

## Is quality of life a useful concept for companion animals?

KD Taylor and DS Mills\*

Animal Behaviour, Cognition and Welfare Group, Department of Biological Sciences, University of Lincoln, Riseholme Park, Lincoln LN2 2LG, UK

\* Correspondence: dmills@lincoln.ac.uk

### Abstract

Although the term 'quality of life' (QoL) is not unfamiliar to veterinary surgeons, only recently has the scientific community attempted to measure it in farm and companion animals. Typically such studies have applied methodologies from the field of human health-related quality of life (HRQoL), without due consideration of the applicability of both the term and its measurement to animals. However, it is necessary to clarify the philosophical basis of QoL if it is to be defended as a rigorous and reliable aid to decision-making in animal welfare science. In this paper we review common concepts in human HRQoL and discuss the value of, and difficulties regarding, the transfer of the concept of human HRQoL to companion animals. Human definitions tend to focus on individuals and their assessment of the state of their life in terms of physical, social and psychological functioning. The use of the term 'quality of life' for animals may therefore expand on what is usually considered when using the term 'welfare', and thereby improve on current practice, which tends to focus on relatively few outcome measures that are largely indicative of poor welfare. However, failure in the human literature to properly define QoL and defend the choice of measures accordingly, together with the common use of objective indicators and proxies, has led to confusion over the relative roles of objective and subjective measures in the determination and constitution of QoL. A suggestion for an appropriate definition of animal QoL that clarifies these relationships is offered, together with a list of social/environmental and physical/psychological health-related domains that may be suitable for a generic companion animal QoL assessment tool. In the absence of knowledge on both basic needs and individual preferences, particularly for institutionalised animals, QoL tools may be more appropriately designed as outcome-based tools, focussing on observable signs of health and behaviour. The extent to which recent QoL assessment tools for companion animals have covered these domains, and the extent to which the psychometric properties of the tools have been addressed, is also briefly discussed.

**Keywords:** animal welfare, assessment, behaviour, companion animal, human health-related quality of life, quality of life

### Introduction

The term 'quality of life' (QoL) has made a fairly recent appearance in the animal scientific literature. As a concept, QoL is not, however, new. Veterinary surgeons in particular have used it to help guide decisions about the treatment or euthanasia of their patients (Edney 1998; McMillan 2000; Wojciechowska & Hewson 2005). This is particularly the case in companion animal practice, where the patient is not being kept for financial gain but by an owner who usually wants to do what is best for their animal. Typically, QoL judgements are made on a compassionate subjective basis, with little qualification (McMillan 2000), although the presence of pain is often a major consideration in the decision-making process (Christiansen *et al* 2004). More recently, the issue of novel or aggressive treatments has raised concern over how QoL in pet animals is assessed, because such treatments may extend a patient's life but at a cost to their QoL (Anon 2003; Wojciechowska & Hewson 2005). Although several treatment strategies now include assessment of QoL (McMillan 2000, 2005; Christiansen *et al* 2004; Wojciechowska & Hewson 2005), a recent

review of these found that almost none defined what was meant by QoL or attempted to measure it with more than a cursory question towards the pet owner (McMillan 2000). If the use of QoL assessment is to be defended as a rigorous and reliable aid to decision-making, then it is necessary for the philosophical basis of QoL to be clear and well understood, so that it is not misapplied nor results misrepresented or misunderstood (Gill & Feinstein 1994; Appleby & Sandøe 2002; Wojciechowska & Hewson 2005).

Although QoL may be intuitively understood by veterinary surgeons and their clients (McMillan 2005), there is currently no accepted definition or methodology for its assessment in companion animals (Anon 2003; Wojciechowska & Hewson 2005). Without this, any attempt to measure it scientifically is likely to be unreliable, as different investigators may have different understandings and so measure different constructs. This is a problem which has often befallen the concepts of 'stress' and 'welfare' in animals (Fraser 2003) and can lead to unnecessary confusion and debate. Current attempts to define QoL for animals (McMillan 2000, 2005; Wojciechowska &

Hewson 2005) and to measure it have drawn from analogy with human medicine, especially health-related quality of life (hereafter HRQoL). Disease-related QoL tools for companion animals include those developed by Hartmann and Kuffer (1998) for cats in relation to feline immunodeficiency virus, by Freeman *et al* (2003) for dogs in relation to cardiac disease, and by Wiseman-Orr *et al* (2004) for dogs in relation to chronic pain (specifically, chronic degenerative joint disease). However, generic HRQoL tools, which assess QoL in a more general sense and can therefore be used across a range of situations (Eiser & Morse 2001a), are common in the human field; these include the Short Form 36 (Ware & Sherbourne 1992), the Sickness Impact Profile (Iorio *et al* 1997, proxy version), and the Nottingham Health Profile — Part 1 (Hunt 1984). Only recently have there been attempts to develop generic tools to assess the QoL of pets, and these apply only to dogs (Schneider 2005; Wojciechowska *et al* 2005a). These tools may be of use to people working outside the health professions, such as those working with animals in rescue, welfare or assistance organisations. Indeed, confinement might have a similar impact on QoL as does disease (eg reduced mobility and reduced opportunities for social contact and play), making HRQoL tools equally relevant for the assessment of animals held within institutions.

It is also worth noting that within human medicine, QoL assessment implies not only a defined concept, but also an established methodology. Therefore, it is sensible to ensure that both terminology and methodology are addressed in any attempt to build consensus for the transfer of QoL assessment in animals. The aim of this review is not only to discuss the value of the concept of QoL in the context of animal welfare science, but also to defend our proposed definition of ‘quality of life’ and explain how it might be assessed. We focus on companion animals, as companion animal veterinary science is an area where the term has its most familiar context. The welfare of these species has been relatively less well explored compared to farm animals, whilst simultaneously being a growing area of concern. There may therefore be a greater possibility to build a consensus within this relatively ‘virgin’ welfare territory, although the arguments could be equally applied to species in other contexts.

### **The concept of quality of life in veterinary and human medical literature**

Two basic definitions of QoL appear to have been offered in the veterinary literature to date: one that largely subscribes to objective list theory (positivist approach to welfare), and one to hedonism (see Appleby & Sandøe 2002 for a review of the philosophical approaches to welfare). The first approach was adopted by Wojciechowska and Hewson (2005), who define QoL as being “made up of satisfaction and predictability of basic physical needs (feed, water and shelter), a high degree of biological functioning, satisfaction of *telos* needs (needs arising from the animal’s nature, eg opportunities for social interaction and environmental control), opportunities for pleasure and minimal distress”.

They argue that QoL can be assessed objectively, ie by a third party, to some extent and is characterised by fulfilment of a list of basic and species-specific needs (ie objective list theory). The work of Hurnik *et al* (1995), Duncan and Fraser (1997) and Scott *et al* (2003) also adopts this approach. However, for those that subscribe to the second approach, QoL assessment represents more of an evaluation of all positive and negative experiences over a period of time (Simonsen 1996; Mench 1998a; McMillan 2000, 2005). This might be considered to be more akin to the hedonistic approach to animal welfare, because it concerns present positive and negative affect, rather than potential opportunity.

Within the scientific community, the terms ‘welfare’ and ‘well-being’ have dominated expressions of our concern for animal suffering and it seems that, to some, welfare and QoL are considered one and the same. This includes both those that subscribe to objective list theory (Duncan & Fraser 1997; Wojciechowska & Hewson 2005) and those that subscribe to a hedonistic approach (Simonsen 1996; Clark *et al* 1997). For others, though, QoL encompasses an aspect of welfare (Mench 1998a) or is similar to but not synonymous with welfare (Hurnik *et al* 1995; McMillan 2000; Scott *et al* 2003). However, it is often not clear in what way QoL might differ from welfare. To help clarify this, let us first refer to the definition of QoL in humans.

QoL in humans has been defined as “the individual’s perception of their position in life, in the context of culture and value systems in which they live and in relation to their goals, expectations, standards and concerns” (World Health Organisation Quality of Life Working Group 1995). More specifically, HRQoL has been defined as the “individual’s subjective perception of the impact of health status, including disease and treatment, on physical, psychological and social functioning” (Leidy *et al* 1999). These definitions emphasise concern about psychological, physical and social well-being (Cummins 1997) within a particular context; and subjective assessment is frequently considered to be the defining characteristic of QoL, in contrast to objectively measured health or functional status (Gill & Feinstein 1994; WHOQoL Working Group 1995; Pal 1996; Revicki *et al* 2000; Eiser & Morse 2001a; Anon 2003; Klassen *et al* 2003). Most modern definitions of human QoL therefore emphasise that it is the individual’s perception or evaluation of the state of their life (Shin & Johnson 1978; Mendola & Pelligrini 1979; Calman 1984; Aaronson *et al* 1991; Gill & Feinstein 1994; Pal 1996; Eiser 1997; Birnbacher 1999). In this respect, human definitions of QoL may be seen to reflect the hedonistic approach to welfare. In humans, the concept of QoL was intended to bring social and psychological well-being into the assessment process, whether this was in the evaluation of the success of social policy or the treatment and care of patients (Birnbacher 1999). In particular, the assessment of HRQoL in children arose out of a concern for acknowledging their well-being as a consequence of novel and aggressive treatment options for chronic disease (Eiser 1997). These same issues are now featuring in the animal literature (Mench 1998b; Dawkins

2001; Wojciechowska & Hewson 2005). Concerns about adding to circuitous arguments about the differences between terms such as 'welfare' and 'well-being' (Patronek & Sperry 2001; Wojciechowska & Hewson 2005) may have led these and other authors to consider QoL as synonymous with these terms. However, it is often overlooked that QoL is a socially constructed concept rather than a property of the individual (unlike welfare), and so its measurement will reflect what society considers it to mean (Fraser 2003). Further consideration of the human situation may also suggest other ways in which QoL can be usefully differentiated from welfare, which, to date, are not very apparent in the animal literature.

First, the human approach to QoL assessment emphasises the individual nature of QoL and that measurement should be at this level. This is very different to many welfare assessment approaches that frequently refer to assessment at the group level (Whay *et al* 2003a). The construct of QoL may thus provide a useful framework for the individual-animal-centred approach that is increasingly being advocated (Hewson 2003). Second, the use of the term QoL emphasises the subjective evaluation dimension of the assessment process, and, as in humans, the evaluation may be considered to be an affective *and* cognitive process on the part of the individual (Clark *et al* 1997). This differentiates it from some of the hedonistic definitions of animal welfare, which focus just on how the animal is feeling at that moment in time rather than being more global assessments of its psychological health (Hetts 1991).

What also follows from this is that QoL is concerned with the presence of pleasurable experiences more than the absence of unpleasant experiences. Good QoL can be seen as a preponderance of good experiences over bad (Mench 1998a). For McMillan (2000), QoL is measured in two dimensions: comfort–discomfort, and pleasure. It can be argued that, historically, perhaps because of its background in concern for farm animals, approaches to the investigation of animal welfare have largely considered only the first of these, with an emphasis on the absence of negative states such as failure to cope (Broom 1986), suffering (Carpenter 1980; Dawkins 1990) or pathology (McGlone 1993; Moberg 1996). There is now a growing awareness of the need to focus on more positive aspects of welfare, including subjective states such as pleasure (Gonyou 1993; Fraser 1995; Mench 1998a). The use of the term 'quality of life' places the focus of research more on the importance of control, social relationships, challenges, etc, to the animal as opposed to the absence of fear and stress (Knierim *et al* 2001). Thus, the concept of QoL appears to have a different emphasis to welfare, in both its focus on the subjective and the presence of positive experiences (Sandøe 1996).

### **Considerations when applying the human definition of quality of life to animals**

There are two primary concerns with the direct transfer of the human definition of QoL or HRQoL to animals. First, the definition of QoL as *the individual's subjective evaluation or perception of the state of their life* (in relation to their

health, expectations of success, hopes, achievements, relative position in life, eg Shin & Johnson 1978; Mendola & Pelligrini 1979; Calman 1984; WHOQoL Working Group 1995) may not be appropriate for animals (McMillan 2005). This definition requires the ability to reflect and evaluate (think about thinking), which are not established capabilities of non-human animals (McMillan 2005). By way of solution, McMillan (2005) defined QoL as "the affective and cognitive ... assessment that an animal makes of how its life is faring", with the proviso that the extent to which it is a cognitive assessment depends on the animal's capacity to form such a construct. Clark *et al* (1997) have made a similar suggestion, that QoL is a result of what the animal both knows and feels. It may therefore be valid to retain the evaluative element of the definition of QoL, although this may be more appropriately considered to relate to needs and desires, which may exist without a human type of consciousness. In the meantime, identifying the cognitive capabilities of companion animals should be a high priority. Such a definition of QoL in animals may also help to redress the balance in the welfare debate which has been skewed by positivism (ie the emphasis on physical over psychological health parameters). Science, by its very nature, deals with uncertainty; but within the welfare debate it appears that in some contexts scientific fallacies related to a positivist philosophy of science have held sway. For example, there is sometimes a failure to recognise that absence of evidence does not equate to evidence of absence, and thus the failure to demonstrate a particular capacity, such as cognitive evaluation of affective state, does not mean that it does not exist, nor does it necessarily provide weight to the argument against it. The logical procedure, instead, is to assess the evidence from all sources, including phylogenetic and functional arguments, and then decide, on the balance of probabilities, whether the hypothesis proposing or denying specific cognitive capacities is the stronger, rather than take the absence of these as the default position. Whilst it is important that those who wish to ascribe certain capacities to animals gather the necessary evidence in support of their case, it is equally important that those who wish to deny such capacities do likewise for their case and do not assume that absence is the logical default. Thus it might be that the introduction of a term such as QoL to the welfare debate, with its emphasis on the subjective, will help to refocus the philosophical basis of animal suffering.

The second concern with the direct transfer of the human term into the non-human animal field is the argument that QoL should be assessed only by determining the opinion of the patients (Gill & Feinstein 1994), since it is defined as such (Pal 1996; Matza *et al* 2004). This is usually done by asking patients direct questions about how they would rate the quality of their life (eg the Lancashire Quality of Life Profile, Oliver *et al* 1996) or by asking them to rate the importance of each objective item to their QoL. Thus the use of proxies (third parties reporting on behalf of the individual), as would be necessary for QoL evaluation in animals, is not consistent with the definition of QoL. However, even in the human field some subjects cannot

self-report, and studies of such individuals appear to move the level of evaluation to that of the proxy (Bradlyn *et al* 1996; Eiser 1997; McMillan 2003). Whilst proxies may base their opinion on objective measures, in all cases it must be recognised that their report ultimately remains their subjective opinion. Although the proxy's opinion *per se* may be relevant in veterinary medicine where the evaluation of the pet by the owner is integral to the treatment process, in other situations a third party's assessment of QoL may be less accessible or valid. An alternative solution to this problem would be to remove the evaluative assessment from the definition of QoL and talk in terms of 'life experience' or 'subjective health status' (Leplege & Hunt 1997). Proxy report for an individual's health status may be more theoretically sound than for their QoL (Matza *et al* 2004). In fact, whilst QoL is often defined as the 'the individual's evaluation of the state of their life', the use of objective indicators of QoL in addition to, or to the exclusion of, the patient's own subjective assessment of their QoL (Gill & Feinstein 1994; Eiser & Morse 2001b) appears to have reduced it in practice to no more than simply the patient's report of their state of health (Gill & Feinstein 1994; Leplege & Hunt 1997; Eiser & Morse 2001a). It is perhaps this shift in emphasis that has supported the use of the proxy as the reporter of the patient's state of their life in place of the patient. Therefore, if QoL in animals were defined as it appears to be in proxy human tools, this might move it closer to the construct of animal welfare that encompasses positive experiences and psychological well-being (Knierim *et al* 2001), which is perhaps more holistic than the traditional positivist approach in science, which focusses primarily on the absence of disease. Somewhat ironically, this definition is analogous to the World Health Organisation's definition of health as "a state of complete physical, mental and social well being, not merely the absence of disease" (WHO 1948), which broadened previous concepts of health (Seedhouse 1986). This has erroneously been reported to be the WHO's definition of QoL (Patronek & Sperry 2001); nonetheless, the similarity between this and definitions of both animal welfare and human QoL should be noted.

Whilst it might be argued that the term 'animal welfare' is equivalent to 'quality of life' for some individuals, avoidance of the term 'quality of life' as a result would potentially mean that the advantages associated with the use of the term, such as the individual-centred approach, might be lost. There are clearly problems associated with defining QoL as the 'individual's subjective evaluation or perception of the state of their life', not least because we are not sure of the extent to which an individual animal can 'evaluate' its life, but also because we cannot assess this evaluation directly. Nevertheless, basing definitions on only what we can measure may not be a valid proposition (see Fraser 2003). As seems to be the case in the human literature, it seems reasonable to suggest that we may define it as the individual's evaluation, but have to measure it indirectly (McMillan 2000). However, in order to avoid the confusion that appears to occur in the human literature, the definition

should be supported by the assumptions that have been made regarding how the choice of measures might reflect how the individual feels about the state of their life, since we are not able to ask them directly. It is of concern, therefore, that within the growing animal QoL assessment field, there are already varying extents to which the definition of QoL and methodology for the choice of measures is reported. In particular, with the exception of Wiseman-Orr *et al* (2004), specific validation of the choice of measures and items within these has been limited. This is also of particular concern as, for animals, it may be even less valid to assume that 'on the face of it' the tool measures the aspects of QoL of interest.

## Application of the assessment of quality of life in humans to non-human animals

### Multiple measures

In contrast to many studies of animal welfare that are often restricted to limited and/or overly simplistic physiological or behavioural observations (Broom & Johnson 1993; Mason & Mendl 1993; Dawkins 2001), QoL assessment tools attempt to assess a range of relevant indicators. HRQoL assessment in humans provides an established methodology for the collection of these indicators in the form of a questionnaire of the patient (Leidy *et al* 1999). Each component (topic or area of concern) of relevance to the definition of QoL is called a domain (Gill & Feinstein 1994). Common domains in HRQoL tools include physical, psychological and social functioning, or dimensions of these (Sprangers & Aaronson 1992; Eiser & Morse 2001a; Scott *et al* 2003). For example, items within the physical functioning domain in the Paediatric Quality of Life (PedsQL) family impact module include feeling tired, getting headaches, feeling weak and having stomach problems (Varni *et al* 1999).

Typically the patient completes the questionnaire regarding their current situation, reflecting over the last few days or weeks, but usually no longer. Each item has a simple ordered response; the use of Likert scales is common (eg 0 = never a problem to 4 = always a problem: PedsQL family impact module, Varni *et al* 1999). When the patient has completed the questionnaire, the results of scores for each domain may be presented separately in a profile (Dijkers 1999). This enables the evaluator to quickly identify domains in which individuals or groups are doing particularly well or badly compared to others (Scott *et al* 2003). Alternatively, or in addition, a composite score can be formed by combining all of the item scores across all domains. The advantage of this is that it yields a summary score of QoL that can be used in evaluation and decision-making (Dijkers 1999). Scores may be summed and then divided by the maximum possible score to give a single percent score for QoL (eg SIP, Iorio *et al* 1997; Infant Toddler Quality of Life Questionnaire [ITQOL], Klassen *et al* 2003). To avoid the potential problem that some domains may be more important to the subject than others, weights have to be given to the domains, for which various

scaling models have been developed (see Scott *et al* 2003). A utility approach may also be used in which the subject is asked to rate their satisfaction with a range of current life situations (eg the Quality of Life Scale: adapted version, Burckhardt & Anderson 2003), or to indicate their preference for each life situation (Revicki & Kaplan 1995). Preferences may then be used to weight the relative importance of each item or domain.

### Use of proxy

As we have stated, because QoL is an evaluation of subjective experience, there are strong arguments in favour of eliciting data directly from the patient (Eiser & Morse 2001a). However, as we have also previously mentioned, in the case of infants, children and the mentally challenged, this is not always possible because they may lack the cognitive and linguistic skills necessary to complete the questionnaire (Eiser & Morse 2001a). In these cases, researchers seek the information from a 'proxy', usually the clinician, parent or teacher. It should not be assumed that a proxy's assessment of an individual's QoL will be the same as the individual's (Eiser & Morse 2001a), but there is increasing evidence from the human literature that often they may not be significantly different (Addington-Hall & Kalra 2001). Reviews of proxy-patient agreement across several studies tend to report moderate to high agreement for physical domains (physical activity and symptoms) but slightly lower agreement for psychological domains (emotional and social functioning) (child-proxy: Eiser & Morse 2001a; adult-proxy: Brunelli *et al* 1998; Sneeuw *et al* 2002; Boyer *et al* 2004). For adults, there is evidence that health care professionals and other proxies may tend to underestimate overall QoL (eg Pierre *et al* 1998), particularly by overestimating the extent of psychological problems (depression, anxiety and distress) (Sprangers & Aaronson 1992; Sneeuw *et al* 2002), although they may underestimate pain (Sprangers & Aaronson 1992). It is interesting to note, though, that parents in the TNO-AZL Child QoL study (TACQoL) (Theunissen *et al* 1998) were in more agreement with their child over negative emotions than over positive ones. However, comparison between patient and proxy assessment is fraught with difficulty since it has been pointed out that the patient's report may not be reliable, valid or even obtainable in the first place, by the very nature of the condition requiring a proxy (Sprangers & Aaronson 1992). To date there are so few studies specifically reporting proxy-patient agreement, particularly for children and the mentally challenged, that definite conclusions as to the validity of proxy report for humans cannot yet be made (Eiser & Morse 2001a).

Nonetheless, the use of proxy report in HRQoL studies supports the premise of the use of proxies in animal studies (McMillan 2003; Wojciechowska & Hewson 2005). Completing a QoL form on behalf of someone else requires proxies to imagine what it must feel like to be the patient (Addington-Hall & Kalra 2001). Whilst there is evidence that human proxies might be good at doing this for others, the question remains as to whether we are also good at

doing this for animals (Patronek & Sperry 2001). However, it is worth noting that when a proxy is used in the human situation, the domains and structure of the QoL assessment are set by scientists with an understanding of the subject's psychological state. With non-human animals, 'critical anthropomorphism', that is empathy set within the framework of available evidence relating to the phylogeny, physiology and behaviour of the subjects concerned (Clark *et al* 1997), might provide a similarly sound scientific foundation for scale development. Observations of animal behaviour and physiological measures may be used to make inferences about the subjective state of animals (Sandøe 1996; McMillan 2000), much as they have been used regarding humans that cannot self-report (McGrath *et al* 1998; van Dijk *et al* 2000). Such an approach might also facilitate comparative assessments which avoid argument over exactly what the animal feels (see review by Paul *et al* 2005). Wojciechowska and Hewson (2005) suggested that clinicians may be more valid assessors of health, but owners may be in a better position to assess mental well-being and experience, because they are more familiar with the animal's character, behaviour and daily routine (see also Serpell & Hsu 2001; Hsu & Serpell 2003). This suggestion is supported by evidence from the human field. For example, Bryan *et al* (2005) found that clinicians were better proxy reporters (higher construct validity) for patients with dementia over more observable domains such as mobility and self-care, whereas carers were better reporters of less observable dimensions such as usual activities and anxiety/depression.

### Psychometric analysis

Psychometric analysis has become an established methodology within the human HRQoL field, perhaps because the subjective nature of the assessment requires greater evidence of reliability and validity (Revicki & Kaplan 1995). This involves proper consideration of the content of the tool during development, and analysis of reliability and external validity of the tool *post hoc* (Jenney & Campbell 1997). The domains and the items contained within them are usually first chosen in consultation with experts (Scott *et al* 2003) and sometimes also lay people (SIP: proxy version, Iorio *et al* 1997; and Nottingham Health Profile, Hunt 1984). Alternatively, relevant items are sought and then formed into domains *post hoc* by the use of statistical techniques such as factor analysis or by consultation with experts (Juniper *et al* 1996). Reliability assessments take the form of evaluation of the consistency of reports within and between individuals, of consistency between two occasions (test-retest reliability) and of the internal consistency of items within domains (Dijkers 1999). Validity assessments take the form of evaluation of the domains and whether they appear to describe the construct in question (content validity), the agreement between related domains (construct validity), and the agreement between domains and other measures that are meant to be assessing the same construct (criterion validity). In the absence of any

gold standard, criterion validity is more appropriately assessed as concurrent validity against another, more established QoL measure and might be considered a more robust form of construct validity (Eiser & Morse 2001a). Therefore, although 'simple checklists' of welfare indicators have been criticised for being just as crude as single measures of welfare (Dawkins 2001), the application of psychometric theory may at least encourage the seeking of evidence for the reliability and validity of such tools. That said, within the human QoL literature there are concerns regarding poor reporting of validity and reliability assessments (Eiser & Morse 2001a). It is promising therefore to find that in the limited companion animal QoL studies to date, all have provided at least one of the above quality assessments (Hartmann & Kuffer 1998; Freeman *et al* 2003; Wiseman-Orr *et al* 2004; Schneider 2005; Wojciechowska *et al* 2005a,b).

### Application of tools

QoL tools can be used for three purposes: to discriminate between individuals or groups with respect to an underlying dimension at any one point of time (discriminative index), to predict the outcome of treatment based on a set of predefined categories (predictive index), or to evaluate the longitudinal change in the individual or group (evaluative index) (Guyatt *et al* 1993). Assessment tools developed for veterinary clinical studies could therefore be used to compare QoL as an endpoint across treatment groups, to prioritise treatment for at-risk individuals or to evaluate change as a consequence of treatment. However, generic tools could also be used to compare QoL between animal management systems, to prioritise intervention for specific individuals within institutions or to evaluate the change in QoL as a result of a change in environment or over time (eg following admittance to a re-homing facility).

### Use of measures

In their surveys of a range of human QoL assessment tools, Gill and Feinstein (1994) and Eiser and Morse (2001b) found that most did not define what was meant by QoL, distinguish between HRQoL and QoL, or defend the choice of measures accordingly. This absence of information has limited reviews of QoL tools, both within disease topics and more generally (Eiser & Morse 2001a,b; Clarke & Eiser 2004). In addition, the unqualified use of both objective and subjective measures appears to have given rise to confusion between what determines as opposed to what comprises HRQoL (Schumaker & Naughton 1995). Objective measures can, in theory, be measured externally and include social indicators (income, housing), health indicators (physical signs of mental and somatic illness) and functional ability (ability to perform activities, get out and about, form relationships) (Oliver *et al* 1996). Subjective measures are those which only the patient can assess (Dijkers 1999), and include subjective satisfaction (their perceived QoL), mental health (positive and negative affect), happiness, personality (extroversion/introversion) and independence (Oliver *et al* 1996). It is generally considered that QoL is an outcome measure (ie it is what *results*

from the individual's emotional and physical experience; see Barofsky 1996; Birnbacher 1999; Freeman *et al* 2003). Therefore, objective measures (or more usually, the patient's subjective assessment of objective measures) are indirect measures of QoL (indicators) and do not constitute QoL in themselves (Taylor *et al* 1995; Birnbacher 1999; McMillan 2000). The inclusion of such measures appears to be based on objective list theory (see above) — the assumption that in order to have good QoL it is important to have good health and functional status (Dijkers 1999). As a result, objective measures can explain significant proportions of the variation in subjective global well-being (Oliver 1991; Oliver *et al* 1996). However, a meta-analysis of studies showed that, from the patient's perspective, QoL and health status are different concepts (Smith *et al* 1999). There is considerable literature that challenges the view that if functional, or even health, status is compromised, QoL is inevitably compromised (Eiser & Morse 2001a; Matza *et al* 2004). For example, although objective life status was shown to correlate with subjective life satisfaction, Li *et al* (1998) found that groups of people who might be expected to have poorer QoL (eg older, rural, uneducated) did not necessarily rate their QoL lower than groups who might be assumed to have higher QoL (eg younger, urban, educated). It may therefore be dangerous to assume that objective measures will necessarily predict subjective ones (Leplege & Hunt 1997). However, Oliver *et al* (1996) make the point that just because objective measures may be insufficient measures in and of themselves, this does not mean that subjective measures will be. This is particularly pertinent in the field of mental health, where happiness and dissatisfaction can be pathological and subjective assessment may not be reliable: "A judgement which a person makes about his or her life may well be a subjective judgement, but it is based upon an assessment of both the subjective and objective aspects of life" (Oliver *et al* 1996). The concept is further confused by disagreement over whether the patient's assessment of their mental health falls under objective or subjective measures, and whether it is a causal indicator of QoL (Barofsky & Rowan 1998; Birnbacher 1999) or a symptom (Schumaker & Naughton 1995).

This confusion raises similar concerns to the introduction and definition of the term in the animal sciences as it does within the human literature. For example, Wojciechowska and Hewson (2005) appear to have defined QoL according to how it is *measured* rather than *defined* in the human field. Although objective measures such as environmental and social situations are included in many QoL assessment tools, consensus regarding the definition of QoL in humans would suggest that these are indicators rather than constituents of QoL. In contrast, McMillan's (2000, 2005) definition of QoL as a subjective state that may be measured indirectly by objective measures is not only more in line with the definition of QoL in humans, but helps clarify the role of objective and subjective measures in its cause and effect. Since companion animals have little control over their own environment it is unlikely that their QoL will be *reflected* in such measures except in extreme circumstances.

As a result, social and environmental measures are more likely to be objective and largely causal for QoL in companion animals. However, health (physical and mental) and behaviour may be either objectively or subjectively measured, and either causal or symptomatic of QoL.

### Suggestions for the definition and measurement of companion animal quality of life

#### Suggested definition

From the preceding discussion it should be apparent that any definition of QoL should clearly state what constitutes QoL (individual sense of well-being), what predicts it (fulfilment of needs) and what reflects it (health and behaviour). To this end we propose the following definition:

Quality of life is the state of an individual animal's life as perceived by them at any one point in time. It is experienced as a sense of well-being which involves the balance between negative and positive affective states and any cognitive evaluation of these, where the animal has the capacity. To some extent, QoL can be predicted by the fulfilment of basic and species-specific health, social and environmental needs (and individual preferences for these) and is reflected in the animal's health and behaviour.

#### Suggested domains

HRQoL assessment tools, particularly those developed for proxies, include many domains that are relevant to companion animals. Eiser and Morse (2001a) reviewed the use of proxy-completed generic and disease-specific HRQoL assessments for chronic childhood diseases. We used domains included in these tools to form a list of suitable domains for companion animals. These are listed in Table 1, together with suggestions for items relevant to companion animals that might appear within each domain. The extent to which these domains have been represented by the limited number of QoL tools for companion animals reported to date is also shown. Domains have been split into social/environmental indicators, which are largely causal, and physical/psychological indicators that include measures of health and behaviour, which may be both causal and symptomatic of QoL. Hartmann and Kuffer (1998) and Wiseman-Orr *et al* (2004) looked at behavioural indicators of physical and psychological health, whereas Freeman *et al* (2003), Schneider (2005) and Wojciechowska *et al* (2005a) included both the social/environmental situation of the animal and its physical/psychological health in their QoL tools.

#### The measurement of social/environmental indicators

Social and environmental indicators, such as the animal's housing and provision for social contact, can be objectively assessed by a third party. Such indicators are widely used in human QoL research and there appears to be a consensus here that they are important to QoL and therefore valid. The choice of domains is therefore not often defended in the human literature unless the authors specifically refer to

**Table 1** Suggestions for relevant social/environmental and physical/psychological domains derived from child-proxy HRQoL tools (reviewed in Eiser & Morse 2001a) and their use in companion animal QoL assessments to date. Studies that feature aspects of the domains listed are identified by number: Hartmann & Kuffer (1998)<sup>1</sup>, Freeman *et al* (2003)<sup>2</sup>, Wiseman-Orr *et al* (2004)<sup>3</sup>, Schneider (2005)<sup>4</sup>, Wojciechowska *et al* (2005a)<sup>5</sup>.

Domain	Example items
<b>Social/environmental indicators</b>	
Basic needs <sup>4, 5</sup>	Access to food, water, rest area, health care
Non-social environment <sup>2, 4, 5</sup>	Opportunities for exercise, object-directed play, exploration, size of range, environmental change, enrichment, treats, level of restriction, location
Social environment <sup>2, 5</sup>	Quantity and quality of social interactions (intra- and inter-specific), stability of relationships
Autonomy <sup>5</sup>	Independence, control
<b>Physical/psychological indicators</b>	
Physical health <sup>2, 3, 4, 5</sup>	Sickness, diarrhoea, injury, irritation, disease, breathing difficulties, mobility, weight change, physiological measures (parasite load, cortisol, immune function), behavioural indicators of pain
Activity <sup>1, 2, 3, 5</sup>	Energy and activity levels, play, sleep patterns, arousal
Appetite <sup>1, 2, 3, 5</sup>	Quality and quantity of food eaten
Self-care <sup>1, 2, 5</sup>	Grooming, avoiding injury, soiling living area, self-harming
Sociability <sup>2, 3, 4, 5</sup>	Inter- and intra-specific social competence, interest, compliance, obedience, aggression
Intelligence <sup>4</sup>	Trainability, cognitive function, perseverance, perception
Temperament <sup>2, 3</sup>	Emotional stability, general demeanour, changes in mood, introvert/extrovert, compulsivity
Positive behaviour <sup>1, 3, 5</sup>	Comfort behaviours, sunbathing, playing, exploration, interest
Negative behaviour <sup>3, 4, 5</sup>	Signs of anxiety, distress, abnormal behaviour, fear, depression

aspects that might be affected by disease or treatment. Although this failure has been criticised, particularly for tools that emphasise health and functional status (Leplege & Hunt 1997), there is evidence from surveys that measures of social interaction, health, finance, etc are in fact important to our QoL (Campbell *et al* 1976; Bowling 1995). Unfortunately, the inclusion of objective, causal indicators in QoL tools for companion animals is not so straightforward. This is because there is currently both a lack of consensus on the basic needs of companion animals and a

lack of research into more species-specific ones. Our assumptions regarding their need for social contact, exercise, toys, etc (such as in Schneider 2005) may not be valid. It is important that the choice of measures is defended, but since we cannot ask the animals directly, this is difficult to do. There are techniques developed in the farm animal welfare field that aim to assess important needs and preferences. These include preference testing (Fraser & Matthews 1997) and aversion techniques (Rushen 1996). The application of consumer demand theory (Dawkins 1983) helps to quantify the animal's choice by incrementally increasing the cost to access a particular resource. For example, such an approach has been used to identify preferences by captive mink for various resources (Cooper & Mason 2000). However, there are numerous problems with the theory and design of preference tests (Houston 1997; Wojciechowska & Hewson 2005) and to date they have been little used with companion animals. It is also interesting to note that in many human QoL tools, individual preferences are not taken into account; it is assumed that social support, for example, is important to all. This appears to be in contrast to the animal QoL and welfare literature, where the need to take into account the individual's nature and preferences has often been highlighted (Patronek & Sperry 2001; McMillan 2005; Wojciechowska & Hewson 2005). However, whether this reflects an under-emphasis of individuality in the human field or an over-emphasis in the animal field is unclear.

Recent companion animal QoL studies have tried to avoid the problem of lack of information regarding needs by asking the pet owner about the individual's preferences. For example, Wojciechowska *et al* (2005a) asked the dog's owner whether the dog enjoyed a certain activity and based their measure of QoL on how often the dog had experienced it over the last week. Similarly, Freeman *et al* (2003) asked about the impact of disease on activities the pet enjoyed. However, for animals in establishments for which current or prior preferences are not known, this method may not be feasible. In the absence of evidence of the validity of quick behavioural tests to establish individual preference, QoL tools may have to rely on purely outcome-based measures, ie health and behaviour. In fact, the example of animals in institutions supports the conclusion that QoL is ultimately a subjective assessment on the part of the animal and cannot be solely determined by input-based measures, ie those that might predict QoL such as housing and management. This is because it is counter-intuitive to suppose that all animals within the same environment, such as a kennel block, will be experiencing exactly the same QoL.

#### The measurement of physical/psychological indicators

Many indicators of physical and mental health can also be objectively observed by a third party. Recently, the application of QoL theory in the creation of multiple indices for the assessment of farm animal welfare has been reported (Taylor *et al* 1995; Scott *et al* 2003; Whay *et al* 2003b; Pritchard *et al* 2005). Parameters were sought using expert consensus and included health and behaviour observations

such as coat condition, lameness, disease and willingness to approach people. Similar tools have been created to assess pain-related behaviour in individual dogs (Firth & Haldane 1999; Holton *et al* 2001). However, the assumption that *any* health status measure is a QoL measure is to be avoided (Oliver *et al* 1996; Bowling 1997; Leplege & Hunt 1997) and for this reason such tools should not aim to be a complete QoL assessment (Fallowfield 1990). In this instance a battery approach can be used which combines several separate tools that each assess aspects of QoL (Eiser & Morse 2001a). These could be combined to form a single composite QoL measure or retained as separate measures of one aspect of QoL. However, this approach has not yet been reported commonly for the assessment of QoL in children by proxy, which is the field that might most closely inform QoL in animals (Eiser & Morse 2001a). In addition, current multiple indices for animals are primarily indicators of poor welfare and assess the welfare of groups as opposed to individuals (Whay *et al* 2003b).

Behavioural indicators, particularly those that are intended to reflect the animal's emotional state, are considered to be more difficult to assess objectively (Patronek & Sperry 2001). However, the application of tools developed to assess psychological disturbances in humans may be helpful. Examples of scales include Zhung's self-rating depression scale (Zhung 1965), the Montgomery-Asberg Depression Rating Scale (Montgomery & Asberg 1979), the Hamilton Depression Scale (Hamilton 1967), the Mood, Interest and Pleasure questionnaire (Ross & Oliver 2003), the Aberrant Behaviour Checklist (Aman & Singh 1986) and the Infant Toddler QoL questionnaire (Klassen *et al* 2003). Many items within these questionnaires include signs that may also be observable in companion animals, such as agitation and crying, lethargy, social withdrawal, stereotypic behaviour, hyperactivity, non-compliance, aggression, and sleeping and eating patterns. Techniques for the qualitative assessment of subjective behaviour are also developing from the farm animal welfare literature (eg Wemelsfelder *et al* 2001) and in fact, the tool developed by Wiseman-Orr *et al* (2004) was based on purely qualitative terms such as happy, sad, apathetic, quiet, etc, developed using psychometric principles.

#### Conclusion

The application of human health-related QoL assessment to the field of animal welfare research is an exciting proposition. However, since the field is in its infancy, it is worth careful consideration of the appropriateness of the use of the human definition for non-human animals. QoL in humans is largely defined as a subjective evaluation on the part of the individual. In this respect the use of the term may help to change the emphasis of concerns within the field of animal welfare science, by increasing focus on the impact of environments upon the individual (rather than the group) and on measurement of positive aspects of health and behaviour (rather than suffering). The use of the term may also encourage greater appreciation of the application of psychometric analysis during the development of assessment tools.



The consideration of the concept of QoL may also help to increase the rigour of work, by encouraging philosophical reflection upon that which is being assessed, rather than blind subscription to certain methodologies aimed at measuring some form of suffering. However, this depends on consideration of the definition and appropriate choice of measures in each new study. Failure to do this in the human field appears to have fuelled confusion over the relative roles of objective and subjective measures in the determination and constitution of QoL. The use of the term 'quality of life', rather than 'welfare', may therefore lead to an improvement on current practice, which tends to focus on relatively few outcome measures that are largely indicative of poor welfare.

### Acknowledgements

This paper formed part of a wider review of approaches to the assessment of welfare and quality of life in kennelled dogs commissioned by the Dogs Trust and we are indebted to them for their support of this work. The first author was supported by the charity to undertake these reviews. We would like to thank Stine Christiansen, Caroline Hewson and Franklin McMillan for supplying early copies of their papers for inclusion in the review. We would also like to thank members of the Dogs Trust 'Quality of Life Working Party' for their support and comments: Jon Bowen, John Bradshaw, Keith Butt, Rachel Casey, Philip Daubeny, Paul DeVile, Sarah Heath, Andrew Higgins, Chris Laurence, Matthew Leach, Sam Lindley, David Main, Joe Mayhew, Rose McIlrath, Dirk Pfeiffer, Jacqueline Reid, Irene Rochlitz, Marian Scott, Jacqueline Stephen, Natalie Waran, Deborah Wells and Lesley Wiseman-Orr.

### References

- Aaronson NK, Meyeravitz BE and Bard M** 1991 Quality of life research in oncology: past achievements and future priorities. *Cancer* 67: 839-843
- Addington-Hall J and Kalra L** 2001 Who should measure quality of life? *British Medical Journal* 322: 1417-1420
- Aman MG and Singh NN** 1986 *Manual for the Aberrant Behaviour Checklist*. Slosson Educational Publications Inc: New York, USA
- Anon** 2003 How do you measure quality of life? *Veterinary Record* 153: 37-38
- Appleby MC and Sandøe P** 2002 Philosophical debate on the nature of well-being: implications for animal welfare. *Animal Welfare* 11: 282-294
- Barofsky I** 1996 Cognitive aspects of quality of life assessment. In: Spilker B (ed) *Quality of Life and Pharmacoeconomics in Clinical Trials (2nd Edition)* pp 107-115. Lippincott Williams & Wilkins: Philadelphia, USA
- Barofsky I and Rowan A** 1998 Models for measuring quality of life: implications for human-animal interaction research. In: Wilson CC and Turner DC (eds) *Companion Animals in Human Health* pp 91-101. Sage Publications: London, UK
- Birnbacher D** 1999 Quality of life: evaluation or description? *Ethical Theory and Moral Practice* 2: 25-36
- Bowling A** 1995 What things are important in people's lives? A survey of the public's judgements to inform scales of health related quality of life. *Social Science and Medicine* 10: 1447-1462
- Bowling A** 1997 *Measuring Health: A Review of Quality of Life Measurement Scales (2nd Edition)*. Open University Press: Buckingham, UK
- Boyer F, Novella JL, Morrone I, Jolly D and Blanchard F** 2004 Agreement between dementia patient report and proxy reports using the Nottingham Health Profile. *International Journal of Geriatric Psychiatry* 19: 1026-1034
- Bradlyn AS, Ritchey AK and Harris CV** 1996 Quality of life research in pediatric oncology: research methods and barriers. *Cancer* 78: 1333-1339
- Broom DM** 1986 Indicators of poor welfare. *British Veterinary Journal* 142: 524-526
- Broom DM and Johnson KG** 1993 *Stress and Animal Welfare*. Chapman and Hall: London, UK
- Brunelli C, Costantini M, Di Giulio P, Gallucci M, Fusco F, Miccinesi G, Paci E, Peruselli C, Morino P, Piazza M, Tamburini M and Toscani F** 1998 Quality of life evaluation: when do terminal cancer patients and health-care providers agree? *Journal of Pain and Symptom Management* 15: 151-158
- Bryan S, Hardyman W, Bentham P, Buckley A and Laight A** 2005 Proxy completion of EQ-5D in patients with dementia. *Quality of Life Research* 14: 107-118
- Burckhardt CS and Anderson KL** 2003 The quality of life scale (QoLS): reliability, validity and utilisation. *Health and Quality of Life Outcomes* 1: 60-67
- Calman KC** 1984 Quality of life in cancer patients — an hypothesis. *Journal of Medical Ethics* 10: 124-127
- Campbell A, Converse PE and Rodgers WL** 1976 *The Quality of American Life: Perceptions, Evaluations and Satisfactions*. Russell Sage Foundation: New York, USA
- Carpenter E** 1980 *Animals and Ethics: A Report of the Working Party Convened by Edward Carpenter*. Watkins and Dulverton: London, UK
- Christiansen SB, Kristensen AT and Sandøe P** 2004 Quality of life of pets and pet owners — implication of follow up studies for veterinary advice. In: *Proceedings of the 10th International Conference of the International Association of Human-Animal Interaction Organisations, 6-9 Oct, Glasgow, UK* p 152
- Clark JD, Rager DR and Calpin JP** 1997 Animal wellbeing: I. General considerations. *Laboratory Animal Science* 47: 564-570
- Clarke SA and Eiser C** 2004 The measurement of health-related quality of life (QoL) in paediatric clinical trials: a systematic review. *Health and Quality of Life Outcomes* 2: 66-70
- Cooper JJ and Mason GJ** 2000 Increasing costs of access to resources cause re-scheduling of behaviour in American mink (*Mustela vison*): implications for the assessment of behavioural priorities. *Applied Animal Behaviour Science* 66: 135-151
- Cummins R** 1997 Assessing quality of life. In: Brown RI (ed) *Quality of Life for People with Disabilities* pp 116-150. Stanley Thornes Ltd: Cheltenham, UK
- Dawkins MS** 1983 Battery hens name their price: consumer demand theory and the measurement of ethological needs. *Animal Behaviour* 31: 1195-1205
- Dawkins MS** 1990 From an animal's point of view: motivation, fitness and animal welfare. *Behavioural and Brain Sciences* 13: 1-61
- Dawkins MS** 2001 How can we recognize and assess good welfare? In: Broom DM (ed) *Coping with Challenge: Welfare in Animals Including Humans* pp 63-76. Dahlem Workshop Report 87. Dahlem University Press: Berlin, Germany
- Dijkers M** 1999 Measuring quality of life: methodological issues. *American Journal of Physical Medicine and Rehabilitation* 78: 286-300
- Duncan IJH and Fraser D** 1997 Understanding animal welfare. In: Appleby MC and Hughes BO (eds) *Animal Welfare* pp 19-31. CAB International: Wallingford, UK

- Edney ATB** 1998 Reasons for the euthanasia of dogs and cats. *Veterinary Record* 143: 114
- Eiser C** 1997 Children's quality of life. *Archives of Disease in Childhood* 77: 350-354
- Eiser C and Morse R** 2001a Quality of life measures in chronic disease of childhood. *Health Technology Assessment* 5: 1-156
- Eiser C and Morse R** 2001b A review of measures of quality of life for children with chronic illness. *Archives of Disease in Childhood* 84: 205-211
- Fallowfield L** 1990 *The Quality of Life: The Missing Measurement in Health Care*. Souvenir Press Ltd: London, UK
- Firth AM and Haldane SL** 1999 Development of a scale to evaluate post operative pain in dogs. *Journal of the American Veterinary Medical Association* 214: 651-659
- Fraser D** 1995 Science, values and animal welfare: exploring the inextricable connection. *Animal Welfare* 4: 103-117
- Fraser D** 2003 Assessing animal welfare at the farm and group level: the interplay of science and values. *Animal Welfare* 12: 433-443
- Fraser D and Matthews R** 1997 Preference and motivation testing. In: Appleby MC and Hughes BO (eds) *Animal Welfare* pp 159-173. CAB International: Wallingford, UK
- Freeman LM, Rush JE, Farabaugh AE and Must A** 2003 Development and validation of the functional evaluation of cardiac health (FETCH) questionnaire for dogs. In: *Proceedings of the 21st Annual Veterinary Medical Forum, American College of Veterinary Internal Medicine, 4-8 Jun, Charlotte, USA* p 1014
- Gill TM and Feinstein AR** 1994 A critical appraisal of the quality of quality of life measurements. *Journal of the American Medical Association* 272: 619-626
- Gonyou HW** 1993 Animal welfare: definitions and assessment. *Journal of Agricultural and Environmental Ethics* 6 (Suppl 2): 37-43
- Guyatt GH, Feeny DH and Patrick DL** 1993 Measuring health-related quality of life. *Annals of Internal Medicine* 118: 622-629
- Hamilton M** 1967 Development of a rating scale for primary depressive illness. *British Journal of Social and Clinical Psychology* 6: 278-296
- Hartmann K and Kuffer M** 1998 Karnofsky's score modified for cats. *European Journal of Medical Research* 3: 95-98
- Hetts S** 1991 Psychologic well-being: conceptual issues, behavioural measures and implications for dogs. *Veterinary Clinics of North America: Small Animal Practice* 21: 369-387
- Hewson CJ** 2003 Can we assess welfare? *Canadian Veterinary Journal* 44: 749-753
- Holton L, Reid J, Scott EM, Pawson P and Nolan A** 2001 Development of a behaviour based scale to measure acute pain in dogs. *Veterinary Record* 148: 525-531
- Houston HI** 1997 Demand curves and welfare. *Animal Behaviour* 53: 983-990
- Hsu Y and Serpell JA** 2003 Development and validation of a questionnaire for measuring behaviour and temperament traits in pet dogs. *Journal of the American Veterinary Medical Association* 223: 1293-1300
- Hunt SM** 1984 Nottingham Health Profile. In: Wenger NK, Mattson ME and Forberg CD (eds) *Assessment of Quality of Life in Clinical Trials of Cardiovascular Therapies* pp 170-183. Le Jacq: New York, USA
- Hurnik JF, Webster AB and Siegel PB** 1995 *Dictionary of Farm Animal Behaviour (2nd Edition)* p 148, 197. Iowa State University Press: Ames, USA
- Iorio R, Pensati P, Botta S, Moschella S, Impagliazzo N and Vajro P** 1997 Side effects of alpha-interferon therapy and impact on health-related quality of life in children with chronic viral hepatitis. *Pediatric Journal of Infectious Diseases* 16: 984-990
- Jenney MEM and Campbell S** 1997 Measuring quality of life. *Archives of Disease in Childhood* 77: 347-350
- Juniper EF, Guyatt GH and Jaeschke R** 1996 How to develop and validate a new health related quality of life instrument. In: Spilker B (ed) *Quality of Life and Pharmacoeconomics in Clinical Trials (2nd Edition)* pp 49-56. Lippincott Williams & Wilkins: Philadelphia, USA
- Klassen AF, Landgraf JM, Lee SK, Barer M, Raina P, Chan HWP, Matthew D and Brabyn D** 2003 Health related quality of life in 3 and 4 year old children and their parents: preliminary findings about a new questionnaire. *Health and Quality of Life Outcomes* 1: 81-93
- Knierim U, Carter CS, Fraser D, Gartner K, Lutgendorf SK, Mineka S, Panksepp J and Sachser N** 2001 Group report: good welfare. Improving quality of life. In: Broom DM (ed) *Coping with Challenge: Welfare in Animals Including Humans* pp 79-100. Dahlem Workshop Report 87. Dahlem University Press: Berlin, Germany
- Leidy NK, Rich M and Geneste B** 1999 Recommendations for evaluation of the validity of quality of life claims for labelling and promotion. *Values in Health* 2: 113-127
- Leplege A and Hunt S** 1997 The problem of quality of life in medicine. *Journal of the American Medical Association* 278: 47-50
- Li L, Young D, Wei H, Zhang Y, Zheung Y, Xiao S, Wang X and Chen X** 1998 The relationship between objective life status and subjective life satisfaction with quality of life. *Behavioural Medicine* 23: 149-159
- Mason G and Mendl M** 1993 Why is there no simple way of measuring animal welfare? *Animal Welfare* 2: 301-319
- Matza LS, Swensen AR, Flood EM, Secnik K and Leidy NK** 2004 Assessment of health-related quality of life in children: a review of conceptual, methodological and regulatory issues. *Values in Health* 7: 79-92
- McGlone JJ** 1993 What is animal welfare? *Journal of Agricultural and Environmental Ethics* 6 (Suppl 2): 26-36
- McGrath PJ, Rosmus C, Canfield C, Campbell MA and Hennigar A** 1998 Behaviours caregivers use to determine pain in non-verbal, cognitively impaired individuals. *Developmental Medicine and Child Neurology* 40: 340-343
- McMillan FD** 2000 Quality of life in animals. *Journal of the American Veterinary Medical Association* 216: 1904-1910
- McMillan FD** 2003 Maximising quality of life in ill animals. *Journal of the American Animal Hospital Association* 39: 227-235
- McMillan FD** 2005 The concept of quality of life in animals. In: McMillan FD (ed) *Mental Health and Well-Being in Animals* pp 183-200. Blackwell: Ames, USA
- Mench JA** 1998a Thirty years after Brambell: whither animal welfare science? *Journal of Applied Animal Welfare Science* 1: 91-102
- Mench JA** 1998b Beyond suffering: the impassible dream. *Journal of Applied Animal Welfare Science* 1: 163-166
- Mendola WF and Pelligrini RV** 1979 Quality of life and coronary artery bypass surgery patients. *Social Science and Medicine* 13A: 457-461
- Moberg GP** 1996 Suffering from stress: an approach for evaluating the welfare of an animal. *Acta Agriculturae Scandinavica, Section A — Animal Science (Suppl 27)*: 46-49
- Montgomery SA and Asberg M** 1979 A new depression scale designed to be sensitive to change. *British Journal of Psychiatry* 134: 382-389
- Oliver J** 1991 The social care directive: development of a quality of life profile for use in community services for the mentally ill. *Social Work and Social Sciences Review* 3: 5-45
- Oliver J, Huxley P, Bridges K and Mohamad H** 1996 *Quality of Life and Mental Health Services*. Routledge: London, UK

- Pal DK** 1996 Quality of life assessment in children: a review of conceptual and methodological issues in multidimensional health status measures. *Journal of Epidemiology and Community Health* 50: 391-396
- Patronek GJ and Sperry E** 2001 Quality of life in long-term confinement. In: August JR (ed) *Consultations in Feline Internal Medicine (4th Edition)* pp 621-634. WB Saunders: Philadelphia, USA
- Paul ES, Harding EJ and Mendl M** 2005 Measuring emotional processes in animals: the utility of a cognitive approach. *Neuroscience and Biobehavioural Reviews* 29: 469-491
- Pierre U, Wood-Dauphinee S, Korner-Bitensky N, Gayton D and Hanley J** 1998 Proxy use of the Canadian SF-36 in rating health status of the disabled elderly. *Journal of Clinical Epidemiology* 51: 983-990
- Pritchard JC, Lindberg AC, Main DCJ and Whay HR** 2005 Assessment of the welfare of working horses, mules and donkeys, using health and behaviour parameters. *Preventative Veterinary Medicine* 69: 265-283
- Revicki DA and Kaplan RM** 1995 Relationship between psychometric and utility-based approaches to the measurement of health-related quality of life. In: Schumaker SA and Berzon R (eds) *The International Assessment of Health-Related Quality of Life: Theory, Translation, Measurement and Analysis* pp 125-135. Rapid Communications: Oxford, UK
- Revicki DA, Osoba D, Fairclough D, Barofsky I, Berzon R, Leidy NK and Rothman M** 2000 Recommendations on health-related quality of life research to support labelling and promotional claims in the United States. *Quality of Life Research* 9: 887-900
- Ross E and Oliver C** 2003 Preliminary analysis of the psychometric properties of the Mood, Interest and Pleasure Questionnaire (MIPQ) for adults with severe and profound learning disabilities. *British Journal of Clinical Psychology* 42: 81-93
- Rushen J** 1996 Using aversion learning techniques to assess the mental state, suffering and welfare of farm animals. *Journal of Animal Science* 74: 1990-1995
- Sandøe P** 1996 Animal and human welfare — are they the same kind of thing? *Acta Agriculturae Scandinavica, Section A — Animal Science (Suppl 27)*: 11-15
- Schneider TR** 2005 Methods for assessing companion animal quality of life. In: *Proceedings of the 2005 North American Veterinary Congress, 8-12 Jan, Orlando, Florida* pp 443-444
- Schumaker SA and Naughton MJ** 1995 The international assessment of health-related quality of life: a theoretical perspective. In: Schumaker SA and Berzon R (eds) *The International Assessment of Health-Related Quality of Life: Theory, Translation, Measurement and Analysis* pp 3-10. Rapid Communications: Oxford, UK
- Scott EM, Fitzpatrick JL, Nolan AM, Reid J and Wiseman ML** 2003 Evaluation of welfare state based on interpretation of multiple indices. *Animal Welfare* 12: 457-468
- Serpell JA and Hsu Y** 2001 Development and validation of a novel method for evaluating behaviour and temperament in guide dogs. *Applied Animal Behaviour Science* 72: 347-364
- Seedhouse D** 1986 *Health: The Foundations of Achievement*. John Wiley: Chichester, UK
- Shin DC and Johnson DM** 1978 Avowed happiness as an overall assessment of the quality of life. *Social Indicators Research* 5: 475-492
- Simonsen HB** 1996 Assessment of animal welfare by a holistic approach: behaviour, health and measured opinion. *Acta Agriculturae Scandinavica, Section A — Animal Science (Suppl 27)*: 91-96
- Smith KW, Avis NE and Assmann SF** 1999 Distinguishing between quality of life and health status in quality of life research: a meta analysis. *Quality of Life Research* 8: 447-459
- Sneeuw KCA, Sprangers MAG and Aaronson NK** 2002 The role of health care providers and significant others in evaluating the quality of life of patients with chronic disease. *Journal of Clinical Epidemiology* 55: 1130-1143
- Sprangers MAG and Aaronson NK** 1992 The role of health care providers and significant others in evaluating the quality of life of patients with chronic disease: a review. *Journal of Clinical Epidemiology* 45: 745-760
- Taylor AA, Hurnik JF and Lehman H** 1995 The application of cost-benefit dominance analysis to the assessment of farm animal quality of life. *Social Indicators Research* 35: 313-329
- Theunissen NC, Vogels T, Koopman HM, Verrips GH, Zwinderman K and Verloove-Vanhorick SP** 1998 The proxy problem: child report versus parent report in health-related quality of life research. *Quality of Life Research* 7: 387-397
- van Dijk M, De Boer JB, Koot HM, Tibboel D, Passchier J and Duivenvoorden HJ** 2000 The reliability and validity of the COMFORT scale as a postoperative pain instrument in 0 to 3 year old infants. *Pain* 84: 367-377
- Varni JW, Seid M and Rode CA** 1999 The PedsQL: measurement model for the pediatric quality of life inventory. *Medical Care* 37: 126-139
- Ware JE and Sherbourne CD** 1992 The MOS 36-item short-form health survey (SF-36). I: Conceptual framework and item selection. *Medical Care* 30: 473-483
- Wemelsfelder F, Hunter EA, Mendl MT and Lawrence AB** 2001 Assessing the 'whole animal': a free-choice-profiling approach. *Animal Behaviour* 62: 209-220
- Whay HR, Main DCJ, Green LE and Webster AJF** 2003a Animal-based measures for the assessment of welfare state of dairy cattle, pigs and laying hens: consensus of expert opinion. *Animal Welfare* 12: 205-217
- Whay HR, Main DCJ, Green LE and Webster AJF** 2003b Assessment of the welfare of dairy cattle using animal-based measurements: direct observation and investigation of farm records. *Veterinary Record* 153: 197-202
- WHO** 1948 *World Health Organisation: Constitution of the World Health Organisation*. WHO Basic Documents: Geneva, Switzerland
- WHOqL Working Group** 1995 World Health Organisation Quality of Life Assessment: position paper from the World Health Organisation. *Social Science and Medicine* 41: 1403
- Wiseman-Orr ML, Nolan AM, Reid J and Scott EM** 2004 Development of a questionnaire to measure the effects of chronic pain on health-related quality of life in dogs. *American Journal of Veterinary Research* 65: 1077-1084
- Wojciechowska JI and Hewson CJ** 2005 Quality of life assessment in pet dogs. *Journal of the American Veterinary Medical Association* 226: 722-728
- Wojciechowska JI, Hewson CJ, Stryhn H, Guy NC, Patronek GJ and Timmons V** 2005a Development of a preliminary discriminative questionnaire to assess non-physical aspects of quality of life in pet dogs. *American Journal of Veterinary Research* 66: 1453-1460
- Wojciechowska JI, Hewson CJ, Stryhn H, Guy NC, Timmons V and Patronek GJ** 2005b Evaluation of the effect of health status on non-physical aspects of quality of life in pet dogs. *American Journal of Veterinary Research* 66: 1461-1467
- Zhug WWK** 1965 A self rating depression scale. *Archives of General Psychiatry* 12: 63-70