

Kangaroo harvesters and the euthanasia of orphaned young-at-foot: applying the theory of planned behaviour to an animal welfare issue

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Abstract

When female kangaroos are shot during commercial harvesting, it is a requirement that dependent young-at-foot are euthanased. However, there are anecdotal reports that harvesters either cannot euthanase young-at-foot (eg they do not see them or they flee) or will not (eg they do not think it is necessary). In this study we used the theory of planned behaviour to understand the beliefs, attitudes and behaviour of kangaroo harvesters with regards to the euthanasia of young-at-foot. We firstly conducted a survey of a small number of kangaroo harvesters ($n = 21$) to gather information to develop the main questionnaire. Recruitment of participants was conducted using a number of approaches including a mail out of over 600 pen-and-paper questionnaires to harvesters in NSW, QLD and SA, Australia. We received completed questionnaires from 65 harvesters. Behaviour was directly observed in only 14 harvesters. The results indicated that those kangaroo harvesters with a more favourable attitude towards euthanasing young-at-foot and who feel more social pressure to do so are more likely to intend to euthanase young-at-foot. However, intention to euthanase orphaned young-at-foot only rarely translated into actual behaviour. The participating harvesters believe that euthanasing young-at-foot reduces joey suffering; that government kangaroo management agencies and farmers and graziers approve of them doing it (but animal protection groups do not); and that the greatest limiting factor preventing them from euthanasing young at-foot is that they escape. This research revealed deficiencies in knowledge and training of kangaroo harvesters with regard to humane harvesting practices. We conclude that the use of social psychology methodology and frameworks, such as the theory of planned behaviour, can provide a detailed insight into human attitudes and behaviours that affect animal welfare. This approach can reveal the most important specific factors to consider when training and educating personnel who have direct responsibility for the humane treatment of animals.

Keywords: animal welfare, attitudes, commercial harvesting, kangaroo, social psychology, theory of planned behaviour

Introduction

In Australia, kangaroos are commercially harvested to produce meat for pet food and for human consumption — both domestically and abroad — as well as skins for leather products. Adult kangaroos, mostly males, are shot by professional shooters who hold the necessary permits and licences. When females are shot they will usually have at least one dependent young at some stage of development (ie pouch young or young-at-foot) and it is a requirement of a national Code of Practice (Commonwealth of Australia 2008) (from herein referred to as the Code) that these young are humanely euthanased by the harvester. According to the Code, euthanasia of pouch young and young-at-foot is done to “prevent the inhumane death of young that cannot survive on their own” (Commonwealth of Australia 2008; p 9). The Code prescribes that small, furless pouch young are killed using either blunt trauma to the head or stunning followed by decapitation. Older, furred pouch

young must be killed with a single, forceful blow to the head whilst young-at-foot must be killed using a single shot to the brain or the heart. Despite being a requirement of the Code the euthanasia of dependent young during harvesting is currently not monitored and has not been studied in any detail. Opponents of kangaroo harvesting argue that it is common practice for young-at-foot to be left to fend for themselves once their mothers have been shot (Ben-Ami 2009) and indeed kangaroo harvesters report that euthanasia of young-at-foot is much more difficult to perform compared with killing young that are still contained within the pouch (RSPCA Australia 2002). In this study we used a social psychology framework to understand the factors that influence the euthanasia of orphaned young-at-foot.

For many years animal protection groups have expressed significant concern for young-at-foot that are not euthanased, believing that they will suffer and die from starvation, exposure or predation (Wilson 1999; RSPCA

Australia 1985, 2002). Recently, we have conducted research that demonstrates that an abrupt and permanent separation from maternal care does have a significant negative impact on the welfare of kangaroo young-at-foot (McLeod & Sharp 2014). Thus, to prevent animal suffering, it is important that euthanasia of orphaned young-at-foot is performed by harvesters whenever possible.

If orphaned young-at-foot are not euthanased by harvesters, then it is likely that large numbers of animals will suffer. Using data from studies by Frith and Sharman (1964), Pople (1996) and Hacker *et al* (2003) we estimate that around one-fifth of females that are harvested are likely to have a young-at-foot. Long-term monitoring of the commercial harvest in Australia over the last 20 years indicates that 20 to 30% of commercially harvested kangaroos were female. For instance, in New South Wales, the proportion of female kangaroos in the commercial harvest — determined from harvest returns 1999–2011 — has been about 30% (Office of Environment and Heritage 2012). Based on an estimate of the number of females shot in NSW from 1999 to 2012 (3,236,600), we estimate that over 600,000 were likely to have a young-at-foot, however the proportion of these young that were euthanased by shooters is unknown.

Recently in NSW, there has been a decrease in the proportion of females commercially harvested (ie from 23% in 2012 to 9% in 2013). This was due to one kangaroo meat processing company changing its policy to accept only male carcasses from October 2012, apparently in response to customer concerns regarding the fate of dependent young orphaned during harvesting (Office of Environment and Heritage 2013). It is not known if this decrease in harvested females will result in them being targeted using other forms of management but recent harvest statistics could suggest that this might occur. In NSW, the number of animals killed by *non-commercial* culling typically represents a figure much less than 10% of the total number killed by commercial harvesting, however in 2013, non-commercial licences were issued for the culling of 77,630 kangaroos, around 22% of the commercial harvest (Office of Environment and Heritage 2013). This large increase could be a reflection of the fact that there were much higher numbers of kangaroos after a good season but could also indicate that land managers perceive that harvesting (or harvesting males only) is no longer meeting their requirements for adequate kangaroo population management. Therefore, despite the recent decrease in the proportion of females being accepted for processing during commercial harvesting, the euthanasia of dependent young-at-foot remains an important animal welfare issue for both the commercial and non-commercial killing of kangaroos.

Based on anecdotal reports together with our own informal discussions with harvesters and observations of harvesting practices, we believe there are a number of factors that could potentially prevent harvesters from effectively and humanely euthanasing young-at-foot. For example, at night, young-at-foot often forage some distance (up to 200 m) away from their mother and can be difficult to see (T Sharp, unpublished) and when young-at-foot are seen they often escape

before the harvester has a chance to euthanase them. Also, if more than one young-at-foot is seen close to the shot female, it is difficult to know which one is hers. Some harvesters have said they do not euthanase young-at-foot (or sometimes even large pouch young), but rather release them because they believe they are old enough to survive on their own (RSPCA Australia 1985). Also, if a young-at-foot is mobile a harvester might not even attempt to euthanase them because of the time it takes to find them. Harvesters have also said they do not like using blunt trauma on the larger joeys, but consider that the alternative of shooting is too dangerous at close range, so they release them (RSPCA Australia 1985).

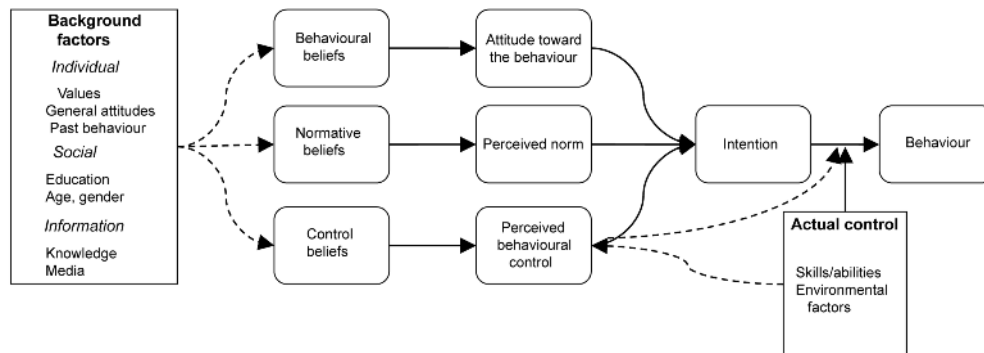
While it is important that kangaroo harvesters have the technical skill, knowledge and experience required to effectively shoot animals and dress carcasses in a hygienic manner, to ensure that harvesting is carried out humanely, other attributes, such as positive attitudes and behaviour toward animals, are equally important. Harvesters are directly responsible for taking accurate head-shots, euthanasing dependent young, ensuring that wounded animals are followed up and killed humanely and checking that animals are dead. Thus, it is their decisions and actions that ultimately determine the level of suffering experienced by animals and subsequently, the humaneness of kangaroo harvesting. To examine the specific beliefs, attitudes and behaviour of harvesters with regard to the euthanasia of young-at-foot we used the theory of planned behaviour (TPB; Ajzen 1991).

The theory of planned behaviour

The TPB follows a reasoned action approach, which is the dominant conceptual framework for predicting, explaining, and changing human social behaviour. According to the TPB, *intention* or a readiness to perform a given behaviour is the most proximal determinant of a person's behaviour and, in turn, intention is influenced by a combination of personal attitudes, social pressures as well as perceived control over one's own behaviour. The TPB is based on the expectancy-value model of attitude formation which describes how our attitudes toward an object or a behaviour develop from the beliefs we hold about the particular object or behaviour (Fishbein & Ajzen 2010). The basic structure of the TPB/reasoned action model is shown in Figure 1 and descriptions of key terms and concepts are provided in Table 1.

The TPB has been extensively applied to the prediction and explanation of a range of human social behaviours in different domains, for example, road safety (Elliott & Armitage 2009); participation in hunting (Hrubes *et al* 2001; Shrestha *et al* 2012), wildlife management (Willcox *et al* 2012) and numerous health-relevant behaviours, such as smoking (Norman *et al* 1999), dieting and weight loss (Schifter & Ajzen 1985) and physical activity (Armitage 2005). The theory has also been used to understand the relationships between attitudes, personal characteristics and behaviour of stockpeople and the welfare, behaviour and production of the farm animals under their care (eg Hemsworth *et al* 1989; Coleman *et al* 1998; Breuer *et al* 2000; Waiblinger *et al* 2002) and to examine the relationship between humans and animals at abattoirs (Coleman

Figure 1



Theory of planned behaviour/reasoned action model (adapted from Ajzen 1991; Fishbein & Ajzen 2010).

Table 1 Description of terms and concepts used in the theory of planned behaviour (from Fishbein & Ajzen 2010).

Term or concept	Description
Beliefs	The information from where a particular behaviour originates. Beliefs can develop from a variety of sources or background factors (such as personal experience, values, education, the media, family and friends) and they guide whether or not a person performs or does not perform a behaviour. There are three main types of beliefs: <i>Behavioural beliefs</i> refer to the positive or negative consequences that might be experienced if the behaviour is performed <i>Normative beliefs</i> refer to the beliefs that important individuals or groups would approve or disapprove of performing the behaviour in question (injunctive norms), as well as beliefs that others are, or not, performing the behaviour (descriptive norms) <i>Control beliefs</i> refer to the personal and environmental factors that can help or impede the carrying out of the behaviour
Attitude toward the behaviour	The overall positive or negative evaluation of performing the behaviour. Determined from behavioural beliefs about the positive and negative outcomes of performing the behaviour
Perceived norm	The perceived total social pressure to perform or not perform the behaviour. Determined from normative beliefs about what others think we should do and what we think others are doing
Perceived behavioural control	The perceived ease or difficulty of performing the behaviour. Determined from control beliefs about factors that will help us or prevent us from doing the behaviour
Intention	The willingness or readiness to perform the behaviour. Formed from the combination of attitude towards the behaviour, perceived norm and perception of behavioural control. The more favourable the attitude and perceived norm and the greater the perceived behavioural control, the stronger should be the person's intention to perform the behaviour
Actual control	Refers to whether or not a behaviour can be performed taking into account constraints such as a lack of skills or abilities or environmental limitations. Actual control moderates the effect of intention on behaviour
Behaviour	The identified specific action of interest

et al 2003, 2012). The TPB has also been used to design interventions aimed at changing people's attitudes and behaviour in a number of different areas (Fishbein & Ajzen 2010) including people handling farm animals (eg Hemsworth *et al* 1994; Coleman *et al* 2000).

According to the TPB, the major predictors of intention and behaviour are behavioural, normative and control beliefs and the origin of these beliefs can be from a variety of personal, social and informational characteristics or background factors (such as age, gender, education, personality traits, intelligence, general attitudes and values). Many investigators have proposed that background factors such as these may influence intentions and behaviour directly and have included them as additional predictors in an attempt to

improve the predictability of the TPB. And, indeed, some studies have revealed significant direct effects for some external variables (such as moral norms, self-identity, affective beliefs, habit or past behaviour) after controlling for the TPB variables (Conner & Armitage 1998). However, Fishbein and Ajzen (2010) have stated that in the numerous studies conducted with the TPB, finding a direct effect for an external variable is rare and it is more likely that background factors will influence intention and behaviour indirectly through beliefs and attitudes towards the specific behaviour.

One factor that does consistently account for a significant proportion of variance in intention and later behaviour after controlling for attitudes, perceived norms and perceived behavioural control is past behaviour or habit. Thus, this is

often included as an additional predictor of people's intentions and behaviours (Conner & Armitage 1998). It is thought that frequent performance of a behaviour may bring subsequent behaviour under the control of habitual processes — that is, 'if I've done it before, I'm likely to do it again'. Although background factors are likely to influence intentions and behaviour indirectly, collecting information on other demographic and psychological factors (eg age, gender, knowledge of relevant facts, level of experience etc) could be useful in segmenting a population and comparing how they differ in terms of their beliefs, attitudes and intentions relative to a particular behaviour and might be useful in providing valuable information about effective strategies for changing behaviour (Fishbein & Ajzen 2010).

A report on the incidence of cruelty to kangaroos by the Royal Society for the Prevention of Cruelty to Animals (RSPCA Australia 1985) concluded that part-time kangaroo shooters were less skilled than their full-time colleagues and that it was part-time shooters that were the main contributors to inhumane practices. Also, a study examining attitudes toward the treatment of animals using the Animal Attitude Scale, developed by Herzog *et al* (1991), found that employees from the primary industry sector in Australia had lower scores on the scale — indicating less concern for animals — compared with other occupation groups (Signal & Taylor 2006a). Based on these studies and reports that harvesters cannot or do not always follow the Code, we predicted that attitudes toward the treatment of animals, knowledge of kangaroo biology and the Code of Practice, as well as factors such as age and experience, might also potentially influence the euthanasia of orphaned young-at-foot.

In this study we thus aimed to determine the relative importance of attitude, perceived norm and perceived behavioural control in guiding intentions of harvesters to euthanase young-at-foot after the mother has been shot. We also attempted to gain an insight into what harvesters think about this behaviour by examining behavioural, normative and control beliefs and to determine if past behaviour predicts intentions to perform behaviour in the future. In accordance with the TPB (Ajzen 1991; Fishbein & Ajzen 2010) we hypothesised that attitude, subjective norm and perceived behavioural control would predict harvesters' intentions to euthanase young-at-foot when the mother has been shot (Hypothesis 1). We proposed that the past behaviour of harvesters with regard to euthanasing young-at-foot would influence their intentions to euthanase young-at-foot in the future (Hypothesis 2). We also tested if the background factors of harvester experience, general attitude to animal welfare, knowledge of kangaroo biology and of the Code of Practice would directly influence intentions to euthanase young-at-foot (Hypothesis 3). We also explored the most important salient (or directly accessible) behavioural, normative and control beliefs underlying harvesters' attitudes, perceived norm and perceived behavioural control. We had intended to test the prediction that intention and perceived behavioural control would directly influence harvesters' decisions to euthanase young-at-foot (ie their actual behaviour), but unfortunately we could only collect data on this for a low number of participants ($n = 14$). To gauge the

importance of this issue, we collected information from harvesters on their current practices with regard to shooting females. Some harvesters may not target females very often and thus the euthanasia of young-at-foot may not be a significant issue for them.

We anticipate that the results from this study will be useful when designing training and education programmes for kangaroo harvesters and for guiding future revisions of the Code. We provide information on what can be done to encourage the humane euthanasia of dependent young-at-foot by harvesters, harvester characteristics that could potentially contribute to more humane harvesting and specific harvester beliefs and attitudes that need to be changed. We will also identify other constraints that could potentially prevent the euthanasia of orphaned young-at-foot.

Materials and methods

Procedures

Development of questionnaire

Following guidelines for conducting a study using the TPB (Francis *et al* 2004; Fishbein & Ajzen 2010), we firstly defined the behaviour under study in terms of its target, action, context, and time elements. Thus, the target was kangaroo 'young-at-foot', the action was 'euthanasia' and the context and time was 'when the mother (female kangaroo) has been shot'. The research population was specified as 'kangaroo harvesters'. The terms 'euthanasia' (killing by a single forceful blow to the head to destroy the brain; or a shot to the head to destroy the brain; or a shot to the chest to destroy the heart) and 'young-at-foot' (joeys that spend time both in and out of the pouch and larger joeys that are still suckling but spend little or no time in the pouch) were defined in the instructions for participants. Note that the term 'joey' is commonly used to refer to all kangaroo young (including pouch young and young-at-foot). Although our questions in both the pilot and main questionnaires, specifically related to young-at-foot, in the open-ended questions harvesters often used the more general term 'joey' so we have used this term where relevant when discussing comments by harvesters.

Pilot questionnaire to elicit salient beliefs

Prior to developing the main questionnaire we used a small sample ($n = 21$) of commercial kangaroo harvesters to elicit salient (or readily accessible) behavioural outcomes, normative referents, and control factors. Harvesters were asked eight open-ended questions, mostly via individual phone interview, but a small number completed the questions using pen and paper. We asked what they thought were the outcomes from euthanasing dependent young-at-foot (ie what are the costs/benefits, advantages/disadvantages, likes/dislikes); who would approve or disapprove of them euthanasing dependent young-at-foot and what makes it easy or difficult to do.

A content analysis of the responses to the elicitation questions was performed independently by two of the researchers and the list of modal salient outcomes, referents, and control factors produced were used to construct the belief-based items for inclusion in the final questionnaire.

Recruitment of participants

For the main questionnaire, kangaroo harvesters were invited to complete a pen-and-paper questionnaire as part of a research project “to investigate animal welfare aspects of commercial kangaroo harvesting with a focus on issues surrounding the euthanasia of dependent kangaroo joeys after their mother has been shot”. Harvesters were recruited using a variety of methods including, a mail out of questionnaires and letters requesting expressions of interest sent via the state government kangaroo management agencies in New South Wales (NSW), Queensland (QLD) and South Australia (SA); advertisements in a range of local newspapers in NSW where harvesters were known to operate; and a public meeting in Western NSW which was publicised in the local newspaper and by a radio news article. An A\$50 gift card from a national retail group was offered as an incentive for completing the questionnaire. An additional gift card was also offered for harvesters that allowed us to accompany them to observe harvesting practices. Due to a mixed recruitment strategy being used, it is uncertain how many potential respondents saw the publicity for the project, and thus it is difficult to compute an accurate response rate. However, an estimate of the response rate just from the state kangaroo agency mail out of questionnaires was very low at only around 5%.

A meta-analysis of 185 independent studies (Armitage & Conner 2001) found that the theory of planned behaviour accounts for 39% of the variance in intention and 27% in behaviour. For the prediction of intention, an effect size (f^2) of around 0.64 was thus expected for the current study. Assuming a target power of 0.80, a critical alpha of 0.05 and a directional hypothesis in a linear multiple regression fixed model with ten predictor variables, a power analysis using G*Power 3.1 (Faul *et al* 2009) indicated that a minimum of 36 participants were required. For the prediction of behaviour, assuming an effect size (f^2) of 0.37, combined with a power level of 0.80, and a critical alpha of 0.05 in a linear multiple regression fixed model with 2 predictor variables, based on a power analysis (Faul *et al* 2009), the minimum sample size required was 30. Despite extensive effort to recruit harvesters to allow us to observe them during one night of harvesting, only 14 agreed to participate. This sample size was too small to achieve the desired power of 0.80 therefore the behaviour data were not analysed using multiple regression. However, the results from the direct observations of harvester behaviour relating to the euthanasia of young-at-foot are included in *Results*.

Participants

Participants were 65 kangaroo harvesters, almost exclusively male (97%). Participants ranged in age from 21 to 70 years (mean [\pm SD] = 40.22 [\pm 11.34]). Thirty-two percent of the sample was from NSW, 23% from QLD, 8% from SA and for 3% of respondents the state of origin was unknown. In terms of highest level of education completed, 3% had completed primary school, 49% were high school graduates, 40% had completed a technical college or industry qualification, 2% had a university degree and 5%

had completed postgraduate training. The number of years spent harvesting kangaroos ranged from 1 to 50 years (13.30 [\pm 10.49]). For half of the participants, 70 to 100% of their income is gained from kangaroo harvesting. On average, they spend three nights per week operating as a harvester. Fifty-one percent of harvesters said that they sometimes shot female kangaroos, 38% said they only rarely shot females, 5% always shot females and 6% of harvesters stated that they never shot females.

Data collection began after gaining approval from The University of Wollongong, Human Research Ethics Committee (Ethics approval number: HE10/298).

Measures

Salient beliefs about euthanasing young-at-foot

The most common salient beliefs that emerged from the elicitation study are listed as follows.

Behavioural beliefs (ie advantages/benefits and disadvantages/costs of euthanasing young-at-foot)

The participants stated that the main advantages of euthanasing young-at-foot were reducing the suffering of joeys (ie from starvation, predation etc) and controlling the population of kangaroos (eg to reduce crop damage). The disadvantages of euthanasing young-at-foot were that it reduced the number of kangaroos available for future harvest and it was expensive in terms of time and ammunition. Many harvesters said that they do not like killing joeys but realise that it is a part of their job. Others believe that killing young-at-foot is unnecessary and will avoid doing it because it takes away the joeys' chance at life.

Normative beliefs (ie people who would approve/disapprove of euthanasing young-at-foot)

When asked if there were any individuals or groups who would approve of their euthanasing young-at-foot, specific reference was made to landholders (eg farmers, station owners, graziers), the relevant state government agencies responsible for kangaroo management and the kangaroo industry. People who disapprove include the general public as well as animal protection groups (eg animal rights, animal liberation, RSPCA) and wildlife or conservation groups (eg 'greenies'). A number of participants could not think of anyone who would disapprove of their euthanasing young-at-foot.

Control beliefs (ie factors that would make it easy or difficult to euthanase young-at-foot)

Factors that could make euthanasing young-at-foot easier included better equipment (such as a 'stun gun'), shooting the joey before shooting the mother, more research into better methods and also training on euthanasia methods. Many of the harvesters said that there is nothing easier than the method that they currently use. Factors that make euthanasing young-at-foot difficult were that many of them escape or they cannot be seen. Joeys often move very fast and get away and it can be difficult to know if a young-at-foot belongs to the female that has just been shot. Some techniques (eg capture to give a lethal injection or apply a captive bolt) would be difficult to employ. 'Emotions' were

also listed as a reason why it can be hard to euthanase young-at-foot. This reflects the attitudes described above that they 'don't like doing it' and 'it takes away the joeys chance at life' and suggests that affect (or sentiment) is likely to be an important factor in harvesters' decisions to euthanase or not. Some harvesters stated that it was easy to euthanase young-at-foot, therefore nothing makes it difficult.

The beliefs that were elicited most frequently were used to construct the TPB items for the main questionnaire.

Direct measures

Attitudes

Direct measures of attitude toward euthanasing young-at-foot were initially obtained using four items presented on seven-point evaluative semantic differential scales with the following bipolar adjectives as anchors: harmful-beneficial, good-bad, pleasant-unpleasant, worthless-useful. Both instrumental items (whether the behaviour achieves something, eg harmful/beneficial) and an experiential item (how it feels to perform the behaviour, ie pleasant/unpleasant) were included, as well as the good-bad scale which tends to capture overall evaluation (Fishbein & Ajzen 2010). Items with negatively worded endpoints on the right were recoded so that higher numbers reflected a positive attitude toward the behaviour. This four-item scale had a Cronbach's alpha of 0.63. To improve internal consistency the pleasant/unpleasant item was dropped, resulting in an alpha of 0.73. The mean of the remaining three item scores was then calculated to give an overall attitude score.

Perceived norm

Perceived norm was assessed using three items rated on seven-point Likert scales. Each item measured participants' perception of the expectations of others. Item wording and scale anchors were as follows: (a) "It is expected of me that I euthanase young-at-foot" (1 = disagree, 7 = agree); (b) "Most people who are important to me think that I (1 = should, 7 = should not) euthanase young-at-foot; and (c) "I feel under social pressure to euthanase young-at-foot" (1 = strongly disagree, 7 = strongly agree). Item (b) was reversed so that higher scores reflected greater social pressure to euthanase young-at-foot. The three-item scale had a Cronbach's alpha of 0.60. To improve internal consistency, item (c) was deleted, resulting in an alpha of 0.77. The mean of the remaining two item scores was then calculated to give an overall perceived norm score.

Perceived behavioural control

Perceived behavioural control was measured using four items rated on seven-point Likert scales. Each item measured participants' confidence that they were able to euthanase young-at-foot. Item wording and scale anchors were as follows: (a) "I am confident that I can euthanase young-at-foot" (1 = disagree, 7 = agree); (b) "For me, euthanasing young-at-foot is (1 = easy, 7 = difficult); (c) "How much control do you have over euthanasing young-at-foot?" (1 = no control, 7 = complete control); and (d) It is mostly up to me whether or not I euthanase young-at-

foot" (1 = disagree, 7 = agree). Item (b) was reversed yielding higher scores reflecting greater perceived control.

Items (a) and (b) were chosen to assess a person's self-efficacy with regard to euthanasing young-at-foot (ie how difficult it is to perform and how confident they are that they could do it). Items (c) and (d) were chosen to measure beliefs about the controllability of euthanasing young-at-foot (ie whether it is up to them or whether factors beyond their control determine if young are euthanased). The four-item scale had a Cronbach's alpha of 0.36. To improve internal consistency, item (a) was deleted, resulting in a marginal alpha of 0.43. With scales that have less than ten items it is common to find low Cronbach alpha values, therefore we also determined the mean inter-item correlation for these three items, which was 0.21. Briggs and Cheek (1986) recommend that an optimal range for the inter-item correlation is 0.2 to 0.4; therefore this was deemed to be acceptable. The mean of the three item scores was then calculated to give an overall perceived behavioural control score.

Intentions

Two seven-point bipolar scales were used to assess participants' generalised intention to euthanase young-at-foot after their mother has been shot. On the first item, respondents indicated whether they intended to euthanase young-at-foot (1 = unlikely, 7 = likely). The second scale asked them whether they always tried to euthanase young-at-foot (1 = disagree, 7 = agree). These two items showed good internal consistency ($\alpha = 0.84$) and variable scores were created by calculating the mean of the items.

A single item was also included to measure intention performance. This question asked "If you shot ten females each with young-at-foot, how many of these joeys would you expect to euthanase?" Participants selected a response from zero to ten.

Measure of past behaviour

One item was used to measure past behaviour (ie "In the past I have euthanased young-at-foot after I have shot their mother"). Participants selected a response from options on a scale ranging from 1 = false to 7 = true.

Behaviour

Behaviour was assessed by accompanying harvesters during a kangaroo harvesting operation. The harvesters were not told that we were specifically observing whether or not they euthanased young-at-foot but rather that we were observing a range of different aspects of harvesting. After shooting female kangaroos, we noted if they euthanased young-at-foot; if they attempted to euthanase a young-at-foot (when they suspected it belonged to a shot female); if they searched (or waited) for a young-at-foot (after observing a long teat in the shot female's pouch); and the proportion of young-at-foot that were euthanased, or attempted to be euthanased, in situations where this was possible (ie the young-at-foot were clearly seen and an accurate head-shot could have been taken).

Belief-based measures

Behavioural beliefs and outcome evaluations

Four items were used to assess the strength of the behavioural belief (eg “If I euthanase young-at-foot I am reducing the numbers of kangaroos available for future harvest”). Participants selected a response from options on a scale ranging from 1 = disagree to 7 = agree. Four items assessed the evaluation of the outcome (eg “Reducing the number of kangaroos available for future harvest is...”). Response options for these statements ranged from 1 = good to 7 = bad. Scores were reverse-coded and converted to bipolar scores (–3 to +3) prior to analysis.

Normative beliefs — Injunctive normative beliefs and motivation to comply

Four items were used to measure *injunctive* normative belief strength (eg “The general public thinks that I should/should not euthanase young-at-foot”). Participants selected a response from options on a scale ranging from 1 = should to 7 = should not. Scores were reverse-coded and converted to bipolar scores (–3 to +3). Four items assessed the motivation to comply with the individual or group (eg “When it comes to kangaroo harvesting I do/don’t want to do what the general public thinks I should do”). Response options ranged from 1 = I do to 7 = I don’t. Scores were reverse-coded prior to analysis.

Normative beliefs — Descriptive normative beliefs and identification with the referent

One item was used to measure *descriptive* normative belief strength (ie “Other kangaroo harvesters do/do not euthanase dependent young-at-foot”). Response options ranged from 1 = do to 7 = do not and this item was reverse-scored prior to analysis. One item measured identification with the referent (ie “Doing what other kangaroo harvesters do is important to me”) with response options ranging from 1 = very much to 7 = not at all. This item was also reverse-scored, with higher scores indicating that doing what other harvesters do is important.

Control beliefs and power of control factors

Three items were used to assess control belief strength relating to the salient factors of joeys getting away, shooting the joey before the female and other methods or equipment (eg “Dependent young-at-foot often get away before I can euthanase them”). Participants selected a response from options on a scale ranging from 1 = likely to 7 = unlikely. Scores were converted to bipolar scores (–3 to +3) and one statement was also reverse-coded. Three items assessed the power of control factors (eg “When young-at-foot get away it makes it difficult to euthanase them”) with response options ranging from 1 = disagree to 7 = agree. Scores were reverse-coded for two of the statements.

Other measures

Attitudes to animals

Attitudes towards the treatment of animals were examined using the Animal Attitudes Scale (Herzog *et al* 1991) consisting of 20 items (eg “It is morally wrong to hunt wild animals for sport”), rated on a five-point Likert scale ranging from 1 = strongly agree to 7 = strongly disagree. Scores on this scale can range from 20 to 100; higher scores indicate greater concern for animal welfare and lower scores indicating more negative attitudes towards animals. The scale achieved marginal internal consistency ($\alpha = 0.63$), with the reported alpha being 0.90 (Herzog undated).

General knowledge of kangaroo biology

General knowledge of kangaroo biology was assessed by responses to eight statements. Four statements were accurate descriptions of an aspect of kangaroo biology (eg “Female kangaroos can produce two different types of milk for their young — one type for pouch young and another for young-at-foot”) and four statements were inaccurate (eg “Joeys are fully weaned at the time of permanent emergence from the pouch”). Participants selected true, false or don’t know in response to each statement. Kangaroo knowledge scores were computed by counting the number of correct responses to the eight knowledge items.

Knowledge of the Code of Practice

Knowledge of the National Code of Practice for the Humane Shooting of Kangaroos and Wallabies for Commercial Purposes (Commonwealth of Australia 2008) was assessed by responses to eight multiple-choice questions. The questions or incomplete statements were based on information taken directly from the Code (eg “In the Code of Practice, what is the maximum range at which a kangaroo can be shot?”) and four multiple-choice responses were presented (eg “[a] 150 m, [b] 100 m, [c] No maximum range as long as a shot to the brain can be achieved, [d] 200 m”). Participants were asked to select the one response that best answers the question or completes the statement. Code of Practice knowledge scores were computed by counting the number of correct responses to the eight knowledge items.

Current practice with regards to shooting females

To gauge the importance of this issue, we also collected information from harvesters on their current practices with regard to shooting females. Harvesters were asked if they shoot female kangaroos (always, sometimes, rarely or never) and if so, do they shoot females with a visible in-pouch young (always, sometimes, rarely or never), a visible young-at-foot (always, sometimes, rarely or never) or no visible joeys (always, sometimes, rarely or never). We also asked the question “Of the females that you shoot that have a visible young-at-foot, please give an estimate of what percentage of these joeys you euthanase?”

Table 2 Inter-correlations and means (\pm SD) of selected demographic, theory of planned behaviour and additional variables.

	1	2	3	4	5	6	7	8	9	10	11	Mean (\pm SD)
1 Attitude	–	0.75**	–0.01	0.62**	0.38**	0.13	0.01	0.36**	0.33*	0.07	0.14	4.29 (\pm 1.54)
2 Perceived norm		–	–0.07	0.63**	0.45**	0.19	–0.00	0.21	0.25	0.01	0.25*	5.23 (\pm 1.80)
3 Perceived behavioural control			–	–0.10	–0.06	0.07	–0.06	–0.16	0.04	0.30*	0.11	5.42 (\pm 1.26)
4 Intention				–	0.58**	–0.01	–0.14	0.39**	0.23	–0.08	0.14	5.15 (\pm 1.93)
5 Past behaviour					–	–0.00	0.03	0.18	–0.01	–0.15	–0.02	6.16 (\pm 1.58)
6 Animal attitude score						–	0.02	–0.73	0.22	0.29*	0.13	54.81 (\pm 7.00)
7 Kangaroo biology score							–	–0.04	–0.27*	0.22	–0.07	3.05 (\pm 1.13)
8 Code knowledge score								–	0.13	–0.02	–0.05	4.91 (\pm 1.00)
9 Age of harvester									–	0.19	0.75**	40.09 (\pm 11.35)
10 Nights per week harvesting										–	0.07	2.99 (\pm 1.57)
11 Years harvesting											–	12.88 (\pm 10.46)

* $P < 0.05$; ** $P < 0.01$; $n = 61$.

Results

Missing data

Four harvesters (6%) stated that they never shoot female kangaroos and so these cases were deleted prior to analysis. The percentage of cases with missing data on the main variables examined in this study ranged from 1% (for age, years spent harvesting, perceived norm and kangaroo biology knowledge) to 11% (for Code knowledge). Little's MCAR test was not significant ($\chi^2 [95] = 95.23$; $P = 0.47$) indicating that there was no systemic pattern of omission across variables. All missing data were imputed using the expectation maximisation option in the Missing Values Analysis module in SPSS v 21.

Correlations and descriptive statistics

The means, standard deviations and correlations between the TPB and additional variables are presented in Table 2. Overall, participants reported positive attitudes and intentions to euthanase young-at-foot. The zero-order correlations revealed large positive correlations between the TPB components of attitude, perceived norm and intention ($r = 0.62$ – 0.75 ; $P < 0.01$), however, perceived behavioural control did not show any correlation with the other TPB variables.

There were moderate positive correlations between past behaviour and intention ($r = 0.58$; $P < 0.01$); past behaviour and perceived norm ($r = 0.45$; $P < 0.01$); and past behaviour and attitude ($r = 0.38$; $P < 0.01$). This suggests that harvesters that have euthanased young-at-foot in the past intend to do it in the future, have a positive attitude towards doing so and perceive an expectation from others that it should be done.

There were also moderate positive correlations between attitude and Code knowledge ($r = 0.36$; $P < 0.01$); attitude and age of harvester ($r = 0.33$; $P < 0.05$); and perceived behavioural control and nights per week harvesting ($r = 0.30$;

$P < 0.05$). Code knowledge was also correlated with intention ($r = 0.39$; $P < 0.01$). These results suggest that older harvesters and those that have a better knowledge of the Code also have a more favourable attitude towards euthanasing young-at-foot. Full-time harvesters or those that derive most of their income from harvesting feel that they have more control over euthanasing young-at-foot compared with those that work on a part-time basis. Also, those that have more knowledge of the Code have higher intentions to euthanase young-at-foot compared to those with less knowledge.

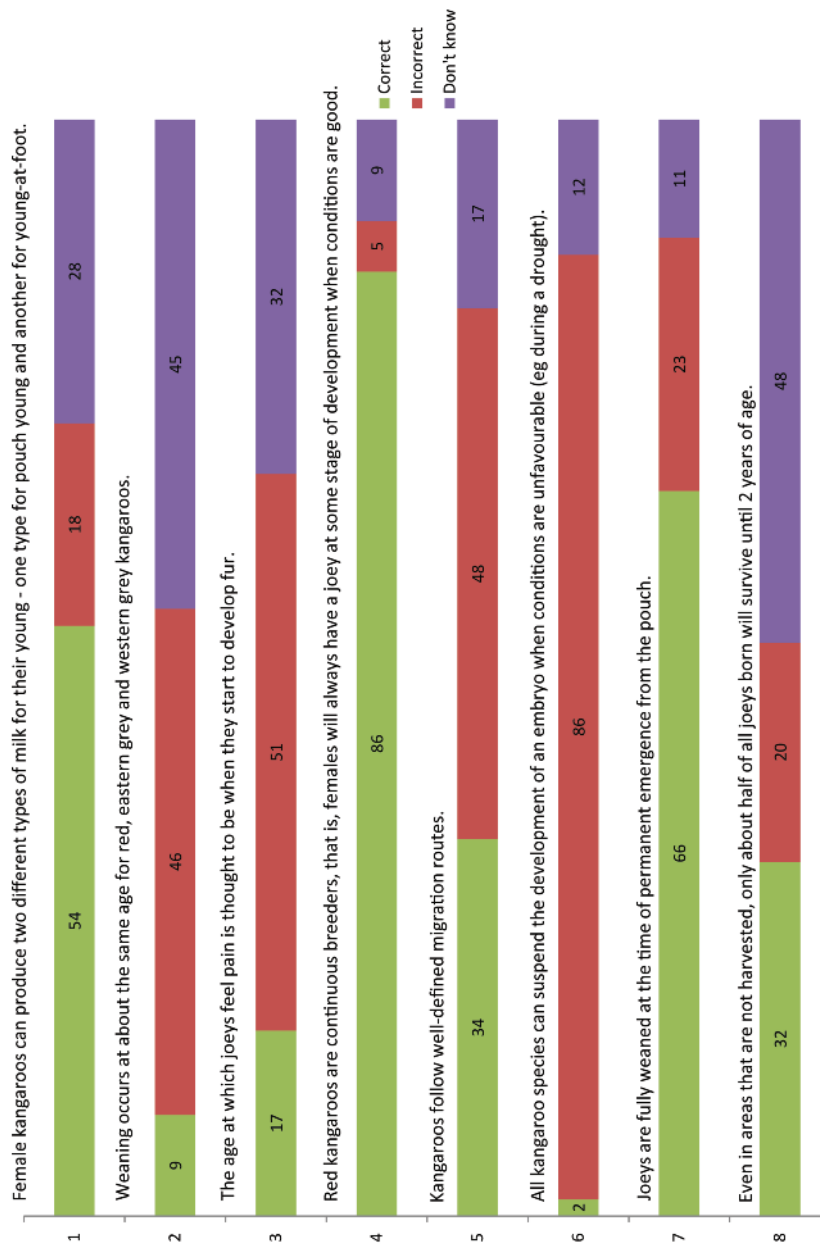
Scores for the Animal Attitudes Scale were positively correlated with nights per week harvesting ($r = 0.29$; $P < 0.05$), thus, full-time harvesters or those that derive most of their income from harvesting have more positive attitudes towards animal welfare.

There was a small negative correlation between scores on kangaroo biology knowledge and age of harvester ($r = -0.27$; $P < 0.05$) thus, harvesters that scored higher on knowledge were younger. Also, as would be expected, there was a large positive correlation between age of harvester and years spent harvesting ($r = 0.75$; $P < 0.01$).

Behaviour

Unfortunately, only 14 harvesters were willing to allow a researcher to go with them to observe harvesting practices. Therefore, we did not have an adequate sample size to reach the chosen level of power and so statistical analysis to predict behaviour using the TPB was not performed (the dependent variable for the TPB analysis was therefore intention to euthanase young-at-foot). Only one harvester euthanased a young-at-foot. Another harvester attempted to euthanase a young-at-foot but was unsuccessful, whilst another considered shooting a young-at-foot but believed it to be large enough to survive on its own. With the other eleven harvesters, no time was spent attempting to euthanase young-at-foot or searching for young-at-foot when females were shot.

Figure 2



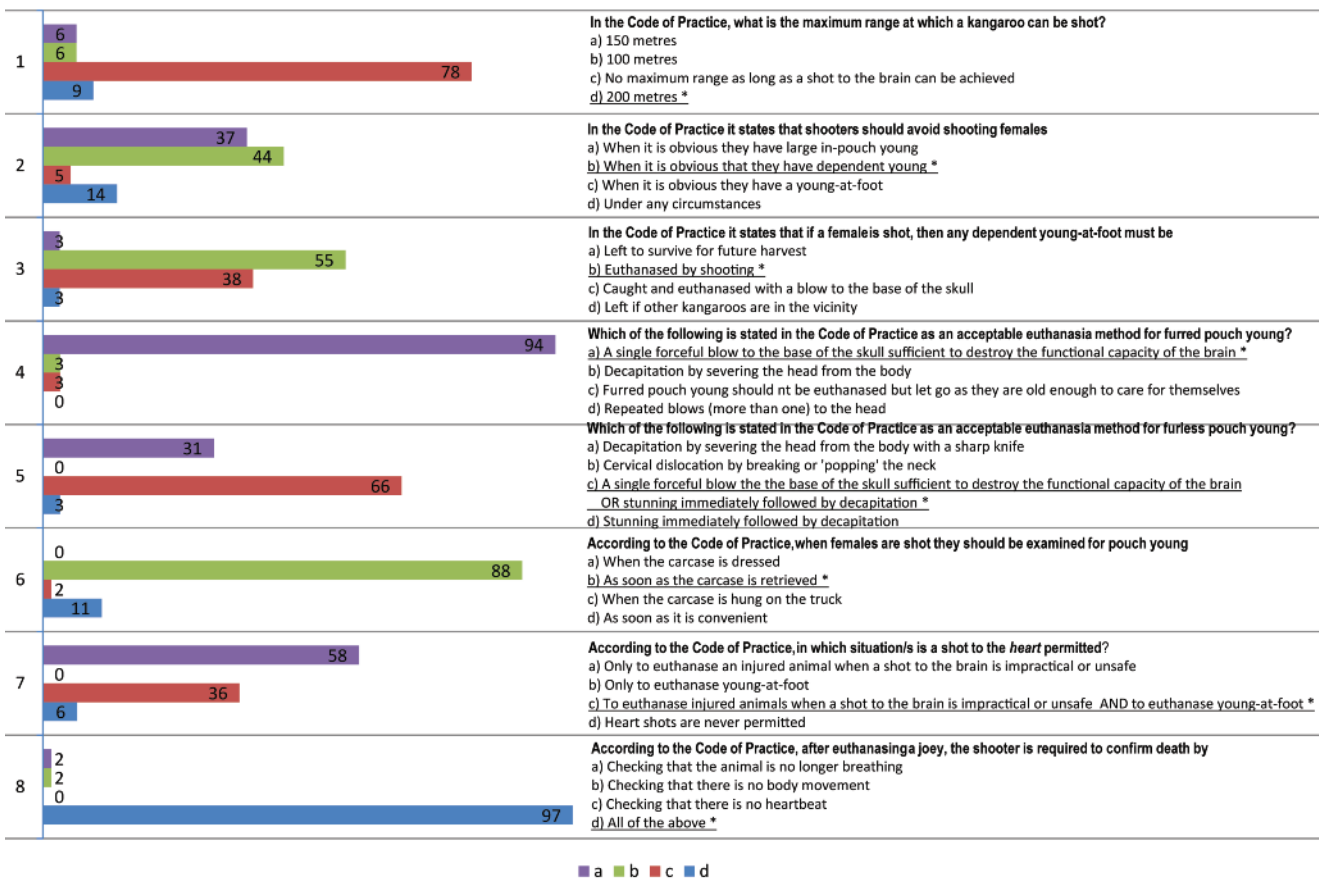
Summary of results from general knowledge of kangaroo biology questions (correct answers: 1 = true, 2 = false, 3 = true, 4 = true, 5 = false, 6 = false, 7 = false, 8 = true).

During these observations, a total of 24 young-at-foot were seen. One was euthanased by a shot to the head, in accordance with the Code. This joey was shot before its mother was shot (and she was successfully shot after). Another young-at-foot was shot at twice but both shots missed and the animal escaped. In all the other instances when young-at-foot were seen, there was no attempt to shoot them. Fourteen of the observed young-at-foot responded to the shooting of the female with an alarmed flight response whilst eight remained stationary and appeared calm. Although it may have been possible to shoot the eight stationary young-at-foot it was not done. Also, when the alarmed young-at-foot took flight, none of the harvesters pursued or searched for them or waited to see if they would

return to the location where their mother was shot. If a young-at-foot was not seen, but the shot female had a long teat — indicating she was likely to be suckling a young-at-foot — none of the harvesters spent any time searching for a young-at-foot, nor did they wait to see if a young-at-foot returned to the location where the female was shot.

Interestingly, in answer to the question “If you shot ten females each with young-at-foot, how many of these joeys would you expect to euthanase?”, the mean (\pm SD) response was 6.23 (\pm 3.50) and the range was from zero to ten, thus harvesters have quite varied opinions on whether they can or cannot euthanase young-at-foot, despite reporting high intentions to do so (mean [\pm SD] intention score 5.15 [\pm 1.93], 1 = unlikely, 7 = likely).

Figure 3



Summary of results from knowledge of the Code of Practice questions (correct answers are underlined and marked with an asterisk).

Attitudes to animals

The mean (± SD) score for harvesters on the Animal Attitudes Scale was 54.8 (± 7.0); (n = 61) (Table 2). To determine if this was different to the mean score obtained from people in the general community as reported in Signal and Taylor (2006b), we used Welch’s modified two-sample *t*-test from the R package BSDA (Arnholt & Arnholt 2012). This score was significantly lower than the mean (± SD) score obtained from a sample of Australian males in the general community (63.8 [± 8.7]; n = 186, *t* = -8.18; *P* < 0.001) but not different from the mean (± SD) score of a sub-sample of males working in the primary industry sector (57.7 [± 10.2]; n = 29, *t* = -1.38; *P* = 0.174) (Signal & Taylor 2006a,b).

For further comparison, the mean (± SD) score on the Animal Attitude Scale for a sample drawn from the animal protection community was much higher, as would be expected (84.7 [± 10.5]; n = 396) (Signal & Taylor 2006b) and in a study to examine the attitude and behaviour of dog owners, the mean (± SD) score was also higher (70.2 [± 12.1]; n = 122) (Sharp 2007). It should be noted that the majority of participants in these other studies were female, whereas in the current research the majority were male. Females show consistently higher scores on this scale compared with males (Herzog 2007). For example, with the Australian community sample, the mean (± SD) score for females was 69.5 (± 9.1); (n = 364) and for males 63.8 (± 8.7); (n = 186) (Signal & Taylor 2006b).

General knowledge of kangaroo biology

The results are summarised in Figure 2. The harvesters answered, on average, just over one-third of the true/false questions correctly (38%). Thirty-seven percent of the questions were answered incorrectly and the remaining 25% were scored as ‘Don’t know’. Three questions out of eight were answered correctly by more than half the participants. The results indicate that there is scope for improving harvesters’ general knowledge of the biology of kangaroos.

Knowledge of the Code of Practice

The results are summarised in Figure 3. The harvesters answered, on average, just under two-thirds of the multiple-choice questions correctly (61%). Five out of eight questions were answered correctly by more than half the participants. The results indicate that there is also scope for improving harvesters’ knowledge of some aspects of the Code of Practice.

Analysis predicting intention to euthanase young-at-foot

A three-step hierarchical regression analysis was conducted to determine the extent to which the theory of planned behaviour components can predict harvesters’ intention to euthanase young-at-foot, and also if past behaviour and the additional variables of harvester age, nights per week operating as a harvester, years spent harvesting, attitudes toward animals, knowledge of general kangaroo biology and knowledge of the Code of Practice would also contribute to

Table 3 Summary of hierarchical regression analyses for the prediction of intentions to euthanase young-at-foot.

	B	95% CI for B		β	sr^2	R	R²	Adjusted R²	R² change
		LB	UB						
<i>Step 1 TPB variables</i>						0.67**	0.45	0.42	
Attitude	0.43*	0.05	0.80	0.34	0.05				
Perceived norm	0.40*	0.07	0.72	0.37	0.06				
Perceived behavioural control	-0.11	-0.41	0.20	-0.07	0.00				
<i>Step 2 Addition of past behaviour</i>						0.74**	0.55	0.52	0.10
Attitude	0.38*	0.03	0.72	0.30	0.04				
Perceived norm	0.26	-0.05	0.56	0.24	0.02				
Perceived behavioural control	-0.09	-0.37	0.19	-0.06	0.00				
Past behaviour	0.44**	0.192	0.683	0.36	0.10				
<i>Step 3 Addition of other variables</i>						0.78**	0.61	0.54	0.06
Attitude	0.27	-0.13	0.67	0.22	0.01				
Perceived norm	0.29	-0.04	0.62	0.27	0.02				
Perceived behavioural control	-0.07	-0.37	0.24	-0.04	0.00				
Past behaviour	0.44**	0.19	0.69	0.36	0.10				
Age of harvester	0.00	-0.06	0.06	0.03	0.00				
Nights per week	0.02	-0.24	0.28	0.02	0.00				
Years harvesting	0.00	-0.05	0.07	0.04	0.00				
Animal attitude score	-0.02	-0.08	0.03	-0.08	0.00				
Kangaroo knowledge score	-0.25	-0.60	0.11	-0.14	0.02				
Code knowledge score	0.33	-0.06	0.71	0.17	0.02				

* $P < 0.05$; ** $P < 0.01$; $n = 61$.

prediction. All of the assumptions of hierarchical regression were met (Tabachnick & Fidell 2007). The residuals for the analysis exhibited a very slight negative skew and mild heteroscedasticity and non-linearity but these were not deemed sufficient to greatly influence the analysis. There was also no evidence of multicollinearity (tolerance values for all predictors were above 0.70) or sequential dependence (Durbin-Watson statistic = 1.90). There were a few univariate outliers however these were retained given that there was no reason to suspect that they were not valid members of the population under investigation. One multivariate outlier was detected using the Mahalanobis criterion however exclusion of this case produced the same substantive results as the original analysis.

Variables were entered into the analysis in the following order: (Step 1) attitude, perceived norm and perceived behavioural control (according to the theory of planned behaviour these three predictors should account for a large proportion of the variation in intention); (Step 2) past behaviour (including past behaviour as an additional predictor has been shown to consis-

tently account for an additional 10% of the variance in intentions) (Fishbein & Ajzen 2010); and (Step 3) harvester age, nights per week, years spent harvesting, animal attitude score, kangaroo knowledge score and code knowledge score (these were included at this step to determine if they contributed to prediction of intention over and above the TPB variables). A summary of the regression analysis is presented in Table 3.

The TPB variables (attitude, perceived norm and perceived behavioural control) accounted for 45% of the variance ($R^2 = 0.45$, $F_{3,60} = 15.53$; $P < 0.01$), with attitude ($\beta = 0.34$; $P < 0.05$) and perceived norm ($\beta = 0.37$; $P < 0.05$) emerging as significant predictors. This indicates that the more positive the attitude and the stronger the social pressure, the greater the intention to euthanase young-at-foot. Perceived behavioural control had no independent influence on intentions to euthanase young-at-foot.

The addition of past behaviour (at step 2) resulted in a 10% increase in explained variance (R^2 change = 0.10, $F_{4,60} = 17.25$; $P < 0.001$) with past behaviour ($\beta = 0.36$; $P < 0.05$); and

Table 4 Mean behavioural belief strength and outcome evaluation, and correlations of belief × evaluation product with intention to euthanase young-at-foot.

Behavioural belief	Belief strength (b)	Outcome evaluation (e)	b × e	Correlation $b_i e_i$ with attitude	Correlation $b_i e_i$ with intention
<i>If I euthanase young-at-foot...</i>					
I am reducing the numbers of kangaroos available for future harvest	4.34	-1.56	-6.84	0.34**	0.13
I am wasting my time and ammunition	2.70	-1.85	-6.00	0.33*	0.11
I am reducing joey suffering (eg from predation, starvation, etc)	6.28	2.87	18.07	0.46**	0.33*
I am taking away their 'chance at life' especially if they appear to be old enough to survive by themselves	4.93	-1.56	-10.02	0.38**	0.24

Behavioural belief strength scored from 1 to 7; outcome evaluation scored from -3 to +3; $b_i e_i$ = behavioural belief × outcome evaluation.
* $P < 0.05$; ** $P < 0.01$.

Table 5 Mean normative belief strength and motivation to comply, and correlations of belief × motivation product with intention to euthanase young-at-foot.

Normative referent	Belief strength (n)	Motivation to comply (m)	n × m	Correlation $n_i m_i$ with perceived norm [#]	Correlation $n_i m_i$ with intention [#]
<i>Injunctive norms[†]</i>					
Government kangaroo management agencies (eg NSW Office of Environment & Heritage)	1.95	5.89	11.74	0.63**	0.58**
Farmers and graziers	2.36	4.29	9.39	0.09	0.15
Animal protection groups (ie animal welfare organisations, animal rights groups, animal liberation)	-0.43	3.49	0.18	0.16	0.15
The general public	0.36	4.05	1.84	0.25	0.18
<i>Descriptive norm</i>					
Other kangaroo harvesters	0.87 [‡]	2.85 [§]	2.74	0.29*	0.23

[†] Injunctive belief strength scored from -3 to +3 (-3 = believe they should not euthanase young-at foot, +3 = believe that they should euthanase young-at foot; motivation to comply scored from 1 to 7).

[‡] Descriptive norm belief strength scored from -3 to +3 (-3 = other kangaroo harvesters do not euthanase young-at foot, +3 = other kangaroo harvesters do euthanase young-at foot).

[§] Identification with referent scored from 1 to 7 (1 = doing what other harvesters do is not important, 7 doing what other harvesters do is important).

[#] The measures of injunctive norms and descriptive norm were combined to form an overall combined normative belief index.

$n_i m_i$ = normative belief × motivation to comply.

* $P < 0.05$; ** $P < 0.01$.

attitude ($\beta = 0.30$; $P < 0.05$) now the only significant predictors. The regression coefficient for perceived norm dropped to a non-significant level at this step ($\beta = 0.24$; $P = 0.09$).

There was no evidence that the additional variables of harvester age, nights spent harvesting per week, years spent harvesting, animal attitude score, kangaroo knowledge score and Code of Practice knowledge score (entered on step 3) contributed to explaining variance in the data. The final model accounted for 61% of the variance in intention ($R^2 = 0.61$, $F_{10,60} = 7.89$; $P < 0.001$), with past behaviour remaining as the only significant individual predictor ($\beta = 0.36$; $P < 0.05$).

Effects of beliefs on intention

To gain a more complete understanding of the determinants of intentions to euthanase young-at-foot, the behavioural, normative and control beliefs were then examined. Firstly, according to the TPB, (and the expectancy value model on which the TPB is based), beliefs provide the basis for formation of attitudes, perceived norms, and perceived behavioural control. We would therefore expect to find significant correlations between the composite measure of beliefs and the direct measures. The results for attitude and perceived norm confirmed these expectations with the correlations being 0.56 for attitude and 0.48 for

Table 6 Mean control belief strength and power of control factors, and correlations of belief × control product with intention to euthanase young-at-foot.

Control factors	Belief strength (c)	Control power (p)	$c \times p$	Correlation $c_i p_i$ with perceived behavioural control	Correlation $c_i p_i$ with intention
Better methods/equipment	2.75	-1.03	0.74	-0.13	0.28*
Young-at-foot getting away	3.10	-1.34	-5.08	0.36**	-0.15
Shooting the joey before the female	2.07	-1.90	-2.30	-0.16	-0.13

Control belief strength scored from 1 to 7; (1 = less likely that this control factor will be present, 7 = more likely that this control factor will be present. Control power scored from -3 (likely to impede euthanasia of young-at-foot) to +3 (likely to facilitate euthanasia of young-at-foot). $c_i p_i$ = control belief × control power.

* $P < 0.05$; ** $P < 0.01$.

perceived norm (both $P < 0.01$). However, there was no correlation between the composite measure of control beliefs and the direct measure for perceived behavioural control ($r = 0.08$; ns). This could indicate that the belief measures of perceived behavioural control did not adequately cover the breadth of the measured construct, that is, there could be other factors that influence control that were not included, such as emotions.

We also examined the correlations of the belief strength by outcome evaluation products with intention to determine which specific beliefs have the most influence on intentions to euthanase young-at-foot. The following is a brief summary of the results.

Behavioural beliefs

Table 4 shows the mean behavioural belief strength (likelihood ratings) and outcome evaluations associated with the perceived outcomes of euthanasing young-at-foot. In addition, four belief evaluation products were calculated for each respondent and the product terms were correlated with intentions. The most important expected outcome from euthanasing young-at-foot was 'reducing joey suffering'. 'Taking away the joeys' chance at life', 'reducing the number of kangaroos for future harvest' and, to a lesser extent, 'wasting time and ammunition' were not as important and were viewed as negative outcomes. The only positive consequence of euthanasing young-at-foot, that is, reducing joey suffering, was the belief that had the greatest influence on intention.

Normative beliefs

Table 5 shows the mean normative belief strength and motivation to comply with regard to the five normative referents identified in the pilot study. Social pressure to euthanase young-at-foot was most strongly perceived to come from government kangaroo management agencies and farmers/graziers, and somewhat less so from the general public and other kangaroo harvesters. Harvesters believe that animal protection groups disapprove of them euthanasing young-at-foot. There is not a strong belief that other harvesters are euthanasing young-at-foot and, interestingly, motivation to comply was lowest for other kangaroo harvesters compared with other referents. The referent that has the most influence on intention to euthanase young-at-foot is government kangaroo management agencies.

Control beliefs

Table 6 shows the mean control belief strength and power of the three control factors identified in the pilot study. 'Young-at-foot getting away' was the factor most likely to impede the euthanasia of young-at-foot. Better methods/equipment was the factor most likely to have a positive influence on intention to euthanase young-at-foot, whereas young-at-foot getting away and shooting the joey before the female had no influence on intention to euthanase young-at-foot.

Discussion

In this study, we sought to identify important factors that underlie kangaroo harvesters' decisions to euthanase young-at-foot when the mother has been shot. Our results indicate that only the attitude and perceived norm components of the TPB are important in predicting harvesters' intentions (Hypothesis 1). This finding suggests that kangaroo harvesters with a more favourable attitude towards euthanasing young-at-foot and who feel more social pressure to do so, are more likely to intend to euthanase young-at-foot. Perceived control over the euthanasia of young-at-foot did not account for any of the variance in intentions. According to Fishbein and Ajzen (2010), as volitional control over a behaviour increases, the importance of perceived behavioural control to predict intention and behaviour decreases. Thus, it is possible that harvesters believe that decisions to euthanase young-at-foot are largely under their control and that external factors do not prevent them from intending to euthanase young-at-foot. Past behaviour also emerged as a significant predictor of harvesters' intentions (Hypothesis 2) suggesting that harvesters that already euthanase young-at-foot intend to continue to do so.

Another aim of the study was to determine if specific additional variables could further predict or explain harvesters' intentions to euthanase young-at-foot (Hypothesis 3). Although additional variables are sometimes included within the TPB model in an attempt to improve predictability, in the current study none of the additional variables tested (ie age of harvester, nights per week harvesting, animal attitude score, kangaroo biology knowledge, code knowledge) independently predicted harvester intentions over and above the influence of the TPB variables (attitude and subjective norm) and past behaviour. This is in line with Ajzen and Fishbein's (1980)

argument that the TPB is a complete model of social behaviour and that most background factors influence intentions and behaviour indirectly by guiding a person's beliefs and attitudes.

As well as examining the influence of general measures of attitude, perceived norm and perceived behavioural control on intention, to better understand the factors underlying these measures we also explored the most important salient behavioural, normative and control beliefs. It is at this level that we learn about the most important considerations that guide people's decisions to perform or not perform a behaviour, specifically the likely consequences, the demands placed on them by others and potential barriers to the action (Fishbein & Ajzen 2010). The participating harvesters believe that: euthanasing young-at-foot reduces joey suffering; government kangaroo management agencies and farmers/graziers approve of them doing it (but animal protection groups do not); and the greatest limiting factor preventing them from euthanasing young at-foot is that they escape.

Despite harvesters having a positive attitude towards euthanasing young-at-foot and believing that they have volitional control over performing it, based on our limited observational data from 14 harvesters, there appears to be a discrepancy between the intention to euthanase young-at-foot and actually carrying out this behaviour. Harvesters report a strong intention to euthanase joeys, but this happens only rarely. There could be two potential reasons for this inconsistency. Firstly, their intentions may actually change (ie they can euthanase young-at-foot, but for some reason they do not) and, secondly, they may be unrealistic in their judgement of how difficult it can be (ie they intend to euthanase young-at-foot, but are prevented from doing so by factors beyond their control). We propose that there is evidence for both of these scenarios, that is, harvesters' intentions changing as well as over-confidence in estimating the control they have over euthanasing young-at-foot.

The term, *literal inconsistency* refers to when people express willingness to perform a certain behaviour but fail to do so (Fishbein & Ajzen 2010). For some behaviours it can be difficult for people in a hypothetical context to imagine what they would believe or how they would feel and react in the real situation. This may be what we are observing here. As a condition of their licence, harvesters must follow the Code, which stipulates that young-at-foot must be euthanased after their mother has been shot. It is not surprising then that harvesters have reported on the questionnaire a high level of perceived control over this behaviour and strong intentions to perform it. According to Fishbein and Ajzen (2010), overestimation of intention to act is more likely to occur with behaviours that are socially desirable. Although the harvesters think that animal protection groups and the general public may not approve, harvesters perceive a strong social (and legal) pressure from farmers and graziers and kangaroo management agencies to euthanase young-at-foot — and they may want to do the right thing — however, in reality, it is probable that it is difficult to perform and their actual control is quite low. Thus, on paper, the harvesters may express an intention to engage in

this behaviour, but when faced with actual performance of the behaviour in a real situation, their perceptions or beliefs may change, producing a different intention.

An important belief that could change in the real situation relates to the suffering of joeys. Harvesters believe that a positive consequence of euthanasing young-at-foot is reducing animal suffering but they also strongly believe that a negative consequence of this behaviour is that they take away the young-at-foot's 'chance at life', especially when they appear to be old enough to survive by themselves. It is possible that harvesters' judge that many young-at-foot are old enough to fend for themselves and will not suffer if they are let go, therefore they do not attempt to euthanase them.

Another factor which could influence harvesters' intentions to euthanase young-at-foot is emotion. Fishbein and Ajzen (2010) have suggested that sometimes when filling out a questionnaire (ie in a hypothetical situation) people do not anticipate the strong emotions that may influence whether or not they perform a behaviour in a real situation. It is possible that harvesters could experience strong emotions when faced with killing a young-at-foot, and these are powerful enough to stop them from doing it. Mellor *et al* (2010) have suggested that vulnerable, young animals can have a significant emotional impact on humans, creating an innate drive to protect them. We may have observed evidence of this internal 'head versus heart' conflict with one harvester who set free a joey because he judged it to be old enough to fend for itself, but later that night euthanased another joey of a similar size.

Changing intentions could explain why young-at-foot that remained stationary and calm — potentially enabling the harvesters to deliver a clean shot — were not euthanased. On the other hand there is also evidence that harvesters believe they have more control over euthanasing young-at-foot than they actually do. Fourteen of the 24 (58%) young-at-foot that we observed quickly fled after their mother was killed, making it impossible for harvesters to take a clean shot. Thus, it is possible that with this particular behaviour, intentions may not be a good predictor of actual behaviour. Harvesters sometimes cannot euthanase young-at-foot but at other times they can, but do not. To investigate this further we would need to make observations of the behaviour of more individual harvesters — it was unfortunate that we did not have the co-operation of sufficient participants with the current research to do this.

Animal welfare implications

The impact that animal carers or stockpeople have on the welfare of their livestock has been well-established (Hemsworth & Coleman 1998) and it has been proposed that human characteristics such as attitudes, empathy, work motivation and technical knowledge and skills, should be the main focus when measuring good stockmanship in on-farm welfare monitoring schemes (Hemsworth *et al* 2009). The research reported in this paper adapts this approach to the harvesting of kangaroos and allows a better understanding of an important animal welfare issue. We have identified incon-

sistencies in beliefs, attitudes and behaviours as well as deficits in the knowledge and technical skills of harvesters and we provide advice on specific areas that need to be improved are provided. The information can be used in the development of training and educational material for harvesters and, in turn, contributes to the application of more humane kangaroo management practices in Australia.

Conclusion

We recommend that a strategy is required to educate harvesters regarding the welfare impact of orphaning on dependent young-at-foot. Our research (McLeod & Sharp 2014) has demonstrated that the welfare impact on young-at-foot can be severe when they lose their mother. Thus, whenever possible, dependent young-at-foot should be euthanased after their mother has been shot, so that suffering is minimised. Most harvesters report a strong desire to reduce the suffering of young-at-foot but also state that they do not like killing them, which can create a strong internal conflict. Therefore, harvesters need to be encouraged to euthanase young-at-foot and be informed about the negative consequences for animals when they are left to fend for themselves. Pressure from external sources is also likely to contribute somewhat to harvesters' conflict. From this study we have learned that harvesters receive inconsistent messages about what they should do when faced with the situation of an orphaned young-at-foot. State kangaroo management agencies as well as farmer and graziers want them to euthanase joeys, but they perceive strong pressure from animal protection groups (and to a lesser extent the general public) not to euthanase them. To reduce the suffering of dependent young, a consistent message to euthanase them must come from all outside influences, but should be especially strong from the management agencies since harvesters are motivated to comply with them the most.

Harvesters should also be strongly encouraged to read, understand and comply with the Code of Practice. Although our data on this aspect are correlational and we cannot make causal inferences, we found that harvesters who had more knowledge of the Code also had more positive attitudes towards euthanasing young-at-foot and greater intention to euthanase young-at-foot. Again, for this to be most effective, the encouragement (possibly in the form of training, education and compliance messages) should come from the kangaroo management agencies. The Code should be reviewed to provide more specific instructions on what actions harvesters should take in specific circumstances when they encounter young-at-foot. This would include an outline of the welfare consequences of leaving or releasing dependent young. In addition, within a revised Code, it should be acknowledged that the euthanasia of orphaned young-at-foot can be logistically difficult. Over half of the animals we observed fled after their mother was shot and so could not be euthanased by the harvester. The current Code stipulates that if young-at-foot are present they must be euthanased, however our observations would suggest that this is not always achievable.

From our correlational data, we also observed that harvesters that receive most of their income from harvesting have more positive attitudes towards animal welfare and towards euthanasing young-at-foot, and they also intend to euthanase young-at-foot more than part-time harvesters. To create a more humane kangaroo industry, and to encourage professionalism and motivation to improve the welfare of harvested animals, the kangaroo industry should be promoting harvesters to work on a full-time basis rather than part-time. Older harvesters also had a more positive attitude toward euthanasing young-at-foot compared with younger harvesters. A mentoring programme, whereby skilled and experienced older harvesters train younger inexperienced harvesters, may also contribute to a workforce that is more driven to improve animal welfare.

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