equine OR Equines OR Colt OR Colts OR Gelding OR Geldings OR Mare OR Mares OR Filly OR Fillies OR Stallion OR Stallions OR Foal or Foals OR Pony OR Ponies OR Equus))
(Rehabilitat* or Recover* OR Sports Maintenance OR Aged Maintenance OR Post-operative*)

Species parameters were needed to reduce the excess number of irrelevant results. This literature review is limited to studies relating to outcome measures applicable to canine and equine cases, so papers focused on other species would be extraneous results produced by the search. The species terms were refined based on a summary of evidence provided by BestBETs for Vets[36] to the most efficient species terms to use. Content parameter search terms were produced from the project research questions but were subsequently expanded on.

Qualifying search factors were added to the end of each word to specifically search for them as subject headings (exp /) and as key words (.mp.) (BestBETsforVets.org, 2021). These factors combined with the key words gave the final search that was entered into the chosen databases.

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[36] bestbetsforvets.org

2.2.2.2 Final search terms

The searches using the following search terms took place in September 2021 (Table 4):

Table 4 The finalised search function that was input into the database search engines

Final search function
(Dog.mp. OR dogs.mp. OR canine.mp. OR canines.mp. OR canis.mp. OR exp dogs/ OR Horse.mp. OR Horses.mp. OR Equine.mp. OR Equines.mp. OR Equus.mp. OR exp horses/)
AND
(Postoperative therapy.mp. OR post-operative therapy.mp. OR postoperative therapies.mp. OR post-operative therapies.mp. OR post-operative rehabilitation.mp. OR postoperative rehabilitation.mp. OR physical therapy.mp. OR physical therapies.mp. OR physical therapy modality.mp. OR physical therapy modalities.mp. OR exp physical therapy modalities/ OR physiotherapy.mp. OR physiotherapies.mp. OR physiotherapist.mp. OR physiotherapists)

2.2.3 INCLUSION AND EXCLUSION CRITERIA

When selecting the papers to analyse, the following inclusion and exclusion criteria were applied (Table 5):

Table 5 Inclusion and exclusion criteria applied to literature selection

	Inclusion criteria	Exclusion criteria
Population of interest	• Studies with dogs as primary species • Studies with horses as primary species • Studies including treatment through involvement of a veterinary physiotherapist	• Papers on exotic or wild animals • Papers with no canine or equine content • Papers relating to human physiotherapy only
Content	• Contains assessment of veterinary physiotherapy with regards to post-operative care/rehabilitation • Includes evaluation of outcome measure • Includes comparison between different outcome measures, including commenting on their efficacy and validity	• Study does not comment on, mention, or evaluate outcome measures • Titles not relevant to topic • Abstract not relevant to topic • Full paper content not relevant to topic
Miscellaneous	• Able to access full paper through the resources open to the University of Nottingham, the public, or requestable from the British library • Peer reviewed literature • Studies containing data gathered from the United Kingdom	• Papers not published in English • Unable to access full paper through the resources open to the University of Nottingham, the public, or requestable from the British library • Abstract only papers • Any format not a published paper • Grey and non-peer reviewed literature • Ongoing studies/trials

2.2.4 LITERATURE SELECTION

An electronic library comprising results from all database searches was compiled using Endnote Online 20[37]. Duplicates were removed from the stockpile employing the inbuilt Endnote software and the inclusion and exclusion criteria listed in Table 5, applied. The titles of all papers were assessed for relevance and duplicates missed by the software. This was then followed by screening of the remaining abstracts, using the same criteria (Table 5). Full text analysis of the final papers then took place, and each was critiqued considering the following criteria:

- Has the same method of application of the included outcome measure been reported and followed in multiple papers?
- Has the same method of application of the included outcome measure been reported and followed by multiple research groups?
- Were the outcome measures applied by the physiotherapist to canine patients, equine patients, or both?
- Were the use of outcome measures in human physiotherapy and veterinary physiotherapy comparable?

2.3 SURVEY OF VETERINARY PHYSIOTHERAPISTS

2.3.1 SURVEY SOFTWARE SELECTION, GDPR, AND CONSENT

UK law requires research conducted involving data collected from members of the public follows strict General Data Protection Regulation [GDPR] law.[38] That is, no personal information can be included without consent. Choosing a piece of survey software that ensures GDPR compliant security for any data collected was of paramount importance. The University of Nottingham requires all research to also ask for informed consent opt in at the beginning of each survey, clearly telling respondents what collected data will be used for. A clear description/rationale of the project must also be provided. Two software pieces were considered: JISC Online Surveys[39], and Microsoft Forms[40]. The two systems were compared in terms of setting up a flow of survey questions. Draft surveys were created on both sets of software to compare and contrast the two systems. Online Surveys, run by JISC, was the software recommended by the University due to GDPR compliance. Microsoft Forms allowed for a greater variety of question flow logic to be applied but was less easy to use and harder to extract the data afterwards. JISC Online Surveys was therefore chosen to be the platform to build the survey.

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[37] endnote.com
[38] www.legislation.gov.uk/ukpga/2018/12/contents/enacted
[39] www.onlinesurveys.ac.uk
[40] forms.office.com

The survey questions were preceded by a section asking for consent. With this in place, the survey was split into two sections; questions designed to gather context and questions about outcome measures specifically.

To comply with University of Nottingham guidelines, an acknowledgement of informed consent was added as the first page of the survey. This was to inform the public of how the data collected in the survey would be used and that it would be confidential, anonymised, and stored. The general structure of the survey is illustrated in Figure 1.

2.3.2 QUESTION GENERATION

In brief, the main survey was designed to add a location and experience data set to put later outcome measure experience into context. Questions regarding the veterinary physiotherapist's background, including the course they qualified through or any previous human qualifications and how long they have been qualified for, were added to allow for inter- and intra-clinician comparison when combined with the outcome measure data. A follow up question was added to stream the respondents down three routes based on discipline: canine, equine, or both. This survey logic stream allowed for species specific questions to be asked whilst avoiding the abundance of irrelevant other species questions and unnecessarily lengthening of the survey. This was to avoid dissuading the participants from giving up and abandoning the survey partway through. The logic pathways for each species all followed similar question patterns to allow for species-to-species outcome measure comparison. All pathways started with two further experience questions, the number of consultations per week and ascertaining the type of practice. This would allow exploration of any correlation between types of workplace and types and prevalence of outcome measures used.

The rest of the questions in each pathway were specifically about the outcome measures used. With the aims of the project being to ascertain if outcome measures are underutilised and the quality of evidence-base behind each outcome measure, investigating which outcome measures are currently being used was vital. Outcome measures included in the survey were selected following analysis of the literature and through consultation and discussion with the veterinary physiotherapists teaching at the School of Veterinary Medicine Science University of Nottingham. Questions were included asking the participants to rate their familiarity with outcome measures and then followed up with rating how effective they believed each outcome measures were for both acute and degenerative joint cases. The survey used the Likert scale of questioning to allow for comparison across responses, including both typical and even choice scales to minimise the central tendency bias. Incorporating these questions in multiple parts allows for investigation of any disparities where an ineffective outcome measure is used frequently or if an outcome measure perceived to be particularly effective

is underrepresented in use. To follow this up, the respondents were asked how useful they found resources for development and discovery of the outcome measures they used, including CPD courses, previous training, and if they developed any themselves. The final question included was to examine how the results of the outcome measures were recorded to identify if there was a correlation between how comprehensive the recording is and how comprehensive the outcome measure use is. The complete questionnaire can be found in Appendix A at the end of this document.
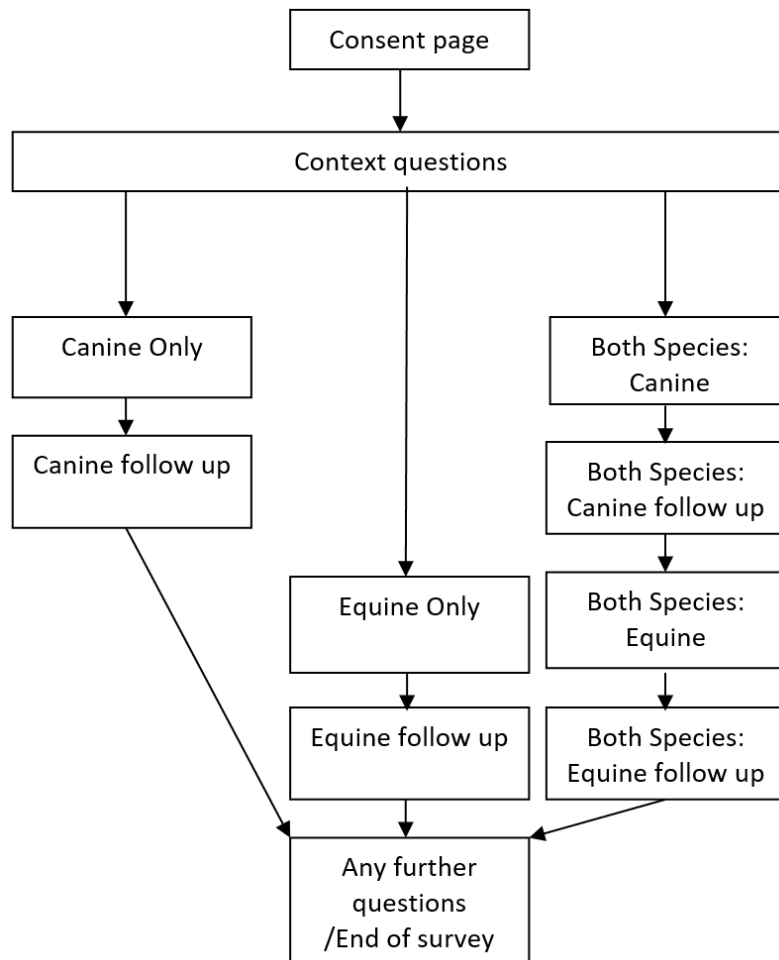
Figure 1 Survey logic diagram showing the possible question routes

2.3.3 DISTRIBUTION

There is no single registration, membership, or governing body for all veterinary physiotherapists.

Veterinary physiotherapy is not a protected title and so legally requires no overarching body.

Instead, multiple registry and professional bodies exist, including RAMP[41], AHPR[42], ACPAT[43], IRVAP[44],

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[41] rampregister.org
[42] ahpr.org.uk
[43] acpat.org
[44] irvap.org.uk

and NAVP[45]. Upon completion of the surveys, these bodies were contacted via email correspondence or through social media pages to request distribution in their restricted member groups and through their member email lists. Universities and colleges offering veterinary physiotherapy courses were approached and asked to distribute the survey amongst their alumni and their veterinary physiotherapist staff. The survey was sent to the veterinary physiotherapists that teach at the School of Veterinary Medicine and Science, University of Nottingham. Since estimating the size of the population that identify themselves as veterinary physiotherapists is not possible, surveys were cascaded out through registered bodies and universities. Recruited respondents therefore constituted a broad and relevant population (convenience sample) representative of those who practice veterinary physiotherapy.

2.4 DATA ANALYSIS PROCESS

The data collected from the JISC Online Survey were exported into Microsoft Excel[46]. The data were grouped into sheets to allow for comparisons to be made according to the project aims. The first datasheet included the raw data produced and formatted for filtering. This enabled the generation of additional datasheets that only included relevant information for each comparison aim. The results intended to be included in graphs were exported into GraphPad Prism 9[47], specifically chosen for its simple interface and ability to produce publication standard graphs of varying types and complexities, both important values in a time-sensitive project with a large dataset.

Analysis of each outcome measure was multifactorial, combining the results of the literature search content with the results of the veterinary physiotherapist survey. The data produced from the survey question set enabled the comparison between the type and quantity of outcome measures in veterinary physiotherapy practice and evidence base, i.e., the quality of research, underpinning them. The data were analysed using Chi Squared tests with the statistically significant threshold alpha (0.05). Chi squared was chosen for the detailed information that can be derived from using the test, along with ease of contribution and its ability to handle data from multiple groups (McHugh, 2013). The tests were performed using the Microsoft Excel inbuilt Chi Squared coded function. The results datasets with limited population size (n<5) were manually combined into larger groups for comparison if needed. Chi squared tests were not performed on datasets where it was not possible to produce comparable populations of n>5 and instead descriptive statistics used.

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[45] www.navp.co.uk
[46] www.microsoft.com/en-gb/microsoft-365/excel
[47] www.graphpad.com/scientific-software/prism

3 RESULTS

3.1 AGREED LIST OF OUTCOME MEASURES

Following consultation with veterinary physiotherapists employed by the University of Nottingham

and analysis of the literature, Table 6 lists the outcome measures selected for the survey.

Table 6 List of outcome measures included in the study with definitions in context of this study

Outcome Measure:	Definition:
How well is the animal?	The veterinary physiotherapist's subjective clinical judgement of the current health status of the animal and involves no other specific tests.
How well does the animal move?	The veterinary physiotherapist's subjective clinical judgement of the animal's movement capabilities and involves no other specific tests.
Hands-on assessment	The veterinary physiotherapist's subjective clinical judgement and subsequent recording of the status of the animal based on a physical clinical assessment.
Owner reported capability	The owner stating whether their animal can do a specific function, e.g. the animal can jump on the sofa.
Owner reported interpretation	The owner's subjective judgement as to how well their animal can do a specific function, e.g. the animal can jump on the sofa easier than before.
Standardised pain score	The veterinary physiotherapist's subjective clinical judgement of the current pain status of the animal compared with standardised descriptive pain levels.
Liverpool Osteoarthritis in Dogs [LOAD] score	The veterinary physiotherapist's subjective clinical judgement of the current osteoarthritis status of the animal against the standardised Liverpool Osteoarthritis in Dogs score levels.
Muscle mass measurement	Measuring the change in muscle mass as that muscle has increased or decreased use, and so indirectly monitors the effect of the veterinary physiotherapist's treatment as the pain in those joints change, e.g. tape measure.
Video tracking and gait analysis via phone/camera video	The veterinary physiotherapist videoing the animal's movement across the treatment and visually comparing changes in gait.
Video tracking and gait analysis via kinematic monitoring and analysis equipment	The veterinary physiotherapist videoing the animal's movement across the treatment using contrast markers and visually comparing changes in gait.
Video tracking, digital mapping, and gait analysis via phone/camera video and computer analysis apps	The veterinary physiotherapist videoing the animal's movement across the treatment, using computer software to map the gait, and then visually comparing changes in gait.
Video tracking, digital mapping, and gait analysis via kinematic monitoring and analysis equipment	The veterinary physiotherapist videoing the animal's movement across the treatment using contrast markers, having advanced computer software digitally map the movement and comparing changes in gait though computer and visual analysis.
Goniometer	The use of a goniometer device to measure changes in the range of motion angles of the joints undergoing treatment.
Weight bearing measurements on pressure mat	The veterinary physiotherapist using a weight distribution mat to monitor any changes in how the animal weight bears through its limbs.

3.2 LITERATURE REVIEW RESULTS

The results from the searches were used to investigate the current evidence-base for outcome measures used in canine and equine joint cases. The three-database literature searches, Web of Science, CAB Abstracts and PubMed, yielded 7138 papers. Web of Science produced the greatest number of results with 3412 papers, whilst PubMed produced 2598. CABabstracts yielded the fewest results with 1128. This was combined with two papers and two published books (McGowan, 2008, BSAVA, 2021), suggested by the consultant group of veterinary physiotherapists, used throughout the study, and created a collection totalling 7,142 papers/publications.

The inbuilt Endnote duplication removal process provided the initial filtering out of extraneous results from database overlap and removed nine papers. Figure 2 illustrates the process by which papers relevant to the project aims were selected. The titles were manually screened against the inclusion and exclusion criteria and any duplicates missed by the Endnote system. This resulted in the removal of 6927 papers deemed not suitable for review. A further 183 were removed via manual screening of the abstracts. During full text analysis, two papers were instead used in the introduction and removed from the list due to containing excellent background information but lack of relevance and contribution to the review itself. This left the final total number of papers that were critically reviewed at 20. These papers are listed in Table 7.
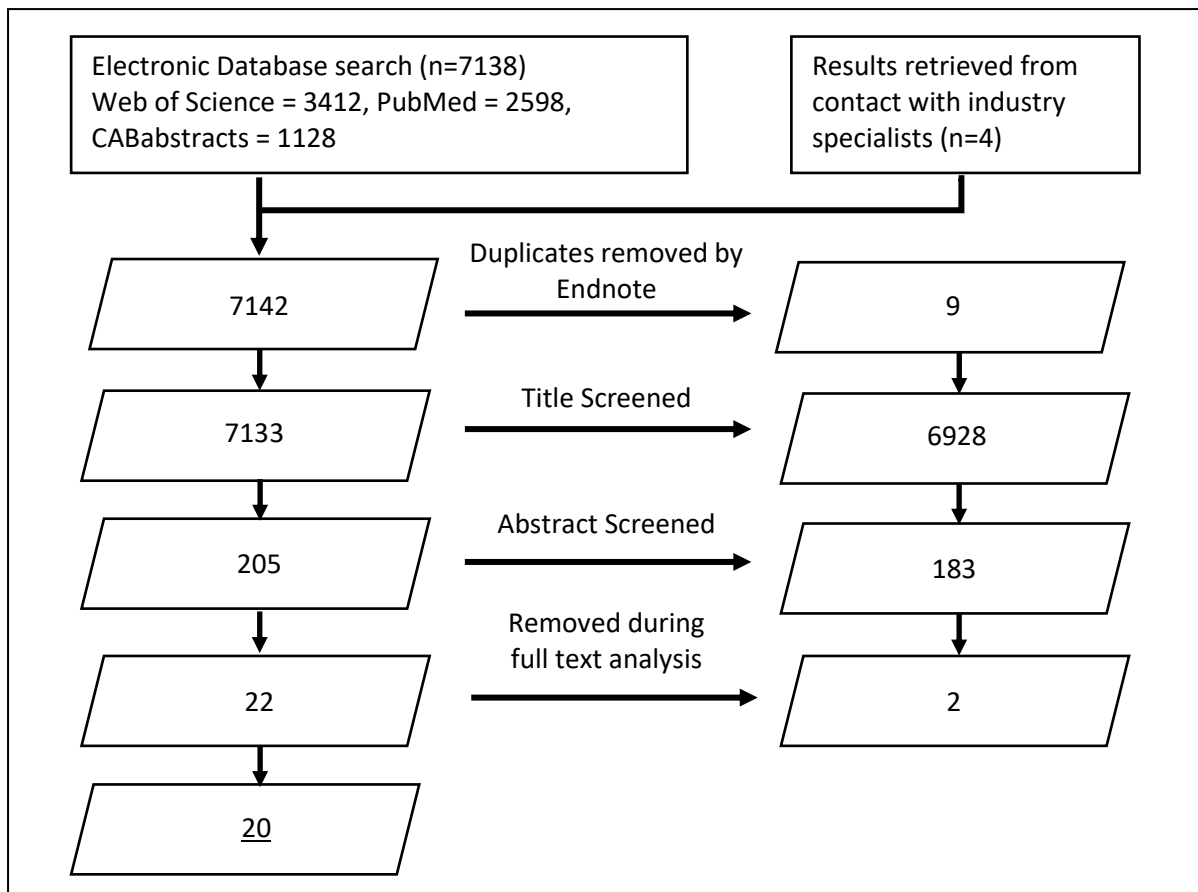
Figure 2 The systematic collection of papers to be analysed for the literature review: The flowchart details the systematic removal of duplicate papers and papers that did not meet the exclusion and inclusion criteria in at least one review stage

Table 7 The table compiling all 20 final papers for the literature review

Paper	Author	Year
Rehabilitation of the canine forelimb	Brown, J. A. *et al.*	2021
Development of an ethogram for a pain scoring system in ridden horses and its application to determine the presence of musculoskeletal pain	Dyson, S. *et al.*	2018
Non-surgical management of hip dysplasia	Farrell, M. *et al.*	2008
Goniometric Assessment in French Bulldogs	Formenton, M. R. *et al.*	2019
An equine pain face	Gleerup, K. B. *et al.*	2015
Physiotherapy Assessment for the Equine Athlete	Goff, L. *et al.*	2016
Psychometric testing of the Helsinki chronic pain index by completion of a questionnaire in Finnish by owners of dogs with chronic signs of pain caused by osteoarthritis	Hielm-Björkman, A. *et al.*	2009
Reliability of goniometry in Labrador Retrievers	Jaegger, G. *et al.*	2002
Use of standardized outcome measures in physical therapist practice: perceptions and applications	Jette, D. U. *et al.*	2009
Kinematic analysis of the hind limb during swimming and walking in healthy dogs and dogs with surgically corrected cranial cruciate ligament rupture	Marsolais, G. S. *et al.*	2003
Evidence for Canine Rehabilitation and Physical Therapy	Millis, D. L. *et al.*	2015
Abdominal myofascial pain syndrome must be considered in the differential diagnosis of chronic pelvic pain	Montenegro, M.L.L.S. *et al.*	2009
Fundamental principles of rehabilitation and musculoskeletal tissue healing	Shaw, K. K. *et al.*	2020
Objective measurement in equine physiotherapy. (Special Issue: Equine practice.)	Tabor, G. *et al.*	2020
The use of outcome measures in equine rehabilitation	Tabor, G. *et al.*	2018
Generation of Domains for the Equine Musculoskeletal Rehabilitation Outcome Score: Development by Expert Consensus	Tabor, G. *et al.*	2020
Routine equine physiotherapy	Tabor, G. *et al.*	2020
Physiotherapy optimizing result	Tanner, N. *et al.*	2018
Evaluation of construct and criterion validity for the 'Liverpool Osteoarthritis in Dogs' [LOAD] clinical metrology instrument and comparison to two other instruments	Walton, M. B. *et al.*	2013
Biomechanics of rehabilitation. (Rehabilitation and physical therapy.)	Weigel, J. P. *et al.*	2005

3.3 SURVEY OF VETERINARY PHYSIOTHERAPIST RESULTS

3.3.1 CONTEXTUAL BACKGROUND RESULTS

Background information was gathered in the survey of 40 veterinary physiotherapists, including current membership of registry bodies (Figure 3), professional interest groups (Figure 4), previous background information, including any previous professions (Table 8) and the route qualified through (Figure 5). All three graphs show spread across all options, with no single option dominating the results. Figure 3A shows 20 members of registry bodies, including one respondent that was a member of multiple registry bodies, and 20 non-members. These were further categorised into canine members (n=16), canine non-members (n=10) equine members (n=11) and equine non-members (n=9) (Figure 3B). Included in those numbers are mixed practitioners that provide treatment for both species. In addition, the respondents were further categorised in the basis of previous occupation including human physiotherapy (Table 8).
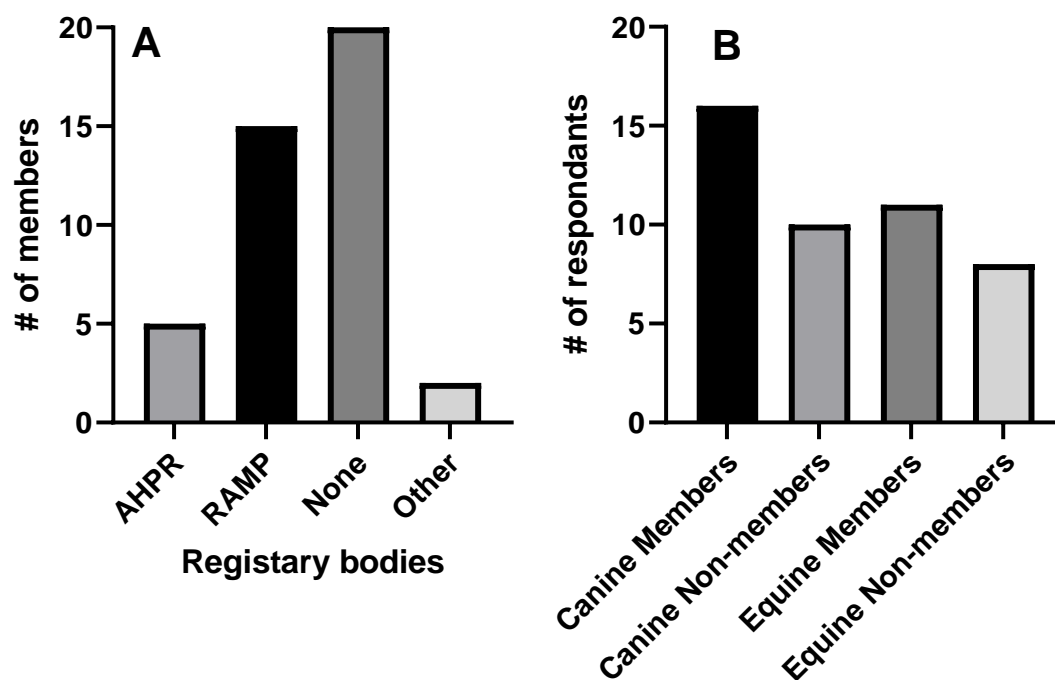
Figure 3 A: The number of members from each registry body taking part in the survey. "Other": 1x AHPRA, 1x RCVS. Any results listing "Other" and only stating professional interest groups were counted as "None". One result listed AHPR with RAMP membership pending, so was counted as currently AHPR only. Any results with multiple answers are displayed in all relevant categories B: The breakdown of registry body members (RAMP, AHPR, or Other) vs non-members split into canine and equine
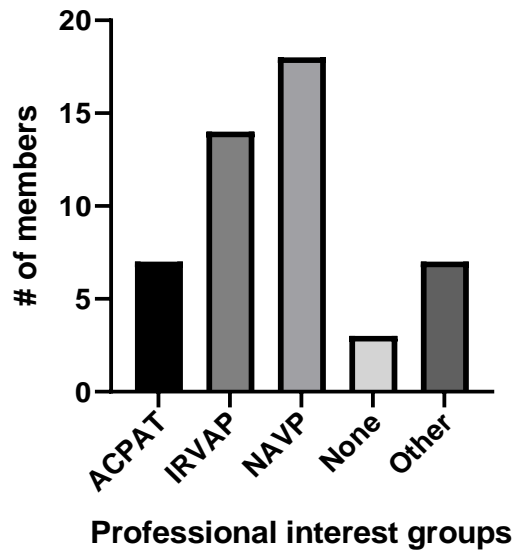
Figure 4 The number of members from each professional interest group taking part in the survey. "Other": 3x IAAT, 1x IAVRPT, 1x BVNA, 1x APG, 1x APA. Any results listing multiple professional interest groups were included in all corresponding data groups. Any results listing "Other" and stating professional interest groups were counted as part of that group as well as "Other".
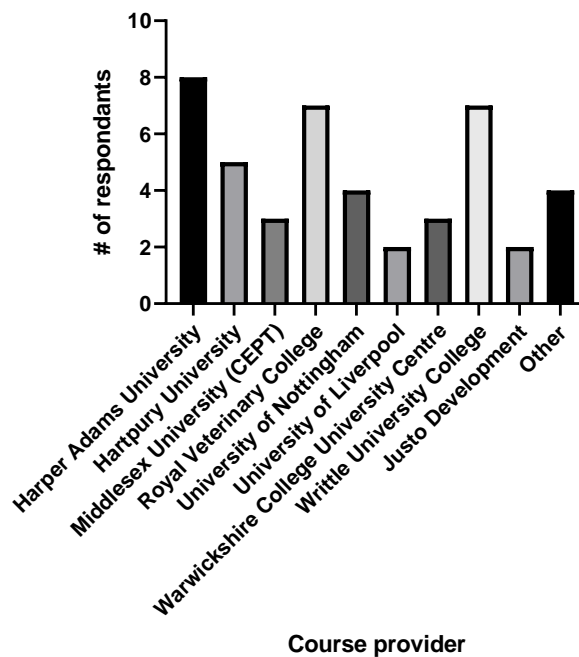
Figure 5 The number of respondents from each veterinary physiotherapy course. "Other": IAAT, Oxford College of Equine Physical Therapy, National Association of Animal Therapists, College of animal physiotherapy, and the University of Tennessee. The Middlesex University (CEPT) course and Justo Development courses no longer run.

Table 8 Previous or additional human qualifications. Any responses left unanswered were counted as "None". Any results with multiple answers are displayed in all relevant categories

Additional/Previous human qualification	# of respondent's answers
Physiotherapist	11
Sports Massage Therapist	2
Chiropractor	1
None	27

3.3.2 PROFESSIONAL REGISTERATIVE BODIES (RAMP/AHPR) MEMBERS VS NON-MEMBERS

Survey responses for canine and equine outcome measures are summarised in Tables 9 and 10 respectively. For each outcome measure, responses are split between those who are members of a registered body and those who have no current affiliation. Tables 9 and 10 indicate that membership of a professional body appears to be associated with increased outcome measure use and this is most evident in the canine data. Comparatively, "Standardised Pain score" is the only outcome measure that has a higher use prevalence in non-members across both species.

Table 9 The use of outcome measures in canine joint cases by veterinary physiotherapists with and without current membership of a registry body

Canine Outcome Measure	Member of registry body	Do not currently use	Have but rarely use	Have and frequently use	Use in every case
How well is the animal	Member	5% (1)	11% (2)	0% (0)	84% (16)
	Not	0% (0)	0% (0)	0% (0)	100% (10)
How well does the animal move	Member	11% (2)	0% (0)	0% (0)	89% (17)
	Not	0% (0)	0% (0)	0% (0)	100% (10)
Hands-on assessment	Member	0% (0)	5% (1)	0% (0)	95% (18)
	Not	0% (0)	0% (0)	0% (0)	100% (10)
Owner-reported capability	Member	0% (0)	0% (0)	16% (3)	84% (16)
	Not	0% (0)	10% (1)	10% (1)	80% (8)
Owner-reported interpretation	Member	0% (0)	0% (0)	16% (3)	84% (16)
	Not	0% (0)	20% (2)	30% (3)	50% (5)
Standardised Pain score	Member	11% (3)	58% (10)	26% (5)	5% (1)
	Not	20% (2)	40% (4)	40% (4)	0% (0)
Load score	Member	26% (5)	26% (5)	37% (7)	11% (2)
	Not	80% (8)	10% (1)	10% (1)	0% (0)
Muscle mass measurement	Member	5% (1)	32% (6)	37% (7)	26% (5)
	Not	10% (1)	50% (5)	20% (2)	20% (2)
Video tracking and gait analysis - kinematic monitoring and analysis equipment	Member	63% (12)	26% (5)	5% (1)	5% (1)
	Not	90% (9)	10% (1)	0% (0)	0% (0)
Video tracking and gait analysis - phone/camera	Member	5% (1)	11% (2)	63% (12)	21% (4)
	Not	30% (3)	30% (3)	30% (3)	10% (1)
Video tracking with digital mapping and gait analysis - kinematic monitoring and analysis equipment	Member	79% (15)	16% (3)	5% (1)	0% (0)
	Not	90% (9)	10% (1)	0% (0)	0% (0)
Video tracking with digital mapping and gait analysis - video recording and computer analysis apps	Member	74% (14)	16% (3)	5% (1)	5% (1)
	Not	90% (9)	10% (1)	0% (0)	0% (0)
Goniometer	Member	5% (1)	63% (12)	26% (5)	5% (1)
	Not	10% (1)	30% (3)	50% (5)	10% (1)
Weight bearing measurements on pressure mat	Member	63% (12)	16% (3)	11% (2)	11% (2)
	Not	80% (8)	10% (1)	0% (0)	10% (1)

Respondants that answered "unaware", "Aware but unlikely to invest in", and "Aware of and would like to invest in" were all counted as "Do not currently use". In cells where n<5, the percentages shown are purely mathematical percentages from the data and not necessarily statistically significant or representative. Shaded squares indicate results of >50% and the lighter shaded squares are 30-50%.

Table 10 The use of outcome measures in equine joint cases by veterinary physiotherapists with and without current membership of a registry body

Equine Outcome Measure	Member of registry body	Do not currently use	Have but rarely use	Have and frequently use	Use in every case
How well is the animal	Member	0% (0)	0% (0)	8% (1)	92% (11)
	Not	0% (0)	0% (0)	11% (1)	89% (8)
How well does the animal move	Member	0% (0)	0% (0)	8% (1)	92% (11)
	Not	0% (0)	0% (0)	0% (0)	100% (9)
Hands-on assessment	Member	0% (0)	0% (0)	8% (1)	92% (11)
	Not	0% (0)	0% (0)	0% (0)	100% (9)
Owner-reported capability	Member	0% (0)	0% (0)	42% (5)	58% (7)
	Not	0% (0)	0% (0)	11% (1)	89% (8)
Owner-reported interpretation	Member	0% (0)	0% (0)	42% (5)	58% (7)
	Not	0% (0)	0% (0)	11% (1)	89% (8)
Standardised Pain score	Member	25% (3)	50% (6)	17% (2)	8% (1)
	Not	11% (1)	22% (2)	33% (3)	33% (3)
Muscle mass measurement	Member	17% (2)	67% (8)	8% (1)	8% (1)
	Not	11% (1)	44% (4)	22% (2)	22% (2)
Video tracking and gait analysis - kinematic monitoring and analysis equipment	Member	75% (9)	17% (2)	8% (1)	0% (0)
	Not	67% (6)	22% (2)	0% (0)	11% (1)
Video tracking and gait analysis - phone/camera	Member	25% (3)	17% (2)	50% (6)	8% (1)
	Not	33% (3)	22% (2)	22% (2)	22% (2)
Video tracking with digital mapping and gait analysis - kinematic monitoring and analysis equipment	Member	75% (9)	17% (2)	8% (1)	0% (0)
	Not	78% (7)	11% (1)	0% (0)	11% (1)
Video tracking with digital mapping and gait analysis - video recording and computer analysis apps	Member	75% (9)	8% (1)	8% (1)	8% (1)
	Not	78% (7)	11% (1)	0% (0)	11% (1)
Goniometer	Member	25% (3)	67% (8)	8% (1)	0% (0)
	Not	56% (5)	22% (2)	11% (1)	11% (1)
Weight bearing measurements on pressure mat	Member	83% (10)	17% (2)	0% (0)	0% (0)
	Not	89% (8)	0% (0)	0% (0)	11% (1)

Respondents that answered "unaware", "Aware but unlikely to invest in", and "Aware of and would like to invest in" were all counted as "Do not currently use". In cells where n<5, the percentages shown are purely mathematical percentages from the data and not necessarily statistically significant or representative. Shaded squares indicate results of >50% and the lighter shaded squares are 30-50%.

3.3.3 BACKGROUND QUALIFICATIONS: HUMAN PHYSIOTHERAPIST VS OTHER

To explore the influence of previous training in human physiotherapy on outcome measure usage in veterinary physiotherapy, responses from those with such training were compared to those with a different educational background. With respect to both canine (Table 11) and equine (Table 12) outcome measures, there appear to be minimal differences between the two demographics. In cells where n<5, the percentages shown are purely mathematical percentages from the data and not necessarily statistically significant or representative.

Table 11 The outcome measures being used in canine joint cases by veterinary physiotherapists with and without a human physiotherapist background.

Canine Outcome Measure	Background	Do not currently use	Have but rarely use	Have and frequently use	Use in every case
How well is the animal	Human Physiotherapist	17% (1)	0% (0)	0% (0)	83% (5)
	Other	0% (0)	9% (2)	0% (0)	91% (21)
How well does the animal move	Human Physiotherapist	17% (1)	0% (0)	0% (0)	83% (5)
	Other	4% (1)	0% (0)	0% (0)	96% (22)
Hands-on assessment	Human Physiotherapist	0% (0)	17% (1)	0% (0)	83% (5)
	Other	0% (0)	0% (0)	0% (0)	100% (23)
Owner-reported capability	Human Physiotherapist	0% (0)	0% (0)	17% (1)	83% (5)
	Other	0% (0)	4% (1)	13% (3)	83% (19)
Owner-reported interpretation	Human Physiotherapist	0% (0)	0% (0)	17% (1)	83% (5)
	Other	0% (0)	9% (2)	22% (5)	70% (16)
Standardised Pain score	Human Physiotherapist	0% (0)	83% (5)	17% (1)	0% (0)
	Other	17% (4)	43% (10)	35% (8)	4% (1)
LOAD Score (Liverpool Osteoarthritis in Dogs)	Human Physiotherapist	17% (1)	67% (4)	17% (1)	0% (0)
	Other	52% (12)	9% (2)	30% (7)	9% (2)
Muscle mass measurement	Human Physiotherapist	17% (1)	50% (3)	33% (2)	0% (0)
	Other	4% (1)	35% (8)	30% (7)	30% (7)
Video tracking and gait analysis - kinematic monitoring and analysis equipment	Human Physiotherapist	83% (5)	17% (1)	0% (0)	0% (0)
	Other	70% (16)	22% (5)	4% (1)	4% (1)
Video tracking and gait analysis - phone/camera	Human Physiotherapist	0% (0)	17% (1)	67% (4)	17% (1)
	Other	17% (4)	17% (4)	48% (11)	17% (4)
Video tracking with digital mapping and gait analysis - kinematic monitoring and analysis equipment	Human Physiotherapist	83% (5)	17% (1)	0% (0)	0% (0)
	Other	83% (19)	13% (3)	4% (1)	0% (0)
Video tracking with digital mapping and gait analysis - video recording and computer analysis apps	Human Physiotherapist	83% (5)	17% (1)	0% (0)	0% (0)
	Other	78% (18)	13% (3)	4% (1)	4% (1)
Goniometer	Human Physiotherapist	17% (1)	50% (3)	33% (2)	0% (0)
	Other	4% (1)	52% (12)	35% (8)	9% (2)
Weight bearing measurement on pressure mat	Human Physiotherapist	67% (4)	17% (1)	17% (1)	0% (0)
	Other	70% (16)	13% (3)	4% (1)	13% (3)

Respondents that answered "unaware", "Aware but unlikely to invest in", and "Aware of and would like to invest in" were all counted as "Do not currently use". Shaded squares indicate results of >50% and the lighter shaded squares are 30-50%.

Table 12 The outcome measures being used in equine joint cases by veterinary physiotherapists with and without a human physiotherapist background.

Equine Outcome Measure	Background	Do not currently use	Have but rarely use	Have and frequently use	Use in every case
How well is the animal	Human Physiotherapist	0% (0)	0% (0)	0% (0)	100% (6)
	Other	0% (0)	0% (0)	15% (2)	85% (11)
How well does the animal move	Human Physiotherapist	0% (0)	0% (0)	0% (0)	100% (6)
	Other	0% (0)	0% (0)	8% (1)	92% (12)
Hands-on assessment	Human Physiotherapist	0% (0)	0% (0)	0% (0)	100% (6)
	Other	0% (0)	0% (0)	0% (0)	100% (13)
Owner-reported capability	Human Physiotherapist	0% (0)	0% (0)	0% (0)	100% (6)
	Other	0% (0)	0% (0)	38% (5)	62% (8)
Owner-reported interpretation	Human Physiotherapist	0% (0)	0% (0)	0% (0)	100% (6)
	Other	0% (0)	0% (0)	38% (5)	62% (8)
Standardised Pain score	Human Physiotherapist	17% (1)	67% (4)	17% (1)	0% (0)
	Other	23% (3)	23% (3)	31% (4)	23% (3)
Muscle mass measurement	Human Physiotherapist	17% (1)	83% (5)	0% (0)	0% (0)
	Other	15% (2)	46% (6)	15% (2)	23% (3)
Video tracking and gait analysis - kinematic monitoring and analysis equipment	Human Physiotherapist	67% (4)	33% (2)	0% (0)	0% (0)
	Other	69% (9)	15% (2)	8% (1)	8% (1)
Video tracking and gait analysis - phone/camera	Human Physiotherapist	50% (3)	33% (2)	17% (1)	0% (0)
	Other	15% (2)	8% (1)	54% (7)	23% (3)
Video tracking with digital mapping and gait analysis - kinematic monitoring and analysis equipment	Human Physiotherapist	83% (5)	17% (1)	0% (0)	0% (0)
	Other	69% (9)	15% (2)	8% (1)	8% (1)
Video tracking with digital mapping and gait analysis - video recording and computer analysis apps	Human Physiotherapist	83% (5)	17% (1)	0% (0)	0% (0)
	Other	69% (9)	8% (1)	8% (1)	15% (2)
Goniometer	Human Physiotherapist	33% (2)	50% (3)	17% (1)	0% (0)
	Other	38% (5)	46% (6)	8% (1)	8% (1)
Weight bearing measurements on pressure mat	Human Physiotherapist	83% (5)	17% (1)	0% (0)	0% (0)
	Other	85% (11)	8% (1)	0% (0)	8% (1)

Respondants that answered "unaware", "Aware but unlikely to invest in", and "Aware of and would like to invest in" were all counted as "Do not currently use". Shaded squares indicate results of >50% and the lighter shaded squares are 30-50%.

3.3.4 LEVELS OF USAGE AND PERCEIVED EFFECTIVENESS IN ACUTE/DEGENERATIVE JOINT CASES

The 40 survey respondents were subdivided into: 19 "Solely Canine", 11 "Solely Equine" and 10 "Mixed". The results datasets with limited population size (n<5) were combined into larger similar groups for comparison if needed. Chi squared tests were not performed on datasets where it was not possible to produce comparable populations of n>5.

3.3.4.1 How well is the animal?

Figure 6 (canine) and Figure 7 (equine) describe the survey returns for the outcome measure "How well is the animal?"

The outcome measure "How well is the animal?" referred to the veterinary physiotherapist's subjective clinical judgement of the current health status of the animal and involves no other specific tests. This outcome measure was familiar to every clinician surveyed. The graphs in Figure 6 demonstrate a clear high use of this outcome measure across both groups in both species, with the option "Use in every case" being the overwhelming answer chosen by the survey respondents using descriptive statistics. A chi squared test was used to test if there were any differences between its use by purely canine, purely equine, and mixed practitioners. This gave a high value (P=0.97: df=1: n=45: Chi Square), indicating its high use was equally prevalent across all species as there was no statistical difference between species.

The perceived effectiveness of the outcome measure (How well is the animal?) from the perspective of the veterinary physiotherapist using it across canine and equine acute and degenerative joint cases is displayed in Figure 7. All four graphs indicate that veterinary physiotherapists believe it to be an outcome measure worthy of use, however most answers appeared in a group encouraging it to be used alongside other outcome measures. Solely canine practitioners, shown in Figure 7A and C, indicate that this outcome measure is believed to be less effective in degenerative joint cases. Using descriptive statistics for comparison of all four graphs in Figure 7 indicates that practitioners believed this outcome measure to be less effective in horses than in dogs, with the largest percentage in every equine dataset being the option "only used in combination".

Notably, Figure 6 indicates that it is an outcome measure very commonly used, whereas Figure 7 illustrates that this is only the case when used in combination with other outcome measures.
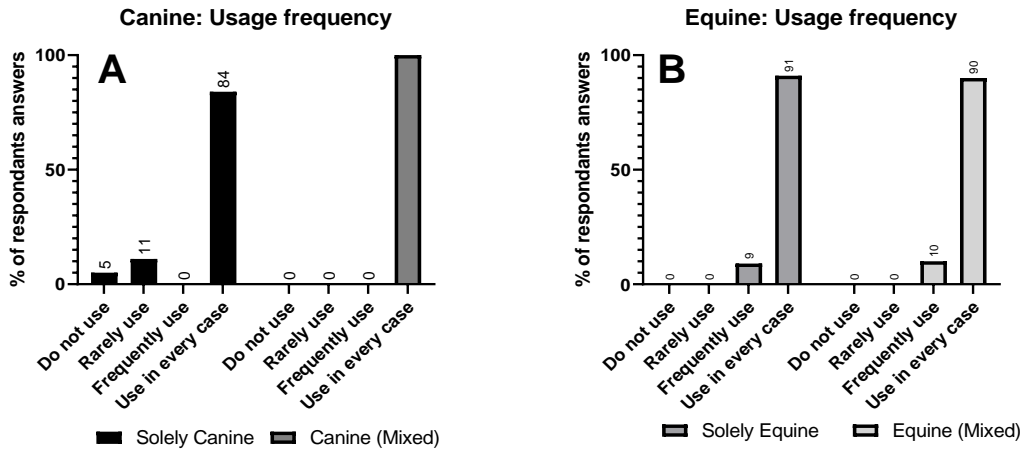
Canine: Usage frequency

A

Equine: Usage frequency

B

Figure 6 The usage frequency of the outcome measure "How well is the animal?". ***A:*** *Data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10).* ***B:*** *Data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10)*
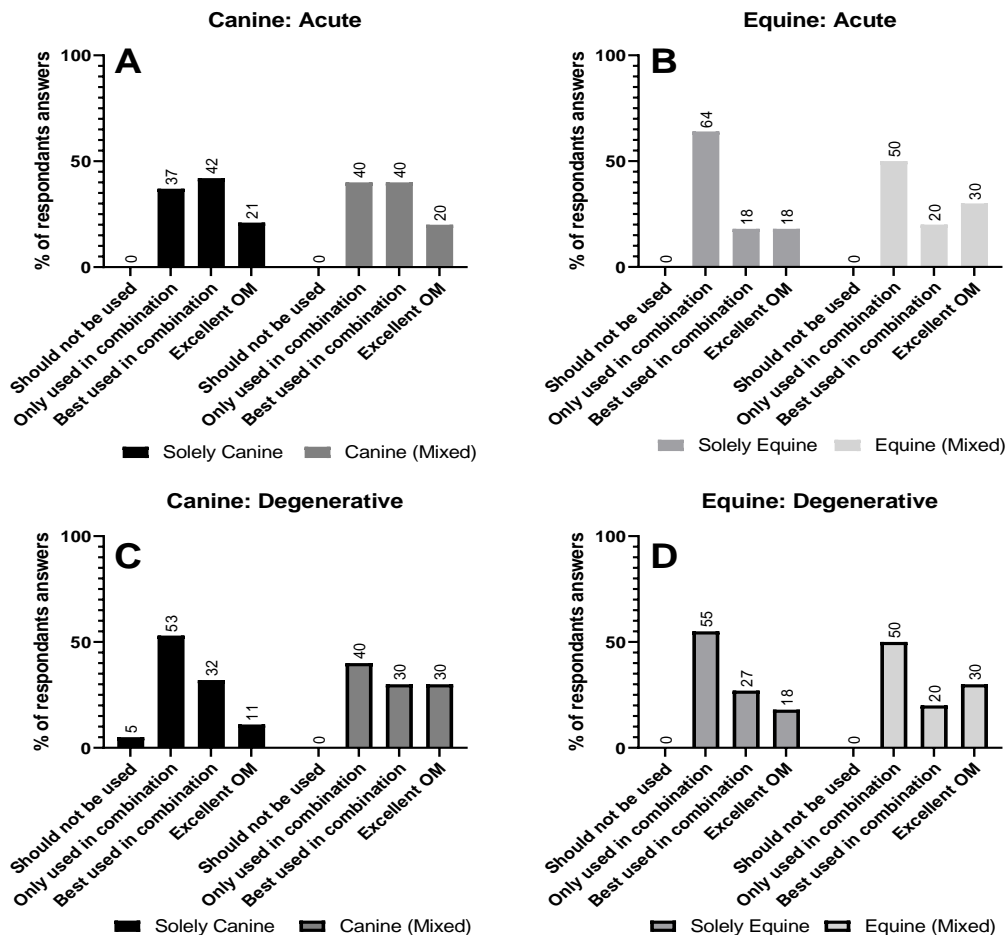

Canine: Acute

A

Equine: Acute

B

Canine: Degenerative

C

Equine: Degenerative

D

Figure 7 The perceived effectiveness of the outcome measure "How well is the animal?" ***A:*** *Acute joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10).* ***B:*** *Acute joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10).* ***C:**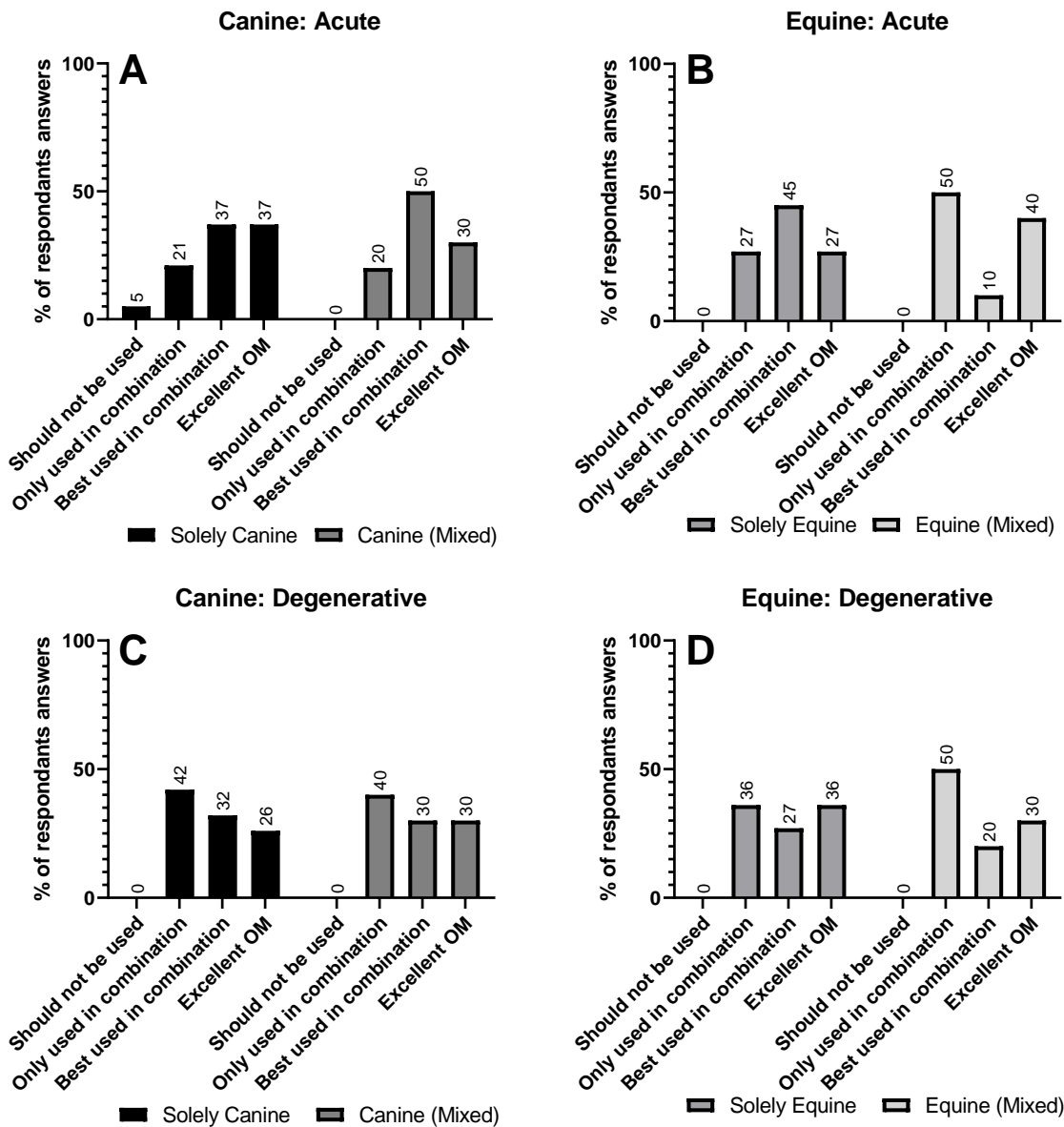* *Degenerative joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10).* ***D:*** *Degenerative joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10)*

3.3.4.2 How well does the animal move?

Figure 8 (canine) and Figure 9 (equine) describe the survey returns for the outcome measure "How well does the animal move?"

The outcome measure "How well does the animal move?" referred to the veterinary physiotherapist's subjective clinical judgement of the animal's movement capabilities and involves no other specific tests. This outcome measure was familiar to every clinician surveyed regardless of speciality (canine, equine, mixed). The graphs in Figure 7 demonstrate a clear high use of this outcome measure across both groups in both species, with the option "Use in every case" being the overwhelming option chosen by the survey respondents.

The perceived effectiveness of the outcome measure from the perspective of the veterinary physiotherapist using it across canine and equine acute and degenerative joint cases is displayed in Figure 9. With descriptive statistics applied, all four graphs appear similar. The option "Only used in combination" has a consistently high value in degenerative and equine acute cases. The outcome measure appeared to be valued highest by veterinary physiotherapists in acute canine joint cases, Figure 9A. Figure 9B shows a split in how effective equine veterinary physiotherapists view this outcome measure with large percentages voting "Only used in combination" and "Excellent OM". This outcome measure appears to be slightly less effective for degenerative joint cases, however this may not be statistically significant due to the limited sample size of the study.

Notably, Figure 8 indicates that it is an outcome measure very commonly used, whereas Figure 9 illustrates that this is only the case when used in combination with other outcome measures.
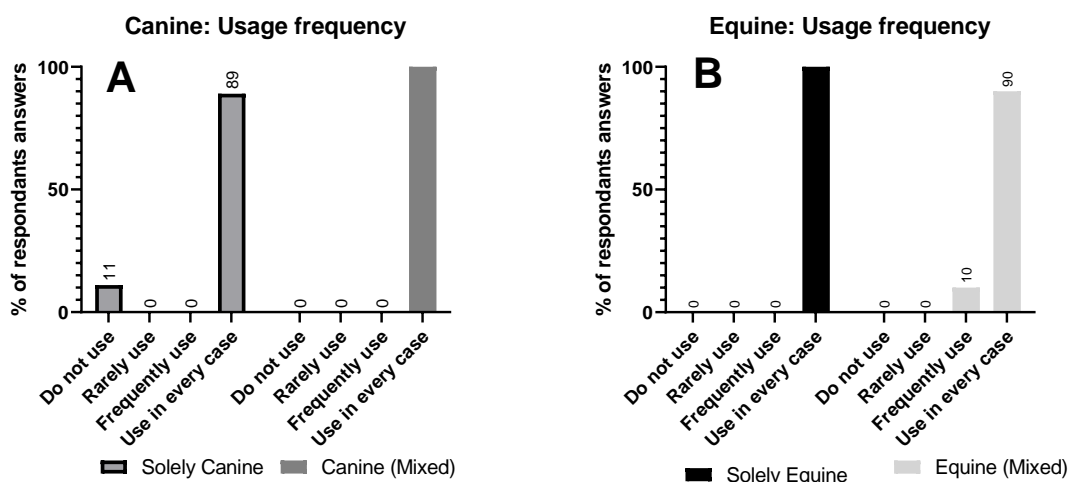
Figure 8 The usage frequency of the outcome measure "How well does the animal move?". *A: Data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). B: Data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10)*
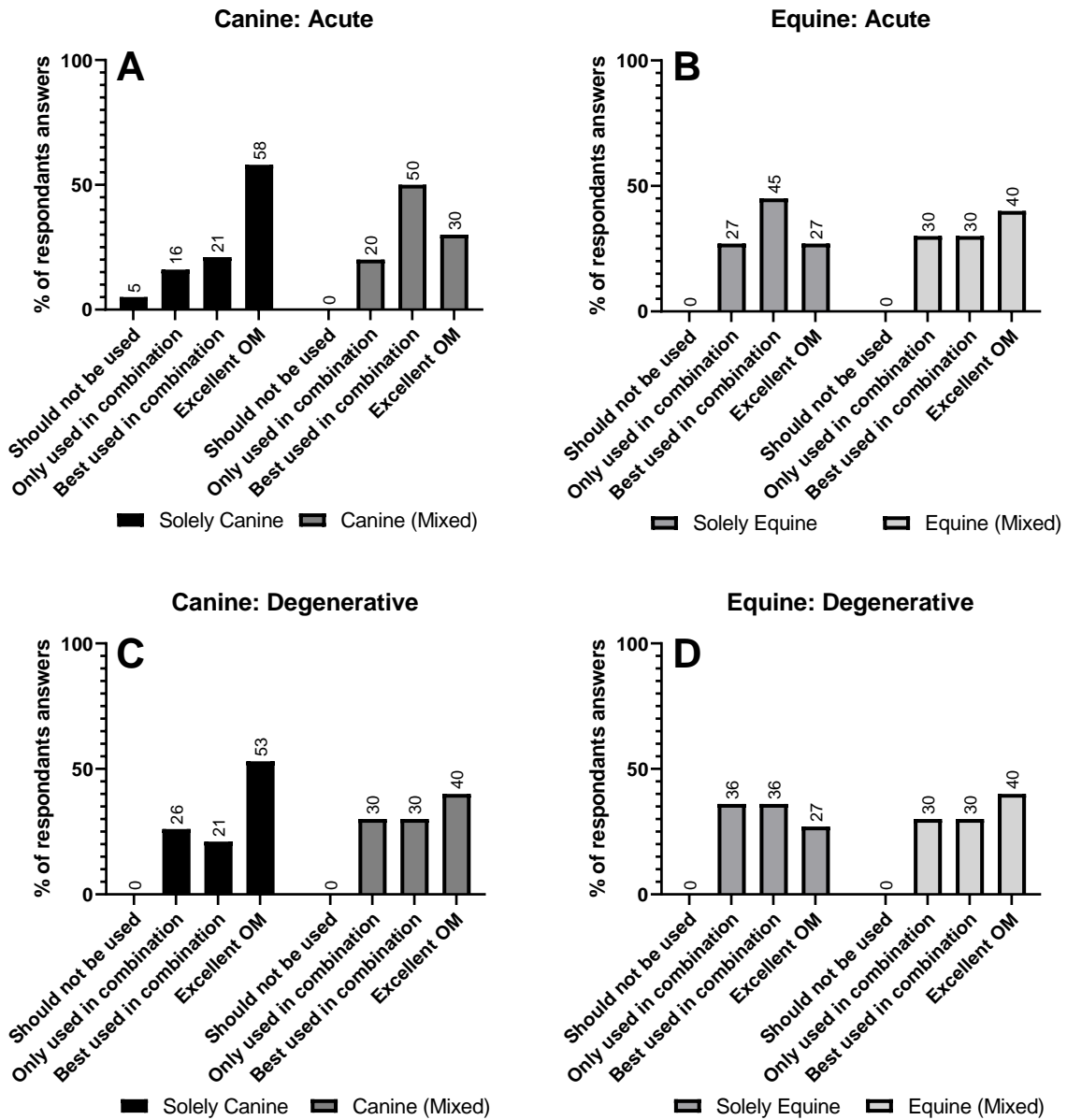
Figure 9 The perceived effectiveness of the outcome measure "How well does the animal move?" A: Acute joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). B: Acute joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10). C: Degenerative joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). D: Degenerative joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10)

3.3.4.3 Hands-on assessment

Figure 10 (canine) and Figure 11 (equine) describe the survey returns for the outcome measure "Hands-on assessment."

The outcome measure "Hands-on assessment" referred to the veterinary physiotherapist's subjective clinical judgement and subsequent recording of the status of the animal based on a physical clinical assessment. This outcome measure was familiar to every clinician surveyed. The graphs in Figure 10 demonstrate a clear high use of this outcome measure across both groups in both species, with the option "use in every case" being the overwhelming option chosen by the survey respondents when descriptive statistics are applied for analysis. No statistically significant differences were observed between species for how often this outcome measure is used.

Comparison of responses shown in Figure 11 shows that "Hands-on Assessment" is viewed as a more effective outcome measure in dogs than in horses. There appears to be no significant differences between its perceived effectiveness in acute and degenerative joint cases for both dogs (Figure 11A vs 11C) and horses (Figure 11B vs D). Figure 11B and D indicate that the outcome measure is used more in combination with other outcome measures in equine joint cases as compared to canine (Figure 11A vs C).
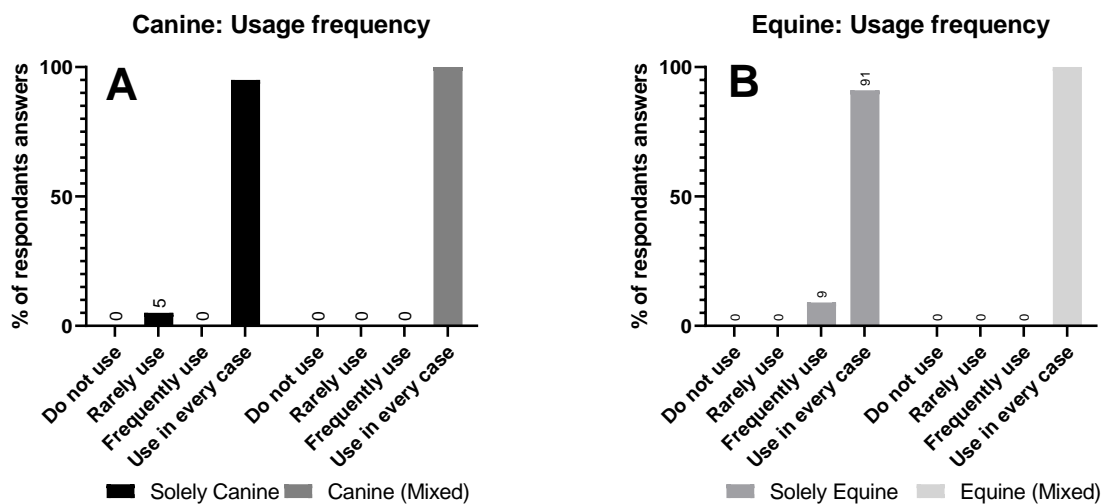
*Figure 10 The usage frequency of the outcome measure "Hands-on assessment". **A:** Data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). **B:** Data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10)*

Figure 11 The perceived effectiveness of the outcome measure "Hands-on assessment". *A: Acute joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). **B:** Acute joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10). **C:** Degenerative joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). **D:** Degenerative joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10)*

3.3.4.4 Owner-reported capability and Owner-reported interpretation

Figure 12, Figure 13, and Figure 14 describe the survey returns for the outcome measures "Owner reported capability" and "Owner-reported interpretation."

The outcome measure "Owner reported capability" referred to the owner stating whether their animal can do a specific function, e.g., the animal can jump on the sofa. The outcome measure "Owner reported interpretation" referred to the owner's subjective judgement as to how well their animal can do a specific function, e.g., the animal can jump on the sofa easier than before.

Figure 12A and B show a greater use of the "Owner reported capability" in the canine joint cases than in equine cases, and both graphs show a higher use by mixed-species veterinary physiotherapists against their sole species counterparts. However, statistical analysis of the raw data indicated no significant difference (P=0.83: df=1: Chi Square) between sole and mixed species clinicians. A second statistical analysis comparing its use in canine and equine cases indicated no statistical difference (P=0.10: df=1: Chi Square). Figure 12C and D show very little variation between species in how often "Owner reported interpretation" is used as an outcome measure. It should be noted that the limited sample size of the study may influence both the graphs and statistical tests to not be representative of the wider veterinary physiotherapist profession.

There appears to be minimal difference between the outcome measure shown in Figure 12A and B and the outcome measure shown in Figure 12C and D, with the only variation being slightly decreased use in canine joint cases in Figure 12C.

In terms of the outcome measure "Owner reported capability", no differences were observed between canine and equine acute disease (Figure 13A vs B). Similarly, no species differences were observed for the outcome measure "Owner reported interpretation" (Figure 13C vs D For both outcome measures, the veterinary physiotherapists chose the option "Only used in combination", a trend shared amongst all eight datasets. The other dataset options appear to be unremarkable. When the same analysis was carried out for degenerative diseases, there was again no difference for either of the two outcome measures (Figure 14). In comparing degenerative to acute canine disease, any differences are minimal and may not be significant due to the limited respondent size. Descriptive statistical analysis of the differences between equine acute and degenerative datasets provide no remarkable differences.

Figure 12 indicates that these are very frequently used outcome measures, especially by mixed-species veterinary physiotherapists, whereas both Figure 13 and Figure 14 illustrates that this is only the case when used in combination with other outcome measures.
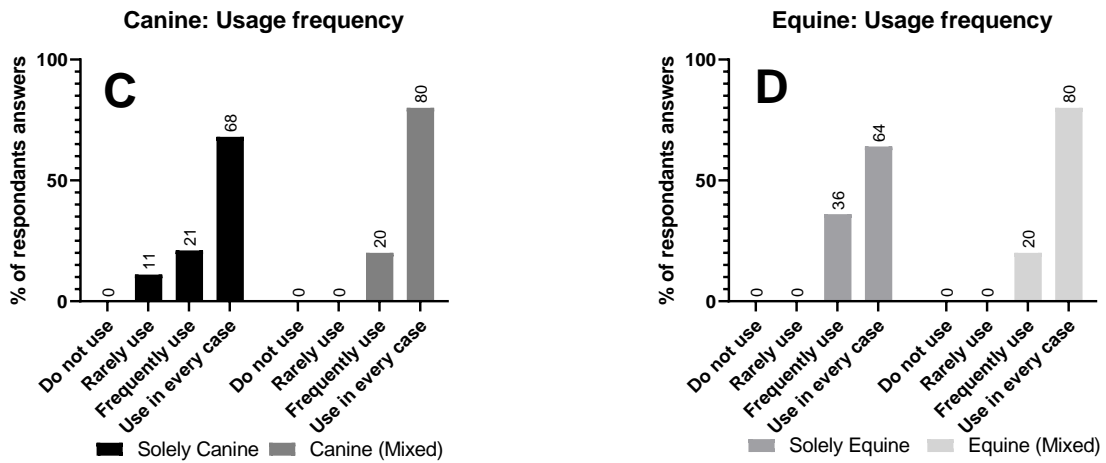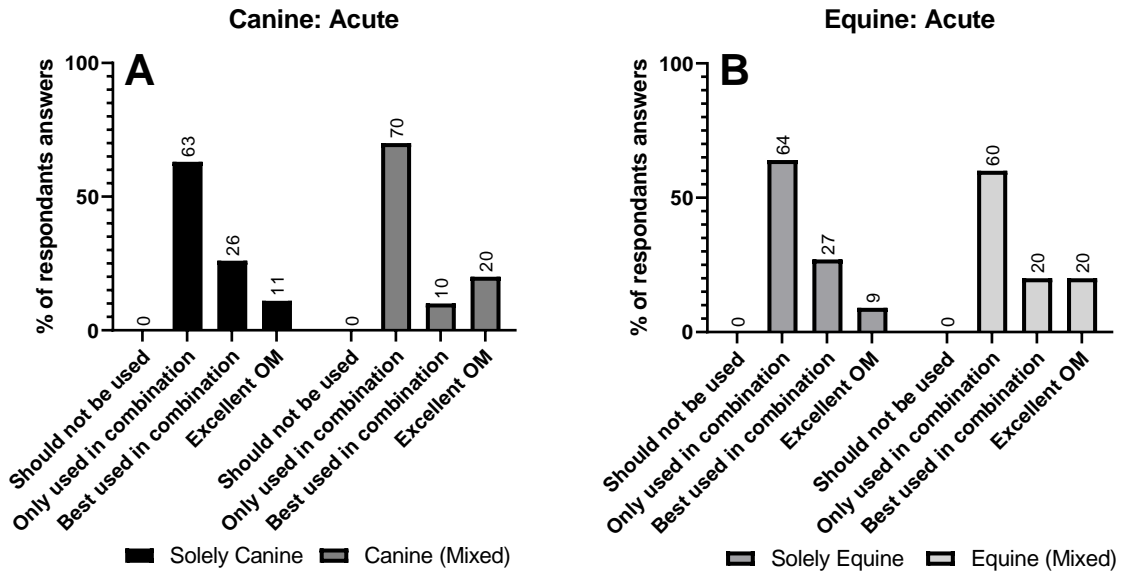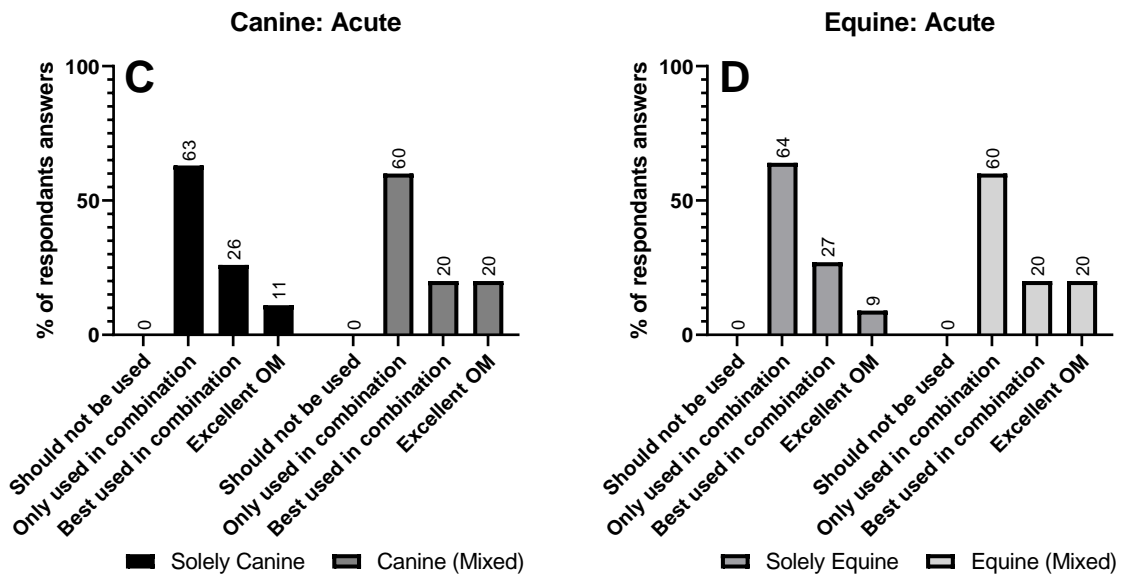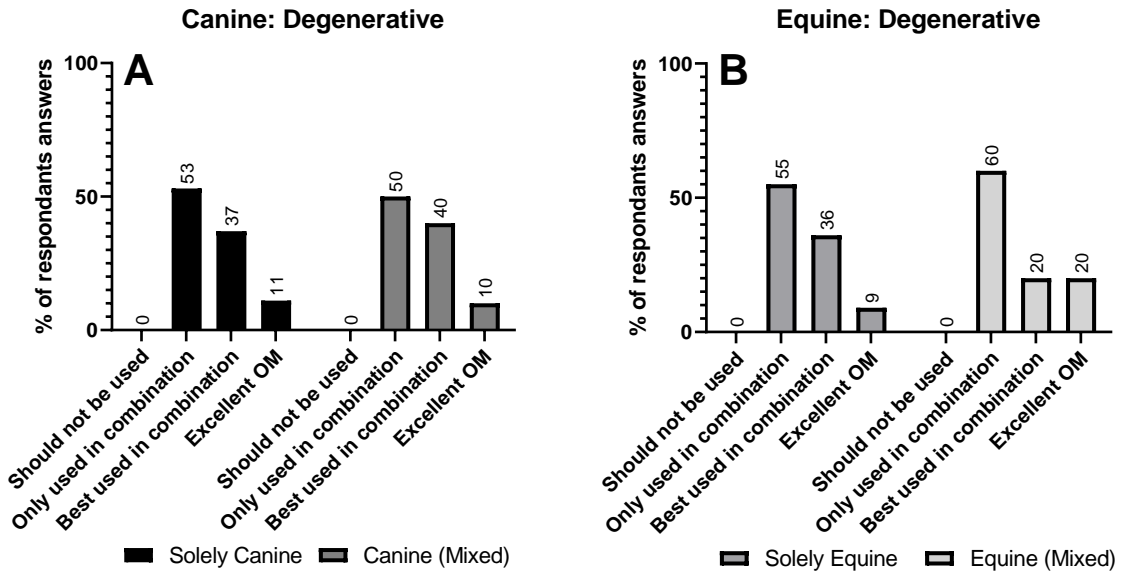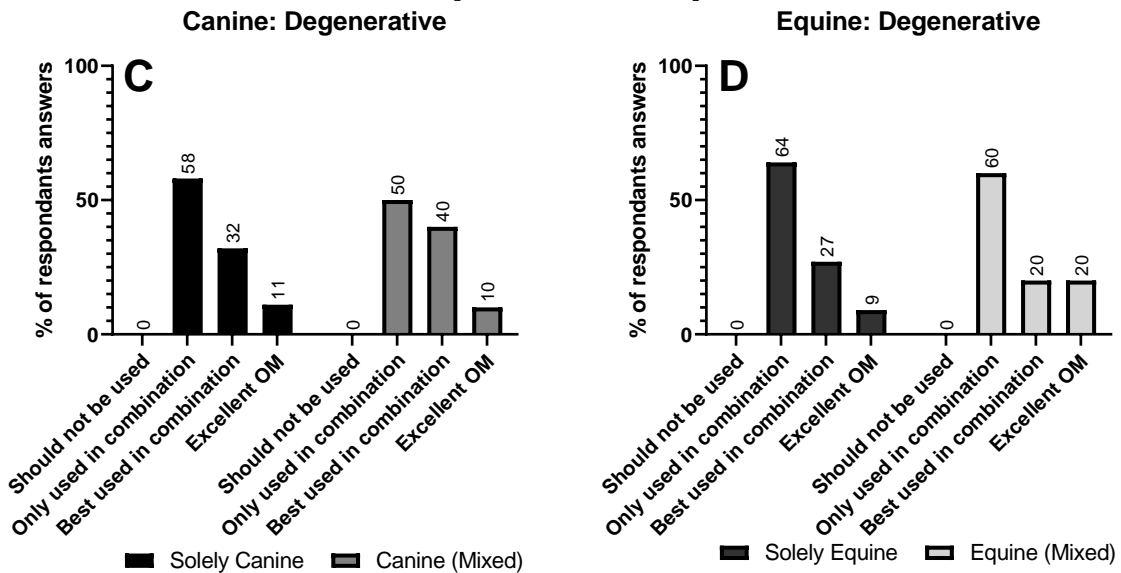
Owner reported capability

Canine: Usage frequency

A
Values shown: Do not use 0, Rarely use 5, Frequently use 16, Use in every case 79 (Solely Canine); Do not use 0, Rarely use 0, Frequently use 10, Use in every case 90 (Canine Mixed)

■ Solely Canine ■ Canine (Mixed)

Equine: Usage frequency

B
Values shown: Do not use 0, Rarely use 0, Frequently use 36, Use in every case 64 (Solely Equine); Do not use 0, Rarely use 0, Frequently use 20, Use in every case 80 (Equine Mixed)

■ Solely Equine ■ Equine (Mixed)

Owner reported interpretation

Canine: Usage frequency

C
Values shown: Do not use 0, Rarely use 11, Frequently use 21, Use in every case 68 (Solely Canine); Do not use 0, Rarely use 0, Frequently use 20, Use in every case 80 (Canine Mixed)

■ Solely Canine ■ Canine (Mixed)

Equine: Usage frequency

D
Values shown: Do not use 0, Rarely use 0, Frequently use 36, Use in every case 64 (Solely Equine); Do not use 0, Rarely use 0, Frequently use 20, Use in every case 80 (Equine Mixed)

■ Solely Equine ■ Equine (Mixed)

*Figure 12 The usage frequency of the outcome measures "Owner reported capability" and "Owner reported interpretation". **A & C:** Data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). **B & D:** Data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10).*

Owner reported capability

Owner reported interpretation

Figure 13 The perceived effectiveness of the outcome measures "Owner reported capability" and "Owner reported interpretation". A & C: Acute joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). B & D: Acute joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10).

Figure 14 The perceived effectiveness of the outcome measures "Owner reported capability" and "Owner reported interpretation". *A & C:* Degenerative joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). *B & D:* Degenerative joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10).

3.3.4.5 Standardised Pain score

Figure 15 (canine) and Figure 16 (equine) describe the survey returns for the outcome measure "Standardised Pain score."

The outcome measure "Standardised pain score" referred to the veterinary physiotherapist's subjective clinical judgement of the current pain status of the animal compared to descriptive pain levels. Chi squared could not be used to investigate this further due to low results population (n<5) in certain categories. With the application of descriptive statistics to Figure 15A, there appears to be an obvious difference between how often solely canine practitioners and mixed-species practitioners use standardised pain scores when treating dogs. This difference is not present in the responses from the equine practitioners. There is also an obvious difference between how often the outcome measure is used by mixed-species veterinary physiotherapists based on which species they are treating, with it tending to being used in every case in dogs, Figure 15A, but rarely in horses, Figure 15B.

Figure 16 shows minimal variation between the perceived effectiveness for acute and degenerative joint cases for both dogs and horses. "Standardised Pain scores" tend to be seen as more effective in canine joint cases, Figure 16A and C, than in equine joint cases, Figure 16B and D. There appears to be no significant variation between single-species practitioners and mixed-species practitioners as to how effective the outcome measure is. This is in stark contrast to the differences in how often the outcome measure is used, as shown in Figure 15.

Notably, Figure 15A shows a clear high use of this outcome measure by canine mixed practitioners. This was not reciprocated in the equine mixed practitioners' group (Figure 15B). With respect to acute and degenerative disease, those same mixed practitioners prefer to use the outcome measure in combination with others (Figure 16A).

Canine: Usage frequency

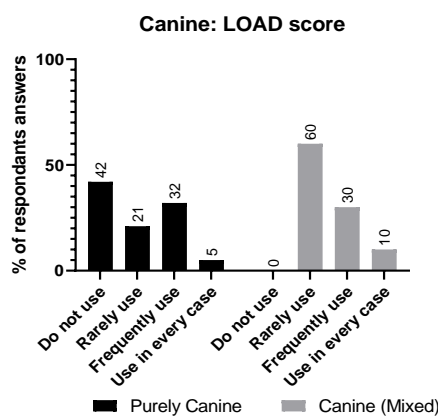**Equine: Usage frequency**
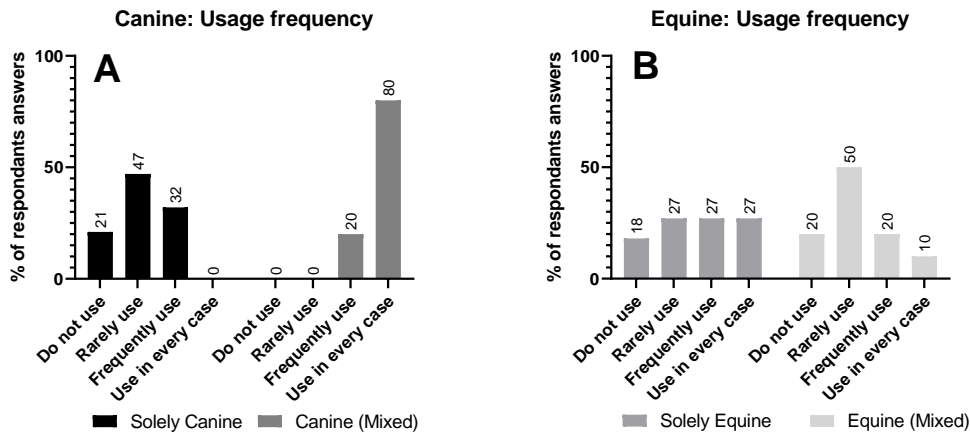
Figure 15 The usage frequency of the outcome measure "Standardised Pain score". A: Data from canine-only veterinary physiotherapists (n=19) and from the canine da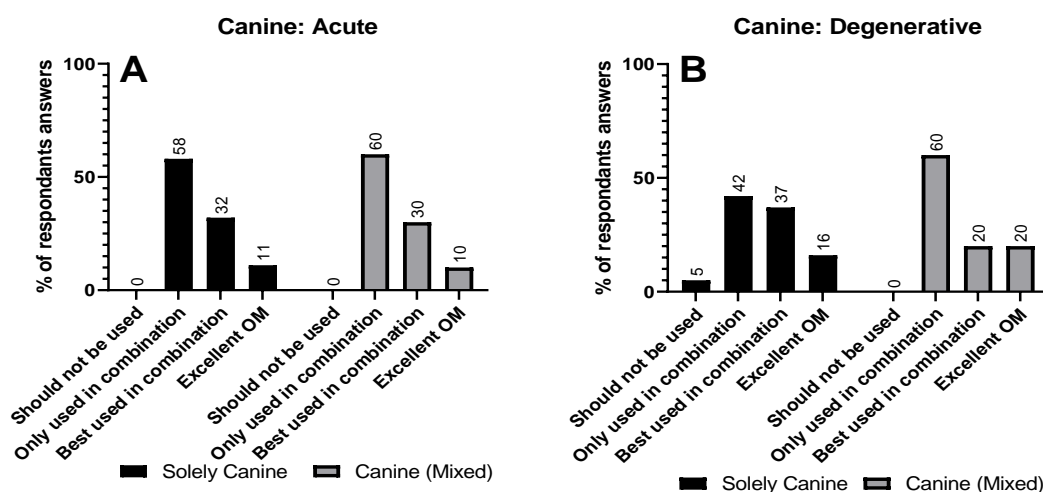taset from mixed-species veterinary physiotherapists (n=10). B: Data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10).

Canine: Acute

Equine: Acute

Canine: Degenerative

Equine: Degenerative
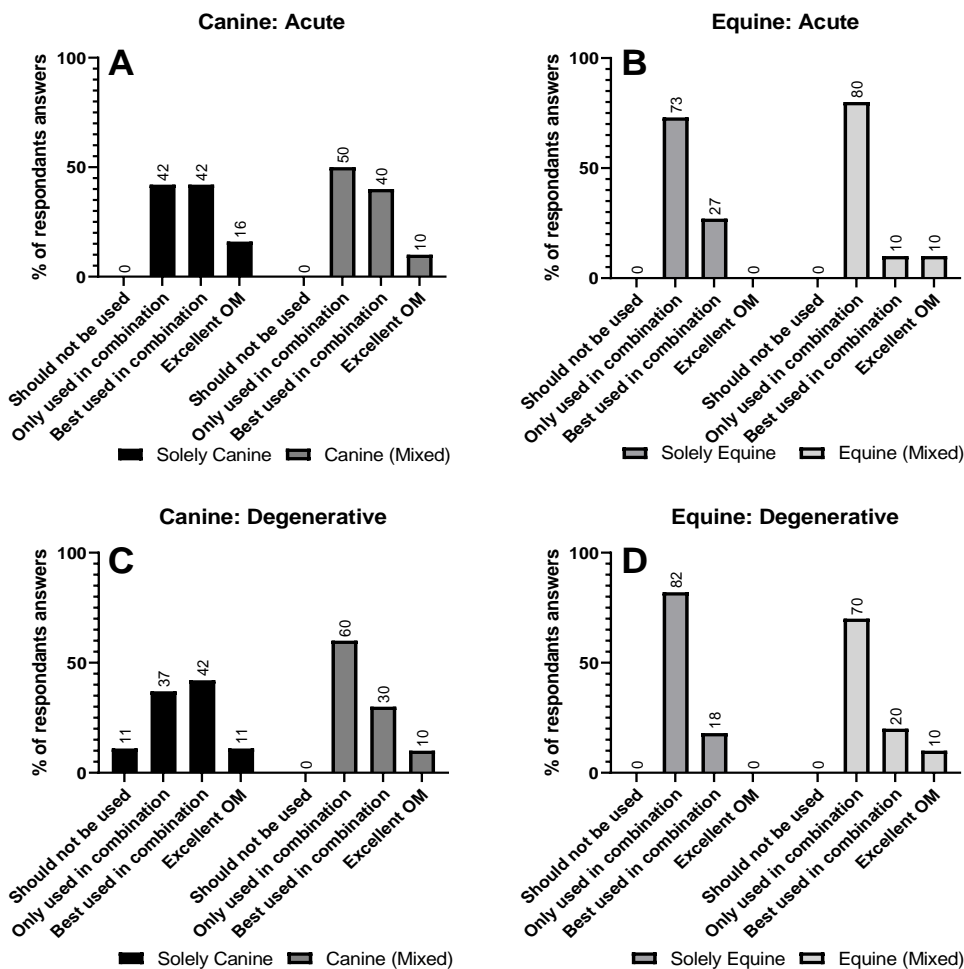
Figure 16 The perceived effectiveness of the outcome measure "Standardised Pain score". A: Acute joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). B: Acute joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10). C: Degenerative joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). D: Degenerative joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10)

3.3.4.6 LOAD score

Figure 17 and Figure 18 show the survey return of the outcome measure "LOAD score", an outcome measure specific to canine physiotherapy. "LOAD score" referred to the veterinary physiotherapist's subjective clinical judgement of the current osteoarthritis status of the animal against the standardised score levels. Application of descriptive statistics for analysis of Figure 17 indicates that the "LOAD score" outcome measure has a minimal use by canine veterinary physiotherapists; the dataset showed 63% of solely canine and 60% of mixed physiotherapists stating that they "do not use" or "rarely use". No statistically significant differences were observed (p>0.05: df=1: n=19: Chi Squared) between the Purely Canine and Canine (Mixed) practitioners. Figure 18 displays a consensus that the outcome measure should be used in combination with others, with over 75% of answers in all datasets being "Only used in combination" or "Best used in combination" and the former being the largest constituent of that. Figure 17 and Figure 18 indicates that this outcome measure is widely used in conjunction with other outcome measures.

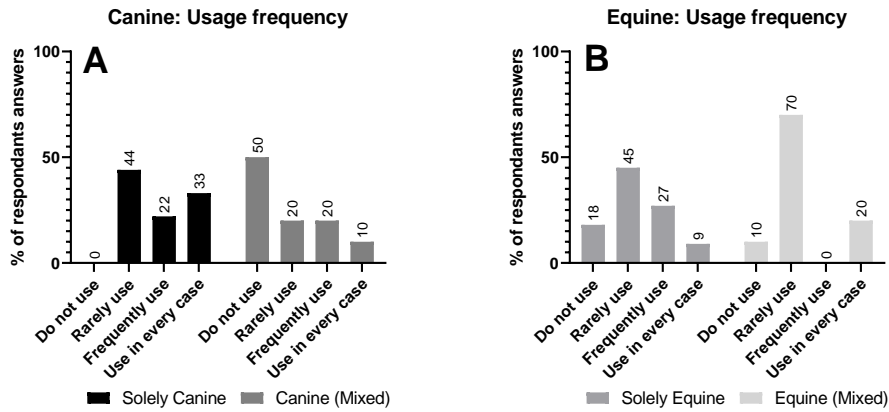*Figure 17 The usage frequency of the outcome measure "LOAD score". Data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10).*
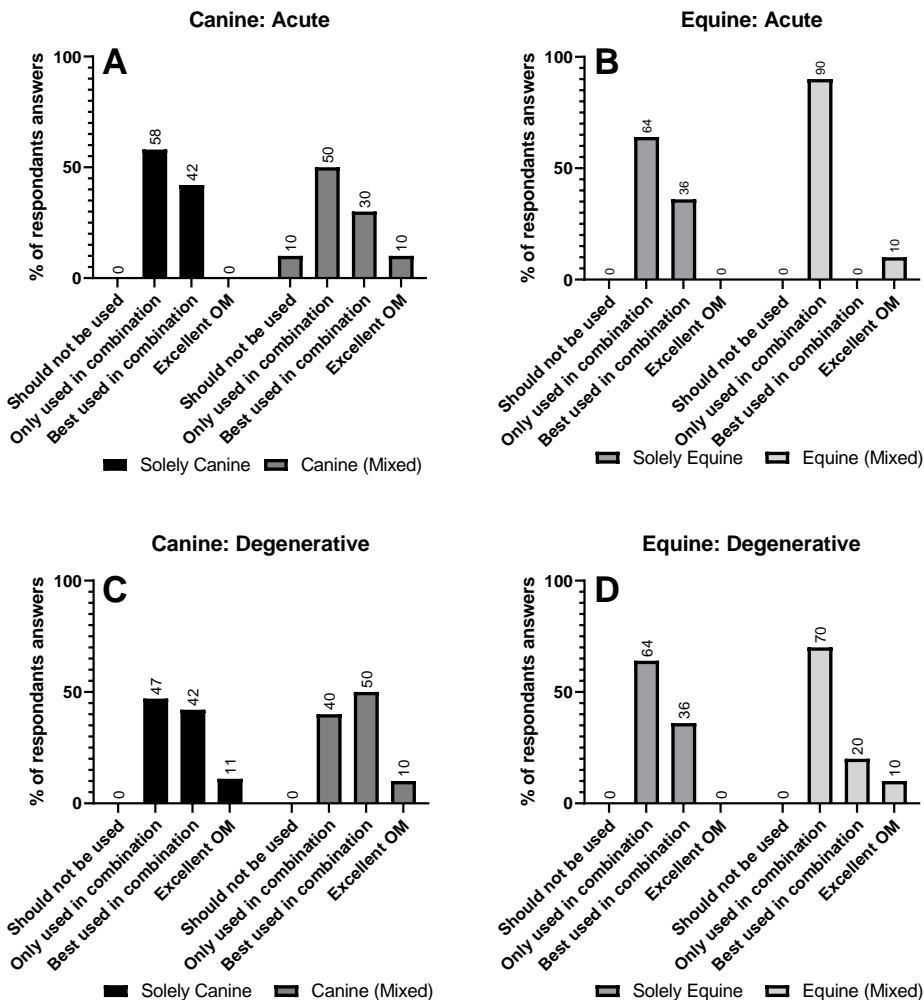

*Figure 18 The perceived effectiveness of the outcome measure "LOAD score". **A:** Acute joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). **B:** Degenerative joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10).*

3.3.4.7 Muscle mass measurement

Figure 19 (canine) and Figure 20 (equine) describe the survey returns for the outcome measure "Muscle mass measurement." Measuring the change in muscle mass as that muscle has increased or decreased use indirectly monitors the effect of the veterinary physiotherapist's treatment as the pain in those joints change. The datasets for each species were combined and compared. When responses were grouped into "Rarely or do not use", "Frequently use", and "Use in every case", a between species speciality statistically significant difference was observed (P=0.03: df=1: Chi Square). Whilst both species had the "rarely or do not use" sections as the most frequently picked option, the equine veterinary physiotherapists had a far greater majority of their respondents picking this option than their canine equivalent. The graphs also supports the statistical data with the canine dataset having a clearly higher usage, although does still have a large percentage that does not use this outcome measure.

This species split is further shown when acute and degenerative diseases are considered independently (Figure 20). For equine acute and degenerative joint cases, displayed in Figure 20B and D, the surveyed veterinary physiotherapists had a majority for the option "Only use in combination", with an even clearer majority in the equine component of the mixed-species veterinary physiotherapists dataset. Figure 20B and D showed minimal variation between the outcome measure's effectiveness in acute and degenerative cases for equine cases. Comparatively, the canine datasets, Figure 20A and C, were far less clear, with a greater divide amongst all options, although most answers came in an option advising it to be used with another outcome measure to some capacity. The canine datasets showed with a minimally improved perception of effectiveness in canine degenerative joint cases compared to canine acute cases.

Upon application of descriptive statistics for comparison of Figure 19 and Figure 20, it can be concluded that this outcome measure is used more in canine joint cases. When it is used, in both canine and equine cases, it is primarily used in combination with other outcome measures. It should be noted that the limited sample size of the study may indicate that this is not representative of the entire veterinary physiotherapy profession.

Figure 19 *The usage frequency of the outcome measure "Muscle mass measurement". **A:** Data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). **B:** Data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10)*

Figure 20 The perceived effectiveness of the outcome measure "Muscle mass measurement". *A: Acute joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). **B:** Acute joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10). **C:** Degenerative joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). **D:** Degenerative joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10)*

3.3.4.8 Video tracking, Kinematic monitoring, and gait analysis +/- digital mapping

Figure 21 and Figure 22 describe the survey returns on four related progressing outcome measures. These are:

- "Video tracking and gait analysis via phone/camera video" referred to the veterinary physiotherapist videoing the animal's movement across the treatment and visually comparing changes in gait.
- "Video tracking and gait analysis via kinematic monitoring and analysis equipment" referred to the veterinary physiotherapist videoing the animal's movement across the treatment using contrast markers and visually comparing changes in gait.
- "Video tracking, digital mapping, and gait analysis via phone/camera video and computer analysis apps" referred to the veterinary physiotherapist videoing the animal's movement across the treatment, using computer software to map the gait, and then visually comparing changes in gait.
- "Video tracking, digital mapping, and gait analysis via kinematic monitoring and analysis equipment" referred to the veterinary physiotherapist videoing the animal's movement across the treatment using contrast markers, having advanced computer software digitally map the movement and comparing changes in gait though computer and visual analysis.

In descriptive statistical analysis across Figure 21 and Figure 22, the outcome measures involving video recording appeared to be more commonly used in equine joint cases, whereas the outcome measures involving kinematic monitoring were more commonly used in canine joint cases. Figure 21A shows a higher usage level by purely canine practitioners, however the same outcome measure is used more by mixed practitioners in equine cases, Figure 21B. Figure 22A and B shows that same outcome measure with added digital mapping, however no statistically relevant species variation was present ($p>0.05$ df=2: n=36: Chi Squared), including when mixed practitioners responses were assessed. Descriptive statistical analysis of Figure 21C and D showed the highest use of the kinematic monitoring outcome measure was by multi-species veterinary physiotherapists, specifically in canine joint cases. Figure 22C and D also reflect the same usage pattern with added digital mapping. When analysed as a group across both figures, the veterinary physiotherapist that treated multiple species had a greater usage of phone/video recording outcome measure modalities in equine cases, but a greater use of kinematic monitoring equipment in canine cases. Both the canine and equine sole species practitioners had the highest usage of the basic video recording outcome measure, Figure 21A and B, but a similarly low usage level across the other three outcome measures.

There appears to be very little variation in both canine data groups between the outcome measures shown in Figure 23 and Figure 24 regarding acute joint cases. The canine-treating veterinary physiotherapists ranked all four outcome measures primarily as "Best used in combination." Comparatively, the veterinary physiotherapists treating equine horse cases believed all four should be "Only used in combination".

Descriptive statistical analysis of Figure 25 and Figure 26 showed a higher perceived effectiveness by canine-only veterinary physiotherapists than equine-only practitioners across all four outcome measures in degenerative join cases. Mixed practitioners appeared similar with no significant species variation in effectiveness ($p > 0.05$ df=1: n=40: Chi Squared). The mixed species practitioners had a higher perceived effectiveness of these four outcome measures than the equine-only veterinary physiotherapists. It appears that when comparing Figures 23 with Figures 25, that all four outcome measures have a higher perceived effectiveness in degenerative long-term cases.
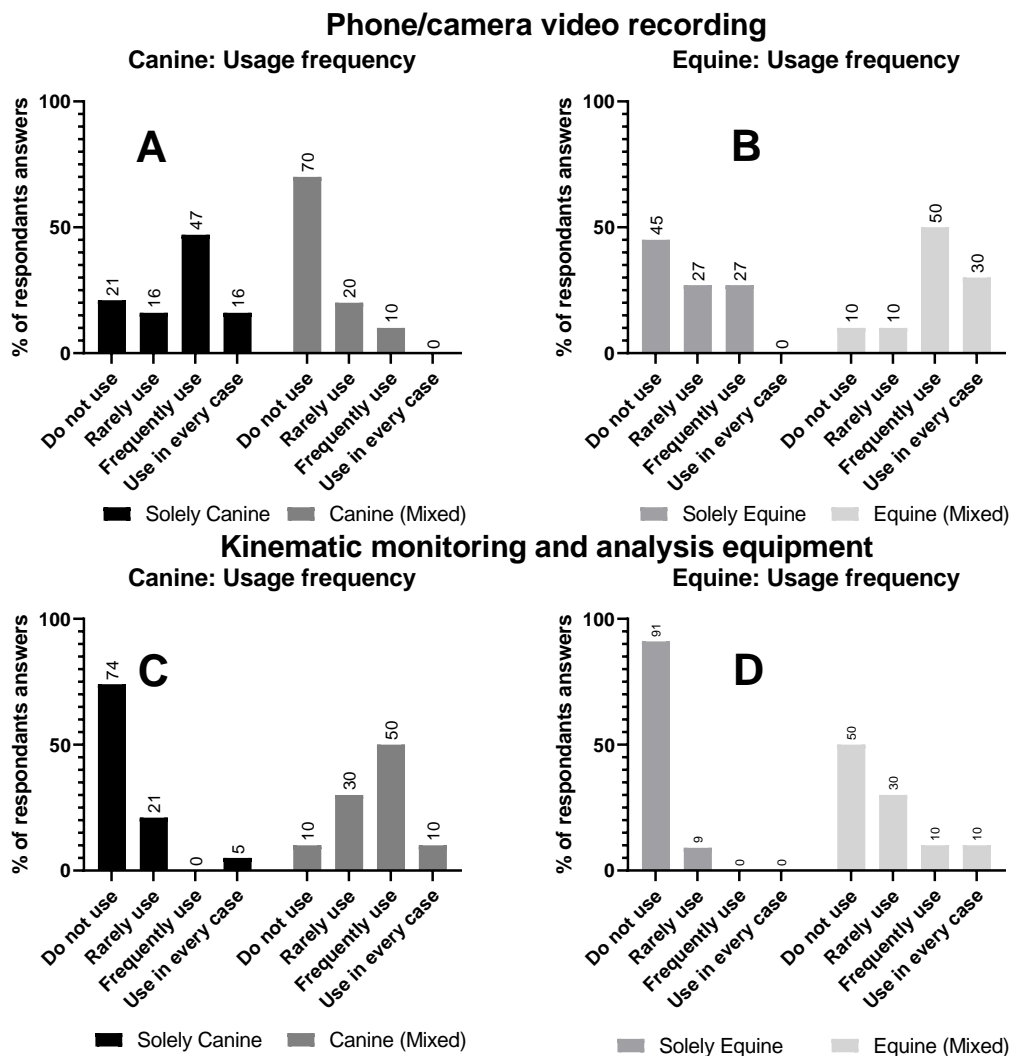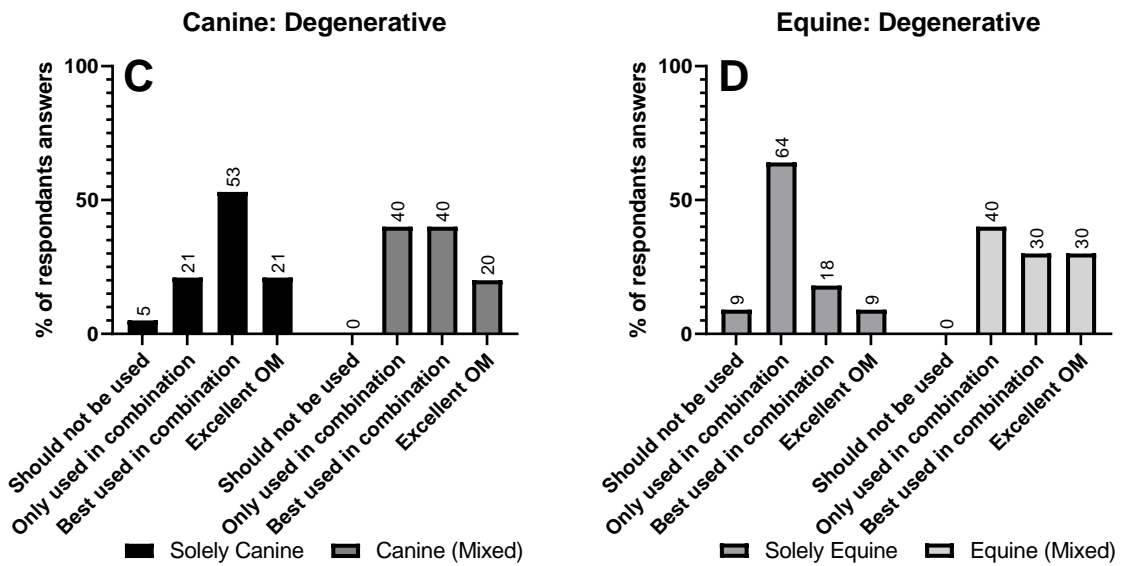

Figure 21 The usage frequency of the outcome measures "Video tracking and gait analysis via phone/camera video" and "Video tracking and gait analysis via kinematic monitoring and analysis equipment". A & C: Data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). B & D: Data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10)
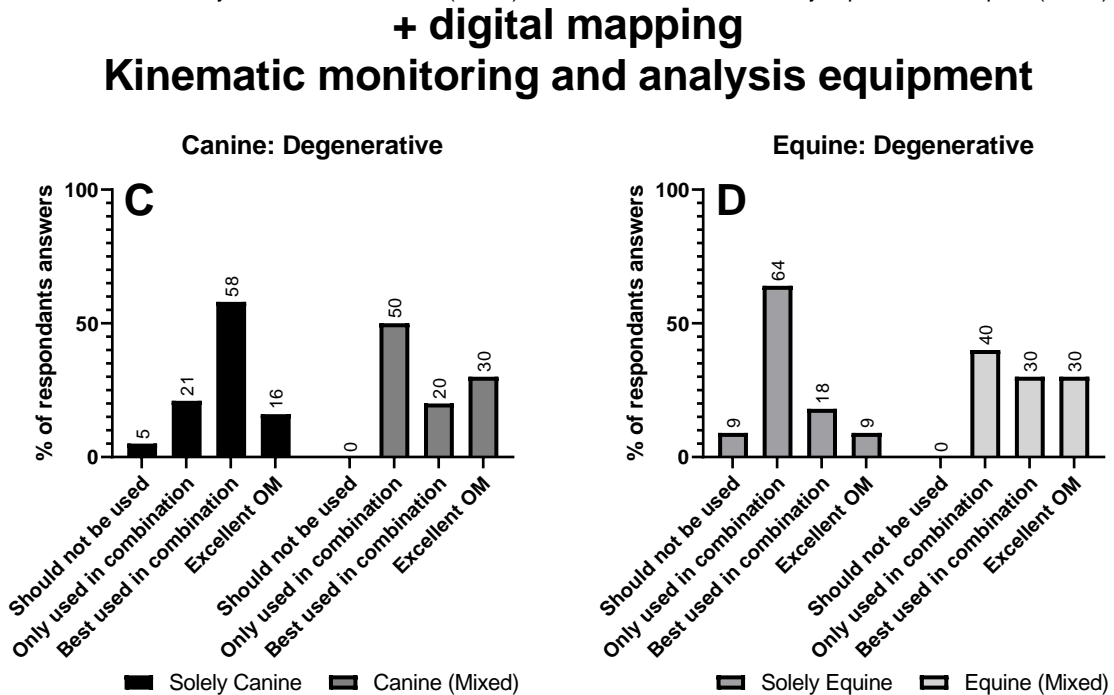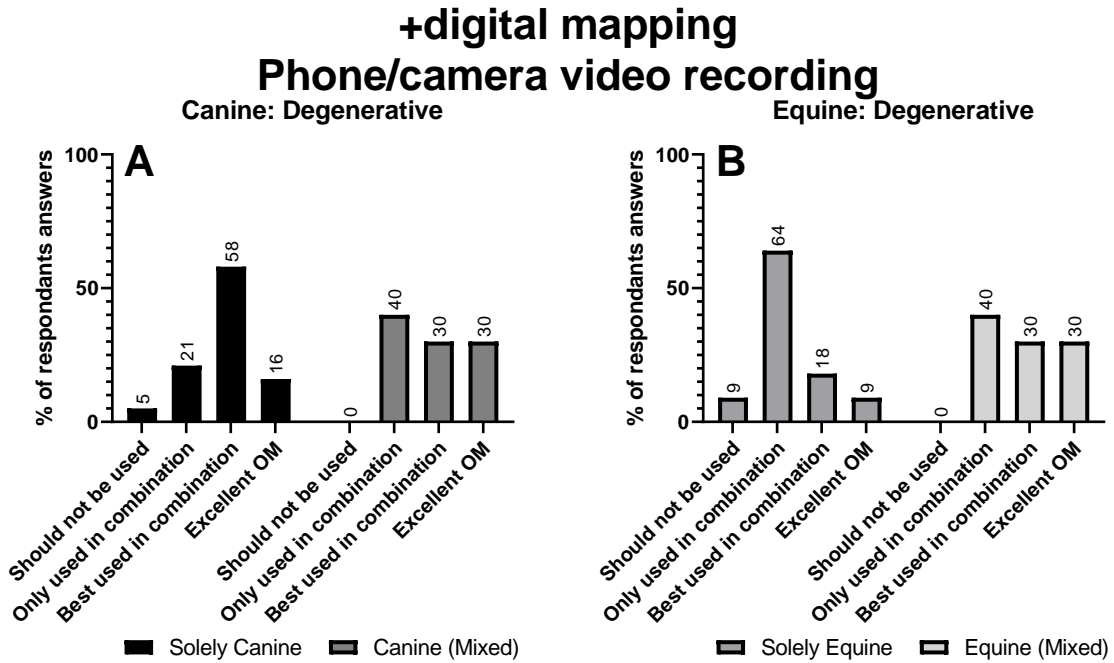
+ digital mapping
Phone/camera video recording and computer analysis apps

Canine: Usage frequency

A

Equine: Usage frequency

B
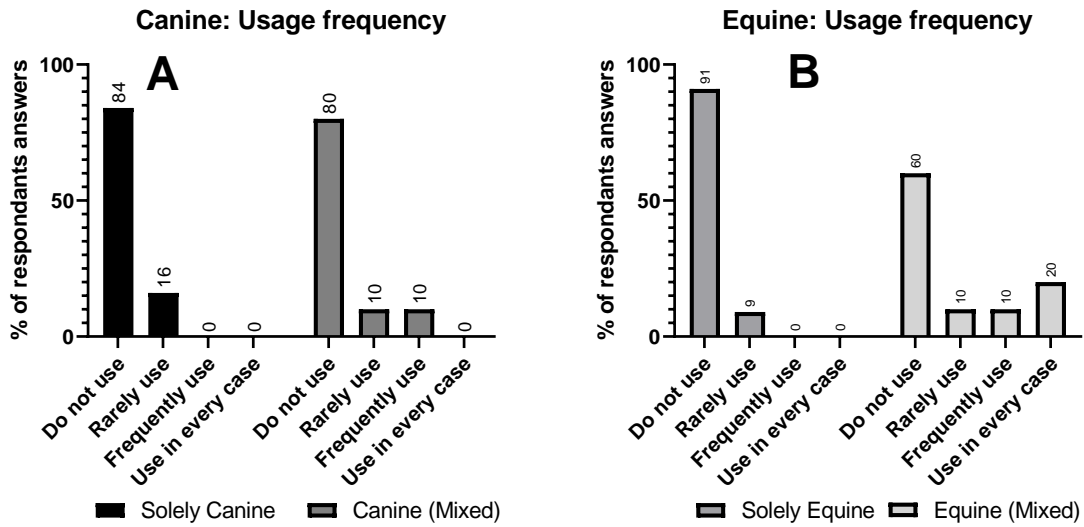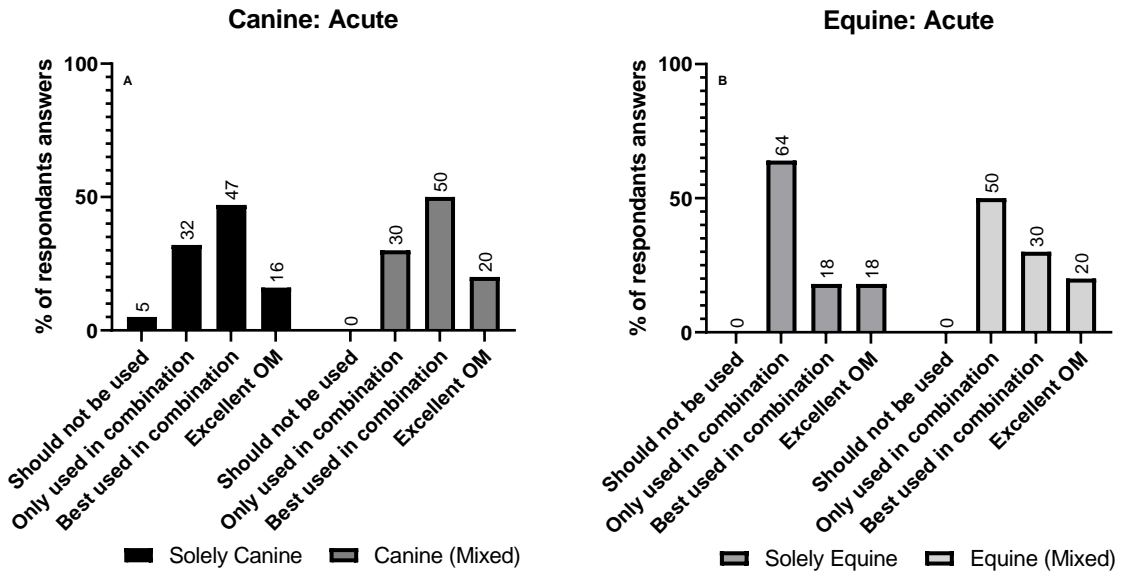
+ digital mapping
Kinematic monitoring and analysis equipment

Canine: Usage frequency

C

Equine: Usage frequency

D

Figure 22 The usage frequency of the outcome measures "Video tracking, digital mapping, and gait analysis via phone/camera video and computer analysis apps" and "Video tracking, digital mapping, and gait analysis via kinematic monitoring and analysis equipment". A & C: Data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). B & D: Data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10)

Figure 23 The perceived effectiveness of the outcome measures "Video tracking and gait analysis via phone/camera video" and "Video tracking and gait analysis via kinematic monitoring and analysis equipment". A & C: Acute joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). B & D: Acute joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10).

*Figure 24 The perceived effectiveness of the outcome measures "Video tracking, digital mapping, and gait analysis via phone/camera video and computer analysis apps" and "Video tracking, digital mapping, and gait analysis via kinematic monitoring and analysis equipment". **A & C:** Acute joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). **B & D:** Acute joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10).*
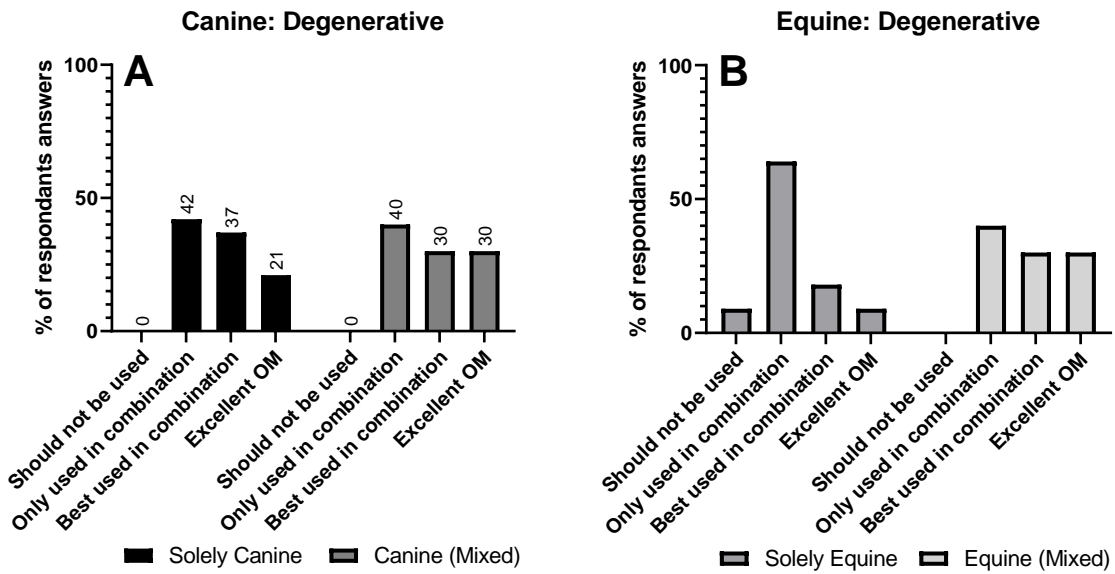
Figure 25 The perceived effectiveness of the outcome measures "Video tracking and gait analysis via phone/camera video" and "Video tracking and gait analysis via kinematic monitoring and analysis equipment". A & C: Degenerative joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). B & D: Degenerative joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10).
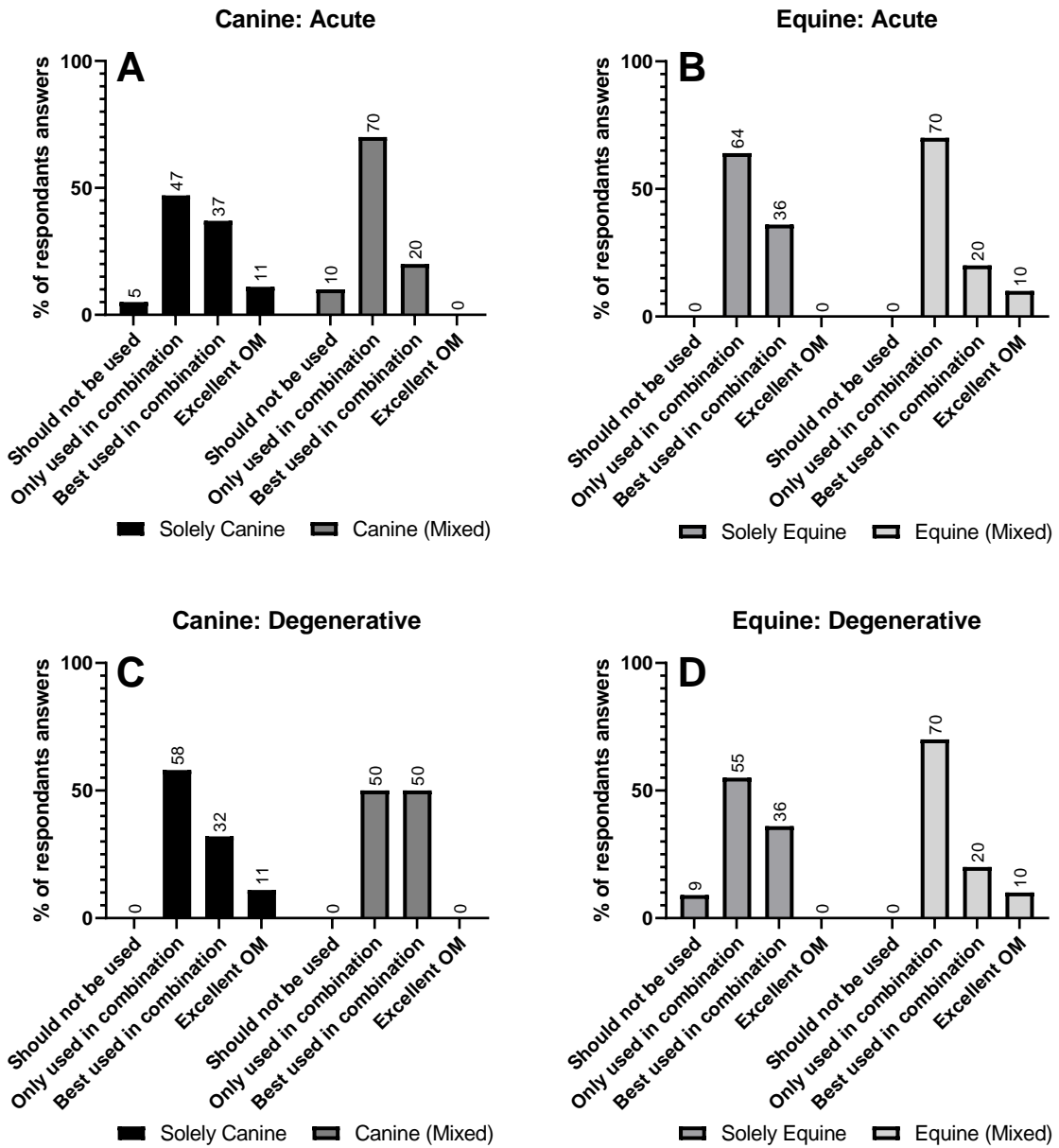
Figure 26 The perceived effectiveness of the outcome measures "Video tracking, digital mapping, and gait analysis via phone/camera video and computer analysis apps" and "Video tracking, digital mapping, and gait analysis via kinematic monitoring and analysis equipment". A & C: Degenerative joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). B & D: Degenerative joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10).

3.3.4.9 Goniometer

Figure 27 (canine) and Figure 28 (equine) describe the survey returns for the outcome measure "Goniometer."

The outcome measure "Goniometer" referred to the use of a goniometer device to measure changes in the range of motion angles of the joints undergoing treatment. "Goniometers" appear to have a greater use amongst canine-only veterinary physiotherapists than any other demographic surveyed.

Some of the results in the groups displayed in Figure 27 had low frequency, below five respondents. To ensure a reliable chi squared test, the intra-species data were combined into overarching canine and equine results for "Use in every case or frequently use" and "Rarely or do not use" (P=0.026: df=1: n=50: Chi Square). This showed a statistically significant difference (P<0.05) between the options and species. The graphs show the most striking difference was the use by purely canine veterinary physiotherapists vs the canine results of the mixed species practitioners.

A uniform consensus can be seen across all eight datasets shown in Figure 28, with all groups ranking the outcome measure "Only used in combination". Descriptive statistical analysis indicates a potential higher perceived effectiveness in canine joint cases, and in particular canine degenerative joint cases.
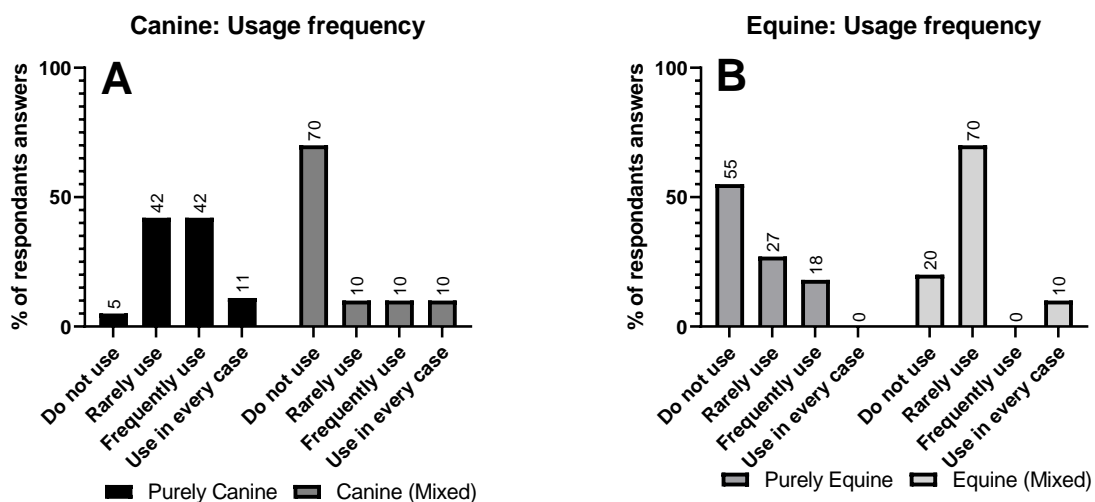
*Figure 27 The usage frequency of the outcome measure "Goniometer". **A:** Data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). **B:** Data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10)*
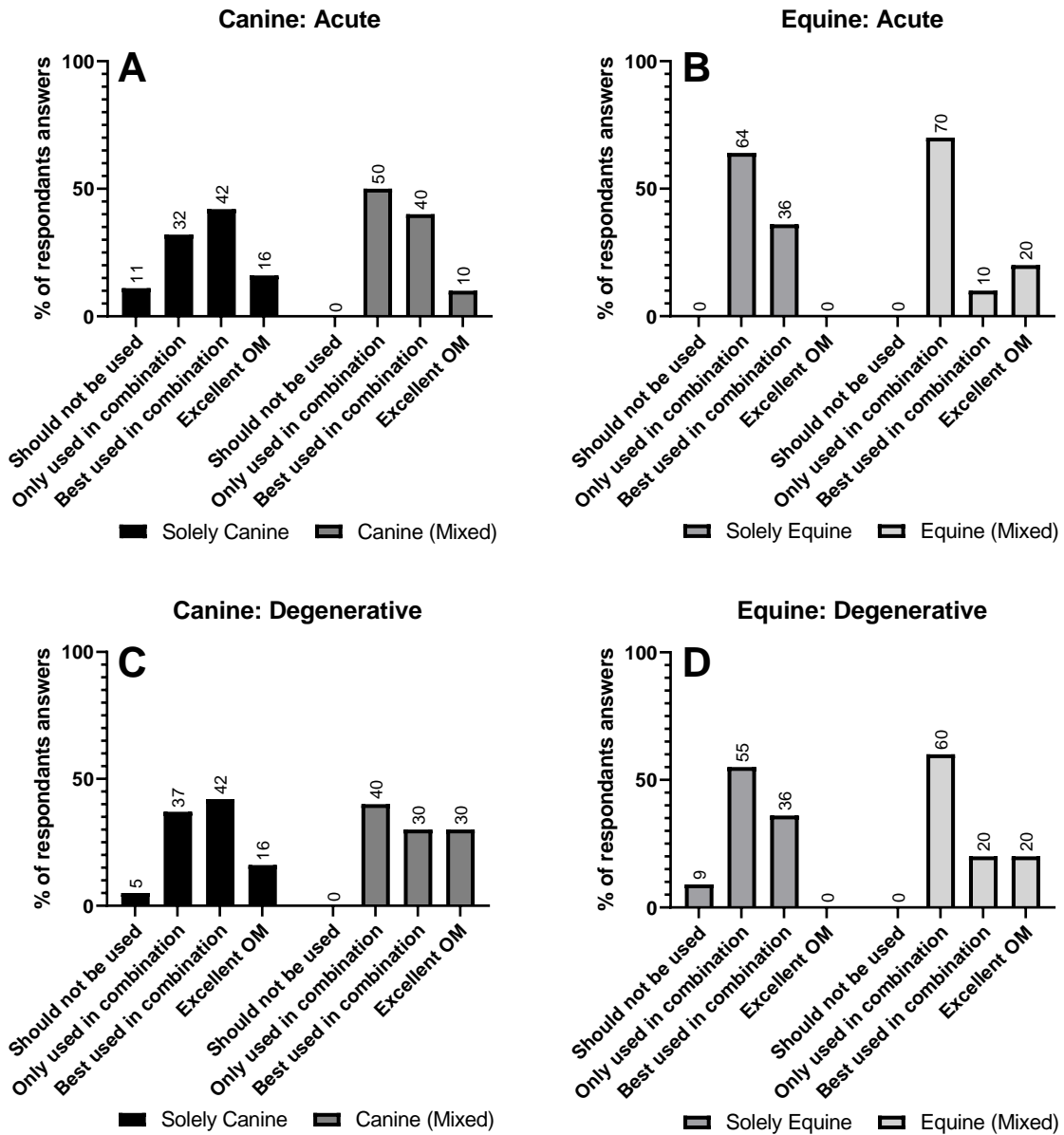
Figure 28 The perceived effectiveness of the outcome measure "Goniometer". *A: Acute joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). **B:** Acute joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10). **C:** Degenerative joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). **D:** Degenerative joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10)*

3.3.4.10 Weight bearing measurements on pressure mat

Figure 29 (canine) and Figure 30 (equine) describe the survey returns for the outcome measure "Weight bearing measurements on pressure mat."

The outcome measure "Weight bearing measurements on pressure mat" referred to using a weight distribution mat to monitor any changes in how the animal weight bears through its limbs. This outcome measure has a very low usage across the demographics shown in Figure 29, and a chi squared statistical test indicates there is no statistically significant difference between the species.

The perceived effectiveness of the outcome measure from the perspective of the veterinary physiotherapist using it across canine and equine acute and degenerative joint cases is displayed in Figure 30. Analysis of Figure 30 using descriptive statistics indicates a higher perceived effectiveness in canine cases. The canine-treating respondents' answers were spread across the options, with either "Only used in combination" or "Best used in combination" being displayed as the preferred perceived effectiveness. Comparatively, less variation can be seen in the equine cases with the largest sections in each dataset being "Only used in combination". There appears to be minimal difference in the perceived effectiveness of this outcome measure between acute and degenerate cases.
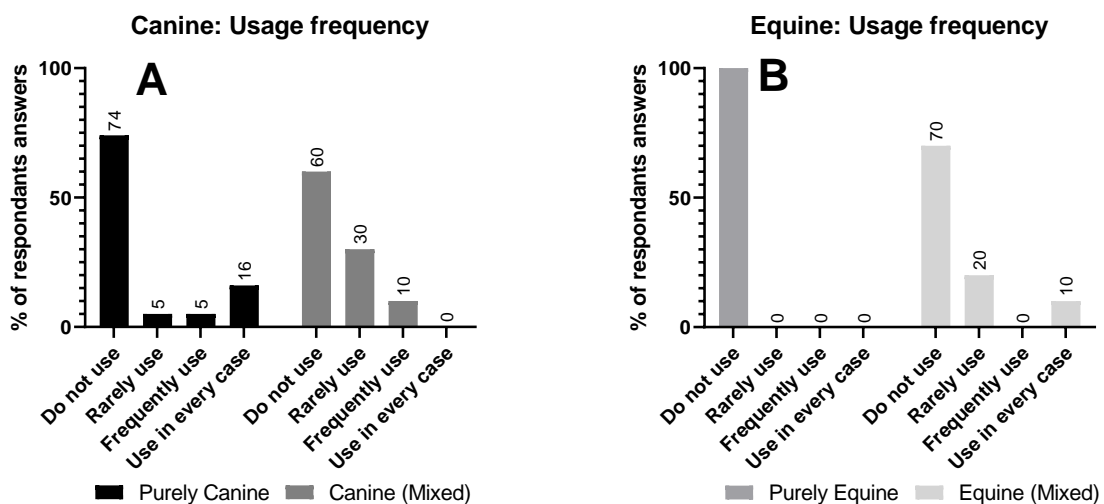
Figure 29 The usage frequency of the outcome measure "Weight bearing measurements on pressure mat". A: Data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). B: Data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10)

Figure 30 The perceived effectiveness of the outcome measure "Weight bearing measurements on pressure mat". A: Acute joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). B: Acute joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10). C: Degenerative joint diseases data from canine-only veterinary physiotherapists (n=19) and from the canine dataset from mixed-species veterinary physiotherapists (n=10). D: Degenerative joint diseases data from equine-only veterinary physiotherapists (n=11) and from the equine dataset from mixed-species veterinary physiotherapists (n=10)

3.3.5 BRIEF OVERVIEW OF KEY FINDINGS

Table 13 A brief summary of the key survey results from each subject

Background data results:	Number of respondents		
Dataset of survey respondents	(n=40)		
Species practitioner breakdown	Solely canine (n=19)	Solely Equine (n=11)	Mixed (n=10)
UK Registry body members (AHPR, RAMP)	Canine members (n=16) Equine members (n=11)	Canine non-members (n=10) Equine non-members (n=9)	
Additional/Previous human qualification	Human Physiotherapist (n=11) (Canine n=6, Equine n=6)	None/other (n=29) (Canine n=23, Equine n=13)	

Demographic:	Comparison results
Professional Registrative Bodies (RAMP/AHPR) members vs non-members	Membership associated with a slight increase in use of outcome measures. Differences appear more evident in canine rather than equine subsections. Biggest differences were an increase in use of videoing gait analysis by members and an increase in use of standardised pain scoring by non-members
Background qualifications: Human Physiotherapist vs Other	Although analyses revealed no differences between the two demographics, a key limitation was the species sub-section sample size.

Outcome Measure:	Prevalence and perceived quality
How well is the animal?	Highly prevalent across all species with no statistical difference. Best used alongside other outcome measures
How well does the animal move?	Commonly used in combination with other outcome measures. Appears to be viewed as more effective in horses than dogs
Hands-on assessment	Highly used in both species but appears more effective in dogs than horses. Can be used independently or in combination with other outcome measures
Owner reported capability and Owner-reported interpretation	High use and highly valued, but largely used in combination. Owner reported capability viewed as more effective than owner reported interpretation.
Standardised pain score	Mixed usage in both canine and equine joint cases but tended to be used more by mixed species practitioners. Used in combination with other outcome measures
Liverpool Osteoarthritis in Dogs [LOAD] score	Low usage with 63% of solely canine and 60% of mixed physiotherapists stating that they "do not use" or "rarely use" this and over 75% suggesting this should be used in combination with other outcome measures
Muscle mass measurement	Statistically significant ($p<0.05$) higher usage in canine joint cases and improved perception of effectiveness in canine degenerative joint cases
Video tracking, Kinematic monitoring, and gait analysis +/- digital mapping	Basic video recording highly used by canine and equine sole species practitioners. The other three more advanced and costly outcome measures used less. All four movement recording outcome measures (Video tracking and kinematic monitoring) in both species were viewed as more effective for longer term degenerative cases
Goniometer	Statistically significant ($p<0.05$) higher usage in sole species practitioners, particularly Solely Canine and a far lower usage by mixed practitioners
Weight bearing measurements on pressure mat	Pressure mat weight bearing measurements had a low usage across all demographics. Its perceived effectiveness appears to be higher for use in canine cases with minimal difference between acute and degenerative cases

4 DISCUSSION

4.1 THE IMPORTANCE OF OUTCOME MEASURES IN VETERINARY PHYSIOTHERAPY

Addressing aim: "To determine the quality of outcome measures being used in canine and equine veterinary physiotherapy practice"

In the field of veterinary physiotherapy, the use of outcome measures is less defined than in human physiotherapy. The overarching aim of the project was to investigate the current level and perceived quality of outcome measure usage by veterinary physiotherapists and to generate a set of recommendations as to how this can be improved.

A key output of this project was a number of recommendations that will positively impact the use of outcome measures in the veterinary physiotherapy profession. Some key observations made from the data in this report include the lack of differences between veterinary physiotherapists with and without a human physiotherapy background, the positive impact being a member of a registry body has on the use of outcome measures, and the overall skew towards subjective outcome measures being used more than objective outcome measures.

One common aspect that both human physiotherapy and veterinary physiotherapy agree on is that consistent use of outcome measures are important to prevent missing small incremental changes between sessions where case progression is slow, a phenomenon similar to "sustained change blindness" (Hollingworth and Henderson, 2004). This phenomenon was explored by Hollingworth and Henderson and it was found that participants failed to detect significant incremental changes from an original over a period of time. The paper also noted that participants that were unable to detect the incremental changes reliably detected the changes when the initial view was once again presented. This study has a very real application to veterinary physiotherapy and is especially important in degenerative joint disease cases and in cases of sports optimisation.

Veterinary physiotherapists are busy clinicians with a multitude of clients, so small changes between sessions may not even be noticed or if they are, they might be attributed to normal fluctuations. Comparatively, this risk would be decreased upon use of a baseline outcome measure and regular repeats, with the results either plotted on graphs, an appropriate example being range of motion measurements using a goniometer, or shown in context to the original baseline, such as a video with gait analysis. Noticing such changes in these cases facilitates earlier interventions to redirect or improve therapies thus shortening treatment times with enormous benefit to patient welfare and performance.

By monitoring, redirecting, and modifying treatments as they progress, veterinary physiotherapists can provide an excellent tailored program for patients (Burnett and Wardlaw, 2012) to achieve an outcome that is satisfactory (BSAVA, 2021). As recently as the 2021 Tokyo Summer Olympics and Paralympics, multiple veterinary physiotherapists were part of the Team GB Equestrian behind-the-scenes care team, joining Veterinary Surgeons, grooms, Farriers, riders, saddlers, equine nutritionists, coaches, and human Physiotherapists. The team together won multiple team and individual medals[48], which showed the effectiveness of a comprehensive and collaborating equine healthcare team as well as the importance of tailored programs under constant review in achieving top results. Over the past decade, Team GB horses have had their own individual performance and health management team in the UK. One such example being the London and Rio Olympic gold medal winner Valegro's team at Carl Hester's yard [49], which included a veterinary physiotherapist. This additionally highlights the importance for any performance metrics and outcome measures being objective and repeatable on an inter-clinician basis if needed.

It is because of human errors and fallibilities, like sustained change blindness, that insurance companies require audits, including evidence of outcome measures used, to be submitted with every human physiotherapy private insurance claim. Appendix B shows an example of such a form required by Bupa[50]. Insurance companies, such as Bupa, require the inclusion of outcome measures in their reports for their own protection against fraudulent claims and pay-outs; the Physiotherapist must be able to evidence that they are collecting progress and client-satisfaction data as well as evidence demonstrating the quality and effectiveness of the treatment (Bupa Q&A[51], 2019). If these are not included, the insurance company would reject any further funding requests. Whilst audits and proof of outcome measures by insurance companies is currently unique to the human physiotherapy profession, it is possible that animal insurance companies will one day require this too as the field of veterinary physiotherapy continues to advance. A logical recommendation of this paper would therefore be ensuring familiarity with various outcome measures and recording them thoroughly and accurately in a way that could be presentable to a third party. This would ensure the veterinary physiotherapist would be working to the best possible standard in this regard and the financial incentive that any insurance changes introduced would not have any negative financial implications for the clinician.

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[48] www.britishequestrian.org.uk/assets/TEAM/MEDAL%20TABLES/Medal%20table%20-%202021.pdf
[49] www.carlhester.co.uk/team/support-team/
[50] www.bupa.co.uk
[51] https://www.bupa.co.uk/~/media/files/hcp/physio/physio-qa.pdf?la=en&hash=320F451FB2B0E479A8BC5CD21AF281CECF4086C7

4.2 THE OUTCOME MEASURES AND THEIR EVIDENCE BASE

Addressing aim: "To identify and investigate any disparity between the use of outcome measures and their perceived effectiveness between canine only, equine only, and multi-species veterinary physiotherapists"

Within published literature, there are studies and peer-reviewed articles that comment on the reliability and validity of different outcome measures and how they are used in both initial baseline assessment and in progression reassessment. This study has focused on a mixture of subjective and objective outcome measures intended to evaluate modalities including palpation, owner-contributions, pain, muscle-size, range-of-motion (ROM), gait, and posture (Tabor and Williams, 2020).

One of the biggest challenges in veterinary physiotherapy is the non-verbal capability of the patients. With human patients, Physiotherapists can place a large emphasis on patient-reported outcome measures, and these have been shown to be both repeatable and reliable in human practice (Kyte *et al*., 2014). The patient reported outcome measures are usually in a format of functional self-assessment and a series of questions (Tabor and Williams, 2018). However, with canine and equine patients being unable to vocalise their interpretations of indicators like pain or range of motion another approach is needed to measure outcomes accurately, both in an acute setting and for degenerate joint cases. Indeed, one could argue that since patient vocalised outcome measures are not relevant to veterinary physiotherapy, strong standardised outcome measures of other parameters are of prime importance to this profession. Veterinary physiotherapists therefore have two options; outcome measures made through their clinical assessment and proxy-outcome measures from the owner.

The outcome measures, "How well is the animal?", "How well does the animal move?, and "Hands-on assessment", are all fundamental parts of a veterinary physiotherapist's clinical exam. All three are commonly used together as part of a clinical assessment that veterinary physiotherapists use to identify joint movement dysfunctions (Goff, 2016). This was mirrored in the survey dataset with all three outcome measures having a high usage prevalence amongst the veterinary physiotherapy practitioners and with all three being commonly used alongside other outcome measures in patient evaluation. Goff (2016) suggests that before hands-on palpatory assessment, distance observational assessment should first be used to ascertain the state of the animal and its locomotion, due to the presence of the practitioner potentially having an effect on the animal. This approach for veterinary physiotherapists is consistent with the clinical assessment skills taught to Veterinary Surgery

students in UK veterinary schools. Muscle palpation and joint manipulation are subjective assessment techniques based on the veterinary physiotherapist's experience of feeling the joints and surrounding soft tissue (Goff, 2016) and will differ from practitioner to practitioner.

One suggested way to try to remove the human error and variation between clinicians was the use of algometry. Algometry is an objective outcome measure that can be used as a repeatable modality technique to analyse pressure in the soft tissue surrounding joints in equine physiotherapy for both establishment of a baseline and for long term reassessment (Goff, 2016), however it is best used reliably with the muscles at rest (Montenegro et al., 2009) and does not provide as much information when compared to the hands of a veterinary physiotherapist, including perception of contact and subtle structural qualities (Behrens et al., 2013).

Both physical assessment ("Hands-on assessment") and observational assessments ("How well is the animal?" and "How well does the animal move?") were highly used by the veterinary physiotherapists that responded across both species and all three should be used in combination alongside other outcome measures. This is clearly also reflected in the literature. This paper would recommend that these outcome measures continue to be used in conjunction with other outcome measures, with accurate and detailed notes made and kept within patient records. Reassessment should then be made by the same practitioner using the patient records for reference. This is still liable to human inaccuracies, however the level of detail and expertise available at the hands of an experienced veterinary physiotherapist is unmatched by any other device. These three outcome measures, whilst subjective, should continue to be the essential outcome measures (Tabor et al., 2020) used due to their importance in clinical assessment. For best practice they should also be used in combination with some of the following outcome measures.

Whilst assessment by the clinician in the session is important, owner-reported outcome measures are important to gather information about the animal outside of treatment consults. Owners are a vital part of the rehabilitation process (Tanner, 2018), spending the majority of the time with the animal and being able to see the day-to-day status of the animal. Involving the owner in outcome measure assessments can improve owner compliance, education, and satisfaction (Cook, 2003) and provide necessary information for the clinician. They do however have shortcomings. Owner's appreciation of chronic or mild acute clinical signs are often inaccurate, especially when compared to a person with clinical training (Farrell, 2008), unless the owner is able to compare the affected animal with a similar, unaffected animal. Farrell (2008) suggested that overall assessments of the animal take place with both an owner and a clinician present. The owner has the ability to distinguish subtle changes in the dog's or horse's demeanour, behaviour, and locomotion and the

clinician has the knowledge, expertise, and experience of managing clinical cases. Farrell concludes that owner reported outcome measures should not be considered a replacement or substitute for clinical assessment by a trained professional, however the owner's assessment of subtle changes is an important measure to be valued so is ideally used in conjunction with clinical assessments.

Cook (2003) presented an approach to osteoarthritis and degenerative joint disease at the North American Veterinary Conference. He advocated allowing the client to actively participate in the treatment by giving them an outcome measure score card to record their own outcome measures outside of sessions. The scorecard included a combination of subjective owner interpretations and objective functional assessment. He claimed that this approach promoted greater client understanding of the rehabilitation process through increased participation inside and outside of sessions. Increased and consistent client involvement would be more likely to ensure continued comprehensive treatment and higher client satisfaction (Jette *et al*., 2009, Cook, 2003). Cook's paper was originally formatted as a conference paper and whilst its conclusions as to the benefits of introducing outcome measures are mirrored across multiple other papers and published works, this particular methodology does not appear in much other literature.

The overall sentiment presented in the literature appears to be shared by the veterinary physiotherapists surveyed. The vast majority of respondents indicated that these are very frequently used outcome measures, however they should only be used in conjunction with others. One major difference between the literature and the survey responses comes in differentiating owner-reported capabilities and owner-reported interpretations. Specifically, owner reported capability were viewed as slightly more effective in the dataset evaluated. This difference is, however, more obviously displayed and explored in the literature. Owner reported interpretations are shown to be very beneficial due to the owner's ability to detect subtle changes in behaviour (Farrell, 2008) but they can be extremely subjective and have the potential to be very unreliable due to the average owner lacking taught clinical reasoning. Comparatively, by their very nature, owner-reported capabilities are a form of objective functional assessment. Reporting whether their animal can or cannot complete a task leaves no room for the human error associated with non-clinical interpretations (Farrell, 2008) and is therefore the more evidence-based and reliable approach.

A recommendation of this paper would be practicing veterinary physiotherapists consider the introduction of a similar technique as presented by Cook (2003). Some outcome measures are costly or time consuming to implement, but something of this calibre would allow for their gentle introduction in a way that does not compromise the limited hands-on time they have. An owner outcome measure chart relating to more subjective assessments requiring owner interpretation,

such as "How well does the animal move?", rating activity levels, or rating "How well is the animal?", combined with objective functional assessment carried out regularly would provide the clinician with all the necessary information at the start of the session. As shown in the survey results, owner-reported outcome measures are highly valued by veterinary physiotherapists, so inclusion in this manner would potentially save time during sessions and thus allow time for the inclusion more evidence-based objective outcome measures.

A further recommendation of this paper would be a study based in the United Kingdom to see if the technique presented by Cook (2003) is an applicable methodology specifically for veterinary physiotherapists here and to establish a solid evidence base for this approach. The study would likely involve a range of veterinary physiotherapists across the country in treatment programs relating to degenerative joint disease cases with each clinician having their own control and study groups. It should be noted that each case is individual and requires individual planning and assessment, so the participant numbers would need to be high to minimise any individual variation and allow identification of any obvious outliers.

Pain recognition and measurement of pain is crucial to welfare but is a subjective outcome measure open to bias and misinterpretation (Tanner, 2018, Tabor *et al.*, 2020). Attempts have been made to create an evidence base for techniques to make it more objective. Tabor *et al.* (2020) notes that assessment of pain can be split into four domains, including pain and behaviours at rest and pain and behaviour during exercise. A study by Dyson *et al.* (2018) aimed to produce an ethogram for equine pain and behaviour assessment through use of lame and sound horses as controls. The paper identified potential pain markers to be included in the ethogram that were present significantly more in lame horses and included assessments at rest and during non-ridden movement. Some of the most significant behaviours identified by Dyson *et al.* (2018) included change in eye posture and expression, changing gait spontaneously, crookedness, ears back, going above the bit, head tossing, hurrying, mouth opening, poor quality canter, resisting movement, stumbling and toe dragging, tilting the head, tongue out, and unwillingness to go. Identification of such behaviours is part of the veterinary physiotherapist's skillset, however standardising them into a list of behaviours with an evidence base indicating their significance allows for a reliable and repeatable assessment of equine pain when performed by the same practitioner (Dyson *et al.*, 2018). A study by Gleerup *et al.* (2015) investigated changes in a horse's face when they were exposed to induced pain via a noxious stimulus. Their conclusion included a list of notable pain behaviours including change in eye posture and expression (including a withdrawn and/or tense stare), ears going back (both symmetrically and asymmetrically), mediolaterally dilated nostrils, and facial muscle tension. Multiple of the

behaviours were common to both studies, despite utilising different methodologies of investigation, indicating their accuracy and validity to assess equine pain. Assessing whether a specific characteristic of pain behaviour is present takes the outcome measure from being fundamentally subjective to a far more objective form of assessment.

Comparatively, there are multiple examples of standardised pain assessment scales in canine cases. (Millis and Ciuperca, 2015) states that assessment of chronic pain in canine osteoarthritis cases can be reliably evaluated with the Helsinki Chronic Pain index, and mentions other standardised pain scores for acute pain, including the Glasgow Composite Measure Pain Scale and the University of Melbourne Pain Scale. The Glasgow Composite Measure Pain Scale is one of the pain scores covered in teaching at the University of Nottingham's veterinary physiotherapy course. A University of Helsinki study (Hielm-Björkman *et al.*, 2009) investigated how effective the Helsinki Chronic Pain index was for canine osteoarthritis cases with a sample size of 61 dogs. It concluded the outcome measure to be valid, reliable, and responsive.

The data in this report has shown mixed usage in both canine and equine cases with an increased usage by multi-species practitioners in comparison to their sole species counterparts. This indicates that standardised approaches to assessing pain in equine joint cases are not currently widespread through the veterinary physiotherapy profession, however the evidence base is there for this to become the new standard. It is likely that as this continues to develop, a standardised comprehensive ethogram will be produced for standardised pain scoring. Despite the strong evidence base for the use of pain scoring in canine joint cases, it still has a relatively low usage in solely canine practitioners. This indicates that there is a limiting factor preventing it being further used. With this outcome measure being inexpensive, it is most likely that the time limits of a consultation combined with the perceived lack of effectiveness results in veterinary physiotherapists either preferring to not use it or having other outcome measures being used instead to assess other variables.

A recommendation of this paper would be the inclusion of a form of standardised pain assessment in both canine and equine joint cases. Identifying pain is a very important part of ensuring patient quality of life. Pain assessment could be included in a checklist form using a standardised comprehensive ethogram or use of an existing pain score. It could also be potentially reformatted into an owner-reported outcome measure to save time during the consult; however, this would then lose the reliability that comes with being assessed by a trained professional.

The LOAD questionnaire[52] was designed to score dog osteoarthritis progression in a reliable, repeatable and objective way. Walton *et al*. (2013) evaluated 222 dogs with osteoarthritis and concluded that LOAD scoring is a reliable and recommended outcome measure to use. This outcome measure can be filled out by the dog owner before the session, so has the advantage of not taking up any consultation time as well as being a low-cost way of tracking osteoarthritis progression. Despite this, the survey data evaluated in this report showed this outcome measure currently has a very low usage by veterinary physiotherapists. This could potentially suggest that many veterinary physiotherapists do not give this to their clients in osteoarthritis cases due to a lack of familiarity with this outcome measure or due to lack of owner compliance/ability in filling the assessment in correctly. Further study into this would be needed to evidence why it is not being utilised to its full potential. A further study into this could also determine whether it could be advised to add to the owner involved outcome measures previously discussed.

Animals alter their postures and gait to put less weight through the leg with a painful joint and reduce its use where possible to minimise pain. As the pain associated with movement in joint increases or decreases, its usage decreases or increases. Changes in joint usage result in a change of the surrounding muscle mass, with periods of disuse or immobilisation causing the muscles to atrophy (Millis and Ciuperca, 2015). It was found in the Millis and Ciuperca (2015) study that dogs with cranial cruciate ligament rupture in particular are commonly affected by changes in muscle mass. Kirkby Shaw *et al*. (2020) commented that in the absence of early weight bearing and muscle activation post-surgery, muscle mass should be expected to decrease. Regaining muscle mass and strength is therefore a common goal in veterinary physiotherapist rehabilitation and establishing baseline and progression measurements to measure this goal is a logical step to meeting that goal. Assessments often incorporate this outcome measure in a subjective manner, through visual and palpebral evaluation of patient symmetry, however objective ways do exist to measure this and ensure intra- and inter- practitioner reliability. Many high-cost objective measurement devices can be used to calculate muscle mass measurements for both canine and equine patients, including quantitative computerised tomography or magnetic resonance imaging, but often these are expensive and require the animal to be sedated (Millis and Ciuperca, 2015). A more appropriate method for use in everyday practice is a spring tension tape measure to measure limb circumference. Muscle strength has been shown to correlate directly with muscle girth circumference (Dyke, 2014). Utilising a tape measure with spring tension allows for a consistent amount of end tension to be applied, therefore tape measures without this are subjective to human

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[52] assets-us-01.kc-usercontent.com/933a959d-47e3-0014-e47a-1fff3fc5607e/fe234e9b-ff1c-4a1f-982e-1ac489452957/Printable_LOAD_Form.pdf

variation between application (Millis and Ciuperca, 2015). When utilised to measure muscle circumference, specific bony landmarks should be used to ensure the same exact area is being measured each time in order for the repeated measurements to be comparable (Millis and Ciuperca, 2015, Goff, 2016). An alternative to a spring tension tape measure is a Gulick girthometer to objectively measure the muscle girth (Dyke, 2014).

The literature has identified some potential flaws in using muscle mass measurements. Muscle girth and circumference may also be affected by variables other than the muscle itself, such as subcutaneous fat and the hair/fur. There may also be increases in muscle mass in response to exercise and increased use; this is a normal response and function of both the canine and equine bodies. In order for the outcome measure to be reliable, these variables should be taken into consideration, standardised where possible and monitored alongside the measurement itself (Kirkby Shaw *et al.*, 2020). When used correctly, muscle mass measurements are objective outcome measures with a strong evidence base for their efficacy. Yet despite this evidence base, the data in this report showed it has a low usage amongst equine practitioners with canine only slightly higher, indicating a limiting factor. This could potentially be that the outcome measure relies on the temperament of the animal allowing the repeat measurements, taking too much time in a consult, or simply prioritising other outcome measures. The discrepancy could also potentially be because of lack of familiarity with the equipment and therefore either lack of trust in the outcome measure or lack of trust in being able to consistently replicate the process due to some of the previously mentioned flaws. Both number of variables and potential human error during application, if the anatomical landmarks are used incorrectly, could result in this being viewed as a risky outcome measure with potential to produce non-significant results. It should be noted that the survey data supported this outcome measure being used most effectively in long-term degenerative cases, possibly due to the time period allowing more opportunity for more significant changes to develop.

A recommendation of this paper would be that a strong CPD resource be created for veterinary physiotherapists based around introduction to using muscle mass measurement as an outcome measurement. This could be through a set of practical sessions run by a university with a veterinary physiotherapy course, or through a set of online videos talking through how to reliably repeat the technique. This recommendation does not have to be exclusively limited to muscle mass measurement, as a similar resource for the correct application of other objective outcome measures mentioned in this paper could increase the profession's understanding and use of evidence-based outcome measures.

Evaluation of the animal in motion is a fundamental part of animal function assessment (Weigel *et al.*, 2005). Gait analysis by eye is quick, inexpensive, and does not require equipment, however, is a very subjective outcome measure with variations between clinicians lowering reliability (Tabor, 2020) as well as human error potentially missing key observations. Subtle lameness in particular can be a challenge to quantify. Convention indicates that lameness be monitored through evaluation at walk and at trot (Weigel *et al.*, 2005). Technology has allowed this outcome measure to become far more objective (Millis and Ciuperca, 2015). Smartphones or other devices can be used to record observational parameters and are commonly carried by many practitioners (Goff, 2016). Recording the motion allows the veterinary physiotherapists to watch specific limbs and joints without requiring excess movement from the patient, it also allows observation at multiple speeds, including slow-motion for subtle changes to be picked up (Millis and Ciuperca, 2015). Of the four gait analysis outcome measures surveyed, the dataset results showed that basic video recording assessment had the highest usage by the veterinary physiotherapist respondents, with the other three more advanced and costly outcome measures having a comparatively much lower usage. All four of these outcome measures were viewed as more effective for long term degenerative cases. Video assessment was the cheapest and least time-consuming option available, whilst still providing a more objective way of analysing a subjective pattern in comparison to repeated visual analysis over a time period with no recording. Several relatively inexpensive software applications exist to evaluate joint motion, but these lack a solid evidence base (Millis and Ciuperca, 2015) and this is reflected in its relatively low usage in the data in this report.

The word "kinetic", originally in the survey, was replaced with "kinematic" for ease of understanding and clarification. Kinetic analysis refers to the forces involved, however kinematic evaluates the gait from a spatial and temporal perspective without reference to forces (Weigel *et al.*, 2005) and is more appropriate term for those two outcome measures. Kinematic gait analysis involves placing contrast marker targets on the animal's skin over specific anatomical landmarks and recording their movement using a single or series of cameras. The targets can then be mapped digitally on computer software enabling a 2D or 3D digital replication of the animal's movement to be produced and its motion analysed. Joint motion can be objectively categorised using kinematic gait analysis in species including dogs and horses (Marsolais *et al.*, 2003, Brown and Tomlinson, 2021). The report does identify limiting aspects relating to placement of the retroreflective or colour contrast markers. Placement of skin surface markers can potentially be inaccurate when estimating the centre of a joint during motion and so any angles or deductions made on this would therefore be skewed, however if correctly placed, there is potential for a large amount of objective data to be collected and used to accurately tailor the animal's rehabilitation program. Kinematic analysis requires

expensive equipment, a dedicated space in the facility, and the time to map and analyse results and so may not be appropriate for every veterinary physiotherapist. If these expenses can be justified on a clinician-to-clinician basis, this would be a good outcome measure to integrate into their practice.

Millis and Ciuperca (2015) stated that recording gaits allows for changes over time to be compared, reducing the chance of inaccurate memory recall, and allowing detection of subtle changes that scoring system may not include. A challenge of comparing recorded gaits over time is that the speed of the animal being monitored, as a potential variable, should be constant across the recordings. Pain and lameness intrinsically change the speed of movement; however, this could be controlled for by editing the video playback speed or through using frame by frame comparison to ensure consistency. A recommendation of this paper would be that these outcome measures be included to the best of the veterinary physiotherapists ability and for what is allowed by both their monetary constraints and time constraints. The literature indicates the benefits increase with more specialised equipment, however using a phone to record movement is an inexpensive and quick process that is a minimum to include in baseline assessment and further reassessment to minimise the chance of inaccurate memory recall.

Goniometers can also be commonly used in dogs and horses to assess joint range of motion (Brown and Tomlinson, 2021, Goff, 2016), which is frequently associated with joint stiffness in degenerative joint diseases. Goniometry measures joint flexion and extension but does not evaluate accessory motion involved in circumduction or circumvention (Millis and Ciuperca, 2015). Goniometers were found to be comparable to measuring the joint angles on radiographs to a degree of high statistical accuracy (Jaegger *et al*., 2002). The Jaegger *et al*. (2002) study was cited by several of the papers found in the literature. The literature indicates that goniometry is a low-cost, extremely efficient, reliable, objective, and user-friendly outcome measure to assess range of motion (Formenton *et al*., 2019) and has a high inter and intra-assessor repeatability (Tabor and Williams, 2018). Kirkby Shaw *et al*. (2020) advises the goniometer to be used to assess stifle, tarsal, and hip flexion/extension range of motion be measured at baseline and reassessed at regular 2–4-week intervals. This suggested methodology of application was also used independently in the Jaegger *et al*. (2002) study, indicating the validity of the suggestion. The dataset produced by the survey indicated a statistically significant difference in usage between the species subsets. The outcome measure had a much higher usage in sole species practitioners, particularly solely canine veterinary physiotherapists and a far lower usage by mixed respondents. The survey results indicated the best perceived use of goniometers would be in canine degenerative joint cases. The literature supports this consensus but indicates it would also be equally as valid in equine degenerative cases, although restricted by the

practicality of using it to measure a much larger animal. Similar to several of the other outcome measures indicated for long term cases, an objective way of measuring the changes over time reduces the error associated with human recall and judgement.

Pressure plate analysis quantifies weight bearing forces while a limb is in contact with the ground. This can be a complex or simple as the practitioner wants, with high cost, high detail pressure analysis equipment (Weigel *et al.*, 2005) available from top end suppliers, or as low cost as required, by using four sets of bathroom scales (Millis and Ciuperca, 2015, Kirkby Shaw *et al.*, 2020) to measure the force through each limb at rest. Kirkby Shaw *et al.* (2020) notes that static weight bearing is yet to be fully validated with comprehensive evidence based but was commonly used by several of the paper's authors. Force plates can be combined with kinematic analysis in a dynamic setting to produce a complete analysis detailing the motion and forces involved (Weigel *et al.*, 2005). Whilst this would be expensive and require dedicated space in the veterinary physiotherapist's facility, it would produce a lot of usable data that could be used to revaluate the rehabilitation or management treatment plan. Weight bearing measurements using a pressure mat had the lowest use of any outcome measure surveyed and yet was perceived to be potentially very useful when used with other outcome measures. It is likely that this outcome measure has a high perceived cost by veterinary physiotherapists, which further research would be needed to confirm, however, low-cost alternatives do exist that could be potentially included at the veterinary physiotherapist's discretion.

4.3 SECTOR-WIDE RECOMMENDATIONS

Addressing aim: To identify and investigate the effect of external factors, including education and professional groups, on the use of outcome measures by veterinary physiotherapists

It should be noted that this study had a limited dataset produced by 40 veterinary physiotherapist survey respondents so may not be representative of the whole profession.

Historically, veterinary physiotherapists were human Physiotherapists that underwent a follow-up qualification (Sharp, 2008) but over the past 15 years more courses have become available, with the majority not requiring previous human qualifications. In the current project, where those with prior training in human physiotherapy were compared to those without, a major limitation was the small sample size of the human physiotherapists. This was exacerbated by splitting them into species groups, further reducing the sample size, however this was deemed necessary due to the fundamental differences between horses and dogs. Interestingly, there appears to be minimal differences between the two demographics surveyed. This is in direct contradiction to a survey

comparing veterinary physiotherapists with prior human training, against those with no prior human qualifications performed by Tabor and Williams (2018).

A major difference, between the Tabor and Williams study (2018) and this survey, was the results produced when the respondent's definition of outcome measures were compared to the definition used in the study. In their study, 72.5% of the human Physiotherapist participants were correct/partially correct and 7.8% were incorrect. The veterinary physiotherapists without prior human training only scored 40% correct/partially correct with 15% being incorrect. In this survey, 100% of veterinary physiotherapists with a human physiotherapy background answered correctly/partially correctly (11/11) and 96.7% of veterinary physiotherapists with no previous human qualification were correct/partially correct (29/30). Similar to the Tabor and Williams study (2018), the definitions were marked as correct if it included establishing baseline data and it included reference to tracking or determining treatment progress or efficacy**.**

The differences between these two studies could be because of the difference in sample size or the time in which the Tabor and Williams study (2018) was carried out against the present day, that is the use of outcome measures was likely less prevalent.

It should be noted that the Tabor and Williams study (2018) had 71 respondents in comparison to the 40 in the survey section of this study. The difference in dataset size could potentially have an impact on the comparison, however with the range of methods used to distribute this survey, the proportional representation has been maximised and potential biases reduced.

With the Tabor and Williams' study (2018) taking place 3 years prior to this one, there is a possibility that the difference is due to the advancement of the profession and outcome measures being more widespread and prevalent. In the Tabor and Williams survey (2018), 93% and 71.4% of veterinary physiotherapists in the above groups answered that they used outcome measures, and whilst there was no directly comparable question in this survey, there were individual outcome measures that received 100% of answers in the categories "frequently use" or "every case use" in the equine respondents.

One potential explanation of this is that every veterinary physiotherapist that took part in this survey received some type of formal training and holds a veterinary physiotherapy qualification. This could potentially indicate that the current veterinary physiotherapy education does include emphasis on the inclusion of outcome measures in the treatment process. Whilst the differences in the frequency of each outcome measures, between the veterinary physiotherapists with and without a human physiotherapy background, are minimal, both groups have a far higher usage of more subjective

outcome measures, such as the owner reported outcome measures or hands-on clinical assessment, than the objective outcome measures, such as the goniometer or standardised pain scores. The current guidance for veterinary physiotherapist education courses to be accredited by RAMP and AHPR makes mention to the use of outcome measures[53] [54], but does not specify types, give examples, or comment on subjective or objective outcome measures. This is likely because the sector is still developing and there is a very limited evidence base for the outcome measures, so they simply advise for their general use. With no sector-wide guidance on which specific outcome measures to use, there may be a significant variation of outcome measure teaching between the institutions. As part of many veterinary physiotherapy courses, students are advised to shadow qualified veterinary physiotherapists. However, if those qualified veterinary physiotherapists do not use any objective outcome measures, and if they are not emphasised in the course teaching, the students may not be exposed to how useful different types of outcome measures, and particularly objective evidence-based outcome measures, can be.

A recommendation of this project would be a review into the current teaching of outcome measures in veterinary physiotherapy courses. The review would be completed with a view to potentially reforming outcome measure teaching with further emphasis on a breadth of techniques and their importance. A further recommendation would be potential changes to the examinations at the end of the course, with questions designed to specifically examine the student's proposed use of outcome measures. This further recommendation is in line with changes currently being introduced in examinations at Hartpury University and at the University of Nottingham. These changes would likely result in a greater use of evidence-based objective outcome measures across the profession.

Currently the RCVS regulate Veterinary Surgeons and Registered Veterinary Nurses. All Veterinarians must be registered with the RCVS in order to practice acts of veterinary medicine in the UK and to call themselves Veterinary Surgeons. Failure to meet the standards of the profession or failing in professional conduct would result in the removal from the RCVS registry and the individual would no longer be able to carry out acts of veterinary surgery or be referred to as a Veterinary Surgeon[55]. An important difference in the field of veterinary physiotherapy is that the term "acts of veterinary physiotherapy", performed by veterinary physiotherapists, has no clear distinction from "acts of physical therapy", performed by animal physical therapy professions, including hydrotherapy,

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[53] www.ahpr.org.uk/key-documents/
[54] www.rampregister.org/sites/default/files/CodeOfConduct.pdf
[55] www.rcvs.org.uk/how-we-work/the-role-of-the-rcvs/

massage therapy, and other musculoskeletal practitioners, and so could not be regulated in the same way as "acts of Veterinary Surgery".

With veterinary physiotherapy currently lacking legal protection, people without any formal qualifications are allowed to claim to be veterinary physiotherapists and perform acts of physiotherapy (BSAVA, 2021). This is likely to be confusing and promote misunderstanding to the general public and the referring veterinarians when considering how to proceed with rehabilitation for their animals, especially with the lack of clarity for Veterinary Surgeons referring to musculoskeletal therapists[56]. This raises the question over regulation of the profession, which could be provided through legal protection of the title "Veterinary Physiotherapist." This would require a regulatory body, of which registration would be mandatory in order to use the protected title.

Registration in veterinary physiotherapy is currently split between AHPR and RAMP, however, there are a large proportion of veterinary physiotherapists that are not members of either. Upon completion of an accredited Veterinary Surgery course, graduate Vets are automatically registered with the RCVS. At the time of writing, the university veterinary physiotherapy courses provide eligibility to be members of the registry groups, but registration is not automatic. The goals of both AHPR and RAMP are to raise standards in the industry and for their members to maintain the top standards of practice.[57] [58] However, data presented in this report show minimal differences between members of these regulatory bodies and non-members. Some differences can be seen, including improved use of video recording and LOAD scoring as outcome measures, however many results were very similar between the two categories. This indicates that membership of a registry body does associate positively with increased use of outcome measures, but this association is not as strong as it could be. This could potentially be due to the fact that veterinary physiotherapists are competent professionals that are already acting as if they are regulated so any differences are minimised. Alternatively, part of the lack of discrepancy could be that whilst the 20 non-member respondents are currently not members of a registry body, they may have been previous members that have let their membership expire.

Currently, there are no legal requirements for the use of outcome measures because membership of a registry body, like RAMP and AHPR, is voluntary. Therefore, membership requirements, including the CPD and quality standards that refer to outcome measures, are also voluntary. This means not

[56] https://www.legislation.gov.uk/uksi/2015/772
[57] www.ahpr.org.uk
[58] www.rampregister.org

being a member, and therefore potentially not following the suggested use of outcome measures, lacks any meaningful consequences.

Another recommendation of this paper would therefore be that the regulation and registration of veterinary physiotherapists be reviewed, potentially investigating the viability of a single mandatory regulatory registration body, including mandatory audits, CPD involving use of outcome measures, and Day One competencies including use of outcome measures. The RCVS currently regulate multiple members of the animal healthcare team, including both Veterinary Surgeons and Veterinary Nurses [RVNs], so would be a logical regulatory option for inclusion in the review. In 2019, the RCVS ruled that veterinary and animal health paraprofessionals fall within the college's regulatory remit[59]. A review of the veterinary physiotherapist regulation could then pave the way for "Veterinary Physiotherapist" to become a protected title, ensuring each member performs relevant CPD, facilitating further education in the use of outcome measures in gold standard practice. For clarification, this paper does not comment or conclude on the legal status of veterinary physiotherapists outside of the use of outcome measures, nor does the remit of this paper extend to comments or conclusions on the legal status of musculoskeletal practitioners that do not refer to themselves as veterinary physiotherapists.

Whilst the scope of this paper is based on veterinary physiotherapists, it may also be relevant for other musculoskeletal practitioners to consider their use of outcome measures. Further industry specific research would be needed to provide an evidence base; however, this study indicates that there are a lot of benefits for increased use of outcome measures where possible, and it appears likely that other musculoskeletal practitioners also would benefit from their use.

With further time, the study could be expanded to investigate to what extent the use of outcome measures have an effect on owner satisfaction with veterinary physiotherapists and their trust in the profession. That could also investigate if there was a difference in owner satisfaction between how the results of the outcome measures are recorded. This could include a comparison between, for example, owners being presented with a table with the joint ROM goniometer measurements, against a graph plotting their ROM progression, and finally against a control of the veterinary physiotherapist keeping the results in their clinical notes with no owner access. This study would need to include multiple voluntary participating veterinary physiotherapists and for validation purposes could not be completed retrospectively.

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[59] www.rcvs.org.uk/news-and-views/features/lwp-update-2-paraprofessional-regulation/

A broad interpretation of the collected data appears to show a greater current use of more subjective outcome measures in clinical practice by veterinary physiotherapists. This conclusion is something that has also been found and supported by other previous studies and literature (Tabor and Williams, 2018). With further time, this study would have benefitted with a follow up survey, including questions asking why certain outcome measures have limited current usage. This research into the limitations associated with implementing these outcome measures would allow clarification between the effect monetary and time constraints have on their selection or if it is due to the lack of trust or familiarity in their reliability or effectiveness.

In its entirety, this project has shown that there is a current high prevalence of outcome measure usage by veterinary physiotherapists, however analysis of the literature base and the survey of veterinary physiotherapists has shown there is an underutilisation of objective, evidence-based outcome measures. This shows the potential for improved outcomes for both animals and owners. This supports the initial contention and hypothesis that outcome measures are underutilised in the veterinary physiotherapy profession.

5 CONCLUSIONS AND RECOMMENDATIONS

Consistent use of outcome measures are important to record case progression in the animal, including small, incremental changes that may be missed session to session, which allows the veterinary physiotherapist to produce an adaptable tailored treatment and rehabilitation course for the animal. Considering patient vocalised outcome measures are impossible in veterinary physiotherapy, strong standardised outcome measures of other parameters are of prime importance to this profession. However, it is still important for subjective outcome measures, including visual and hands-on assessments, to be used during the initial baseline assessment and subsequent reassessment made by the veterinary physiotherapist. Efforts should be made to reduce incidence of human error in these assessments through the accurate and thorough notes stored within the patient's clinical records, ensuring the same clinician consistently performs the reassessment, and the introduction of video recording for dynamic assessments and retrospective analysis.

Another recommendation was the introduction of an outside-of-sessions outcome measure checklist system for use by the owners for tracking progression, modified on a case-by-case basis and including animal function tests and pain scoring. This would allow the key integration of owner information in a way that does not compromise the time limitations during the consultation and promotes owner engagement with the rehabilitation process. Additionally, if the veterinary physiotherapist was to repeat a standardised pain score, for example using an ethogram, it would allow any disparity with the owners' perceptions to be identified early and expectations managed. Introduction of this system would potentially save time during sessions and thus allow time for the inclusion of more evidence-based objective outcome measures that could benefit the rehabilitation of the animal. These could include outcome measures with a strong evidence base, such as goniometers, muscle mass measurements and kinematic assessments. These outcome measures should be included to the best of the veterinary physiotherapists ability and for what is allowed by both their monetary and time constraints.

The first profession-wide recommendation was for the introduction of a set of comprehensive CPD resources based about the introduction of specific outcome measures into clinical practice. This could be through a set of practical sessions run an accredited CPD provider, or through a set of online videos talking through how to reliably repeat the techniques. This could increase the understanding and use of evidence-based outcome measures amongst current qualified veterinary physiotherapists. This could be combined with a review into the current teaching and assessments of outcome measures in veterinary physiotherapy courses to target the future generations of veterinary physiotherapists.

The final recommendation of this paper would therefore be that the regulation and registration of veterinary physiotherapists be reviewed, potentially investigating the viability of a single mandatory regulatory registration body, including mandatory audits, CPD involving the use of outcome measures, and Day One competencies including the use of outcome measures.

The sustained use of outcome measures can positively impact owner compliance, expectation and satisfaction which can result in a high standard of care for the patient. Many objective outcome measures have a lower perceived effectiveness and usage than their evidence base would suggest. Whilst it appears that outcome measures are used extensively throughout the veterinary physiotherapy profession, there is a lack of consistency and quality in their use. This likely reflects the regulation and training of the profession.

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7 APPENDIX

Appendix A - Copy of the survey sent out to qualified veterinary physiotherapists

Survey map

The current sequence, routing and relationships between your survey pages:
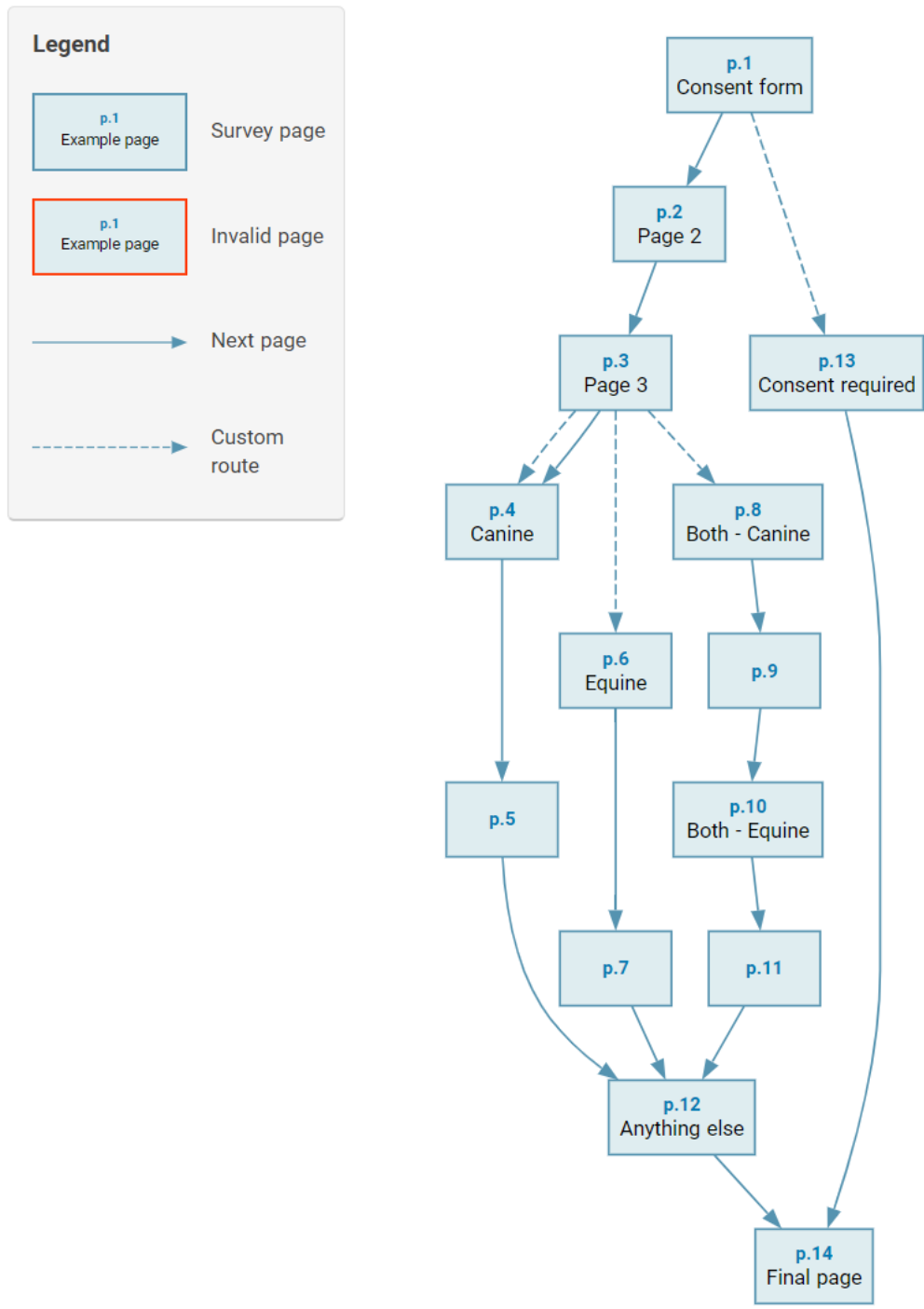
Evaluating the Use of Outcome Measures in Veterinary Physiotherapy

Researchers: William Brookes with Richard Lea and Richard Payne

Purpose of the study:

To determine the current use of outcome measures within Veterinary Physiotherapy practice, explore their clinical relevance, and to evaluate intra and inter-clinician comparisons

If you have any queries regarding this study, please speak to the researcher directly or contact them via e-mail (details on the accompanying letter/at the end of the survey).

Consent:

This consent form is a formal way of indicating that you agree to participate in this study and that you understand that any information collected by the researchers:

- will be used for a research study

- may be written in a report for publication

- may be presented at research conferences or meetings

- will be anonymised and treated confidentially

- will only be accessed by research colleagues or examiners

- that you can request to see a copy/summary of the completed study when finalized

- that you can request to see any information written down/kept during the process of data collection.

- that any comments you make will be anonymous so that in the final study write up, it will not be possible to identify you.

By consenting below you confirm that you:

- understand that participation in this study is voluntary and that may leave the study at any time (without needing to provide reasons for doing so)

-agree that information given during the study can be used in a report, a published paper or a conference or meeting presentation.

- understand that the study is being conducted for the purposes of research.

- understand that you can request to see a summary of the findings, and you can also request to see any notes made during the process of the data collection.

1 ◉ 🔧 Please answer below: *

I consent

I do not consent

p. 2   Page 2

2 T ⊘ How many years have you been working / involved with veterinary physiotherapy? *

3 ☑ ⊘ Which Veterinary Physiotherapy registary bodies are you a part of? (please tick only one box) *

RAMP

AHPR

RAMP & AHPR

Show all (5)

a T If you selected Other, please specify any other bodies:

4 ☑ Which Veterinary Physiotherapy professional bodies are you a part of? (select all that apply) *

ACPAT

IRVAP

NAVP

Show all (5)

a T If you selected Other, please specify any other groups:

5 ⚙ Where did you get your Veterinary Physiotherapy qualification from? *

Harper Adams University

Hartpury University and Hartpury College

Middlesex University (CEPT)

Show all (8)

a ▤ If you selected Other, please specify: *

6 ☑ Please indicate any human qualifications that you hold? (If none, please leave blank)

Physiotherapist

Sports Massage Therapist

Osteopath

Show all (4)

7 T ⊘ What is the first part of the postcode of where your practice is based? e.g. LE14

◆ The following two questions are designed to get a general understanding of your perception of
Outcome Measures

8 ▤ How would you define an Outcome Measure? *

9 ⚙ Do you believe there is a need for Outcome Measures to be used more in veterinary physiotherapy? *

Yes

No

p. 3   Page 3

10 ⚙ ⊞ Which species do you work with predominantly? (select the most appropriate option) *

Canine

Equine

Both

You have selected Canine. You will now be asked about your experience with Outcome measures when treating dogs. The aim of this is to ascertain if there is a difference in approach to Outcome Measures for one species from different Veterinary Physiotherapists.

11 T ⊘ How many canine consultations do you have per week? *

12 ⚙ How would you describe your practice as a Veterinary Physiotherapist? *

Entirely clinic based - own clinic

Entirely clinic based - within a veterinary clinic/hospital

Mostly clinic based - own clinic

Show all (8)

8 ▭ If you selected Other, please specify: *

For the purpose of this study, we are defining Outcome Measures as tools, tests or scales administered and interpreted by Veterinary Physiotherapists that have been shown to measure accurately a particular attribute of interest and are expected to be influenced by outcome

13 ⚙ Do you use Outcome Measures in practice in cases relating to joint issues? *

Never   Few cases   Most cases   Show all (4)

8 ▭ If you selected never or few, what are your reasons for not using outcome measures currently in your practice and how do you assess the effectiveness of treatment provided? *

14 ▦ ⊘ Please rank the usefulness of each of the following resources for developing the Outcome Measures you use in canine joint cases? *

	N/A	Least Useful	Somewhat Useful	Very Useful	Most Useful
Developed them yourselves	☐	☐	☐	☐	☐
Taught in your original Veterinary Physiotherapy training	☐	☐	☐	☐	☐
CPD Courses	☐	☐	☐	☐	☐
Literature	☐	☐	☐	☐	☐
Adapted from training in a previous profession (e.g. human Physiotherapy)	☐	☐	☐	☐	☐

8 ▭ Please include any other sources not mentioned above in the box below:

The following questions are designed to specifically examine trends in the outcome measures for canine joint cases. The questions are exploring the effectiveness of individual techniques as they are used in combination as part of an overall treatment plan.

15 Please rate your familiarity with the following outcome measures for joint cases: *

	Unaware	Aware but unlikely to invest in	Aware of and would like to invest in	Have but rarely use	Have and frequently use	Use in every case
How well is the animal	☐	☐	☐	☐	☐	☐
How well does the animal move	☐	☐	☐	☐	☐	☐
Hands-on assessment	☐	☐	☐	☐	☐	☐
Owner-reported capability e.g. can jump on/off sofa	☐	☐	☐	☐	☐	☐
Owner-reported interpretation e.g. can jump on/off sofa easier than before, engages with enrichment more/less	☐	☐	☐	☐	☐	☐
Standardised Pain score – Helsinki etc	☐	☐	☐	☐	☐	☐
LOAD Score (Liverpool Osteoarthritis in Dogs)	☐	☐	☐	☐	☐	☐
Muscle mass measurement (tape measure)	☐	☐	☐	☐	☐	☐
Video tracking and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐	☐	☐
Video tracking and gait analysis - phone/camera	☐	☐	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - video recording and computer analysis apps	☐	☐	☐	☐	☐	☐
Goniometer	☐	☐	☐	☐	☐	☐
Weight bearing measurements on pressure mat	☐	☐	☐	☐	☐	☐

Please include any other Outcome Measures not mentioned above in the box below with your usage:

16 Please rate how EFFECTIVE you believe the following outcome measures are as part of your management plan for ACUTE joint cases: *

	Shouldn't be used	Should only be used in conjunction with other Outcome Measures	Useable on their own but best used with other Outcome Measures	Excellent on their own and excellent with other Outcome Measures
How well is the animal	☐	☐	☐	☐
How well does the animal move	☐	☐	☐	☐
Hands-on assessment	☐	☐	☐	☐
Owner-reported capability e.g. can jump on/off sofa	☐	☐	☐	☐
Owner-reported interpretation e.g. can jump on/off sofa easier than before, engages with enrichment more/less	☐	☐	☐	☐
Standardised Pain score – Helsinki etc	☐	☐	☐	☐
LOAD Score (Liverpool Osteoarthritis in Dogs)	☐	☐	☐	☐
Muscle mass measurement (tape measure)	☐	☐	☐	☐
Video tracking and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐
Video tracking and gait analysis - phone/camera	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - video recording and computer analysis apps	☐	☐	☐	☐
Goniometer	☐	☐	☐	☐
Weight bearing measurements on pressure mat	☐	☐	☐	☐

Please include any other Outcome Measures not mentioned above in the box below with how effective you believe them to be:

17 Please rate how EFFECTIVE you believe the following outcome measures are as part of your management plan for DEGENERATING joint cases: *

	They shouldn't be used in these cases	Should only be used in conjunction with other Outcome Measures	Useable on their own but best used with other Outcome Measures	Excellent on their own and excellent with other Outcome Measures
How well is the animal	☐	☐	☐	☐
How well does the animal move	☐	☐	☐	☐
Hands-on assessment	☐	☐	☐	☐
Owner-reported capability e.g. can jump on/off sofa	☐	☐	☐	☐
Owner-reported interpretation e.g. can jump on/off sofa easier than before, engages with enrichment more/less	☐	☐	☐	☐
Standardised Pain score – Helsinki etc	☐	☐	☐	☐
LOAD Score (Liverpool Osteoarthritis in Dogs)	☐	☐	☐	☐
Muscle mass measurement (tape measure)	☐	☐	☐	☐
Video tracking and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐
Video tracking and gait analysis - phone/camera	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - video recording and computer analysis apps	☐	☐	☐	☐
Goniometer	☐	☐	☐	☐
Weight bearing measurements on pressure mat	☐	☐	☐	☐

Please include any other Outcome Measures not mentioned above in the box below with how effective you believe them to be:

18 How do you record the results of the Outcome Measures that you use? (Select all that apply) *

Noted within patient physical records

Noted online within patient records

Plotted on a progression graph

Show all (8)

You have selected Equine. You will now be asked about your experience with Outcome measures when treating horses. The aim of this is to ascertain if there is a difference in approach to Outcome Measures for one species from different Veterinary Physiotherapists.

19 T ⊘ How many equine consultations do you have per week? *

20 ⚙ How would you descripe your practice as a Veterinary Physiotherapist? *

Entirely clinic based - own clinic

Entirely clinic based - within a veterinary clinic/hospital

Mostly clinic based - own clinic

Show all (8)

a ▤ If you selected Other, please specify: *

For the purpose of this study, we are defining Outcome Measures as tools, tests or scales administered and interpreted by Veterinary Physiotherapists that have been shown to measure accurately a particular attribute of interest and are expected to be influenced by outcome

21 ⚙ Do you use Outcome Measures in practice in cases relating to joint issues? *

Never   Few cases   Most cases   Show all (4)

a ▤ If you selected never or few, what are your reasons for not using outcome measures currently in your practice and how do you assess the effectiveness of treatment provided? *

22 ▦ ⊘ Please rank the usefulness of each of the following resources for developing the Outcome Measures you use in equine joint cases? *

	N/A	Least Useful	Somewhat Useful	Very Useful	Most Useful
Developed them yourselves	☐	☐	☐	☐	☐
Taught in your original Veterinary Physiotherapy training	☐	☐	☐	☐	☐
CPD Courses	☐	☐	☐	☐	☐
Literature	☐	☐	☐	☐	☐
Adapted from training in a previous profession (e.g. human Physiotherapy)	☐	☐	☐	☐	☐

a ▤ Please include any other sources not mentioned above in the box below:

The following questions are designed to specifically examine trends in the outcome measures for equine joint cases. The questions are exploring the effectiveness of individual techniques as they are used in combination as part of an overall treatment plan.

23 Please rate your familiarity with the following outcome measures for joint cases: *

	Unaware	Aware but unlikely to invest in	Aware of and would like to invest in	Have but rarely use	Have and frequently use	Use in every case
How well is the animal	☐	☐	☐	☐	☐	☐
How well does the animal move	☐	☐	☐	☐	☐	☐
Hands-on assessment	☐	☐	☐	☐	☐	☐
Owner-reported capability e.g. can jump on/off sofa	☐	☐	☐	☐	☐	☐
Owner-reported interpretation e.g. can jump on/off sofa easier than before, engages with enrichment more/less	☐	☐	☐	☐	☐	☐
Standardised Pain score – Helsinki etc	☐	☐	☐	☐	☐	☐
Muscle mass measurement (tape measure)	☐	☐	☐	☐	☐	☐
Video tracking and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐	☐	☐
Video tracking and gait analysis - phone/camera	☐	☐	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - video recording and computer analysis apps	☐	☐	☐	☐	☐	☐
Goniometer	☐	☐	☐	☐	☐	☐
Weight bearing measurements on pressure mat	☐	☐	☐	☐	☐	☐

a Please include any other Outcome Measures not mentioned above in the box below with your usage:

24 Please rate how EFFECTIVE you believe the following outcome measures are as part of your management plan for ACUTE joint cases: *

	They shouldn't be used in these cases	Should only be used in conjunction with other Outcome Measures	Useable on their own but best used with other Outcome Measures	Excellent on their own and excellent with other Outcome Measures
How well is the animal	☐	☐	☐	☐
How well does the animal move	☐	☐	☐	☐
Hands-on assessment	☐	☐	☐	☐
Owner-reported capability e.g. can jump on/off sofa	☐	☐	☐	☐
Owner-reported interpretation e.g. can jump on/off sofa easier than before, engages with enrichment more/less	☐	☐	☐	☐
Standardised Pain score – Helsinki etc	☐	☐	☐	☐
Muscle mass measurement (tape measure)	☐	☐	☐	☐
Video tracking and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐
Video tracking and gait analysis - phone/camera	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - video recording and computer analysis apps	☐	☐	☐	☐
Goniometer	☐	☐	☐	☐
Weight bearing measurements on pressure mat	☐	☐	☐	☐

a Please include any other Outcome Measures not mentioned above in the box below with how effective you believe them to be:

25 Please rate how EFFECTIVE you believe the following outcome measures are as part of your management plan for DEGENERATING joint cases: *

	They shouldn't be used in these cases	Should only be used in conjunction with other Outcome Measures	Useable on their own but best used with other Outcome Measures	Excellent on their own and excellent with other Outcome Measures
How well is the animal	☐	☐	☐	☐
How well does the animal move	☐	☐	☐	☐
Hands-on assessment	☐	☐	☐	☐
Owner-reported capability e.g. can jump on/off sofa	☐	☐	☐	☐
Owner-reported interpretation e.g. can jump on/off sofa easier than before, engages with enrichment more/less	☐	☐	☐	☐
Standardised Pain score – Helsinki etc	☐	☐	☐	☐
Muscle mass measurement (tape measure)	☐	☐	☐	☐
Video tracking and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐
Video tracking and gait analysis - phone/camera	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - video recording and computer analysis apps	☐	☐	☐	☐
Goniometer	☐	☐	☐	☐
Weight bearing measurements on pressure mat	☐	☐	☐	☐

a Please include any other Outcome Measures not mentioned above in the box below with how effective you believe them to be:

26 How do you record the results of the Outcome Measures that you use? (Select all that apply) *

Noted within patient physical records

Noted online within patient records

Plotted on a progression graph

Show all (8)

You have selected BOTH. You will first be asked about your experience with dogs followed by a set of identical questions for horses. The aim of this is to ascertain if there is a difference in approach to Outcome Measures for each species from the same Veterinary Physiotherapist.

27 How many canine consultations do you have per week? *

28 How would you descripe your practice as a Veterinary Physiotherapist? *

Entirely clinic based - own clinic

Entirely clinic based - within a veterinary clinic/hospital

Mostly clinic based - own clinic

Show all (8)

If you selected Other, please specify: *

For the purpose of this study, we are defining Outcome Measures as tools, tests or scales administered and interpreted by Veterinary Physiotherapists that have been shown to measure accurately a particular attribute of interest and are expected to be influenced by outcome

29 Do you use Outcome Measures in practice in cases relating to joint issues? *

Never   Few cases   Most cases   Show all (4)

If you selected never or few, what are your reasons for not using outcome measures currently in your practice and how do you assess the effectiveness of treatment provided? *

30 Please rank the usefulness of each of the following resources for developing the Outcome Measures you use in canine joint cases? *

	N/A	Least Useful	Somewhat Useful	Very Useful	Most Useful
Developed them yourselves	☐	☐	☐	☐	☐
Taught in your original Veterinary Physiotherapy training	☐	☐	☐	☐	☐
CPD Courses	☐	☐	☐	☐	☐
Literature	☐	☐	☐	☐	☐
Adapted from training in a previous profession (e.g. human Physiotherapy)	☐	☐	☐	☐	☐

Please include any other sources not mentioned above in the box below:

The following questions are designed to specifically examine trends in the outcome measures
for canine joint cases. The questions are exploring the effectiveness of individual techniques as
they are used in combination as part of an overall treatment plan.

31 Please rate your familiarity with the following outcome measures for joint cases: *

	Unaware	Aware but unlikely to invest in	Aware of and would like to invest in	Have but rarely use	Have and frequently use	Use in every case
How well is the animal	☐	☐	☐	☐	☐	☐
How well does the animal move	☐	☐	☐	☐	☐	☐
Hands-on assessment	☐	☐	☐	☐	☐	☐
Owner-reported capability e.g. can jump on/off sofa	☐	☐	☐	☐	☐	☐
Owner-reported interpretation e.g. can jump on/off sofa easier than before, engages with enrichment more/less	☐	☐	☐	☐	☐	☐
Standardised Pain score – Helsinki etc	☐	☐	☐	☐	☐	☐
LOAD Score (Liverpool Osteoarthritis in Dogs)	☐	☐	☐	☐	☐	☐
Muscle mass measurement (tape measure)	☐	☐	☐	☐	☐	☐
Video tracking and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐	☐	☐
Video tracking and gait analysis - phone/camera	☐	☐	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - video recording and computer analysis apps	☐	☐	☐	☐	☐	☐
Goniometer	☐	☐	☐	☐	☐	☐
Weight bearing measurements on pressure mat	☐	☐	☐	☐	☐	☐

Please include any other Outcome Measures not mentioned above in the box below with your usage:

32 Please rate how EFFECTIVE you believe the following outcome measures are as part of your management plan for ACUTE joint cases: *

	They shouldn't be used in these cases	Should only be used in conjunction with other Outcome Measures	Useable on their own but best used with other Outcome Measures	Excellent on their own and excellent with other Outcome Measures
How well is the animal	☐	☐	☐	☐
How well does the animal move	☐	☐	☐	☐
Hands-on assessment	☐	☐	☐	☐
Owner-reported capability e.g. can jump on/off sofa	☐	☐	☐	☐
Owner-reported interpretation e.g. can jump on/off sofa easier than before, engages with enrichment more/less	☐	☐	☐	☐
Standardised Pain score – Helsinki etc	☐	☐	☐	☐
LOAD Score (Liverpool Osteoarthritis in Dogs)	☐	☐	☐	☐
Muscle mass measurement (tape measure)	☐	☐	☐	☐
Video tracking and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐
Video tracking and gait analysis - phone/camera	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - video recording and computer analysis apps	☐	☐	☐	☐
Goniometer	☐	☐	☐	☐
Weight bearing measurements on pressure mat	☐	☐	☐	☐

Please include any other Outcome Measures not mentioned above in the box below with how effective you believe them to be:

33 Please rate how EFFECTIVE you believe the following outcome measures are as part of your management plan for DEGENERATING joint cases: *

	They shouldn't be used in these cases	Should only be used in conjunction with other Outcome Measures	Useable on their own but best used with other Outcome Measures	Excellent on their own and excellent with other Outcome Measures
How well is the animal	☐	☐	☐	☐
How well does the animal move	☐	☐	☐	☐
Hands-on assessment	☐	☐	☐	☐
Owner-reported capability e.g. can jump on/off sofa	☐	☐	☐	☐
Owner-reported interpretation e.g. can jump on/off sofa easier than before, engages with enrichment more/less	☐	☐	☐	☐
Standardised Pain score – Helsinki etc	☐	☐	☐	☐
LOAD Score (Liverpool Osteoarthritis in Dogs)	☐	☐	☐	☐
Muscle mass measurement (tape measure)	☐	☐	☐	☐
Video tracking and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐
Video tracking and gait analysis - phone/camera	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - video recording and computer analysis apps	☐	☐	☐	☐
Goniometer	☐	☐	☐	☐
Weight bearing measurements on pressure mat	☐	☐	☐	☐

Please include any other Outcome Measures not mentioned above in the box below with how effective you believe them to be:

34 How do you record the results of the Outcome Measures that you use? (Select all that apply) *

Noted within patient physical records
Noted online within patient records
Plotted on a progression graph
Show all (8)

Add item

Now switching to equine questions - questions are the same but different species

Please note the following questions are identical to the ones you have just answered, however are now relating to your work as an EQUINE physiotherapist

Add item

35 T ⊘ How many equine consultations do you have per week? *

Add item

Add item

36 ⚙ How would you describe your practice as a Veterinary Physiotherapist? *

Entirely clinic based - own clinic
Entirely clinic based - within a veterinary clinic/hospital
Mostly clinic based - own clinic
Show all (8)

Add item

a ▤ If you selected Other, please specify: *

Add item

Add item

Add item

For the purpose of this study, we are defining Outcome Measures as tools, tests or scales administered and interpreted by Veterinary Physiotherapists that have been shown to measure accurately a particular attribute of interest and are expected to be influenced by outcome

Add item

37 ⚙ Do you use Outcome Measures in practice in cases relating to joint issues? *

Never   Few cases   Most cases   Show all (4)

Add item

a ▤ If you selected never or few, what are your reasons for not using outcome measures currently in your practice and how do you assess the effectiveness of treatment provided? *

Add item

Add item

Add item

38 ▦ ⊘ Please rank the usefulness of each of the following resources for developing the Outcome Measures you use in equine joint cases? *

	N/A	Least Useful	Somewhat Useful	Very Useful	Most Useful
Developed them yourselves	☐	☐	☐	☐	☐
Taught in your original Veterinary Physiotherapy training	☐	☐	☐	☐	☐
Courses	☐	☐	☐	☐	☐
Literature	☐	☐	☐	☐	☐
Adapted from training in a previous profession (e.g. human Physiotherapy)	☐	☐	☐	☐	☐

Add item

a ▤ Please include any other sources not mentioned above in the box below:

Add item

The following questions are designed to specifically examine trends in the outcome measures for equine joint cases. The questions are exploring the effectiveness of individual techniques as they are used in combination as part of an overall treatment plan.

39 Please rate your familiarity with the following outcome measures for joint cases: *

	Unaware	Aware but unlikely to invest in	Aware of and would like to invest in	Have but rarely use	Have and frequently use	Use in every case
How well is the animal	☐	☐	☐	☐	☐	☐
How well does the animal move	☐	☐	☐	☐	☐	☐
Hands-on assessment	☐	☐	☐	☐	☐	☐
Owner-reported capability e.g. can jump on/off sofa	☐	☐	☐	☐	☐	☐
Owner-reported interpretation e.g. can jump on/off sofa easier than before, engages with enrichment more/less	☐	☐	☐	☐	☐	☐
Standardised Pain score – Helsinki etc	☐	☐	☐	☐	☐	☐
Muscle mass measurement (tape measure)	☐	☐	☐	☐	☐	☐
Video tracking and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐	☐	☐
Video tracking and gait analysis - phone/camera	☐	☐	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - video recording and computer analysis apps	☐	☐	☐	☐	☐	☐
Goniometer	☐	☐	☐	☐	☐	☐
Weight bearing measurements on pressure mat	☐	☐	☐	☐	☐	☐

Please include any other Outcome Measures not mentioned above in the box below with your usage:

40 Please rate how EFFECTIVE you believe the following outcome measures are as part of your management plan for ACUTE joint cases: *

	They shouldn't be used in these cases	Should only be used in conjunction with other Outcome Measures	Useable on their own but best used with other Outcome Measures	Excellent on their own and excellent with other Outcome Measures
How well is the animal	☐	☐	☐	☐
How well does the animal move	☐	☐	☐	☐
Hands-on assessment	☐	☐	☐	☐
Owner-reported capability e.g. can jump on/off sofa	☐	☐	☐	☐
Owner-reported interpretation e.g. can jump on/off sofa easier than before, engages with enrichment more/less	☐	☐	☐	☐
Standardised Pain score – Helsinki etc	☐	☐	☐	☐
Muscle mass measurement (tape measure)	☐	☐	☐	☐
Video tracking and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐
Video tracking and gait analysis - phone/camera	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - video recording and computer analysis apps	☐	☐	☐	☐
Goniometer	☐	☐	☐	☐
Weight bearing measurements on pressure mat	☐	☐	☐	☐

Please include any other Outcome Measures not mentioned above in the box below with how effective you believe them to be:

41 Please rate how EFFECTIVE you believe the following outcome measures are as part of your management plan for DEGENERATING joint cases: *

	They shouldn't be used in these cases	Should only be used in conjunction with other Outcome Measures	Useable on their own but best used with other Outcome Measures	Excellent on their own and excellent with other Outcome Measures
How well is the animal	☐	☐	☐	☐
How well does the animal move	☐	☐	☐	☐
Hands-on assessment	☐	☐	☐	☐
Owner-reported capability e.g. can jump on/off sofa	☐	☐	☐	☐
Owner-reported interpretation e.g. can jump on/off sofa easier than before, engages with enrichment more/less	☐	☐	☐	☐
Standardised Pain score – Helsinki etc	☐	☐	☐	☐
Muscle mass measurement (tape measure)	☐	☐	☐	☐
Video tracking and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐
Video tracking and gait analysis - phone/camera	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - kinetic monitoring and analysis equipment	☐	☐	☐	☐
Video tracking with digital mapping and gait analysis - video recording and computer analysis apps	☐	☐	☐	☐
Goniometer	☐	☐	☐	☐
Weight bearing measurements on pressure mat	☐	☐	☐	☐

Please include any other Outcome Measures not mentioned above in the box below with how effective you believe them to be:

42 How do you record the results of the Outcome Measures that you use? (Select all that apply) *

Noted within patient physical records

Noted online within patient records

Plotted on a progression graph

Show all (8)

p. 12 Anything else

43 📝 If you have any other comments you would like to make, please do so here:

44 📝 Please enter your email address here if you would like to receive a summary of the study results at the end of the project:

p. 13 Consent required

This survey requires your consent to proceed.

Please reload the survey through the following link or press previous to return to the opening page and consent to fill in the questions.

If you have any issues or inquiries, please email William Brookes at svywtb@nottingham.ac.uk

p. 14 Final page

Thank you for taking part in the survey!

If you have any question about the project feel free to email William Brookes at svywtb@nottingham.ac.uk.

Further physiotherapy treatment
Funding request form

Bupa

Please complete this form to request funding for all Bupa patients who need more sessions of physiotherapy than we've initially pre-authorised. It will mean we have all the information we need to see whether the patient's scheme covers any additional sessions of physiotherapy.

We initially pre-authorise five sessions of physiotherapy except post-operation, when we use best practice guidelines to determine the number of sessions for the initial pre-authorisation (you can find the number of sessions covered on **Providers Online**).

We'll consider funding more where it is clinically necessary and covered by the patients' health insurance policy or healthcare trust. We may request a copy of the patient's full medical notes from you and their GP to confirm that the proposed treatment is covered by their benefits.

Our schemes cover evidence based, clinically appropriate treatment for acute conditions which is expected to quickly restore the patient to their previous state of health. You can find out more at **bupa.co.uk/important-points-about-your-bupa-patients-cover**

We recommend that you submit this form as soon as you know that the patient needs more sessions than originally authorised to avoid delaying future treatment. We'll let the patient know and update the number of sessions on Providers Online for you within three working days of receiving your completed form.

Please send us your completed form by secure email to **tmtsm@bupa.com**. Information you send to this email address may not be secure unless you send us your email through Egress. To sign up for a free Egress account, go to **https://switch.egress.com**

If you've any questions, please call us on **0345 600 0541** between 8am and 8pm Monday to Friday, and 8am and 4pm on Saturdays. We may record or monitor our calls.

About the patient

Title (please tick) ☐ Miss   ☐ Mrs   ☐ Ms   ☐ Mr   ☐ Dr   ☐ Other (please state)

Patient's name

Date of birth   ☐ D ☐ D ☐ M ☐ M ☐ Y ☐ Y ☐ Y ☐ Y

Bupa membership number

Phone number

Therapist's details

Therapist's name

Bupa provider number

Phone number

About the patient's condition

What's the patient's diagnosis?

Assessment

	Initial assessment	Current assessment
Subjective markers Such as Visual Analogue Scale, functional limitation etc		

	Initial assessment	Current assessment
Objective markers		

	Initial score	Current score
Outcome Measures Such as Patient Specific Functional Scale		

About the treatment

Treatment start date

Please summarise the patient's treatment to date and response

Number of sessions to date

Proposed treatment plan

Number of additional sessions requested

Please explain the clinical reason for further treatment, detailing best practice guidelines used

Does the patient have any other unrelated conditions which may affect their recovery?

Therapist's declaration

I understand that the clinical information I've supplied may be considered to be a medical report for insurance purposes. I confirm that my patient (or their legal representative) has given their permission for me to share this information and, where they've asked to review this information, they've been given an opportunity to do so before I submitted this form.

Therapist's name

Date | D | D | M | M | Y | Y | Y | Y |

HCPC number

Personal Training record	Skill Level /5		Brief reflection	STATUS	DATE (completed)
Word-processing	5	5	I already had strong word processing skills through previous projects, including the 3rd year project on the vet course and hold an ICT Functional Skills Qualification. This project allowed me to develop them further through the use of the Endnote add-on, which I had not used before.	Completed	2015 - ongoing
Other basic computing skills	5	5	I currently hold an ICT Functional Skills Qualification obtained during my secondary school education.	Completed	2015 - ongoing
Identification of library resources and how to use them	5	5	We were taught how to use this during my undergraduate study on the Veterinary Medicine and Science D100 course at the University of Nottingham by UoN library staff.	Completed	2017 - 2021
Creating and Managing Long Documents in Microsoft Word	3	5	As the document got longer, having a complete system for identifying each section became more important. Using a regularly updating table of contents, line numbers and section headings allowed me to keep track and manage the long document well.	Completed	Entire project duration – finished 13.04.2022
Learning how to use JISC Online Surveys questionnaire software	1	4	In-built software training and guidance o how to use conditional logic sequencing to create custom routes for each species and to display further questions when certain answers are given.	Completed	18.08.2021
Statistical analysis – Chi Squared	2	4	Guidance and training received from two supervisors. Statistical tests performed were double checked by supervisors	Completed	26.01.2022
Attending academic conference	5	5	I attended the BSAVA Congress in Manchester. During the three-day event I observed the presentation of 4 clinical abstracts from recent orthopaedics research papers. Observing their presentation allowed me to get a good idea of the level of detail I need in my own abstract, as well as the style of presentation if I were to ever present it.	Completed	24.03.2022 - 26.03.2022
Introduction to Writing for Academic Journals	1	3	I attended the BSAVA Congress in Manchester. During the breaks in the talks, I spoke with the editors of UK Vet and Vet Times about the style of writing for their respective academic journals. I took contact information. I intend to follow this up after submission.	In progress	24.03.2022 - ongoing
Training in identifying and disclosing Conflict of Interest	4	5	Research Integrity: Concise - Conflict of Interest module (21-22)	Completed	28.03.2022

Bystander Training (Online Course)	4	5	Completed the mandatory bystander training provided by the university of Nottingham	Completed	28.03.2022
Undertaken the mandatory research integrity training	4	5	Completed online at the UoN Graduate School - Research integrity: concise (standalone online learning course)	Completed	28.03.2022
Writing Scientific Abstracts	4	5	Guidance and training received from two supervisors. Abstracts need to be a succinct overview of the project. After completing the rest of the project, the first draft of the abstract was written which received minor correctional changes and was used as final version.	Completed	11.04.2022
Endnote	4	5	In previous projects I used Endnote to collate references. During this project I decided to learn how to use it to automatically reference and create a bibliography as I went along.	Completed	12.04.2022
LinkedIn for academic networking	2	4	I started the project with 18 LinkedIn connections. I now have 93, including the BVA President, academic journey editors, lecturers, veterinary specialists, peers and veterinary physiotherapists. I have been able to use my project to network and improve my confidence with	Completed	13.04.2022
Submitted my drafts at each stage to 'Test your text' via TurnitIN on Moodle	5	5	I did this throughout. I found it interesting to note how much was considered "similar" as it classed things like graph axis and references as similar to other papers. This contributed to the relatively high score my paper received (17%) however no paper was higher than 2% similarity. This was the last thing I double checked before submitting.	Completed	13.04.2022