10 The human–cat relationship

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Introduction

As detailed in Chapter 11, the association between cats and people is very old, though not as old as that between dogs and humans. Various theories exist about the reasons for domestication of cats by humans, the most plausible of which relate to either the ancestral cat's propensity to exploit concentrations of prey (rodents in the granaries of Mesolithic agricultural settlements) or the natural and universal human tendency to adopt and nurture young, sick or injured animals, i.e. to include other living creatures in their emotional world (Messant & Serpell, 1981). Research on the human–cat relationship is, however, relatively young – about 20 years old – but expanding rapidly. In this chapter, factors affecting the establishment and maintenance of the cat–human/human–cat relationship will be discussed, including recent information on the mechanisms involved; differences between relationships, be they due to the human or the feline partner, will also be considered.

The establishment and maintenance of the relationship

The sensitive period of socialisation

Socialisation refers to the process by which an animal develops appropriate social behaviour toward conspecifics. Typically, an infant animal first relates to its parents (usually the mother), then to littermates or siblings, next to peers, and finally to other members of its species. To study the normal socialisation process, scientists have frequently interfered by taking an infant animal away from its mother and/or littermates (deprivation or isolation experiments), or by exposing the infant to an unnatural substitute or caretaker. This substitute has sometimes been an object, sometimes a member of another species, and sometimes a person. For example, Konrad Lorenz (1935), in an early demonstration of imprinting, divided a clutch of goose eggs in half and, after hatching, left half the goslings with the mother and exposed the other half to himself. Upon testing, the goslings that had been exposed to Lorenz followed him.

The term 'critical period', taken from embryology, was introduced to animal behaviour by Konrad Lorenz (1937) in relation to imprinting. Imprinting refers to the development of a strong social attachment by precocial infant animals to their mother (or a substitute, initially Lorenz himself) and frequently involves a following response. Precocial young (typically birds such as goslings, ducklings, chicks, but also some mammals like lambs and goats) are born in a well-developed state (they are able to walk the same day they are born) and they typically follow the first moving object they see, normally their mother, and develop a strong attachment to her. The imprinting process in precocial young was thought to be confined to a short critical period very early in life, which had a definite onset and an equally well-defined end. The social attachment or preference was presumed to be permanent and irreversible. Bateson (1987a) has characterised this early version of imprinting as based on a permanent image left by experience on the 'soft wax' of the developing brain. Slower-developing altricial young (such as kittens, puppies, and human infants) also form social attachments but during a longer period of time, beginning a little later in life due to their slower maturation.

Subsequent research in the 1960s and 1970s (reviewed by Bateson, 1979 and Immelmann & Suomi, 1981) has led to a number of changes. The term 'critical period' has been replaced by 'sensitive period', with the latter term implying a less definitive onset and end. Evidence for an extended gradual decline in sensitivity was generated by a series of experiments by Immelmann (summarised in Immelmann & Suomi, 1981).

Both Bateson (1979, 1987b) and Immelmann & Suomi (1981) agree that the onset of the sensitive period is primarily determined by the sensory and motor development of the animal but can be altered by environmental changes. Bateson (1981, 1987a) has proposed a two-stage model based on competitive exclusion to explain the offset of the sensitive period. The first stage, called the recognition system, has a large capacity to deal with learning about familiar objects. The second-stage executive system controls behaviour and has a limited capacity. Bateson (1981) attributes the narrowing of responsiveness to familiar objects, which occurs in imprinting, to the connection from a particular store in the recognition system gradually dominating access to the executive system which controls social behaviour. This domination by the first object is not necessarily irreversible if a second object can also gain access to the executive system. The second object can come to be preferred at a later time if the majority of connections between the first object and the executive system become inactive.

The rate at which a stimulus gains control of the executive system seems to be related to a richness–impoverishment dimension. A rich stimulus, such as an animal's natural mother, dominates the executive function rapidly, while an impoverished stimulus gains access much more slowly. As the limited-access connections to the executive system are completed, the sensitive period draws to a close. Karsh (in Karsh & Turner, 1988) applied this model to her data for the sensitive period of socialisation in the cat, which will be discussed below.

Another important distinction between the 'critical' and 'sensitive' period is in restrictiveness. The critical period concept confined the development of attachment within its boundaries, while the sensitive period definition deals with relative difficulty and relative probability of forming social attachments. Within the sensitive period, attachments are formed easily and fairly rapidly. At other times, attachments may be formed, or preferences may be changed, but it is a much more tedious process involving extensive exposure. This, too, will be discussed below under 'Effects of later experiences with humans'.

Fox (1970) was the first author to consider the socialisation period in cats, stating that it began at 17 days; later, in a popular book (Fox, 1974) he mentioned a 'critical period' lasting from four to eight weeks, without providing any data to support this. Beaver (1980) stated that the socialisation period in cats 'probably ranges from three to nine weeks of age', but only cited work on dogs and Fox's popular reference. Until the work of Karsh (1983a, b), data on the timing of the socialisation period in cats had not been published. In an elegant series of experiments, already summarised in Karsh & Turner (1988), Karsh was able to show that the sensitive period of socialisation toward humans fell between the second and seventh week of kitten life. Her experiments involved human handling of the kittens for different durations and beginning at different ages and measured various responses to humans, in particular holding scores (or time remaining on a person's lap), latency times to approach a person, and other behaviour such as head and flank rubs, purrs and chirps. One set of results which speak strongly for a sensitive period between two and seven weeks of age appears in Table 10.1. (The results for timid cats will be discussed under 'Cat temperament/personality' below.)

Karsh interpreted her results in light of Bateson's (1981, 1987a) competitive exclusion model in Karsh & Turner (1988): kittens that are reared with their mother and littermates are exposed to strong, rich, biologically suitable stimuli. Those stimuli are expected to promote rapid growth of neural connections and thus gain access to the executive system controlling social behaviour. Since the executive system has limited access and rich stimuli can capture this access rapidly, other potential attachment objects, such as a person or persons must be present near the onset of the socialisation period in order to gain access to the executive system (i.e. to have social behaviour directed toward them). As objects become familiar to the kittens and capture access to the executive system (control social behaviour) the sensitive period draws to a close. This means it will be more difficult, but not impossible, for new objects to control social behaviour at a later time. (See also 'Effects of later experiences with humans', below.)

Table 10.1. *Holding scores in seconds as a function of handling period*[a]

	Handling period (weeks)			
	1–5	2–6	3–7	4–8
For all cats				
Group size	18	21	19	17
Holding scores	86.88	108.96	108.06	87.35
For non-timid cats				
Group size	13	17	16	13
Holding scores	109.98	126.05	120.45	103.57
For timid cats				
Group size	5	4	3	4
Holding scores	26.82	36.32	42.02	34.64

[a] See Karsh & Turner (1988) for details.

Other factors affecting cat-to-person attachment

Amount of handling

The amount of handling given kittens in the various studies has been different enough (between one minute to over 5 hours per day) to allow some conclusions regarding the amount required for adequate socialisation to humans. Generally, it can be said that the more handling a kitten has received the 'friendlier' it will be towards humans. Most experimental treat-

ments resulting in socialised kittens have handled them for 30–40 minutes per day (Karsh, 1983b; Rodel, 1986; Karsh & Turner, 1988). However, as McCune, McPherson & Bradshaw (1995) have pointed out, citing unpublished work by J. Bradshaw and S. Cook, there seems to be an upper limit of about an hour per day beyond which, further handling no longer produces dramatic effects.

To date nothing conclusive can be said about the effects of the form of handling on the kitten's later behaviour towards people. But it is well known that some adult cats prefer being stroked while sitting on the lap; others reject this, but still rest alongside their owners and allow stroking there. Whether this has to do with having been held on the lap as kittens is unknown; but it may also be related to coat length and/or general thermoregulation problems (see Turner, 1995a).

Number of handlers

Collard (1967) found that kittens handled by one person made more social responses than kittens handled by five persons. Karsh (1983b; Karsh & Turner, 1988) had eight kittens handled for 40 minutes daily from three to 14 weeks of age by one person and eight sibling kittens handled by four persons during the same period. Although most (but not all) of the one-handler kittens differentiated between 'their handler' and other persons, the holding scores between the one-handler kittens and their four-handler siblings did not differ. From these results it is clear that kittens (and adult cats: see 'Effects of later experiences with humans' below) are capable of developing a personal relationship with their individual 'handlers', but also that socialised animals are able to generalise their responses to other people (see also Turner, 1995a). An interesting, but as yet unanswered question, is whether handling by children during the socialisation phase affects the cat's later response to children, although some studies, e.g. (Mertens & Turner, 1988) have assumed this and had their animals handled by children before later testing with adults and children.

Mother presence during early contact with humans

Most studies on the effects of early handling of kittens on their later attachment to humans have ignored the fact that the mother cat is normally present during early kitten–human contact periods and may influence the course of events leading to the establishment of her kittens' relationships with humans. Turner (1985) proposed looking at the effects of both mother presence and early handling together, which Rodel (1986) later carried out. She found that when the kittens' mother was present (but restrained in a cage) in an encounter room along with an unfamiliar test person, the kittens entered the room on their own at an earlier age than those kittens tested without their mothers; but they went directly to and stayed near their mothers and not the test person. However, somewhat later, these kittens were still the first ones to start exploring the encounter room with the test person. It was Rodel's interpretation that at the beginning the mother cat and human can be viewed as competitors for the kitten's attention and that the more familiar mother wins at this stage. If the mother has been socialised to humans, her calm presence may reduce the kitten's anxiety (build up its confidence), allowing exploration of the environment (Rheingold & Eckermann, 1971), and through this, may actually facilitate establishment of a relationship between the kitten and human. If, on the other hand, the mother is shy (a condition Rodel did not have), she might induce her kittens to be even more frightened by humans than if they were exposed to people without their mother. Mendl (1986, cited in McCune *et al.*, 1995) has also shown that kittens are more confident when accompanied by their siblings and best socialised with their littermates.

The mother may also indirectly influence her kittens' attachment to humans in another way, if she has free access to areas outside the home. Turner (1988, 1995a) suggested that if she hides her nest with kittens for a sufficiently long period the first human contact may come late, even after the sensitive period for socialisation; and an interesting but, to date, unanswered question is whether mother cats who tend to do this are themselves less attached to their owners. But one should not assume *a priori* that only 'indoor' mothers produce candidates for well-attached kittens.

Feeding

For many cat owners, especially owners of cats free to roam outside the home, feeding time may represent one of the regular contact periods between the human and the cat. Additionally, owners often suggest that the family member who feeds the cat has a 'better' relationship with the cat than other family members. To test the effect of the act of feeding on the establishment of a new (albeit with adult cats) relationship,

K. Geering (1986) set up the following experiment. The cats in the author's research colony were fed by an animal caretaker in a large outdoor enclosure. During a control phase of 11 days, two persons unknown to the cats entered the enclosure immediately after they had finished eating and stood 'motionless' (without interacting with the cats) equidistant from the food trays on opposite sides of the enclosure. From day to day their positions were assigned randomly to eliminate any side-preferences the cats might have for the enclosure. During this control phase, one of the two test persons was statistically preferred by the cats, i.e. approached more often ($p < 0.005$). Then, during the following experimental phase, the non-preferred test person fed the cats without speaking to or touching them. He left the enclosure right away; then both test persons entered it again and took up their randomly assigned positions. During the first half of this experimental phase, the new 'feeder' was statistically preferred; during the latter half neither test person was preferred. Geering interpreted these results as follows: The act of feeding a cat can enhance the establishment of a relationship, but it is not sufficient to maintain it. Other interactions (stroking, playing, vocalising, etc.) are required to cement a newly founded relationship.

On the other hand, regular feeding at home certainly influences the potential for a long-lasting human–cat relationship by ensuring that a cat allowed outdoors more or less regularly returns to that home base. Food abundance and distribution play an important role in the size, location and overlap of home ranges in cats (see Chapter 7). People who feed 'stray' cats, regardless of their motives, may be establishing new relationships with them, possibly at the cost of the cats' relationships with other people (Turner, 1995b).

Effects of later experiences with humans

Although early experience with humans during the sensitive period probably produces more lasting effects on attachment than experiences gained after that period, the latter should not be ignored. In a field study Meier & Turner (1985) were able to classify 35 cats that Meier had encountered outside their houses into either 'shy' or 'trusting' behavioural types, based on their reactions to her. Later, the cats' owners qualitatively classified 32 of these 35 into the same type as the authors did. During the interviews, eight owners were able to answer the question, 'Has your cat had a negative experience with a stranger?' precisely and describe that experience. Six of their cats had been classified as 'shy', based on their reaction to the test person; two, as trusting. And for one of the latter two, the owner related that ever since her cat had been struck by a family member, the cat was trusting only toward strangers.

McCune *et al.* (1995) have proposed the term *social referencing* to refer to the broadening of an animal's experience during the juvenile period, i.e. after initial socialisation. Often (lay) people incorrectly use the term 'socialisation' for (usually desired or positive) effects of experience with conspecifics or other species after the initial socialisation period. I would not be opposed to using this term even after the juvenile period if it would help avoid confusion concerning what is truly meant by 'socialisation'.

Clearly juvenile and adult cats continue to have experiences with humans after the initial socialisation period. Interestingly, Podberscek, Blackshaw & Beattie (1991) found that their adult laboratory cats made even more direct contacts with an unfamiliar person than with a familiar one. Turner (1995a) proposed that negative and positive experiences with humans after the sensitive period work differently depending upon the whether or not the animal was truly socialised: a friendly, trusting cat needs only few positive experiences with a strange person to show positive behaviour towards that person, but significant negative experiences to override the initial (positive) socialisation. A shy, unsocialised cat requires a great deal of positive experience with a stranger to overcome its lack of experience during the sensitive phase; however, it reacts strongly (and negatively) to even minor negative encounters. The former, socialised cat generalises positive experiences quickly; the latter must learn to trust the individual person (or family) and does not generalise its later positive experiences, but if anything, its negative ones. This model still requires testing, but the personnel of cat shelters will attest to the outcome. Friendly animals are relatively easy to place permanently (or re-home successively) and can establish relationships with many people more quickly; shy (presumably non-socialised) cats require great patience and understanding on the part of the new owner, are more difficult to re-home, but tend to make good 'one person' or 'one family' cats if they are allowed to remain there (see also Chapter 11).

Cat temperament/personality

In this section, some of the points made in Chapter 4 on the origins, development and stability of individuality in the domestic cat will be expanded upon. As we shall see, there is an interplay between genetic effects and environmental conditions met during the sensitive phase of socialisation which lead to more or less stable cat temperaments and personality types.

Feaver, Mendl & Bateson (1986) assessed the distinct individual style or personality of 14 female cats living in a laboratory colony by observers' ratings and also by direct behavioural measurements. The two observers, who did not initially know the cats, familarised themselves with the cats' behaviour through both formal and informal observations in the cats' living quarters over a three-month period. At the end of this period, both observers rated each cat on 18 dimensions. Ten of these dimensions (e.g. active, aggressive, curious, equable) were adopted from a list developed by Stevenson-Hinde, Stillwell–Barnes & Zunz (1980) for rhesus monkeys and the other eight (e.g. agile, fearful of people, hostile to cats, vocal) were chosen by the authors. The correlations between the observers' ratings were significantly positive for 15 of the 18 rated items, but only those seven items where the inter-observer correlations were 0.70 or greater were used for further analysis. When inter-item correlations were calculated, the seven items fell into three groups: (a) alert = (active + curious)/2, (b) sociable = (sociable with people – fearful of people – hostile to people – tense)/4, and (c) equable. These three groupings seemed to be independent personality dimensions. When five of the personality scores obtained by ratings were compared to observational categories that were judged by the authors to be equivalent (e.g. sociable with people = approach + sniff + head and body rub observer), the correlations ranged from 0.60 to 0.85 and were all significant beyond the 0.02 level. Thus the rating of personality dimensions, which is usually regarded as subjective, seems to be reasonably reliable (inter-observer correlations) and valid (correlations between ratings and direct observations) when done by well-trained observer/raters.

As a follow-up to the study by Meier & Turner (1985, see above), Mertens & Turner (1988) conducted a more detailed ethological study of first encounters between 231 test persons and 19 adult colony cats in a standardised encounter room. They were able to qualitatively distinguish between two friendly (trusting, above) types – initiative/friendly and reserved/friendly – depending on whether the cat or the human made the first move to interact, and a rebuffing/unfriendly type. Still, individual differences between the cats (things affecting their 'personality': see Chapter 4) proved to be the most significant factor affecting the cats' behaviour towards the humans, more so than the sex of the cat (although all were neutered or spayed, see below), or the behaviour, age or sex of the human test partner.

Karsh (1983b; see also Karsh & Turner, 1988) became interested in personality differences and profiles in cats early on in connection with successful placement (rehoming) of her adult laboratory cats. She found that activity level and vocalisations seemed to be independent aspects of cat behaviour which were discernible early in life and remained stable during development. She also became interested in identifying cats that were shy, timid, or fearful. To test cats for timidity, she added a starting component to the apparatus used for approach testing, reasoning that timid cats would be more reluctant to emerge into the test situation. Her assistants also subjectively rated the cats on several dimensions, including timidity. When latency times to emerge from the starting compartment were examined for cats rated timid and confident, there were large, significant differences in the direction expected.

From the above-mentioned studies researchers in three widely separated laboratories, using different methods, have identified two common personality types: (a) Feaver, Mendl & Bateson's 'sociable, confident, easy-going', Karsh's 'confident', and Meier & Turner's 'trusting'; (b) Feaver *et al.*'s 'timid, nervous', Karsh's 'timid', and Turner's 'shy' and 'unfriendly'.

Once these individual differences in the behaviour and temperament of cats were established, researchers began searching for sources of that variation. Turner *et al.* (1986) located one rather surprising source using the methods developed by Feaver *et al.* (1986). Independent observers rated adult female cats and their offspring at two research colonies on the trait 'friendliness to people', defined as willingness to initiate proximity and/or contact. The persons showed high inter-observer reliability and, as in the Feaver *et al.* study, such global assessments of friendliness correlated well with measured behaviour towards humans. Turner *et al.* found that at both colonies the friendly-ranked offspring were disproportionately

distributed between one of the two fathers present, although the offspring had never come into contact with their fathers at either colony. Only in the colony where the various mothers had lower coefficients of relatedness (greater genetic variability) could they find a significant mother-effect on this trait, which of course, could be modificatory and/or genetic. The authors stated that they did not find evidence for direct inheritance of the behaviour involved, since it is just as likely that shared genes from the father could generate common personality characteristics in the offspring through an effect on, for example, the growth rate and, thereby, on their socialisation to humans. Nevertheless their results demonstrated that offspring from a particular male are reliably different from those of another particular male; variability on the trait 'friendliness to humans' (or a correlate thereof) was at least partly explained by paternity.

Indeed, McCune (1992, 1995; see also Chapter 4) discovered precisely that correlate of Turner *et al.*'s (1986) 'friendliness to humans'. She conducted a developmental study to examine the interaction between early socialisation effects *and* friendliness of the fathers on the cats' later friendliness to people. In an elegant experimental design, kittens were either handled between two and 12 weeks (the socialised animals) or received no handling (unsocialised) then. They were sired either by a 'friendly' or an 'unfriendly' father in the colony. Later, when one year old, these offspring were tested for (1) response to a familiar person, (2) response to a stranger, and (3) response to a novel object. McCune established that the socialised cats or those from the friendly father were quicker to approach and interact with a test person, spent more time close to that person and were more vocal. Differences were found in the cats' response to a novel object, but these could not be related to differences in early socialisation. However, the cats from the friendly father were quicker to approach, touch and explore the novel object, and stayed closer to it, than the cats from the unfriendly father. McCune (1995) correctly reinterpreted the genetic contribution to 'friendliness towards people' in cats as *boldness* – a general response to unfamiliar or novel objects (which might indeed be people).

Reisner *et al.* (1994) also found a significant paternity effect on 'friendliness to humans' (although they did not control for novelty, as McCune did), but no effect of earlier handling! However, their kittens were early-weaned, separated from their mothers at 4–5 weeks, and handled only between weeks 5 and 8 for only 15 minutes three times per week over three weeks. Since the sensitive period of socialisation runs from the second to the seventh week of life, they were only handled during the latter half and either this, or the fact that handling was rather minimal, might explain why no significant handling effects were found on later (between eight and 20 weeks of age) responses to humans.

Further genetic effects on cat behaviour and temperament are discussed in Chapter 4 and will be touched upon again when influences of the cat help to explain differences between human–cat relationships (below).

Person-to-cat attachment

Whether humans have a sensitive phase of socialisation responsive also to other species has not yet been established. Serpell (1981), however, was able to demonstrate that companion animals are most frequently found in households in which the adults had experienced pets themselves as children. And they usually are of the same species as experienced earlier. Since cats and dogs use different communication signals (see Chapter 5 for cats), it is reasonable to expect that one feels most comfortable with the species one has already learned to understand (Turner, 1995c).

Turner & Stammbach-Geering (1990) used a modified 'semantic differential test' after Serpell (1983) to enable cat owners (adult women in that study) to subjectively assess the behaviour and character traits of their cats (both real and ideally) and relationship qualities. The same persons were also observed during interactions with their animals and later the subjective assessments were combined with the ethological data for interpretation (Turner, 1991, but see also 1995a, c). Turner and Stammbach-Geering found significant positive correlations between self-reported level of affection towards the cat and self-estimated level of affection by the cat towards the owner, for both the real cats and the ideal situation. Level of affection towards the cat also correlated positively with several other items: general cleanliness of the cat, regular use of the cat toilet, curiosity, playfulness and predictability. Self-estimated affection towards the owner correlated positively with the cat's suspected enjoyment of physical contact with the owner, its general proximity to the owner, its predictability, its general cleanliness and its 'likeness to humans' (anthropomorphically speaking).

In the first edition of this book, Karsh differentiated between two types of person–cat relationships in her cat placement programme depending on attachment level (see Karsh & Turner, 1988): strong attachment (cat lovers) and weak attachment (low involvement cat adopters). She used the Pet Attachment Index (Friedmann, Katcher & Meislich, 1983) and found that people who had kept their rehomed cats for a year or longer scored significantly higher than those who had given them up. There are various tools available now to measure attachment to pets (e.g. Garrity *et al.*, 1989; Stallones *et al.*, 1990; Johnson, Garrity & Stallones, 1992; Bradshaw & Limond, 1997; see also 'Mechanisms explaining the human–cat bond' below), but each has advantages and disadvantages. In particular, Zasloff (1996) showed that when used to compare attachment levels to dogs and cats, one has to be careful that the questions asked are equally applicable to both species, i.e. not biased towards one species.

Factors influencing choice of a cat

Aside from previous experience with cats (or dogs) mentioned in connection with the Serpell (1981) study above, little research has been conducted on the motives for selecting a particular cat. Karsh (in Karsh & Turner, 1988) reported from her cat-placement study that appearance of the cat, particularly the cat's colour, was usually the most important factor, followed by size and weight (particularly amongst elderly persons). She found that people often seem to have a prototype or idealised image of what a cat should look like. This is often based on a cat they have known and liked, either one's own former cat (once they have finished grieving), the family's cat when they were young or that of a friend.

More research is needed to enable better matching of the cat and the person, with independent measures of success, e.g. attachment levels, meshing of the interactional goals of both relationship partners (see 'Relationship quality', below), or return-to-shelter rates. One point has already been made by Karsh & Turner (1988) and still holds, given more recent research on individuality (and in spite of genetic coat colour effects on behaviour, see Chapter 4), cat temperament and personality (see above; McCune *et al.*, 1995; also Fogle, 1991), breed differences (Chapter 4; Turner 1995a, c, and below) and other differences between relationships (reported below): more than just the appearance of the cat needs to be considered when selecting a future partner.

Mechanisms explaining the human–cat bond

Several theories have been drawn upon to explain the widespread popularity of pets (cats included) beyond the universal human tendency to adopt and raise young, sick or injured wild animals, mentioned at the outset of this chapter and probably related to the '*Kindchenschema*' (infantile stimuli eliciting an innate nurturing response); most notably 'attachment theory' (Bowlby, 1969) and more recently 'social support theory' (Collis & McNicolas, 1998).

Turner and Stammbach-Geering (1998; Stammbach & Turner, 1999) and Kannchen & Turner (1998) have attempted to determine the relative importance of attachment to the cat, social support by other human beings available to the cat owner and emotional support from the cat as perceived by the owner in explaining the human–cat bond. The researchers used two measures each of the attachment of *c.* 300 women to their cats (Lexington Attachment to Pets Scale [see Garrity *et al.*, 1989,; Stallones *et al.*, 1990; Johnson *et al.*, 1992] and Bradshaw's Attachment Scales [Bradshaw & Limond, 1997, and personal communication]); two measures each of perceived social support from other persons (Social Support Questionnaire SSQ6 [Sarason *et al.*, 1983, 1987] and the Norbeck Social Support Questionnaire [Norbeck, Lindsey & Carrieri, 1981, 1983]); and Bradshaw's Emotion Support Scale (Bradshaw & Limond, 1997, and personal communication) to assess emotional support provided by the cat to the owner. Correlation analyses indicated that both attachment scales (to the cats) and both social support tools (from other persons) yielded similar results. Turner and Stammbach-Geering found a significant positive correlation between both attachment to cat scales and the perceived amount of emotional support provided by the cat, but also a negative correlation between social support provided by other persons and attachment to the cat. However, there was no correlation between perceived emotional support available from persons (a subset of one of the human social support measures) and that available from the cat. Kannchen and Turner selected a subset of these women with extreme positive and negative values for attachment to their cats and social support from other persons for direct

observations of the interactions between these persons and their cats. They found that 'attachment to the cat' significantly affected interactive behaviour, but not social support levels. The authors concluded that cats cannot replace humans in the social network, but provide an additional source of emotional support, especially when attachment is strong; cats are indeed 'significant others' for these persons.

Rieger & Turner (1998, 1999) have looked more closely at the emotional support that cats provide their owners. In particular they have analysed the effects of human moods, especially depressive mood, on interactions with cats by single men and women, and vice versa. Moods before and after one 2-hour observation period in each household were assessed with a standard psychological tool, again several weeks later without the observer being present, and in a similar sample of single persons who were former cat owners, again without the observer there. They found that single persons showed more social behaviour with their cats, the more 'inactive', 'sensitive', 'fearful' and 'depressed' they felt in the course of the two hours. For those persons who were less depressed at the end of the observation period than at the beginning, the researchers found that the cats more frequently reacted to their expressions of need for social contact, than for persons who were equally or more depressed at the end of the observations. Generally, the cats showed the same level of interest in social contact irrespective of the owner's mood; however within an ongoing social interaction, they reacted sensitively to mood, showing more social behaviour towards 'excited', 'extroverted' and 'depressed' persons. The comparison between current and former single cat owners indicated that the latter were generally more 'inactive', 'sensitive', 'introverted', 'fearful' and 'depressed'. Rieger and Turner concluded from these and other results that ownership and interaction with a cat can indeed contribute to alleviating negative moods in their owners, but not necessarily to improving already positive moods, which presumably interactions with other people can.

One further point should be made in connection with mechanisms explaining the human–cat bond. Turner & Stammbach-Geering (1990) discovered a negative correlation between the subjective owner ratings of the cats' independence and their 'likeness to humans'. The more 'independent' the cat is perceived, the less 'human-like' it is, i.e. the owner considers him- or herself to be more 'dependent'. On the other hand, the less independent (the more dependent) the cat is perceived to be, the more 'human-like' it is rated. All owners in their study had high-quality relationships with their cats, both subjectively and objectively (in Turner, 1991) measured. In other words, both humans who consider themselves as being 'dependent', and those who consider themselves to be 'independent' gain something from the cat, which might help explain the widespread popularity of this companion animal species.

Differences between relationships

In this section, the influences of the cat, the person and of housing conditions on human–cat interactions and relationships will be summarised before closing the chapter with a consideration of overall relationship quality.

Influences of the cat

Behavioural style/personality

As mentioned above and discussed in detail in Chapter 4, individuality, or a cat's personal behavioural style, is one of the most salient features of cats and is highly appreciated by most owners (Bergler, 1989; but see Chapter 9). The influence of individuality is so strong that it has to be dealt with, one way or the other, in every study of cat–human interactions; it can become the focus of attention for the researchers, or it must be statistically 'eliminated', so as to allow investigation of the influence of other factors (see below) on behaviour and interactions (Turner, 1995a).

Social relationships can be defined by the content, quality and temporal patterning of their component interactions (Hinde, 1976; Hinde & Stevenson-Hinde, 1976; see Turner, 1995c). Many different kinds of interactions can take place in any given human–cat pair, e.g. feeding interactions, play interactions, vocal interactions and so on. Most human–cat relationships appear to be 'multiplex', although some may indeed be 'uniplex' relationships – based only on one type of interaction, e.g. just feeding the cat (see Hinde, 1976). I suspect that this can also be related to Karsh's (Karsh & Turner, 1988) strong and weak attachment (low involvement) relationships and generally to relationship quality (see below). The importance of the diversity of interactions involved is not to be underestimated, since each partner in the relationship

learns more about the behavioural style, the personality, of his or her counterpart by interacting in different situations (Turner, 1995c). Along with the differences already reported under 'Cat temperament/personality' above, Mertens & Turner (1988), Mertens (1991) and Turner & Stammbach-Geering (1990) have found evidence that adult cats can also be differentiated according to their preferences for social play and physical contact with their owners. Since all kittens and most juveniles play, but not all adult cats, this is one aspect of the individual cat's personality that must be learned in the course of interacting.

Sex and age

In none of the ethological studies of cat–human interactions to date by the author's team was 'sex of the cat' found to be a significant influence (e.g. Mertens & Turner, 1988; Mertens, 1991; Turner, 1995a, 2000). However, most cats in these studies, indeed most cats in the owned population, were either neutered or spayed, and more research is required here before any conclusions can be drawn. Fogle (1991) conducted a survey of 100 practising veterinarians asking them to rank different breeds or colours of cats according to ten different personality characteristics; in that same questionnaire he also asked them to rank intact males, neutered males, intact females and neutered females along similar characteristics. Although somewhat difficult to interpret because of unclear labelling of the graphs (mixing the breed/colour question in the accompanying text with sexual status data in the graphs), he did secure indications for differences, in particular, between intact and neutered animals of each sex. These need to be substantiated by independent observational data which would reduce any bias of subjective ratings in his study.

Other than for obvious differences between kittens/juveniles and adult cats on such behaviour as play or sexual activities, I am unaware of any observational study comparing the behaviour of adult cats of different ages towards their owners. From popular reports and personal observations one can probably expect reduced activity levels (including reduced play behavior) in older animals; since the pet food industry has begun to produce and market meals specially made for older animals and based upon changing nutritional requirements, this is also presumably correlated with changes in activity levels which could also affect interactions with owners.

Breed

As mentioned in Chapter 4 and above, very few observational studies comparing the behaviour of different cat breeds have been conducted. Given the large number of reports of breed differences in popular cat books, and indications from studies based upon subjective ratings of character differences between breeds (Hart & Hart, 1984; Fogle, 1991), behavioural differences that also influence the human–cat relationship can be expected. Turner (1995a, 2000) recently conducted one study, which combined subjective assessments of breed behaviour and relationship traits with independent ethological observations of behaviour and interactions, and compared non-pedigree, Persian and Siamese cats. Siamese and Persian cats were selected for that study since they represent more or less opposite extremes of behavioural or personality types. Not only were differences in the subjective assessements found between the breeds, most of which favoured the purebred animals (Table 10.2), these were substantiated by the direct observational data. However, fewer rating differences were found between the two purebreds, than between each breed and the non-pedigree cats (everyday house cats), suggesting that convergent (though artificial) selection has taken place to produce socially more interesting companion animals. Those (few) differences which did appear, were those expected from the popular character descriptions.

Influences of the person

Several studies have found significant differences in human behaviour and attitudes which influence the human–cat relationship. Bergler (1989) reported that women were more involved in the care of cats than men, also substantiated by data on interaction time from Mertens (1991). Nevertheless, Mertens & Turner (1988) conducted controlled experiments comparing the behaviour of cats toward (unfamiliar) men, women, boys and girls, first when the persons were not allowed to interact, then when they were allow to do as they pleased in the encounter room. The adult cats showed no differences in their spontaneous behaviour towards men, women, boys and girls, but reacted strongly and differentially when the test persons were allowed to interact, i.e. the cats showed differences in behaviour towards the four categories of persons as a *reaction* to differences in their behaviour. Men tended to interact from a seated

Table 10.2. *Comparison of ratings between non-pedigree and pedigree cats*[a]

Trait	Mean rank		
	Non-pedigree	Pedigree	*p* value
Affection to owner	49.8	69.0	≤0.001
Proximity	49.5	69.3	≤0.001
Friendliness to strangers	51.5	67.2	≤0.01
Directed vocalisations	51.7	67.0	≤0.01
Dietary specialisation	52.4	66.1	≤0.05
Use of cat toilet	53.9	64.6	≤0.05
Owner affection	53.3	65.2	≤0.05
Curiosity	52.9	65.6	≤0.05
Predictability	53.0	65.5	≤0.05
Urine spraying	63.4	54.3	≤0.05
Independence	64.3	53.2	≤0.05
Aggressiveness	63.7	53.8	≤0.1
Enjoyment of physical contact	54.6	63.8	≤0.1
Cleanliness	55.4	62.9	≤0.1

Mann-Whitney *U* tests, corrected for ties. $n = 61$ non-pedigree cats, 56 pedigree cats.
[a] From Turner (1999).

position, while women usually went down to the level of the cat, i.e. onto the floor; the same tendency was found for the boys and girls. Adults usually waited for the cat to make the first approach, whereas the children, especially the boys, tended to approach the cats first and the boys followed a withdrawing cat more frequently (which was not especially appreciated by the cats). Women stroked their cats in private households more often than men, interacted more often at a distance (when the cats were more than 1 m away) and were more vocal in their interactions with cats than men (Turner, 1995a). It therefore did not come as a surprise that the cats' 'willingness to comply to an intention to interact' from women was significantly higher than from men (see below, 'Relationship quality' and Turner 1995a, c, 2000).

Turner (1995a, 2000) has conducted the only study comparing the behaviour and attitudes of elderly (retired) cat owners with those of younger adults. He had predicted that the elderly persons would be more particular about their cats' character traits (e.g. greater differences between the ratings for actual and ideal cats), but found that they accepted the 'independence' of their cats better than the younger adults. The original hypothesis was based upon a positive correlation found by Turner & Stammbach-Geering (1990) between the number of cats previously owned and the number of traits showing a significant difference between actual and ideal ratings. It also tacitly assumed that the elderly persons had indeed owned more cats over the years, which was not assessed; but the earlier study did not include elderly persons either, which might explain the difference.

Influences of housing conditions

Three housing conditions have been analysed as to their effects on cat behaviour, interactions and human attitudes toward the cats (Turner & Stammbach-Geering, 1990; Mertens, 1991; Turner, 1991, 1995a, c): number of persons in the household, number of cats there and whether or not the cats are allowed outdoors. The smaller the human family, the more social attention the cat gives each member, social play lasts longer and more contact rubbing (head/flank rubbing) is shown (Mertens, 1991). Single cats spend more time interacting with their owners than cats in multiple-cat households, whereas this difference was due to differences in human behaviour towards the cats in single versus multiple-cat households (Turner, 1991). Perhaps single cats are more pampered by their owners than those in multiple-cat households. Indeed, owners of single cats were less bothered by their cats' fussiness about food and more tolerant of their cats' curiosity, than the owners of multiple cats (Turner & Stammbach-Geering, 1990).

Indoor cats are generally more active, but show less contact rubbing on their human co-inhabitants than cats with outdoor access (Mertens, 1991). Cats allowed outdoors do much more 'greeting' (rubbing) when they come home from an excursion. Indoor cats spend proportionally more time interacting with their human partners than outdoor cats do when they are at home. Turner (1991) was able to demonstrate that this was due to more contact initiation by the indoor cats than by 'outdoor cats' when at home, suggesting that the human partners may be an important source of stimulation for the former (perhaps compensating for lower environmental richness indoors). Outdoor cats were also rated by their owners as being less curious than indoor cats, also suggesting that indoor cats actively seek stimulation, either with objects or people. Lastly, owners of cats allowed outdoors rated

their animals higher on the trait 'independence' and, more significantly with respect to relationship quality, also stated that their cats *should be* more independent, than did the owners of indoor cats, who more often expressed a desire that their cats remain very close to them (Turner & Stammbach-Geering, 1990; Turner, 1991).

Relationship quality

As suggested above in connection with matching the cat to the person, independent measures of relationship quality or success are needed. Since relationships always involve more than one partner, 'quality' should also be assessed from the standpoint of all partners, in our case, that of both the human and the cat. Only Turner (1991, 1995a, 2000) has attempted this by looking at 'intentions' to interact by each partner (approaches and directed vocalisations) and the response or 'willingness to comply' by its counterpart. It was therefore possible to measure the degree to which the interactional 'goals' of each partner 'meshed' (Hinde, 1976) with those of the other. Over all human–cat pairs investigated, this measure for the cat and for the human correlated significantly and positively. If the person complies with the interactional wishes of the cat, then at other times the cat will comply with the interactional wishes of the person. The more the owner does so, the more the cat reciprocates. The fact that the human–cat relationship can exist at low levels of 'willingness to comply with the partner's interactional wishes', as well as at high levels, allows a full range of different interactional intensities from which people can choose and to which the cat adjusts (Turner, 1995c). There is a degree of symmetry in the relationships at all levels of 'willingness to comply'. But when one compares relationships in which both partners show high compliance with those in which both partners show low compliance, one finds that high compliance on the part of the human is also associated with high acceptance of the cat's 'independence'. This, in turn, has been shown to be associated with a higher proportion of the 'intentions to interact' being due to the cat (relative to the person), and also with a higher total interaction time (Turner 1991, 1995a). Thus it would appear that acceptance of a cat's independent nature might indeed be one of the secrets of a harmonious human–cat relationship.

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