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Use of human behaviour change models to investigate horse owner intention to adopt emergency colic recommendations

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Abstract

Background: Behavioural models are widely used within human medicine to understand beliefs and intention associated with major health interventions.

Objectives: To investigate horse-owner beliefs and practices associated with emergency colic planning.

Study design: Cross-sectional study.

Methods: An online survey incorporating the Trans-Theoretical Model of behaviour change and the Theory of Planned Behaviour was developed to assess owner intention to adopt three areas of emergency colic planning: (1) prevention/recognition, (2) involvement of others and (3) personal preparation. Participants were recruited using a snowball sampling strategy; multivariable logistic regression of data was performed.

Results: There were 701 horse-owners who completed the survey. Respondents fell into one of two categories: no intention to adopt or already implementing emergency planning recommendations. Most agreed that emergency colic plans would improve their horse's welfare (68%) and aid in decision making (78%). Most disagreed that colic was inevitable (66%) and that treatment options were not within their control (69%). Multivariable analysis showed that those who believed emergency plans were worth creating were more likely to adopt preventive (OR: 2.33, 95% CI: 1.27–4.30, $p = 0.007$) and personal preparation (OR: 1.61, 95% CI: 1.31–1.97, $p < 0.001$) recommendations. Preventive recommendations were also associated with 'REACT' campaign awareness (OR 2.36, 95% CI: 1.40–3.97, $p = 0.001$). Favourable behavioural beliefs, such as the acknowledgement of welfare and decision-making benefits, were linked to the involvement of others in planning (OR: 2.93, 95% CI: 1.78–4.81, $p < 0.001$).

Main limitations: Potential response bias and small sample size.

Conclusions: The majority of owners were either unwilling to adopt suggested recommendations or believed that their approach was currently sufficient. Most owners perceived veterinary professionals as most influential on their decision to plan for a colic emergency, highlighting their importance in any educational campaign.

KEYWORDS
behaviour change, colic, decision-making, emergency, horse, owner, planning

1 | INTRODUCTION

Early recognition and rapid decision-making are essential during cases of colic in order to maximise survival[1]; however, despite colic being a frequent equine emergency,[2] there are significant gaps in knowledge[3] and a varied approach to management[4] within the horse-owning population. To address these issues, the 'REACT Now to Beat Colic' campaign was launched in 2016[5] to encourage owners to adopt a proactive approach to emergency planning (Figure 1). However, there is limited evidence exploring horse owner intention to adopt emergency recommendations, with the majority of published literature focusing on evacuation planning in the event of a natural disaster[6] or the implementation of biosecurity measures.[7] Socio-cognitive models have been utilised to investigate decision-making processes and attitudes associated with behavioural intentions. The Trans-Theoretical Model (TTM) (Figure 2) of behaviour change[9] is a framework that has

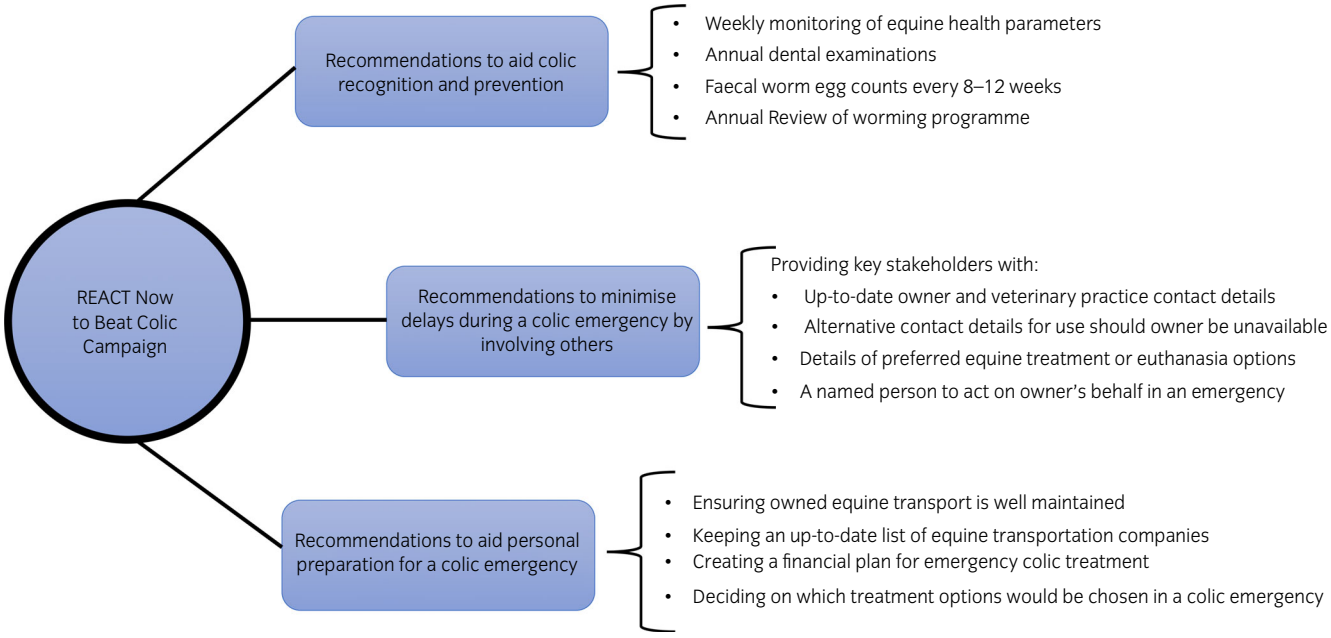

FIGURE 1 Diagram illustrating the three main emergency colic recommendation areas suggested by the 'REACT Now to Beat Colic' campaign.

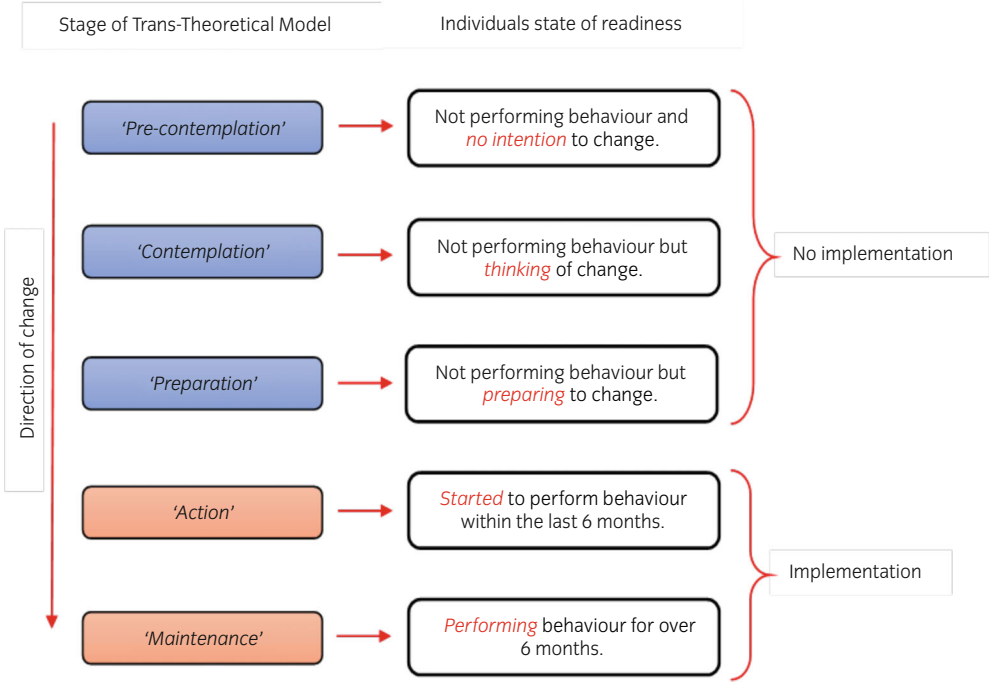

FIGURE 2 Schematic describing the five stages of the Trans-Theoretical Model (TTM) of behaviour change and corresponding states of individual readiness (adapted from Prochaska and DiClemente, 1982).[8]

TABLE 1 Recommendations associated with three areas of emergency colic planning, 'recognition and prevention', 'involving others', and 'personal preparation', as selected from educational resources produced by the 'REACT Now to Beat Colic' campaign.

Name of 'REACT' recommendation	Aim of recommendation	Suggested owner actions
Recognition and prevention	To help horse owners in both minimising the risk of colic ('prevention') and identifying changes in 'normal' health early ('recognition')	• Weekly monitoring of equine heart rate ('recognition') • Weekly monitoring of equine respiratory rate ('recognition') • Weekly monitoring of equine temperature ('recognition') • Annual dental examinations ('prevention') • Faecal worm egg counts every 8–12 weeks ('prevention') • Annual Review of worming programme ('prevention')
Involving others	To minimise delays during a colic emergency by encouraging horse owners to involve others in their emergency colic plans	Providing key stakeholders, such as friends, family, livery yard owners and vets, with: • Up-to-date horse owner and veterinary practice contact details • Alternative contact details for use should horse owner be unavailable • Details of horse owner's preferred equine treatment or euthanasia options should they be unavailable • A named person to act on horse owner's behalf in a colic emergency should they be unavailable
Personal preparation	To minimise delays in decision-making and help horse owners personally prepare for a potential colic emergency	• Ensuring owned equine transport is well maintained • Keeping an up-to-date list of equine transportation companies • Creating a financial plan for emergency treatment • Deciding on which treatment options would be chosen in a colic emergency

often been employed by those developing health-related campaigns.[10] The theory suggests that change occurs in five stages and to elicit the desired behavioural change, interventions must stage-match guidance according to an individual's current state of readiness. Successful behaviour change often relies on the identification of potential barriers. To achieve this, the TTM has often been paired with a second theoretical framework: The Theory of Planned Behaviour (TPB).[11] This concept suggests that intention to carry out a specific behaviour can be influenced by three factors: attitude towards the behaviour (*behavioural beliefs*), social influences (*normative beliefs*) and a person's confidence in performing the behaviour (*control beliefs*).

The aim of this study was to investigate UK horse owners' attitudes and practices associated with planning for a potential colic emergency through the application of two behavioural models: the TTM of behaviour change and the TPB.

The objectives of this study were to describe horse owners' current attitudes and practices associated with colic emergency planning; ascertain horse owners' experience of colic and concern about future episodes; evaluate the importance of various factors on owner decision-making in the event of critical illness, and to identify factors associated with owner intention to implement colic emergency planning recommendations suggested by the 'REACT' campaign.

2 | MATERIALS AND METHODS

2.1 | Sample population

All horse owners/significant care givers over the age of 18 years and residing within the United Kingdom (UK) were included within the sampling frame. Participants were recruited using a snowball sampling strategy, through regular promotion on social media sites frequented by horse owners and advertisement by equine veterinary professionals. Based on an estimated 446 000 horse owning households in the UK,[12] a required sample size of 384 participants, 5% margin of error, 95% confidence and 50% response rate, was calculated (www.raosoft.com/samplesize.html).

2.2 | Survey development

A questionnaire was developed using the 'Online Surveys' tool (Jisc, Bristol, UK). It was divided into four main sections: participant demographics, planning for a colic emergency, experience of colic and awareness of the 'REACT Now to Beat Colic' campaign.

To investigate participants' intention to implement emergency recommendations, section two contained questions developed using the TTM of behaviour change.[9] Recommendations associated with three areas of emergency colic planning, 'recognition and prevention', 'involving others', and 'personal preparation' (Table 1), were selected from educational resources produced by the 'REACT Now to Beat Colic' campaign.[5] Recommendations were selected by the research team as they were considered maintainable over an extended period of time, such as the one reflected in TTM statements. Selected recommendations were incorporated into 15 Likert-type questions, based on those used by Richens et al.[13] each accompanied by a single-choice tick box relating to one of five TTM statements; 1 = I do not do this and have no plans to start doing so, 2 = I do not do this, but I am thinking of doing this in the near future, 3 = I do not do this, but I am preparing to do so in the next month, 4 = I started doing this within the last 6 months, 5 = I already do this and have done so for over 6 months. As this survey aimed to investigate owner intention to

adopt recommendations, rather than past behaviours, the sixth TTM stage 'relapse' was not included in this study. Potential behavioural and social influences on participants' intention to implement emergency recommendations were explored using the TPB.[11] Twenty-one statements associated with three components defined by the TPB, behavioural, control and normative beliefs, were created using previous evidence investigating horse owners' views on colic recognition and approach,[3,4,14] intention to implement biosecurity measures[7,15] and equine welfare.[16–19] A five-point Likert scale was used to measure participants agreement to each statement: 1 = strongly disagree, 2 = disagree, 3 = neither disagree nor agree, 4 = agree, 5 = strongly agree.

2.3 | Pilot survey

The survey was piloted by seven horse owners, two equine veterinary nurses and three veterinary surgeons with final corrections being made prior to dissemination (Table S1).

2.4 | Data management

Data were imported directly from the 'Online Surveys' (Jisc, Bristol, UK) platform into an Excel spreadsheet (Microsoft, 2013) for data cleaning and stored on password-encrypted software.

2.5 | Data analysis

Exploratory descriptive analyses were performed with the mean, median and range calculated for continuous data. Normality of distribution was determined using histograms. Non-parametric data was reported as the median (range). Frequency percentages and mode values were calculated for categorical data, with optional free-text responses associated with the pre-defined answer of '*other*' being reviewed and grouped where appropriate into either existing or new answer categories. Answers which specifically requested a free-text answer were reviewed individually, categorised, and ranked based on frequency of occurrence.

Statistical analysis was performed using Microsoft Office Excel (Microsoft, 2013) and SPSS Version 25 (IBM Corp. 2017). Following preliminary analysis, explanatory variables were grouped to create binary outcomes and converted into the appropriate format to allow for statistical analysis. Correlations between explanatory variables were explored using Kendall's Tau for continuous variables and Chi-squared testing for categorical variables. Associations between categorical and continuous variables were investigated using Mann–Whitney U testing.

Statements relating to the TPB were grouped based on which model component (behavioural, control or normative belief) they reflected. To ensure internal reliability, a Cronbach's α coefficient was calculated for each of the three TPB groups. An α score of 0.7 or above was considered acceptable.[20] If the alpha score had acceptable reliability, a mean score for each participant was calculated for each TPB group. If the score did not have acceptable reliability, each statement within the corresponding TPB group was considered individually throughout statistical analysis.

Preliminary analysis indicated that responses to TTM statements were not normally distributed. Therefore, based on the approach described by Richens et al.[13] answers were dichotomised to represent TTM stages 1–3 and 4–5. A modal participant score was then calculated for each emergency colic planning recommendation, (a) prevention and recognition, (b) involving others and (c) personal preparation, to create a single outcome variable. Participants were assigned a score of either 1 (no implementation) or 2 (implementation) which reflected their intention to undertake each recommendation.

Prior to multivariable analysis, univariable regression was conducted to identify variables for inclusion within each model and to eliminate potential variable multi-collinearity within the final models. To ensure meaningful predictor variables were not overlooked, a *p*-value of 0.25 was chosen to identify variables for inclusion.[21] When conducting multivariable testing, Hosmer and Lemeshow analysis was used to assess model fit. To validate the model's ability to differentiate between the binary outcomes when compared to the baseline model, the chi-square Omnibus goodness of fit test, percentage of correctly classified cases and model variability (using Nagelkerke R square analysis) were explored. P-values less than 0.05 were considered statistically significantly.

3 | RESULTS

3.1 | Survey engagement

One-thousand and eighty-two respondents provided consent to participate. Thirty-three percent (357/1082) did not submit a final response, with a further 24 respondents excluded due to lack of current horse ownership ($n = 7$) or non-UK status ($n = 17$). Subsequently, a total of 701 participants were eligible for inclusion within the final dataset. Eleven submissions were partially completed therefore, the total number of responses is reported for each question (n=).

3.2 | Participant demographics

The majority of participants were female (97.8%, 684/700), had a median age of 36 years old (range, 18–72; 697/701) and resided within the East of England (23.4%, 160/698). Length of equestrian involvement varied (median 20 years, range, 1–60), with most (37.5%, 260/694) having between 11- and 20-years equine experience. At least one formal UK equestrian qualification was held by 50.1% (346/690) of participants.

Ninety-three percent (633/696) of participants currently owned a median of two horses (range, 1–30), with the majority (66.3%, 464/700) being managed at a commercial yard or on private land with

other owners' horses. Of those who had responsibility for a horse they did not own (52/696), a large proportion cared for the horse as part of a loan (38.0%, 19/50) or share (26.0%, 13/50) agreement.

3.3 | Planning for a colic emergency

The majority (77.5%, 543/701) of participants had direct personal experience of managing a median of two (range, 1–50) colic episodes involving a horse that they owned. Eighteen percent (128/701) of respondents had no personal experience but had witnessed another owner manage a horse with this condition. Four percent (30/701) of participants had no colic experience at all (Figure S1).

Direct experience of colic (67.3%, 472/701) and information provided by veterinary professionals (63.1%, 442/701) were the main sources of participants' colic knowledge. Knowledge gained through the completion of equestrian qualifications (28.4%, 199/701) or information provided by equestrian associations/societies (13.0%, 91/701) were least reported.

Participants varied in how concerned they were about colic, with the majority (35.1%, 246/701) being 'somewhat/a little' concerned that their horse would develop colic in the future. When asked how prepared they felt to make emergency decisions if their horse developed a critical colic condition, 50.2% (352/701) of respondents felt 'extremely/very' prepared. A large proportion of the participants (97.7%, 681/697) would be interested in resources which helped them develop an emergency plan.

Awareness of the 'REACT Now to Beat Colic' campaign was indicated by 20.0% (140/701) of survey participants. Of these, 88.6% (124/140) of respondents had read resources provided by the project, with 43.5% (54/124) actively using them. Of those who were not aware of this initiative ($n = 561$), 57.9% would seek further information about colic from their veterinary surgeon.

3.4 | Implementation of 'REACT' recommendations

Implementation of 'REACT' recommendations varied between participants (Figure 3A). The majority of respondents did not measure, and had no intention to start measuring, their horse's temperature (72.4%, 503/695), heart (74.2%, 516/695) or respiratory rate (72.0%, 499/693) on a weekly basis. Annual dental examinations (97.0%, 678/699) and regular faecal worm egg counts (57.2%, 369/692) were already being performed by the majority of participants.

Suggested actions within the recommendation 'involving others' were being implemented by most survey participants (Figure 3B). A financial plan, including insurance, was already held by 78.8% (549/697) of participants, with 81.1% (566/698) having already considered what treatment option they would choose for critical cases. These included sharing their emergency contact details (95.3%, 665/698), veterinary practice details (92.4%, 645/698) and an alternative contact person (87.8%, 609/694) with others involved in the care of their horse (i.e., yard manager) for over 6 months. Forty-two percent (289/695) of participants had not provided others with details of their preferred treatment or euthanasia options in the event they were unavailable during an emergency.

The majority of participants were already implementing actions suggested in the recommendation 'personal preparation' prior to survey completion (Figure 3C). Most participants (64.5%, 443/687) had had access to equine transport for at least 6 months. However, 35.6% (242/680) of respondents had no intention to identify a list of reputable equine transport companies in case of an emergency.

3.5 | Beliefs associated with emergency planning

Sixty-six percent (460/701) of respondents disagreed with the statement 'it is inevitable that my horse will develop colic and require emergency veterinary treatment' (Figure 4). The majority agreed that they could rapidly recognise the signs of colic (93.6%, 656/701) and knew when to seek veterinary assistance (97.0%, 680/701). Sixty-nine percent (485/700) of participants disagreed that treatment options available to their horse would not be within their control.

Implementing an emergency colic plan was seen positively by most participants (Figure 5). Most agreed that having an emergency colic plan would improve their horse's welfare (67.6%, 474/701) and help them to make informed decisions (78.0%, 546/701). Additionally, regular monitoring of equine health (85.5%, 600/701) and involving others in emergency arrangements (76.5%, 536/701) were seen to minimise treatment delays and improve recognition of clinical signs. Implementing a colic plan was not considered to be impractical (71.9%, 501/697) or time-consuming (59.2%, 415/701).

Most participants (85.4%, 597/699) did not feel pressure from others to implement an emergency colic plan (Figure 6). Most participants stated that the opinions of veterinary professionals were important for emergency planning (92.6%, 649/701), but those of equestrian associations or societies were not important to many participants (51.4%, 360/700).

3.6 | Influencing factors

When asked to indicate how important various factors would be on participants' ($n = 701$) decision to pursue referral treatment for their horse (0 = not at all important, 10 = very important), the owner's relationship with their horse and veterinary advice given at the time of diagnosis were considered highly important (median score 10, range 0–10) (Figure S2). Factors directly associated with horse health or management were also highlighted, with a median score of 10 (range, 0–10) for poor prognosis, level of pain and expected quality of life.

Additional factors considered important during critical decision making were provided by 202 participants (Table S2). Of these, 44.6% (90/202) of comments referred to advanced horse age as a main barrier to referral, despite most participants having only witnessed, or been told the outcome of, a horse referred for critical colic.

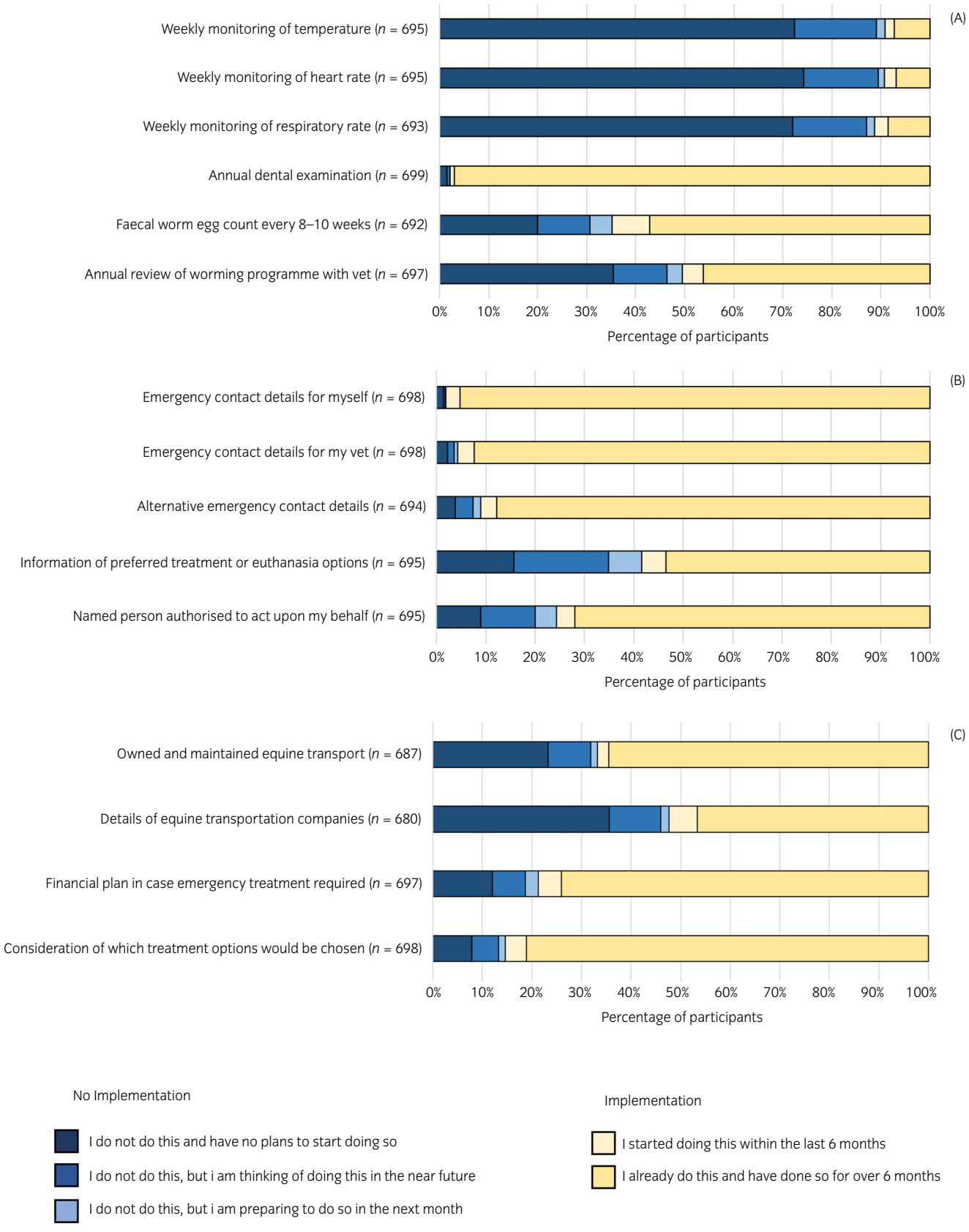

FIGURE 3 Stacked bar charts displaying participants' intention to implement 'REACT' recommendations (A) 'recognition and prevention', (B) 'involving others' and (C) 'personal preparation'.

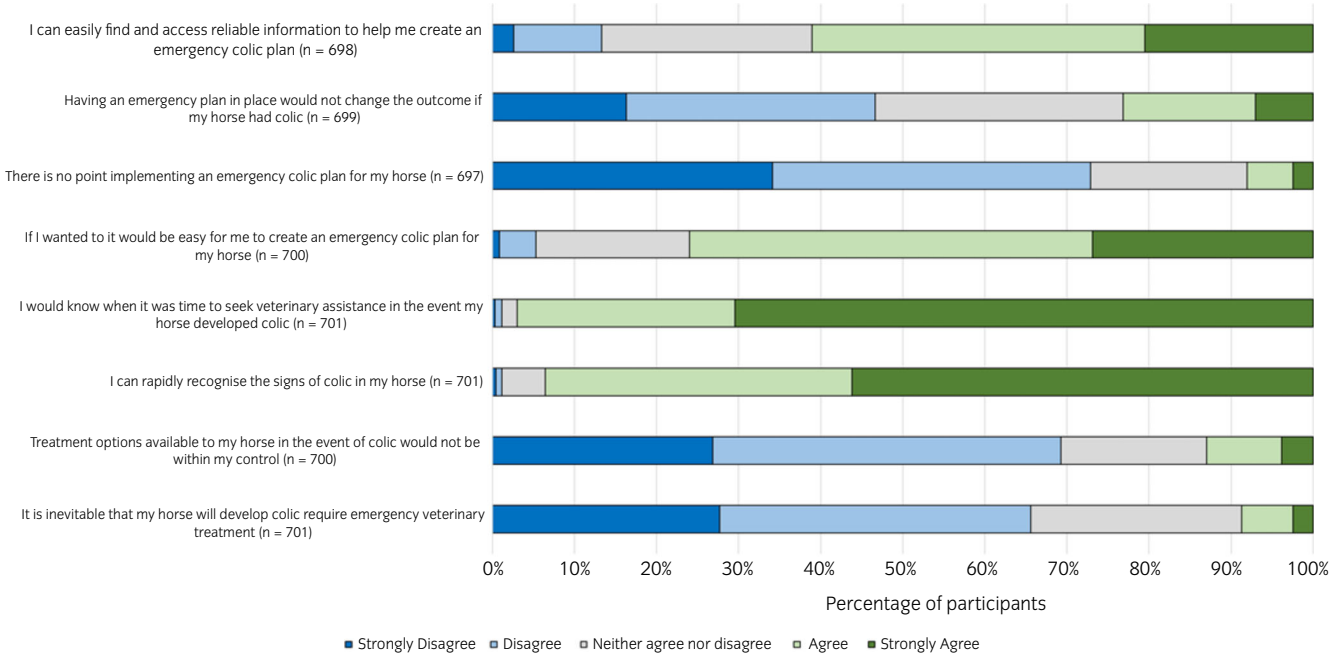

FIGURE 4 Participant agreement with statements reflecting control beliefs associated with colic and the use of emergency plans.

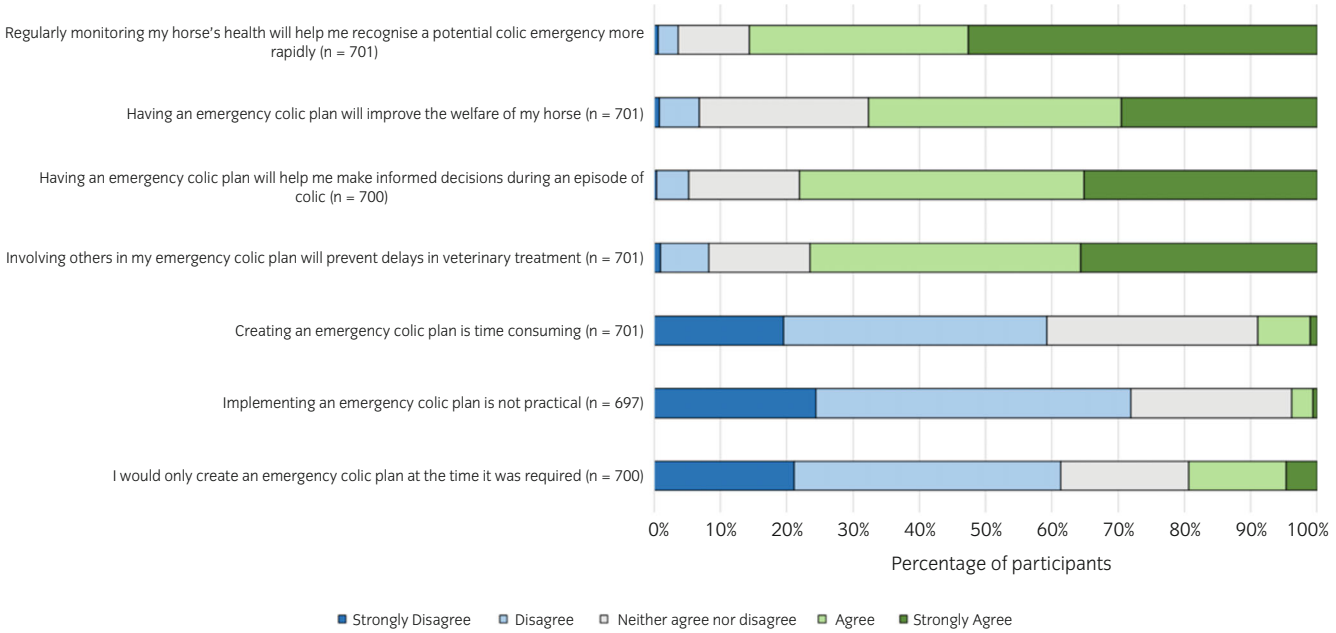

FIGURE 5 Participant agreement with statements reflecting behavioural beliefs associated with emergency colic plans.

3.7 | TPB question reliability

A reliable Cronbach's α Coefficient was calculated for the TPB group relating to behavioural beliefs (0.78). Therefore, a mean score for each participant was generated. Due to an unreliable Cronbach's αscores for both the control (0.49) and normative (0.69) beliefs, each statement was analysed separately.

A number of explanatory variables, such as participant age and number of equestrian qualifications/memberships, were significantly associated. These were subsequently removed from analysis meaning a total of 14 explanatory variables were taken forward to univariable regression. Sixteen outcome variables were initially identified for the model investigating the recommendations 'recognition and prevention' and 'personal preparation'. Fifteen outcome variables were initially eligible for inclusion within the model exploring the recommendation 'involving others' (Table S3).

Multivariable analysis showed aspects of each of the three TPB components were associated with each of the TTM models (Table 2),

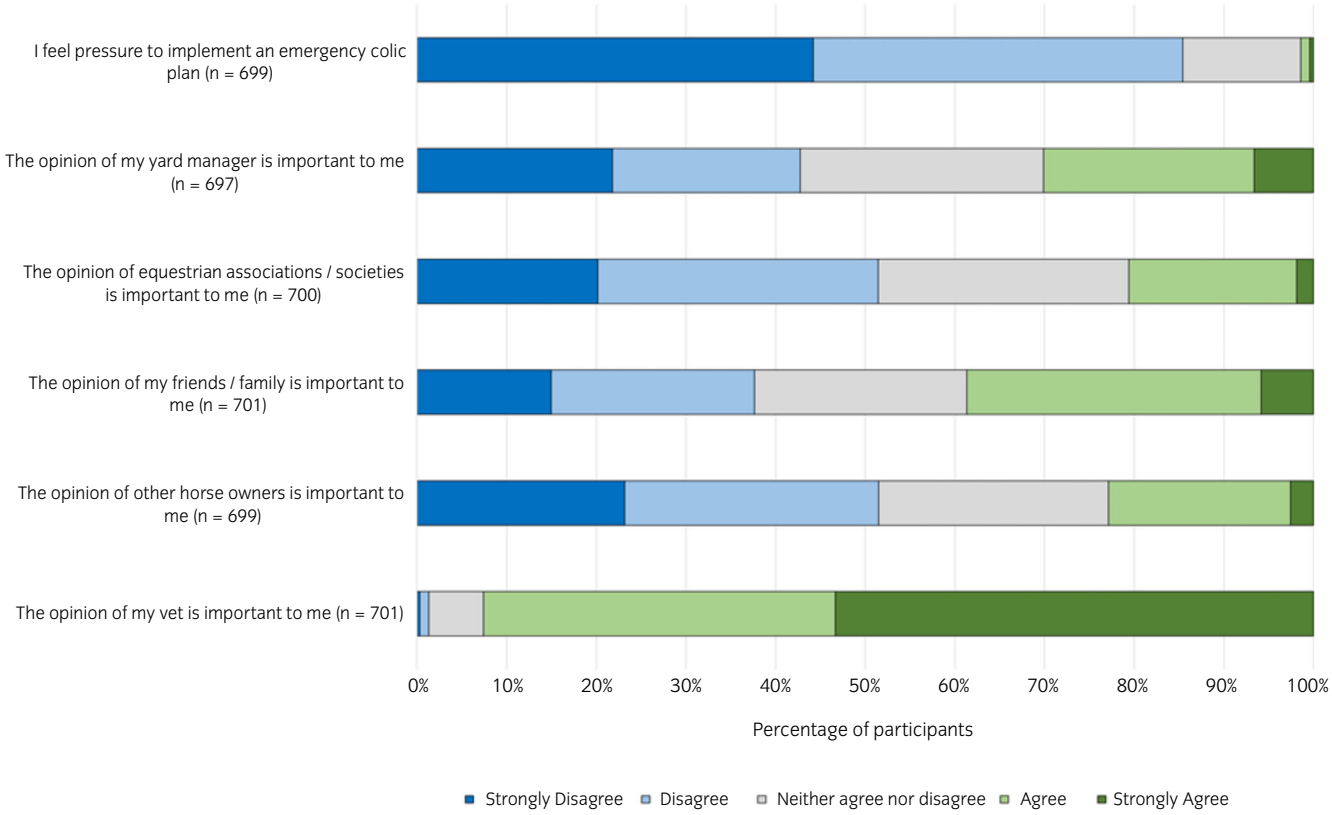

FIGURE 6 Participant agreement with statements reflecting normative beliefs associated with the influence of others on their intention to implement an emergency colic plan.

with control beliefs being most frequently associated with participant intention to implement recommendations. Hosmer and Lemeshow analysis indicated that all three models displayed adequate fit.

The model investigating the recommendation 'recognition and prevention' was found to be statistically significant ($X^2 = 37.49$, $p = <0.001$) with three variables. It appeared that participants were more likely to implement these recommendations if they were aware of the 'REACT' campaign, felt there was a 'point' in creating an emergency plan for their horse (control belief) and felt they knew when to seek veterinary assistance (control belief) (Table 2; TTM Model A).

The model investigating the recommendation 'involving others' was found to be statistically significant ($X^2 = 32.302$, $p = <0.001$) with two variables. Participants who felt they would know when to seek veterinary assistance were more likely to implement recommendations. In contrast to the other models, positive behavioural beliefs towards the use of emergencies plans appeared to influence participants' intention to involve others (Table 2; TTM Model B).

The model exploring the recommendation 'personal preparation' was found to be statistically significant ($X^2 = 77.588$, $p = <0.001$) with five variables. The model suggested that those currently holding an equestrian society membership and who had a greater number of years involved with horses, were more likely to implement these recommendations. Additionally, participants were found to be less likely to implement recommendations if they felt pressured to do so (Table 2; TTM Model C).

4 | DISCUSSION

This was the first study to utilise a combination of theoretical frameworks to investigate horse owner attitudes and practices associated with planning for a potential colic emergency. The findings were that horse owners generally fall into one of two categories: no intention to adopt or already implementing emergency recommendations. Beliefs surrounding the completion of emergency preparation, such as perceived personal relevance and benefit, were significantly linked to horse owners' intention to adopt emergency advice. Lower levels of intention were associated with perceived social pressure to undertake personal preparation.

Despite the fact that many participants had experience of colic and were concerned about future occurrences, neither of these factors was found to be significantly associated with intention to adopt emergency recommendations. Furthermore, though the majority of participants reported high levels of interest and positive behavioural beliefs in relation to emergency plans, only 20% were aware of the 'REACT' campaign at the time of the survey. In contrast to these finding, a study investigating equine biosecurity[15] found that owners with previous experience of equine influenza (EI) displayed increased levels of both help-seeking behaviour and implementation of preventative measures due to higher levels of perceived personal risk. However, most owners in the current study were more likely to adopt recommendations aimed at improving colic prevention and recognition if

TABLE 2 Results of multivariable logistic regression with outcome variables (no intention vs. already implementing) associated with uptake of 'REACT' campaign recommendations: (A) 'recognition and prevention', (B) 'involve others', and (C) 'personal preparation'.

Variable	Significance (*p* value)	Odds ratio	95% Confidence interval (CI)	
			Lower	Upper
TTM Model A – recommendation 'recognition and prevention'				
Awareness of the 'REACT Now to Beat Colic' campaign	0.001	2.356	1.400	3.966
There is a point to creating an emergency plan for my horse (control belief)	0.007	2.332	1.266	4.297
I would know when to seek veterinary assistance (control belief)	0.001	1.702	1.255	2.308
Hosmer and Lemeshow analysis: $X^2 = 4.691$; $p = 0.58$				
TTM Model B – recommendation 'involving others'				
Mean Behaviour Beliefs score	<0.001	2.928	1.781	4.812
I would know when to seek veterinary assistance (control belief)	0.03	1.546	1.033	2.312
Hosmer and Lemeshow analysis: $X^2 = 9.267$; $p = 0.32$				
TTM Model C – recommendation 'personal preparation'				
Number of years involved with horses	0.006	1.026	1.007	1.045
Current member/affiliation with equestrian society and/or association	<0.001	2.567	1.691	3.899
I feel pressure from others to implement an emergency plan (normative belief)	0.015	0.685	0.506	0.928
I can rapidly recognise the signs of colic (control belief)	<0.001	2.131	1.519	2.991
There is a point to creating an emergency plan for my horse (control belief)	<0.001	1.609	1.314	1.969
Hosmer and Lemeshow analysis: $X^2 = 10.527$; $p = 0.23$				

they felt there was a 'point' to creating an emergency plan (control belief). Additionally, the belief that they knew when to seek veterinary assistance was significantly associated with intent to adopt advice.

These findings could be explained by the Protection Motivation Theory (PMT),[22] which has frequently been applied to explain or explore attitudes associated with intent to implement preventative behaviours. The theory postulates that motivation (or intent) to adopt suggested recommendations is based on the target populations' cognitive appraisal of three main elements: perceived risk, likelihood of the event occurring and effectiveness of proposed recommendations. Therefore, if an event or behaviour is perceived to be potentially noxious and likely to occur, and suggested actions are believed to be effective in reducing risk, intention to adopt precautionary advice will be greater. For example, this theory was utilised to explore behaviour change associated with earthquake preparedness and the use of negative threat appeals in at risk areas within California.[23] The authors concluded that the use of negative threat appeals significantly increased participants' motivation to adopt emergency recommendations, which is in line with the elements described by the PMT. However, the use of this method can produce limited or detrimental effects.[24] Therefore, those planning and developing campaigns must ensure focus is upon the desired behavioural change, i.e., calling emergency services, rather than the consequences of a disease or issue.

Taking the PMT into account, it could be postulated that previous experience of colic and reported level of concern were insignificant in this study, due to participants' low perception of personal risk and the belief that their current approach to emergency planning is sufficient. This would coincide with the fact that, not only did the majority of owners already feel prepared to make emergency decisions, but most did not perceive emergency veterinary treatment for colic an inevitability, despite colic being a common equine emergency.[2] However, very few owners within this study had personal experience of referral or euthanasia as a direct result of colic, suggesting that their current state of preparedness may actually relate to their response to mild, rather than critical, episodes of colic.

An over-estimation of personal capabilities has been previously reported in horse owners.[3] Being ignorant of one's own ignorance has been widely studied within human psychology.[25] Therefore, it could be suggested that the polarisation of respondents in respect to the TTM framework is actually the result of over-confidence and not a true representation of performed behaviour. A lack of perceived risk and high levels of self-efficacy could have serious implications for both the 'REACT' campaign and similar initiatives aiming to enhance animal welfare through the improvement of owner emergency preparedness; owners may simply feel that they do not need to implement suggested recommendations. Therefore, the focus should be on strategies to increase uptake of emergency

recommendations for owners who are currently within TTM stages 1–3 (no implementation).

Up to 20% of colic cases will be critical in nature,[2,26] with patient outcome relying to some extent on an owner or care giver's response to clinical signs. Therefore, it was encouraging that personal preparation and steps to involve others in order to minimise treatment delays had already been undertaken by the majority of survey participants. However, despite majority agreement that the involvement of others would prevent delays in veterinary treatment (behavioural belief), over 40% of owners indicated that they had not, and had no intention to, provide details of preferred treatment or euthanasia options to be followed if they could not be contacted. Furthermore, although awareness of the campaign was significantly associated with implementation of this advice, many participants were still within the precontemplation stage of behaviour change and not regularly monitoring their horses' clinical parameters. This result contradicts survey participants' agreement that regular monitoring of equine health (behavioural belief) would improve symptom recognition and minimise delays. Though concerning, the apparent mismatch between owner belief ('involving others is beneficial') and observable behaviour is most likely the result of the 'value-action gap'.[27] This theory posits that, despite holding positive beliefs, a person may be unable to perform recommended behaviours due to a variety of personal and environmental factors. Taking this into account, it may be that owners genuinely believe that involving others will prevent delays in veterinary treatment however, they may not know a suitable individual who could act on their behalf during an emergency. Therefore, prior to providing recommendations, campaigns should strive to understand potential barriers associated with the desired behaviour.

Research has identified that a negative impact on animal welfare can occur if an individual's attitudes and beliefs are based upon misinformation or a low knowledge-based background.[16,28] This study found that a large proportion of participants referred to 'witnessed' episodes of colic when suggesting that age would be a significant barrier to intensive treatment, despite there being no conclusive evidence to suggest age is a major risk factor for colic surgery survival.[29–31] The effect of normative social influences (those being witnessed actions or behaviours of others which can significantly influence an individual's current or future behaviour),[32] has been explored in several areas of human behaviour. Several studies suggest that both direct observation and written communication of a descriptive norm can induce desired or undesired behaviour.[33] Based on these findings, misconceptions relating to colic treatment and outcome could not only be attributed to personal experience, but also to the experience and opinions of other horse owners. However, the majority of owners responded that the opinion of others (*normative beliefs*), with the exception of their veterinary surgeon, were not important to them in relation to the development of an emergency plan. Additionally, participants were less likely to personally prepare for a potential colic emergency if they felt pressured to do so. These findings illustrate the complexity of decision-making. What horse owners consider an influence on decision-making, and what ultimately impacts their choices, are often in conflict. Further research through qualitative studies will be important to allow in depth exploration of how different experiences, beliefs and influence interact, and ensure effective delivery of future educational campaigns.

4.1 | Study limitations

The use of an online platform may have resulted in a bias towards a computer literate population, with owners with previous colic experience or positive views on emergency planning being more likely to complete and share the survey. Social desirability, or the need for social acceptance,[24] may have also resulted in owners responding to questions, such as the TPB statements, based on what they perceive as the most socially acceptable answer. Yet, positive intentions to adopt recommendations were not shared by all participants, suggesting that potential survey bias was not exacerbated through the choice of sampling method or question design. Additionally, a diverse range of equestrian backgrounds was included, with participants having demographical traits similar to those reported in previous research.[3,4,17,25,26] A multi-theory approach was deemed the most appropriate method to assess current attitudes and practices associated with emergency planning.[13] The use of a theoretical framework enabled the identification of several factors associated with owner intention to adopt emergency advice. However, the observational nature of this study, which resulted in the collection of owner perceptions rather than evidence of actions, may be considered a limitation. It must also be noted that the sixth stage of the TTM, often referred to as 'relapse', was not included in this study as intention to adopt recommendations, rather than participants' past behaviours, was the main focus. Given the importance of this stage in habit formation,[34] future studies investigating owner behaviour should strive to include this element.

4.2 | Conclusions

These findings indicate that many horse owners have no intention to adopt emergency recommendations or feel their current approach is already sufficient. Additionally, it has highlighted that prior experience of colic may have a significant bearing on owner decision-making, which warrants further investigation. Most owners perceived veterinary professionals as most influential on their decision to plan for a colic emergency, which highlights their importance in any educational health campaign. However, the role of other people's opinions and experiences was also identified as a potential barrier to information dissemination and informed decision-making. Although not directly assessed in this study, many decisions may be based on misinformation or the beliefs of others. Misconceptions regarding colic survival and management approaches have been anecdotally contributed to traditional beliefs within the equestrian community, which can be deeply ingrained. If true, this could have a detrimental impact on knowledge transfer and the success of educational campaigns. Therefore, further research into potential colic misconceptions and peer pressure amongst the horse-owning population is needed.

AUTHOR CONTRIBUTIONS

Katie L. Lightfoot was the main researcher, with primary responsibility for study design, methodology, data collection, analysis and preparation of the final manuscript. Ellie Frost contributed to survey design and facilitated survey piloting, collation of pilot feedback and subsequent survey dissemination. John H. Burford was involved in the statistical analysis methodology. John H. Burford, Gary C.W. England and Sarah L. Freeman all contributed to the study design and methodology, data interpretation and preparation of the manuscript. Katie L. Lightfoot and John H. Burford had full access to all data in the study and take responsibility for the integrity and accuracy for the data analysis. All authors have reviewed and approved the final manuscript.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request: open-sharing exemption granted by the editor due to lack of provision in the participant informed consent form.

ETHICAL ANIMAL RESEARCH

The study was reviewed and approved by the School of Veterinary Medicine and Science, University of Nottingham.

INFORMED CONSENT

All participants gave informed consent to participate in this study.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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