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Original article

Emotional affect and the occurrence of owner reported health problems in the domestic dog.

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Abstract

Interactions between health, behaviour and individual differences such as; mood, affect or personality have been studied more in humans than they have in non-human animals. In humans, links can be made between personality and the expression of health problems, and between personality, affect, coping, treatment and recovery success. Previous research with animals has shown that personality and mood interact to determine judgement bias and that personality interacts with stress responses and pain expression. This indicates that the way animals deal with life events is dependent on interactions between personality and mood and that pain behaviours observed in animals are not always reflective of disease severity. As such, reliance only on behavioural displays of pain in health assessments, without information on what may mediate or moderate that behaviour makes accurate treatment difficult.

The aim of this study was to look at the interactions between the occurrence of health conditions in pet dogs (as reported by their owner), behaviour and the dogs' score on core (positive and negative) affect. A survey collected information from dog owners about their dog's breed, sex, age, past and current medical record, occurrence of behaviour, and their dog's level of positive and negative affect. Nine hundred and forty-three responses were obtained, of which 796 were used in the analysis.

Binomial logistic regressions were conducted, with either current or previous experience of a range of general health and pain-causing conditions included as dependent variables, and affectivity domains, aggression and age as independent variables. For most of the general health conditions (with the exception of the dental, vision and hearing problem category), only age was a predictor of both current and previous experience of a health condition. However, positive affect was associated with current experience of a pain-causing condition, with lower positive affect scores being most associated with presence of a current pain-causing condition. Only age was associated with experience of a previous condition. Finally, no difference in aggression scores was observed between dogs in any of the pain experience categories. These results provide novel findings for an association between health problems and affect in dogs.

Keywords: Aggression; Behaviour; Canine; Emotional affect, Health; Mood.

1. Introduction

The associations between health problems such as coronary heart disease (Jerram & Coleman, 1999) or fibromyalgia, personality and behaviour have been frequently studied in the human literature as has the presence of physical illnesses and the co-occurrence of mental health problems (Admunson and Katz, 2009), such as depression in cancer patients (Bodurka-Bevers et al, 2000). However, the causative direction of such associations, and the possible mechanisms underlying them are unclear (Deary et al, 2010). Despite this, research has suggested that in humans, personality, affect and mood can all have both mediating and moderating effects on an individual's health.

Chronic health problems are considered to cause prolonged stress for an animal, resulting in the need for that individual to adapt (Martini et al, 2000; Lindley, 2011; Munro et al, 2012). Adaptation can be physiological such as altered neuroendocrine and autonomic nervous system (ANS) functioning, or psychological, such as changes in behaviour and emotional state (Martini et al, 2000). Adaptation requires substantial amounts of energy, and can be at the expense of other biological functions, such as growth and reproduction (Mariti et al., 2012). As such it is reasonable to suggest that prolonged health conditions constitute a stressor and significantly impact the welfare of an individual animal.

In addition, internal factors, such as personality and mood, are thought to impact how individuals respond to life events (Briefer et al., 2015, Asher et al, 2016). However, little research has been undertaken in non-human animals to directly investigate the interrelationship between personality and health or to determine the effect health conditions have on the affective state of an animal. Capitano et al (1999) demonstrated that personality can have a protective effect during compromised health, for example, rhesus macaques (*Macaca mulatta*) with higher levels of sociability less likely to develop simian immunodeficiency virus (SIV) than those with lower levels of sociability. Furthermore, in infant rats, higher levels of the stable behaviour trait of neophobia were found to predict higher adult corticosterone levels and earlier death (Cavigelli & McClintock, 2003), demonstrating a link between personality (as assessed by level of neophobia), health parameters and life span. Whilst Neave et al (2013) found that pain resulted in a negative change in emotional state in dairy calves who had undergone disbudding (Neave et al, 2013), no longitudinal studies exist to determine whether chronic pain has a lasting impact on affective state, including mood, in animals. Furthermore, unrelated to health Asher et al (2016) demonstrated that, as we see with humans, in pigs, personality and mood interact to determine judgements. This may suggest that negative changes in affective state that can result from stressful or painful situations may be mediated by stable personality traits. However, only one study to date has focused on the impact of individual differences, such as personality on the experience and expression of pain in animals (Ijichi et al, 2014).

Pain is a key component of many disease processes in animals with implications for quality of life and welfare. Pain can be defined as an emotional and sensory experience that is associated with actual and/or potential tissue damage (International Association of the Study of Pain, IASP). Therefore, pain goes beyond physical sensation, instead comprising a sensory element (location, intensity), an affective element (emotional response) and a cognitive element (appraisal of pain and the consequences on QOL) (Merola and Mills, 2015). It is also challenging to assess in animals (Merola & Mills, 2015), as it relies on human interpretation of behaviour, and pain behaviours will differ both within and between species. Whilst vets, owners and academics alike are reliant on the assumption that observable signs of pain are indicative of not only the presence of pain but also of the severity of the condition, the study by Ijichi et al (2014) challenged the reliability of this assumption . They assessed the impact personality had on pain expression in horses in relation to the severity of their disease, demonstrating that more extrovert horses display more overt behavioural expressions of pain, regardless of disease severity (Ijichi et al., 2014). Therefore, a more detailed understanding of the relationships between individual differences such as mood and personality and pain is needed to enable our assessments of pain in individuals to be undertaken more accurately.

In this study, we focus on associations between health and emotional affect in dogs. Dogs are one of the most popular domestic animals to be kept as pets worldwide, (PFMA, 2016). Many of these may suffer from painful conditions. In a study by O'Neill et al (2014) from a sample of 3,884 dogs the most common diagnosis-level disorders were, otitis externa (369, 10.2%), periodontal disease (361, 9.3%) and impacted anal sac (277, 7.1%), all of which have the potential to be painful conditions. Furthermore, musculoskeletal disorders were the 3rd most prevalent mid-level diagnoses with 457 (11.8%) of the sample being diagnosed (O'Neill et al. 2014).

When assessing health problems in dogs, veterinarians are dependent upon clinical findings, behavioural observations and owner reports. Yet with some conditions, such as hip dysplasia, we know that clinical findings do not necessarily correlate with observed behaviours and therefore may not be a reliable indication on their own of the presence of disease, severity, progression or improvement (Ginja et al., 2009). Furthermore, signs of chronic illness or pain can be subtle and require an understanding of a dog's behaviour over time which means that owners are often considered to be the most reliable source of information (Wiseman et al, 2001; Mariti et al, 2012). However, this relies on the assumption that owners recognise behaviours that are related to pain or suboptimal health, rather than ascribing them to characteristic of their dog, as has been shown in the case of owner assessment of breathing problems in brachycephalic dog breeds (Packer et al., 2012). Owners may find it easier to recognise sudden changes in behaviour, for example owners often report changes in aggression (Camps et al, 2012), demeanour, "submissiveness", fearfulness, locomotion, and social behaviour when their dog is experiencing a painful condition (Wiseman et al., 2001). However, factors such as training, mood and dog personality could potentially mask pain behaviours, making it difficult to quantify the level of pain with any accuracy.

Despite the large number of studies investigating individual differences such as affectivity (Sheppard & Mills, 2002) and personality or temperament in dogs (Gartner, 2015), no previous research has looked at the impact individual personality or emotional traits have on a dog's health and behaviour or at whether pain negatively impacts affective state in dogs. Therefore, the aim of this study was to determine whether dogs with different experiences of health conditions (current, previous, no experience) could be differentiated by their levels of positive and negative affect. We hypothesised that dogs with different experiences of non-painful general health conditions would not differ in their emotional affect, but that when specific health conditions known to cause pain were examined, a difference in affect would be evident. We expected dogs with current experience of a painful condition would have lower levels of positive affect. We expected to see a difference in positive affect rather than negative affect as across the human literature positive affect seems to be more sensitive to change than negative affect (Bair et al, 2003). We also hypothesised that there would be an interaction between aggression, affect and owner reports of painful health conditions.

2. Materials and methods

2.1 Ethical approval

This study received ethical approval from the University of Lincoln Ethics Committee with the approval ID COSREC168.

2.2 Study Design

A cross-sectional study design was used where a voluntary opportunity sample of dog owners (targeted based on their status as a dog owner) provided information about their dog's health and behaviour. Data were collected between 2014 and 2015. Dogs were not excluded based on their health status.

2.3 Survey

A survey was designed to collect data about the health conditions experienced by pet dogs (see Appendix: Supplementary material). The online survey had four sections (A-D): demographic information, medical information, behavioural information and information on dog affectivity.

Section A contained three questions to collect information on the breed, age and sex/neuter status of each dog. Respondents were provided with a drop-down box with a list of purebred breeds, and a free-text box was also provided for owners of cross breed dogs.

Section B contained 29 general health conditions including conditions known to cause pain. Respondents were given the options of 'yes-treated/resolved' for dogs who had had the medical condition previously, 'yes-ongoing' for those currently suffering from the condition, or had been for a prolonged period; and 'N/a' for the respondents whose dog had never suffered from the condition. Specific health conditions were chosen based on expert opinion of frequency by veterinary clinicians. The clinical experts (DM, HZ) were both professionally recognised veterinary behaviour specialists.

Section C aimed to collect information on behaviours displayed by the dogs; owners were given a list of 22 behaviours and asked to rate how often their dog displayed that behaviour (never, rarely, sometimes, often, very often and all of the time). These behaviours were chosen (by HZ and DM) based upon literature searches for common problem behaviours in dogs. Aggression scores were calculated utilising the questions regarding the dog's frequency of aggression towards: known dogs, strange dogs, known humans and strange humans. For each of these categories a score of between zero and five was possible by assigning a numerical value to the available responses (never=0; rarely=1; sometimes=2; often=3; very often=4; all the time=5). The category scores were summed to give a total aggression score ranging between zero and 20.

Section D contained the positive and negative activation scale (PANAS),a questionnaire designed to assess affectivity in dogs and developed using behavioural traits with a clear psychobiological basis relating to sensitivity to rewards and aversives, in a range of environmental contexts (Sheppard and Mills, 2002). This asks 21 questions that asses two broad personality domains, negative activation and positive activation (available from: http://www.lincolnanimalbehaviourclinic.co.uk/resources.php) . Positive activation has three subordinate facets, energy and interest, persistence and excitement. Negative activation is characterised by the experience of negative emotions and anxiety and positive affect is characterised by positive emotions and interactions. An example question from the survey that contributed to the assessment of negative activation, is *'Your dog is easily startled by noises and / or movements'*; an example question that contributed to the assessment of positive activation is *'Your dog is full of energy'* (please refer to the Supplementary material for survey in full). Each question on the PANAS provides dog owners with a choice of six possible responses on a typical Likert scale (agree strongly, mainly agree, neither agree nor disagree, mainly disagree, disagree strongly) plus the option 'not applicable'.

2.3.1 Survey Dissemination

The survey was accessible online, disseminated via social media and dog interest groups. Participation was voluntary. Respondents needed to own or care for a dog that had lived with them continuously for at least two months, so that respondents would have seen their dog's behaviour in a wide variety of contexts (Poulsen et al, 2010).

2.4 Subjects

943 respondents filled out the online survey. Of these, 146 responses were excluded due to missing data, leaving 796 responses for the final analysis. Of 796 dogs, 120 had experience of a current painful condition as defined by the list provided in section B; 62 had experience of a previous painful condition (but no current painful condition); and 614 had no experience of a painful condition. The age of the dogs was as follows (Age category (AC): AC 1= 6 months - 2 years; AC 2= 2 - 6 years; AC 3= ≥ 6 years) (Table 1).

2.5 Statistical analyses

PANAS data was assessed with principal component analysis (PCA) to determine whether it would replicate the original structure reported in Sheppard & Mills (2002). PCA demonstrated that with the exceptions of questions 9 and 18, the structure was upheld and the data split as expected into the two components of Negative Affect (NA) and Positive Affect (PA). Therefore, questions 9 (relating to garden escape behaviour), and 18 (relating to the use of verbal reprimands) were dropped from the analysis, as their reliability may have changed since the instrument's original development due to changes in dog management and culture in the UK in this time. A score of NA and PA was computed for each dog without the scores for these questions (appendix 1: PANAS scoring).

An initial correlation matrix was created to look at the relationships between all pairs of variables (e.g. behaviours included in section C of the survey, PA, NA, age and aggression scores). Those that were significantly correlated ($P<0.05$) were included in the regression models. The 29 health conditions specified in the online survey were divided into five broad categories based on system affected: upper gastrointestinal tract (UGI), lower gastrointestinal tract (LGI), musculoskeletal (MSK), dental/vision/hearing (DVH); and endocrine. Endocrine disorders were excluded from subsequent analysis due to small sample size and diversity of effects.

To investigate the interrelationship between the occurrence of painful health conditions and affect, a pain category was created. The conditions analysed as likely to have caused pain and the percentage of dogs among whom the conditions were reported were as follows; hip problems (15%), arthritis (13%), dental problems (12%), colitis (11%), bladder problems (10%), anal sac disease (9%), knee problems (9%), spinal problems (8%), cancer (7%) and elbow problems (7%).

A series of backwards (conditional $P<0.05$) binomial logistic regression models were conducted. Regression models for general health conditions (upper gastrointestinal tract, lower gastrointestinal tract, musculoskeletal and dental/vision/hearing) included either current vs no experience OR previous vs no experience as the dependent variables and each of the independent variables (negative affect, positive affect, age and aggression) as the predictors. Regression models for pain included either current vs no experience OR previous vs no experience as the dependent variables, independent variables were: negative affect score, positive affect score, aggression score and age. Kruskal-Wallis tests were used to compare aggression scores between the pain-causing condition groups (current, previous and none) and Mann-Whitney U tests in post-hoc analysis to determine which groups were different.

All analyses were conducted using SPSS version 22.

3. Results

3.1. Risk factors for health problems and pain experience

3.1.1. Positive affect

Across the three pain experience groups (current, previous and none) there was a significant difference in positive affect scores (PA) (Kruskal Wallis: X^2=21.96, P<0.01, df=2). Furthermore, as PA scores increased the odds of having a previous dental, vision and/or hearing problem (DVH) also increased (Table 2). Higher PA scores were associated with lower odds of being in the current pain group (Table 3).

3.1.2. Negative affect

No significant difference in negative affect scores was observed across the pain experience groups (current, previous and none). However, increased negative affect increased the odds of having a previous DVH problem (Table 2).

3.1.3. Aggression

Total aggression scores were combined from ordinal data as described in section C, and in the current sample ranged from 4 (lowest overall frequency of aggression) to 20 (highest overall frequency of aggression) out of the possible range of 0-20. There was no significant difference in aggression scores between individuals in each of the three pain experience groups (current, previous, none) (Kruskal Wallis: X^2=5.126, P>0.05, df=2) or between dogs with current or previous pain experience (Mann-Whitney U (df=1)=3613, P>0.05). Furthermore, increased aggression scores were associated with increased odds of current UGI conditions (Table 4).

3.1.4. Age

Older age was a risk factor for the experience of previous pain and general health conditions. Binomial regression analysis showed that there is an association between current experience of a typically pain-causing condition and age. As age increased, the odds of being assigned to the current pain group also increased (Table 3). Furthermore, only age was predictive of a dog's previous experience of a potentially pain-causing condition, with older dogs having an increased likelihood of having previous experience of a pain-causing condition (Table 5).

Increased age was also associated with increased odds of that dog having a previous UGI problems (Table 6), current UGI problems (Table 4), previous DVH problems (Table 2), current DVH problems (Table 7) and current MSK conditions (Table 8.). For previous MSK problems, as age decreased so did the odd likelihood of that dog having experienced previous MSK conditions (Table 9).

4. Discussion

The focus of this study was to investigate the hypothesis that health status is associated with affective predisposition in dogs. The results describe a relationship between a measure of positive and negative affect and the occurrence of a current health condition likely to cause pain. Specifically, higher scores on the domain of positive affect (PA) indicate a lower likelihood that an individual was currently suffering with a painful health condition, such as arthritis or cancer. Therefore, dogs with current painful conditions had lower levels of positive affect. These results support the hypotheses that dogs currently suffering from a condition likely to cause pain would differ in affect to those with previous experience or no experience of a health condition likely to cause pain. As expected, age was also a positive predictor for current pain experience.

The associations found between positive affect and current experience of a pain-causing condition have not, to our knowledge, previously been reported. These findings may demonstrate either an influence of emotional affect on the expression of pain and/or it changes in mood because of pain; both of which have important clinical significance. This adds weight to the results of a preliminary study by Wiseman et al (2001) which showed that owners felt their dog's demeanour changes in response to pain. Changes to their dog's fearfulness, excitability, aggressiveness, playfulness, curiosity, anxiety, vocalisations and activity were reported (Wiseman et al., 2001), however our results shed light, for the first time, on longer term effects and their relationship with more stable traits, where the effect seems to be more clearly related to positive affect which is in line with the relationship described in people between painful conditions and depression (Bair et al., 2003). Furthermore, research by Goncalves et al (2008) also demonstrated that prolonged pain can cause depressive-like behaviours in rats. Alternatively, if our results indicate that dogs with lower PA are more likely to be diagnosed with painful conditions, it may be that trait emotional affect mediates pain behaviour and the clinical implications of this need to be considered. Asher at al. (2017) demonstrated that in pigs, stable personality traits and more transient mood states interacted to determine judgement bias, further supporting the assertion that to better understand our findings research is needed to determine the causal relationship between measures of more enduring affective state (mood and personality). To determine this, it is vital to undertake longitudinal studies which make comparisons of PANAS scores between pain-or disease-free periods and at times when the dog is experiencing pain. This would allow it to be determined whether, for example, dogs with a certain personality or affectivity style may express and cope with painful conditions by altering their movement and thus present as lame, making pain easier to diagnose, or whether dogs with certain personality traits are more susceptible to mood changes during painful episodes. Considering the research by Ijichi et al (2014) that demonstrated the relationship between pain behaviour and personality in horses, this may not only be relevant in dogs, but may also have cross-species application.

Contrary to the hypothesis that aggression scores would be related to pain experience, the survey found no difference in aggression scores amongst pain groups (current vs no pain experience or previous vs no pain experience). It has previously been documented that aggressive behaviour can increase or occur in different contexts when a dog is experiencing pain (Wiseman et al, 2001; Camps et al, 2012). The finding of no difference between the current and historic pain group in aggression scores means that this hypothesis may need more careful evaluation, and it may be that differences in aggressive behaviour are more qualitative than quantitative (Barcelos et al. 2015). Such changes may not have been detected in this study due to the design of this aspect of the current questionnaire.

One of the wider limitations of this research is that we had no direct measure of the presence or extent of pain experienced by the dogs, therefore, whilst we believe the conditions analysed would be very likely to cause pain, this could not be confirmed. However, this would simply increase the variance between groups and reduce effect size, therefore these findings should be considered a conservative estimate of the effects. With the exception of DVH category, the only difference observed was in affectivity scores between those dogs who had current experience of a condition likely to cause pain, not in those with current general health conditions (unlikely to cause pain, which suggests that something about those specific conditions (arthritis, cancer, hip dysplasia, dental problems etc.) is affecting emotional affect. Pain appears the most parsimonious explanation. As well as the explanation that pain affects a dog's mood (or how owners view their dog's mood) alternative explanations need to be examined in future research, for example the longitudinal studies previously discussed.

5. Conclusion

The findings from this study are amongst the first to demonstrate an association between current pain experience and lower levels of positive emotional affect in animals, and the first in the domestic dog. This research demonstrates the need for future work to focus on the causal relationship between pain expression, affect/mood and behaviour in dogs, alongside the potential for an interaction between personality and mood. Furthermore, aside from the benefits to dogs as a species, these results have cross-species relevance. Pain is a common sign of many illnesses across species and whilst it should be acknowledged that pain behaviours will differ between species, these findings highlight the importance of recognising the influence that individual differences, such as those grounded in affect, can have on behaviour.

6. Conflict of interest statement

None of the authors of this paper have a financial or personal relationship with other people or organisations that could inappropriately influence or bias the content of the paper.

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Appendix. Supplementary material

Supplementary data associated with this article can be found, in the online version, at doi: …

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Table 1.

Frequency and percentage of dogs in each age category.

	Frequency of dogs in age category	Percentage of dogs in age category
Age category 1	158	20
Age Category 2	352	44
Age Category 3	286	36

Table 2.

Final Model for the predictors of previous dental, vision and hearing issues.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	AGE			8.778	2	.012			
	AGE(1)	-18.534	3108.147	.000	1	.995	.000	.000	.
	AGE(2)	-1.321	.446	8.778	1	.003	.267	.111	.639
	NA	-4.350	1.536	8.020	1	.005	.013	.001	.262
	PA	-2.816	1.419	3.936	1	.047	.060	.004	.966
	AGG	.091	.061	2.223	1	.136	1.095	.972	1.233
	Constant	.850	1.254	.460	1	.498	2.340		
Step 2[a]	AGE			9.158	2	.010			
	AGE(1)	-18.604	3113.249	.000	1	.995	.000	.000	.
	AGE(2)	-1.345	.444	9.158	1	.002	.261	.109	.623
	NA	-4.123	1.533	7.238	1	.007	.016	.001	.326
	PA	-2.840	1.415	4.026	1	.045	.058	.004	.936
	Constant	1.362	1.212	1.262	1	.261	3.903		

Table 3.

Final Model for the predictors of current pain condition.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	AGE			29.553	2	.000			
	AGE(1)	-1.188	.322	13.643	1	.000	.305	.162	.573
	AGE(2)	-1.152	.234	24.175	1	.000	.316	.200	.500
	NA	.359	.724	.245	1	.620	1.431	.346	5.921
	PA	-1.600	.788	4.117	1	.042	.202	.043	.947
	AGG	.009	.037	.056	1	.814	1.009	.938	1.085
	Constant	.003	.700	.000	1	.997	1.003		
Step 2[a]	AGE			29.751	2	.000			
	AGE(1)	-1.193	.321	13.812	1	.000	.303	.162	.569
	AGE(2)	-1.153	.234	24.253	1	.000	.316	.200	.500
	NA	.377	.720	.275	1	.600	1.458	.356	5.979
	PA	-1.603	.788	4.136	1	.042	.201	.043	.944
	Constant	.051	.669	.006	1	.939	1.052		
Step 3[a]	AGE			29.578	2	.000			
	AGE(1)	-1.191	.321	13.776	1	.000	.304	.162	.570
	AGE(2)	-1.144	.233	24.054	1	.000	.318	.202	.503
	PA	-1.618	.788	4.219	1	.040	.198	.042	.929
	Constant	.230	.576	.159	1	.690	1.258		

Table 4.

Final model for predictors of current upper gastrointestinal tract problems.

Variables in the Equation[c]

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	AGE			8.076	2	.018			
	AGE(1)	-1.043	.571	3.336	1	.068	.352	.115	1.079
	AGE(2)	-1.049	.405	6.702	1	.010	.350	.158	.775
	NA	1.905	1.166	2.671	1	.102	6.722	.684	66.029
	PA	-.774	1.318	.345	1	.557	.461	.035	6.102
	AGG	.090	.053	2.899	1	.089	1.094	.987	1.213
	Constant	-3.404	1.128	9.102	1	.003	.033		
Step 2[a]	AGE			9.841	2	.007			
	AGE(1)	-1.120	.556	4.064	1	.044	.326	.110	.969
	AGE(2)	-1.104	.394	7.844	1	.005	.331	.153	.718
	NA	1.895	1.161	2.663	1	.103	6.651	.683	64.750
	AGG	.089	.053	2.857	1	.091	1.093	.986	1.212
	Constant	-3.945	.659	35.867	1	.000	.019		
Step 3[a]	AGE			10.247	2	.006			
	AGE(1)	-1.180	.554	4.534	1	.033	.307	.104	.910
	AGE(2)	-1.106	.393	7.929	1	.005	.331	.153	.714
	NA	2.154	1.143	3.550	1	.060	8.621	.917	81.055
	Constant	-3.477	.592	34.545	1	.000	.031		
Step 4[a]	AGE			9.567	2	.008			
	AGE(1)	-1.166	.553	4.445	1	.035	.312	.105	.921
	AGE(2)	-1.047	.390	7.208	1	.007	.351	.163	.754
	Constant	-2.485	.222	125.395	1	.000	.083		
Step 5[b]	AGE			9.147	2	.010			
	AGE(1)	-1.102	.555	3.943	1	.047	.332	.112	.986
	AGE(2)	-1.046	.391	7.145	1	.008	.351	.163	.757
	AGG	.102	.052	3.853	1	.050	1.107	1.000	1.225
	Constant	-3.158	.425	55.179	1	.000	.043		

Table 5.

Final Model for the predictors of previous experience of a painful condition.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	AGE			11.475	2	.003			
	AGE(1)	-.845	.390	4.693	1	.030	.430	.200	.923
	AGE(2)	-.982	.307	10.219	1	.001	.375	.205	.684
	NA	.287	.931	.095	1	.758	1.333	.215	8.267
	PA	.079	1.087	.005	1	.942	1.082	.128	9.109
	AGG	.051	.045	1.295	1	.255	1.052	.964	1.148
	Constant	-2.241	.932	5.783	1	.016	.106		
Step 2[a]	AGE			12.025	2	.002			
	AGE(1)	-.839	.380	4.860	1	.027	.432	.205	.911
	AGE(2)	-.978	.302	10.513	1	.001	.376	.208	.679
	NA	.288	.931	.095	1	.758	1.333	.215	8.274
	AGG	.051	.045	1.302	1	.254	1.052	.964	1.148
	Constant	-2.184	.501	19.033	1	.000	.113		
Step 3[a]	AGE			11.944	2	.003			
	AGE(1)	-.838	.380	4.849	1	.028	.433	.205	.912
	AGE(2)	-.971	.301	10.429	1	.001	.379	.210	.683
	AGG	.053	.044	1.476	1	.224	1.055	.968	1.149
	Constant	-2.072	.340	37.055	1	.000	.126		
Step 4[a]	AGE			11.962	2	.003			
	AGE(1)	-.857	.380	5.093	1	.024	.424	.202	.893
	AGE(2)	-.963	.300	10.295	1	.001	.382	.212	.687
	Constant	-1.738	.192	82.232	1	.000	.176		

Table 6.

Final model for the predictors of previous upper gastrointestinal tract problems.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	AGE			11.255	2	.004			
	AGE(1)	-.964	.301	10.243	1	.001	.381	.211	.688
	AGE(2)	-.436	.205	4.515	1	.034	.647	.432	.967
	NA	.605	.639	.897	1	.344	1.831	.524	6.406
	PA	.420	.740	.321	1	.571	1.522	.356	6.495
	AGG	.048	.031	2.381	1	.123	1.050	.987	1.116
	Constant	-2.047	.635	10.376	1	.001	.129		
Step 2[a]	AGE			11.071	2	.004			
	AGE(1)	-.925	.293	9.961	1	.002	.397	.223	.704
	AGE(2)	-.408	.199	4.201	1	.040	.665	.450	.982
	NA	.611	.639	.914	1	.339	1.843	.526	6.450
	AGG	.049	.031	2.415	1	.120	1.050	.987	1.117
	Constant	-1.749	.354	24.357	1	.000	.174		
Step 3[a]	AGE			10.831	2	.004			
	AGE(1)	-.919	.293	9.853	1	.002	.399	.225	.708
	AGE(2)	-.393	.198	3.924	1	.048	.675	.458	.996
	AGG	.053	.031	2.965	1	.085	1.055	.993	1.121
	Constant	-1.506	.244	37.942	1	.000	.222		
Step 4[a]	AGE			11.560	2	.003			
	AGE(1)	-.951	.292	10.604	1	.001	.387	.218	.685
	AGE(2)	-.397	.198	4.038	1	.044	.672	.456	.990
	Constant	-1.165	.139	70.346	1	.000	.312		

Table 7.

Final regression model for current dental, vision and hearing problems.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	AGE			15.785	2	.000			
	AGE(1)	-18.941	3180.975	.000	1	.995	.000	.000	.
	AGE(2)	-1.719	.433	15.785	1	.000	.179	.077	.418
	NA	-.525	1.211	.188	1	.664	.591	.055	6.346
	PA	-1.975	1.264	2.442	1	.118	.139	.012	1.652
	AGG	.062	.056	1.230	1	.267	1.064	.954	1.186
	Constant	-.803	1.106	.526	1	.468	.448		
Step 2[a]	AGE			16.049	2	.000			
	AGE(1)	-18.946	3182.715	.000	1	.995	.000	.000	.
	AGE(2)	-1.731	.432	16.049	1	.000	.177	.076	.413
	PA	-1.948	1.259	2.393	1	.122	.143	.012	1.682
	AGG	.058	.055	1.123	1	.289	1.060	.952	1.181
	Constant	-1.033	.969	1.137	1	.286	.356		
Step 3[a]	AGE			16.197	2	.000			
	AGE(1)	-18.987	3185.213	.000	1	.995	.000	.000	.
	AGE(2)	-1.737	.432	16.197	1	.000	.176	.076	.410
	PA	-1.964	1.259	2.433	1	.119	.140	.012	1.655
	Constant	-.644	.896	.516	1	.472	.525		
Step 4[a]	AGE			19.234	2	.000			
	AGE(1)	-19.166	3197.581	.000	1	.995	.000	.000	.
	AGE(2)	-1.861	.424	19.234	1	.000	.156	.068	.357
	Constant	-2.037	.185	121.116	1	.000	.130		

Table 8.

Final regression model for previous musculoskeletal problems.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	AGE			12.038	2	.002			
	AGE(1)	-1.337	.510	6.859	1	.009	.263	.097	.714
	AGE(2)	-1.000	.342	8.543	1	.003	.368	.188	.719
	NA	-.429	1.061	.163	1	.686	.651	.081	5.215
	PA	1.884	1.253	2.259	1	.133	6.577	.564	76.688
	AGG	.055	.049	1.255	1	.263	1.057	.959	1.164
	Constant	-3.771	1.083	12.120	1	.000	.023		
Step 2[a]	AGE			12.259	2	.002			
	AGE(1)	-1.341	.511	6.896	1	.009	.262	.096	.712
	AGE(2)	-1.011	.341	8.781	1	.003	.364	.186	.710
	PA	1.876	1.250	2.252	1	.133	6.529	.563	75.690
	AGG	.052	.049	1.143	1	.285	1.053	.958	1.159
	Constant	-3.933	1.004	15.351	1	.000	.020		
Step 3[a]	AGE			12.594	2	.002			
	AGE(1)	-1.370	.509	7.246	1	.007	.254	.094	.689
	AGE(2)	-1.014	.341	8.859	1	.003	.363	.186	.707
	PA	1.885	1.248	2.281	1	.131	6.588	.570	76.099
	Constant	-3.606	.954	14.298	1	.000	.027		
Step 4[a]	AGE			10.593	2	.005			
	AGE(1)	-1.200	.496	5.853	1	.016	.301	.114	.796
	AGE(2)	-.891	.330	7.273	1	.007	.410	.215	.784
	Constant	-2.221	.199	124.570	1	.000	.109		

Table 9.

Final regression model for current musculoskeletal problems.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	AGE			35.951	2	.000			
	AGE(1)	-1.716	.450	14.527	1	.000	.180	.074	.435
	AGE(2)	-1.628	.309	27.823	1	.000	.196	.107	.360
	NA	-.296	.887	.111	1	.739	.744	.131	4.228
	PA	-1.402	.943	2.208	1	.137	.246	.039	1.564
	AGG	.005	.045	.013	1	.908	1.005	.921	1.098
	Constant	-.290	.830	.123	1	.726	.748		
Step 2[a]	AGE			36.151	2	.000			
	AGE(1)	-1.719	.449	14.653	1	.000	.179	.074	.432
	AGE(2)	-1.629	.308	27.890	1	.000	.196	.107	.359
	NA	-.283	.879	.103	1	.748	.754	.135	4.221
	PA	-1.402	.943	2.209	1	.137	.246	.039	1.563
	Constant	-.264	.797	.110	1	.741	.768		
Step 3[a]	AGE			36.385	2	.000			
	AGE(1)	-1.720	.449	14.661	1	.000	.179	.074	.432
	AGE(2)	-1.634	.308	28.160	1	.000	.195	.107	.357
	PA	-1.392	.942	2.185	1	.139	.248	.039	1.574
	Constant	-.395	.683	.335	1	.563	.674		
Step 4[a]	AGE			43.127	2	.000			
	AGE(1)	-1.841	.442	17.376	1	.000	.159	.067	.377
	AGE(2)	-1.721	.303	32.368	1	.000	.179	.099	.324
	Constant	-1.391	.148	88.266	1	.000	.249		