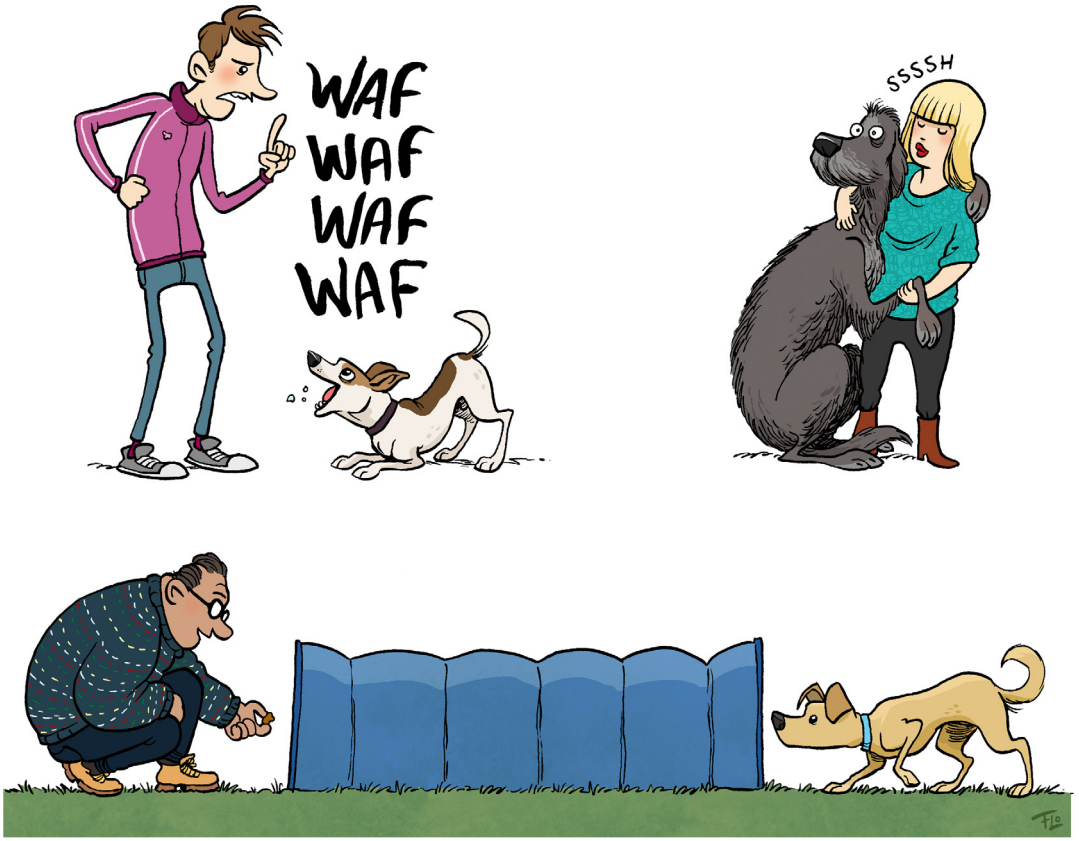
Dog-directed parenting styles



I.R. van Herwijnen

Propositions

1. Raising dogs properly is a balancing act of parental demandingness and responsiveness (this thesis).

2. Dog ownership satisfaction is based more on the perceived low costs of having the dog than on the emotional closeness to the dog (this thesis).

3. The value of science lies in learning more than in knowing.

4. Social issues are not solved by citizen science.

5. If a bridge cannot be anchored, one should not continue building it.

6. Tunnel vision is the result of a professional becoming a specialist, without adopting the attitude of a generalist.

Propositions belonging to the thesis, entitled

Dog-directed parenting styles

Ineke Rombout van Herwijnen

Wageningen, 28 August 2020

Dog-directed parenting styles

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Dog-directed parenting styles

I.R. van Herwijnen

Thesis

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"Upon reaching the top of a mountain
we look back and realise
it was not reaching the summit,
but the journey towards the summit
that made us who we are."

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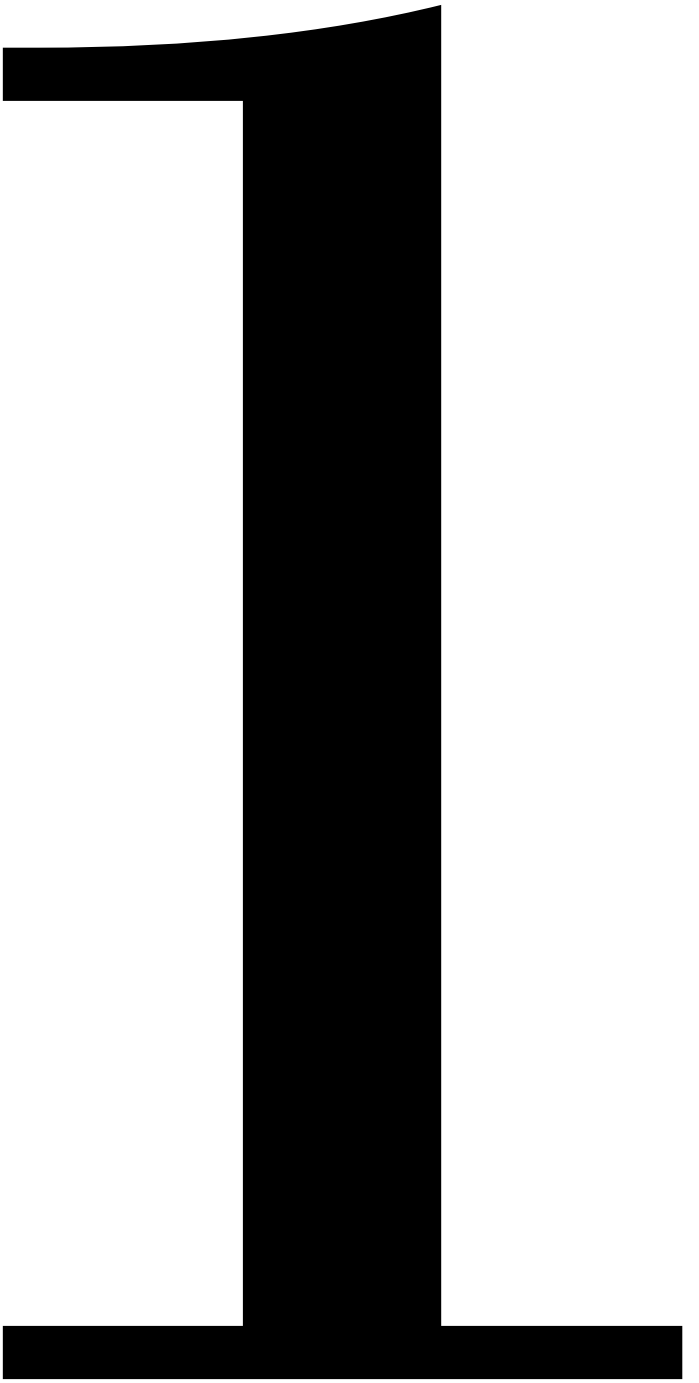


Chapter 1

General introduction

The human-dog relationship

The dog's living environment has included humans with the start of domestication tens of thousands of years ago (Davis and Valla, 1978; Larson et al., 2012; Ovodov et al., 2011; Perri, 2016). Evolutionary change in the dog has been described as co-evolution with humans (Schleidt and Shalter, 2003), although others argue it is 'parallel selection for tameness' (i.e. being 'nice') at most (Kotrschal, 2018). Either way, evolutionary change in the dog has adapted the species to living with humans, behaviourally and physiologically. Dogs adapted to our diets and have increased starch digestion ability in comparison to their ancestor the wolf (Axelsson et al., 2013). Today, in Western societies the dog lives either as community/stray dog or in a close relationship with its owner. Humans control the living environment of the community/stray dog also, but have the most profound influence on the dog that is kept as companion and/or working dog (Akey et al., 2010; Hayward et al., 2016; Parker et al., 2017). For the latter, humans determine the genotype through breeding selection (Akey et al., 2010; Parker et al., 2017), the phenotype, including weight status and consequential health risks (Hayward et al., 2016; Mlacnik et al., 2006; Sibley, 1984), and humans have a near absolute control over the dog's living environment including its behavioural opportunities. For instance, humans select the dog's pack members. Companion dogs were found to live without a conspecific in three quarters of the households in the United Kingdom and Australia (Robertson, 2003; Westgarth et al., 2007). Also, humans determine the amount of time that the dog is without its humans and cannot interact socially. Three quarters of Swedish dog owners reportedly left their dog at home alone during working hours (Norling and Keeling, 2010). Furthermore, humans restrict the dog's movement by living indoors and/or being walked on a leash. Leash-walked dogs were seen to sniff other dogs less and to threat display twice as much towards other dogs through baring teeth, growling or snarling, based on recorded spontaneous dog-dog interactions (Řezáč et al., 2011). Thus, while in the past decennia the dog has become increasingly a part of our homes and families, at the same time the dog's (social) life has become increasingly restricted, such as by mandatory leash-walking in areas where off-leash walking is prohibited (Fox and Gee, 2019; Price, 1999). Changes in the human environment, like the ongoing process of urbanisation (Chatel et al., 2017; Guastella et al., 2019), digitalisation (Brito, 2011; Dufva and Dufva, 2019) and individualisation (Dawson, 2012; Hofmeister, 2013) will affect the dog's environment, through the shared living space and through the close human-dog relationship.

The close human-dog relationship hinges strongly on the dog's marked human-directed attention, social behaviour and attachment bonds. Human face gazing was seen in dog puppy's, but not wolf puppy's (Gácsi et al., 2005). Dogs have even been found to work harder to maintain contact with a human stranger than with a dog from their own

household (Mariti et al., 2014) and shelter dogs readily bond with human strangers (Gácsi et al., 2001). The latter based on findings that they rapidly approached and maintained physical contact for more than seven seconds with a stranger during separation-reunion sessions (Gácsi et al., 2001). Dog to human attachment expresses in all the four basic elements of safe haven, secure base, separation distress and proximity seeking, as found in a variety of studies (Mariti et al., 2013; Palestrini et al., 2005; Palmer and Custance, 2008; Payne et al., 2015; Prato-Previde et al., 2003). Thus, humans determine the dog's world physically and socially, making them responsible for providing dogs with a good living environment and appropriate levels of care.

Benefits and risks of the human-dog relationship

Appropriate dog care contributes to a good human-dog relationship, thus benefitting both humans and dogs. Humans receive companionship from their 'surrogate family member', with dogs taking this role more strongly for the increasing number of people living in 'non-traditional family settings' (Blackstone, 2014). Indeed, couples without children spent more money on companion animals, including dogs, than those with children (Henderson, 2013). In part, this could reflect budgetary resources, as couples with children may have less money to spend on the dog. However, further proof of a companion animal's importance to those living without (many) human companions was found in a study with adult female students (Zasloff and Kidd, 1994). Students living with a companion, whether it was human or animal, were less lonely than those living alone and those students who had only a dog as companion reported higher attachment to it than students living with a human as well (Zasloff and Kidd, 1994). Humans benefit from living with dogs in more ways than experiencing companionship. Dogs are known to present humans with social benefits, health benefits and even work benefits. Although most evidence presented on these benefits is associative, rather than causal, the topic has been well-researched. Social benefits are suggested by the higher self-reported social functioning scores in dog owners than non-dog owners (González-Ramírez and Landero-Hernández, 2014) and dog ownership promotes social support networks, as concluded from focus groups held with elderly dog owners (Knight and Edwards, 2008). Health benefits for dog owners are indicated by the four times greater odds of meeting the physical activity guideline of 150 weekly walking minutes, as compared to non-dog owners in the United Kingdom (Westgarth et al., 2019a). Finally, work benefits of dogs apply to a wide range of occupations. Livestock guarding dogs effectively reduced livestock predation at Australian livestock farms (Van Bommel and Johnson, 2012) and drug detection dogs were considered useful to the Polish police force, although their performance depended on circumstances such as the search environment and training level (Jezierski et al., 2014). Clearly, dogs make valuable contributions to human lives and society, but there are drawbacks. Dogs can pose health risks to humans, for instance

through biting incidents. More than half of the twelve-year olds in the US reportedly experienced a biting incident at some time during their young lives (Spiegel, 2000) and emergency departments treated 1.6 million US citizens for dog bites between 2005-2009 (Quirk, 2012).

The dog's outcomes of the human-dog relationship are two-sided also, with the appropriate care by humans playing an important role in increasing the benefits. At a population level, dogs benefit from living close to humans. Today, dogs outnumber their ancestor the wolf a thousand to one, with an estimated 400,000,000 dogs and 400,000 wolves in the world (Coppinger & Coppinger, 2001; Leonard et al., 2005). A quarter to half of the households in Western societies are dog-owning (Westgarth et al., 2019b). However, humans can seriously impair a dog's welfare. For instance, the dog's genotype has been adjusted by man-made selection to produce extreme morphological forms that are appealing to some and facilitate a closer owner-experienced relationship (Sandøe et al., 2017). This goes at the cost of the dogs as these extreme forms cause them to be seriously hindered/ill and have shortened lives (Collins et al., 2010; Nicholas et al., 2010). Brachycephaly, the shortening of the facial skeleton, as seen in Bulldogs and Pugs, can cause severe breathing difficulties, among other debilitating syndrome aspects (Packer et al., 2015), and abnormalities of the tail or skull can predispose dogs to spina bifida or syringomyelia (Collins et al., 2010). In addition to extreme morphology, the dog's living conditions may be restricted and/or inadequate for the species' requirements, like spending much time alone (Robertson, 2003; Westgarth et al., 2007) or having little exercise (Fox and Gee, 2019). Finally, a dog is typically guided and trained to socially behave in its human-determined living environment, and the way this is done can greatly affect its welfare. Harsh guidance and training increases fear and stress in dogs, as evident from the low body postures in dogs that were subject to aversive stimuli during military dog training (Haverbeke et al., 2008). Such training effects can even continue outside the training setting, as seen in lower tail positions and increased stress signals in dogs trained with electronic devices as compared to a control group when these dogs were not in a training area (Schilder and Van der Borg, 2004). That dogs benefit from appropriate training seems evident though, and inadequate guidance and training led to insufficiently displaying social behaviour, that is 'obedience', at least in dogs weighing less than twenty kilograms (Arhant et al., 2010).

The human caregiving system may play a significant role in dog welfare and aforementioned risks. The ways dogs are raised and cared for, that is 'parented', likely affect the quality of lives of both the dog and its owner. Unfortunately, little science has been conducted on this dog-directed parenting and on how it may facilitate the dog's adaptation to the human environment it lives in. This lack of information on dog-

directed parenting, variations in the expressions thereof and on associations with owner/dog-parameters, warrants research into this particular form of interspecies caregiving.

Human care and parental systems

Caregiving as a behavioural system is about the care provided to infants of a species and thus determines evolutionary success (Bowlby, 1988; George and Solomon, 1999). The infant's survival chances increase through the caregiving aspects of protection and resource provisioning (Bowlby, 1988; George and Solomon, 1999). Notwithstanding the evolutionary benefit of appropriate caregiving, what is regarded as such differs between people. Concepts of appropriate care are defined by cognitive control systems that integrate functional behavioural sequences and mental representations (George and Solomon, 1999). The mental representations of (appropriate) caregiving develop during childhood/adolescence as an infant is being cared for and grows up in a social environment (George and Solomon, 1999; Olsen et al., 2001). The social environment, including living conditions, reflects in parenting (Rankin and Quane, 2002; White et al., 2013). An example is the high level of parenting control exerted by mothers that live in high-risk neighbourhoods (Gonzalez et al., 1996). Even cultural aspects, as a reflection of the social environment, affect parenting. For instance, higher parental rejection was seen in Mexican American parents than in European American parents (Mahrer et al., 2019). As the infant grows up in this social environment and receives care that is characterized by several elements, it forms mental representations of caregiving. Once installed, the mental representations affect the grown up as in turn it provides care to others. Nevertheless, the caregiving system is to some extent a flexible system: through the process of assimilation new experiences and knowledge can be integrated into existing mental representations (Van IJzendoorn et al., 1995; Huber et al., 2015), and this provides opportunities to steer humans towards appropriate caregiving as to benefit those receiving care.

One way of steering may be through parenting styles, as the mental representations that are part of the caregiving system express in these styles. Parenting styles reflect patterns of parenting, based on underlying values that parents have (Darling and Steinberg, 1993). The styles reflect the emotional sphere in which parenting takes place and affect child outcomes regarding cognition, social-emotional health and societal adjustment (Baumrind et al., 2010; Smetana, 2017). Of the styles, the authoritative parenting style is regarded optimal as it results to a higher degree in children that are happy, capable and successful (Hoeve et al., 2011; Simons and Conger, 2007; Spera, 2005; Wing Chan and Koo, 2011). This authoritative parenting style is optimal in balancing the need for demandingness (as to keep the care dependent safe and to teach it how to behave in a socially adapted manner) and responsiveness (as to allow the care dependent sufficient

developmental space and adhere to his/her need to be seen and heard). These two dimensions are both strongly expressed in the authoritative style, but only weakly in the disengaged, neglectful parenting style, also known as the uninvolved style, which resides at the opposing quadrant in the two-dimensional space of parenting. Particularly this uninvolved style is thought to reflect a suboptimal functioning of the caregiving system. In a third, permissive style, demandingness is low, but responsiveness high and in a fourth, authoritarian style, demandingness is high, but responsiveness low (Baumrind, 2013). Table 1 presents characteristics of each of these four parenting styles.

Table 1 – Characteristics of parenting styles (Baumrind, 1991)

Parenting style	Characteristics of style
Authoritarian style	High in demandingness and in psychological control, low in responsiveness. Children are expected to follow strict rules established by parents. Reasoning is not explained. Failure to adhere to rules results in punishment.
Authoritative style	High in demandingness and responsiveness, low in psychological control. High demands placed on children, which are expected to behave properly. Judgements, values and goals are explained to children and parents are more open to give and take.
Permissive (indulgent) style	High in responsiveness, low in demandingness. Children do not have many rules to adhere to, few demands are made of them.
Uninvolved (disengaged/ neglectful) style	Low in responsiveness and demandingness. Children are made few demands, and are communicated to at low rates.

Parents and parenting ways are diverse. Therefore, the original four parenting styles described above were later complemented with 'intermediate' forms of parenting. Based on observational and interview data of 87 families, seven parenting styles were identified (Baumrind et al., 2010; Figure 1). The styles of authoritative, directive and democratic grouped as balanced-committed and the good-enough style is moderately responsive and demanding. Authoritarian, uninvolved and permissive styles grouped as imbalanced-uncommitted. Also, five coercive parenting practices (unqualified power assertion, arbitrary discipline, psychological control, severe physical punishment, hostile verbal criticism) and two confrontive practices (behavioural control, normative spanking) surfaced in variable centred analysis (Baumrind et al., 2010). The pattern of coercive control is manipulative, punitive, autonomy undermining, restrictive and -most importantly- intrusive, whereas the pattern of confrontive control is demanding, firm and -most importantly- goal orientated and reasonable (subject to rational justification and negotiation; Barber and Xia, 2013; Baumrind et al., 2010).

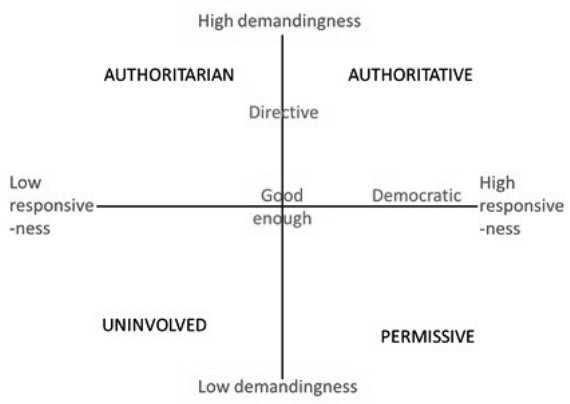


Figure 1–Baumrind's seven parenting styles

Even though up to seven parenting styles may be identified, measurement of parenting styles is done mostly on the three original styles of authoritative, authoritarian and permissive parenting (Olivari et al., 2013). Studies on parenting styles are typically questionnaire-based, often using the 62-item PPQ (Parenting Practices Questionnaire) developed by Robinson et al. in 1995. This questionnaire is referred to by some authors as the 62-item PSDQ (Parenting Style and Dimensions Questionnaire) and here onwards referred to as 62-PSDQ (Olivari et al., 2013). The 62-PSDQ was developed to identify the parenting styles of authoritative, authoritarian and permissive parenting, through self-report by parents of (pre)school-aged children. Of the 62 items, 27 measure the authoritative style, twenty the authoritarian style, fifteen the permissive style. The later adaptation into the 32-PSDQ reduced the authoritative scale to fifteen items, the authoritarian scale to twelve items and the permissive style to five (and see Table 2 for the items of the 62-PSDQ and 32-PSDQ items in bold; Robinson et al., 1995; Robinson et al., 2001).

Table 2 – 62-PSDQ items per parenting style, with in bold items remaining in the 32-PSDQ (Robinson et al., 1995; Robinson et al., 2001)

Item	Parenting style
1. I encourage our child to talk about the child's troubles.	**Authoritative**
2. I guide our child by punishment more than by reason.	Authoritarian
3. I know the names of our child's friends.	Authoritative
4. find it difficult to discipline our child.	**Permissive**
5. I give praise when our child is good.	**Authoritative**
6. I spank when our child is disobedient.	**Authoritarian**
7. I joke and play with our child.	Authoritative
8. I withhold scolding and/or criticism even when our child acts contrary to our wishes.	Permissive

Continue

Continued

Item	Parenting style
9. I show sympathy when our child is hurt or frustrated.	Authoritative
10. I punish by taking privileges away from our child with little if any explanations.	**Authoritarian**
11. I spoil our child.	**Permissive**
12. I give comfort and understanding when our child is upset.	**Authoritative**
13. I yell or shout when our child misbehaves.	**Authoritarian**
14. I am easy going and relaxed with our child.	Authoritative
15. I allow our child to annoy someone else.	Permissive
16. I tell child our expectations regarding behavior before the child engages in an activity.	Authoritative
17. I scold and criticize to make our child improve.	**Authoritarian**
18. I show patience with our child.	Authoritative
19. I grab our child when he/she is being disobedient.	**Authoritarian**
20. I state punishments to our child and does not actually do them.	**Permissive**
21. I am responsive to our child's feelings or needs.	**Authoritative**
22. I allow our child to give input into family rules.	**Authoritative**
23. I argue with our child.	**Authoritarian**
24. I appear confident about parenting abilities.	Permissive
25. I give our child reasons why rules should be obeyed.	**Authoritative**
26. I appear to be more concerned with own feelings than with our child's feelings.	**Authoritarian**
27. I tell our child that we appreciate what the child tries or accomplishes.	Authoritative
28. I punish by putting our child off somewhere alone with little if any explanations.	**Authoritarian**
29. I help our child to understand the impact of behavior by encouraging our child to talk about the consequences of his/her own actions.	**Authoritative**
30. I am afraid that disciplining our child for misbehavior will cause the child to not like his/her parents.	Permissive
31. I take our child's desires into account before asking the child to do something.	**Authoritative**
32. I explode in anger towards our child.	**Authoritarian**
33. I am aware of problems or concerns about our child in school.	Authoritative
34. I threaten our child with punishment more often than actually giving it.	**Permissive**
35. I express affection by hugging, kissing, and holding our child.	Authoritative
36. I ignore our child's misbehavior.	Permissive
37. I use physical punishment as a way of disciplining our child.	**Authoritarian**
38. I carry out discipline after our child misbehaves.	Permissive
39. I apologize to our child when making a mistake in parenting.	Authoritative
40. I tell our child what to do.	**Authoritarian**
41. I give into our child when the child causes a commotion about something.	**Permissive**

Continue

Continued

Item	Parenting style
42. I talk it over and reason with our child when the child misbehaves.	Authoritative
43. I slap our child when the child misbehaves.	**Authoritarian**
44. I disagree with our child.	Authoritarian
45. I allow our child to interrupt others.	Permissive
46. I have warm and intimate times together with our child.	**Authoritative**
47. When two children are fighting, I discipline children first and asks questions later.	Authoritarian
48. I encourage our child to freely express (himself)(herself) even when disagreeing with parents.	**Authoritative**
49. I bribe our child with rewards to bring about compliance.	Permissive
50. I scold or criticize when our child's behavior doesn't meet our expectations.	**Authoritarian**
51. I show respect for our child' s opinions by encouraging our child to express them.	**Authoritative**
52. I set strict well-established rules for our child.	Permissive
53. I explain to our child how we feel about the child's good and bad behavior.	**Authoritative**
54. I use threats as punishment with little or no justification.	**Authoritarian**
55. I take into account our child's preferences in making plans for the family.	**Authoritative**
56. When our child asks why (he)(she) has to conform, I state: because I said so, or I am your parent and I want you to.	**Authoritarian**
57. I appear unsure on how to solve our child's misbehavior.	Permissive
58. I explain the consequences of the child's behavior.	**Authoritative**
59. I demand that our child does/do things.	Authoritarian
60. I channel our child's misbehavior into a more acceptable activity.	Authoritative
61. I shove our child when the child is disobedient.	Authoritarian
62. I emphasize the reasons for rules.	**Authoritative**

The permissive parenting style in the 32-PSDQ was suggested by some to measure more on inconsistency than permissiveness and neither the 62-PSDQ nor the 32-PSDQ measure directly on the uninvolved style (Olivari et al., 2013). However, this style was measured reliably and validly in thesis work by Blakely Kimble (2009). Based on the assumption that uninvolved parents have lax behavioural control and are rejecting, the uninvolved style was hypothesized to be neither controlling nor supportive and measured accordingly with twelve items (five from the permissive style, five from the authoritarian, and two, reversely coded, from the authoritarian style). Indeed, items of rejection and low control associated in an 'uninvolved' style in 378 mothers of first grade children through an exploratory factor analysis. Validity was confirmed by the found differences for parenting practices between this style and other styles, in line with predictions (Blakely Kimble, 2009).

Interspecies caregiving: humans directing caregiving at the dog

Clearly, people differ in their child-directed parenting and thus variation exists in the functioning of the caregiving system. Possibly, the same is true when humans direct caregiving at the dog, reflecting for instance in different dog-directed parenting styles. People view dogs as child-like and the care provided to companion animals resembles the care provided to children (Archer, 1997; Prato-Previde et al., 2003; Prato-Previde et al., 2006; Voith, 1985). For instance, dog owners directed 'motherese', also known as 'baby talk' and 'infant-directed speech' at their dogs (Prato-Previde et al., 2006). Although females used infant-directed speech more, males were also seen to use infant-directed speech to comfort their dogs. This showed in video transcriptions made in several separation-reunion sessions and with infant-directed speech operationalised through utterance repetitions, question tags, self-answers, diminutive frequency, use of endearments and the animal's name (Prato-Previde et al., 2006). Similarly, the pitch in speech was significantly higher when directed at dogs (and cats) and infants as compared to speech directed at adults (Burnham et al., 2002). This although dog owners seemingly acknowledge that the dog does not need language tutoring and thus for instance vowel hyper-articulation was not seen in dog-directed speech (Gergely et al., 2017). The latter study did again find that adult-directed speech differs from child/dog-directed speech regarding pitch height (Gergely et al., 2017).

Next to viewing dogs as child-like to some degree and the resemblance in care provided to dogs and children, the human caregiving system can be triggered by dogs as potential care dependents (Herbeck et al., 2016; Nagasawa et al., 2009; Nagasawa et al., 2015). Due to the fitness consequences of the caregiving system, it is regulated by potent central reward systems that involve signalling mediated by neurotransmitters like oxytocin (Feldman, 2016; Feldman, 2017; Feldman and Bakermans-Kranenburg, 2017; Rilling, 2013). Thus, providing appropriate care is rewarding to the care provider, as in making him/her 'feel good' (Feldman, 2017; Powell et al., 2019). Dogs can activate these systems that make their care providers feel good as seen in the levels of urinary oxytocin in dog owners differing with the durations of intentional eye contact they had with their dogs (Nagasawa et al., 2009; Nagasawa et al., 2015; Odendaal and Meintjes, 2003; Powell et al., 2019). The hypothalamic neuropeptide oxytocin is a key hormone involved in human and non-human caregiving (Feldman, 2016; Feldman, 2017; Feldman and Bakermans-Kranenburg, 2017; Rilling, 2013). Oxytocin interacts with other hormones such as vasopressin and cortisol (Feldman and Bakermans-Kranenburg, 2017), as well as gamma-amino-butyric acid (GABA; Herbeck et al., 2016). Oxytocin itself, but also in interaction with for instance GABA, induces pleasant feelings, for instance by increasing the reward value of signals from a care dependent, by experiencing satisfaction if care

provision is successful (George and Solomon, 1999) and/or by functioning as an anxiolytic (Feldman and Bakermans-Kranenburg, 2017; Herbeck et al., 2016).

From child-directed parenting we know that responsiveness and appropriateness of caregiving and oxytocin interact (Rilling, 2013). However, it remains largely unknown how exactly the functioning of the human caregiving system, including existence and variations in dog-directed parenting, affects the human-dog relationship and benefits and risks thereof. The evidence for dogs triggering the human caregiving system gives reason to investigate if and how dog-directed parenting styles are at play in the owner-dog relationship. New insights in this area have the potential to improve the relationship and benefit both humans and dogs.

Aim and scope of the thesis

Recent research paid considerable attention to the dog and its cognitive abilities (Bensky et al., 2013; Feng et al., 2016; Hiby et al., 2004; Kybinyi et al., 2009; Wynne, 2016). Typical examples are studies that focussed on the dog's abilities to learn behaviours by copying these from other dogs or humans (Fugazza et al., 2015), and on the dog's abilities to follow human pointing (Virányi et al., 2008). So far however, there has been less scientific focus on 'the other side of the leash', that is on the human's interaction with the dog. This leaves many questions unanswered regarding a dog owner's long-term interaction patterns with the dog. Variations in interaction patterns shape the human-dog relationship and are likely to affect dog welfare. The owner-dog relationship resembles the parent-child relationship (Archer, 1997; Herbeck et al., 2016; Nagasawa et al., 2009; Nagasawa et al., 2015; Odendaal and Meintjes, 2003; Powell et al., 2019; Prato-Previde et al., 2003; Prato-Previde et al., 2006; Voith, 1985), which suggests that findings on child care may to some degree apply to dog care. Knowledge on how to raise children may be used to optimize how dog owners guide and train their dog to socially behave. Therefore, this thesis aims to gather scientific insights into the role of parenting styles in the owner-dog relationship. Child-directed parental styles affect parent-child relationship quality, the child's wellbeing and the child's societal adjustment. If dog-directed parenting styles exist, it becomes of interest to know how these affect the owner-dog relationship, dog wellbeing and the dog's adjustment to the human society.

Society is ever changing, and we and our dogs change with it. Predictions point towards more and more of us living individual lives in urban surroundings. On the one hand, this makes dogs increasingly crucial to our lives and the fulfilment of human caring needs. On the other hand, or rather, 'on the other side of the leash', we have an increased responsibility to ensure that the dog's welfare is guaranteed. When we strongly determine

the dog's environment, including its behavioural opportunities, we must care enough–and in an appropriate manner–to ensure that its species specific needs are met.

Outline of this thesis

The overall aim of this thesis is to determine the role of parenting styles in the owner-dog relationship. **Chapter 1** gives the general introduction to this topic. **Chapter 2** outlines the owner-dog relationship by way of quantifying associations between a dog owner's satisfaction with dog ownership and factors such as how the owner perceives this relationship and the dog's (un)desired behaviours. Next, to determine if parenting styles apply to the owner-dog relationship **Chapter 3** describes the associations between parenting styles that are child-directed and dog-directed, and presents a dog-directed parenting style measurement tool. **Chapter 4** provides further insights into people's attitudes and views that underlie dog-directed parenting styles by relating the styles to orientations towards animals and **Chapter 5** presents expressions of dog-directed parenting styles in the behaviour of owner and dog. Dog-directed parenting styles express in leash tension when dogs are leash-walked and we ventured to find a way to objectively measure leash tension, as described in **Chapter 6**. The research focus then shifts from working out the concept of dog-directed parenting styles to the consequences these may have, and specifically for a dog's weight (**Chapter 7**) and the owner perceived relationship with the dog (**Chapter 8**). Finally, we address if dog-directed parenting styles can be corrected by educational interventions and the findings are reported in **Chapter 9**. The thesis concludes with a general discussion (**Chapter 10**) on the strengths and weaknesses of our research and elaborates on the potential of future studies on dog-directed parenting to improve the owner-dog relationship and dog welfare.

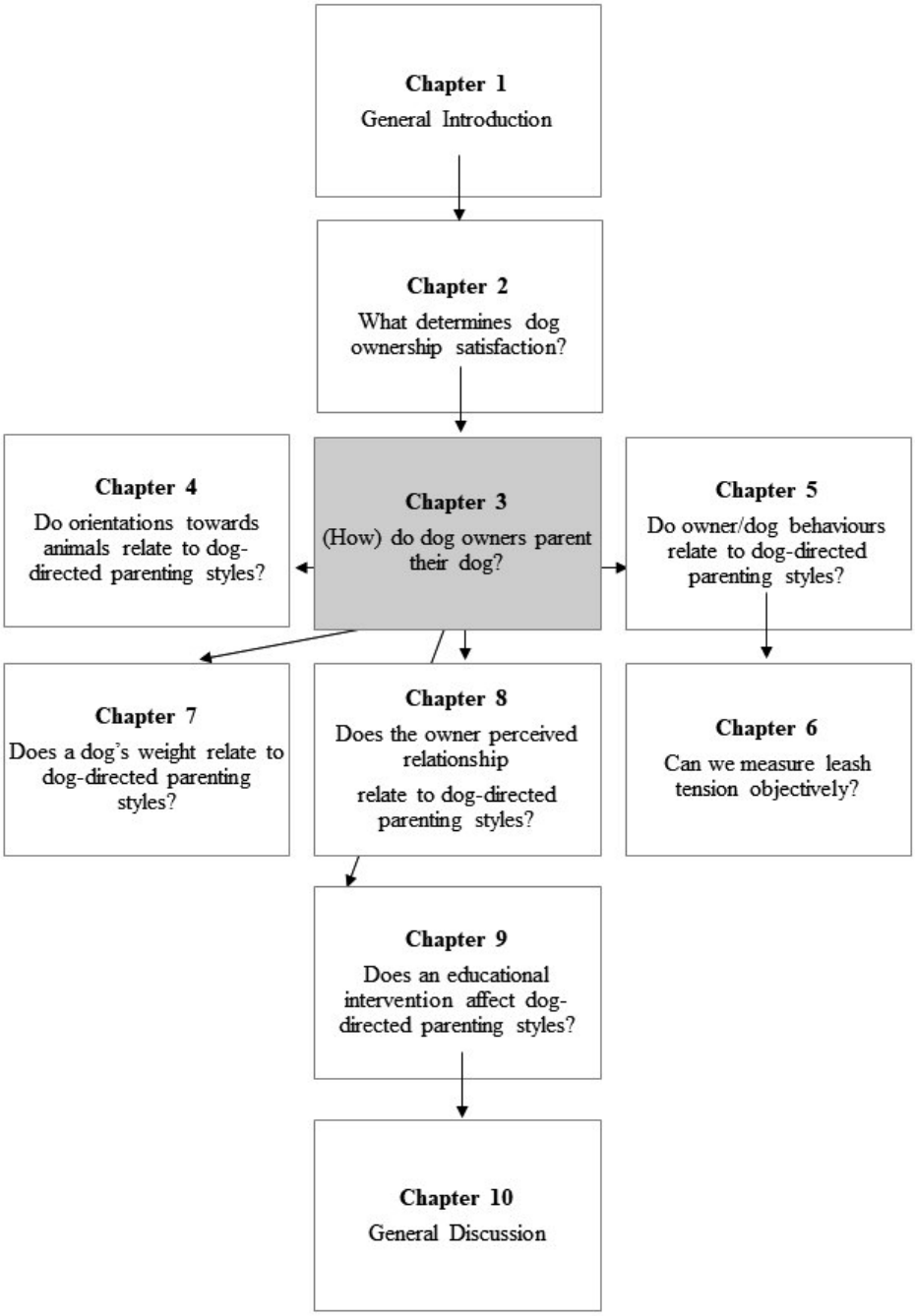
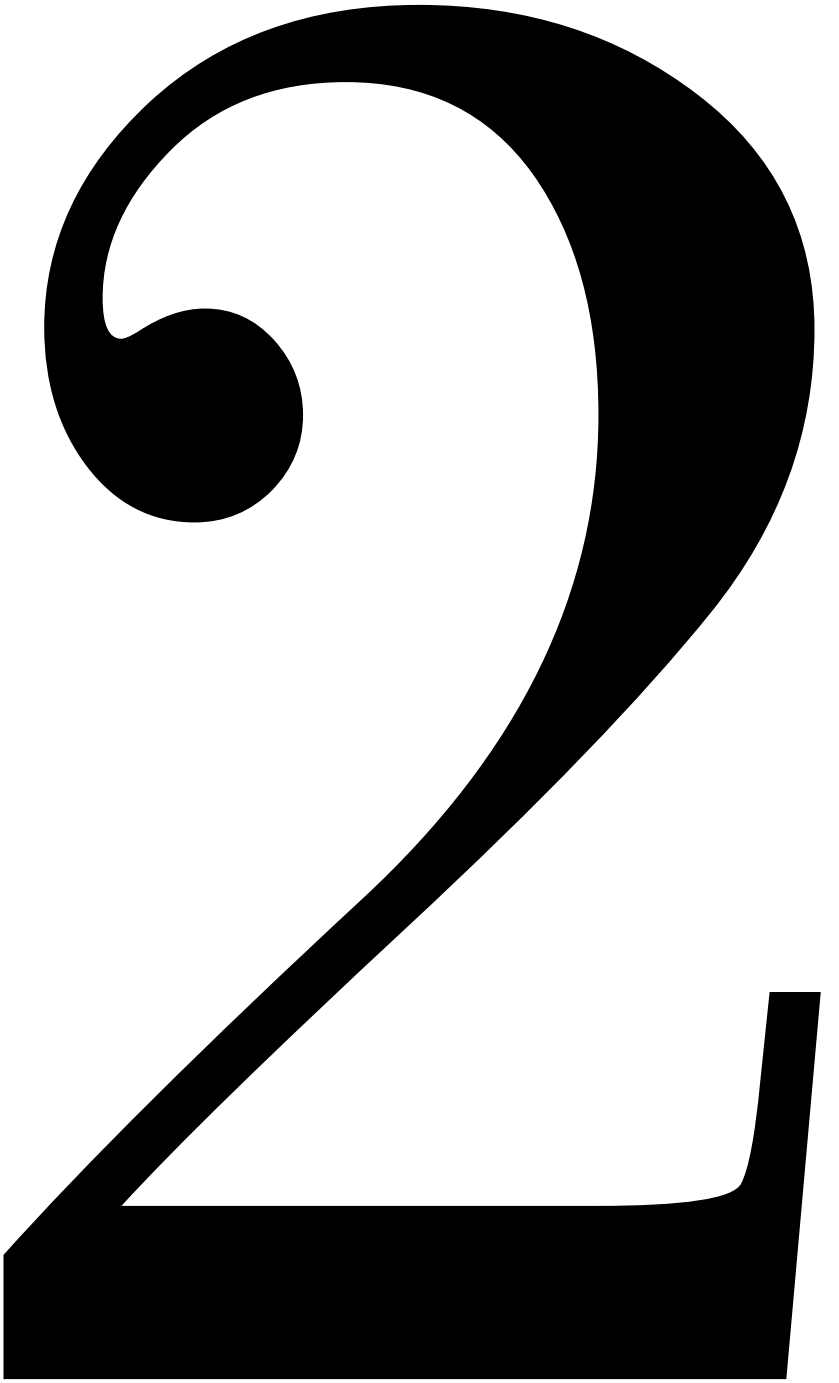


Figure 2 – Dog-directed parenting styles: the figure illustrates how the chapters of this doctoral thesis relate



Chapter 2

Dog ownership satisfaction determinants in the owner-dog relationship and the dog's behaviour

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Abstract

Dog ownership satisfaction relates to the quality of life of both owner and dog, and when seriously compromised may even lead to dog abandonment. Knowledge on determinants of dog ownership satisfaction is limited, obstructing solutions for promoting satisfaction, and here we quantified causes making dog owners less than very satisfied with their dog. We focused on the owner perceived relationship with the dog, unwanted dog behaviour, and dog obedience class attendance. The study population included only few seriously dissatisfied dog owners, preventing discrimination of multiple levels below 'very satisfied'. Consequently, existing relationships in the entire population may have been missed or underestimated and the findings apply specifically to dog owners that are relatively contented with dog ownership. Nine hundred seventy-seven Dutch dog owners completed an online questionnaire and we found the probability of being very satisfied to associate with all three subscales of the Monash Dog Owner Relationship Scale. Most strongly with perceived costs of ownership and less so with shared activities between owner and dog, and perceived emotional closeness to the dog. Aggression and/or disobedience related directly to high perceived ownership costs and to an increased probability of being less than very satisfied. Interaction effects indicated that dog disobedience was less influential on ownership satisfaction at high levels of aggression. Surprisingly, dog ownership satisfaction was unrelated to dog obedience class attendance, raising questions about the effectiveness of these classes in establishing satisfying dog-owner relationships. Training aids used during classes could play a role here, as choke chain use associated with high perceived costs and increased probabilities of being less then very satisfied with dog ownership. Ownership satisfaction in relatively contented dog owners, seems more influenced by unwanted dog behaviour and perceived costs of ownership, than by perceived emotional closeness to the dog, shared activities and dog obedience class attendance.

Keywords: dog ownership satisfaction, perceived relationship, Monash Dog Owner Relationship Scale (MDORS)

Highlights

- Dog ownership satisfaction associated with the Monash Dog Owner Relationship Scale.
- Perceived dog ownership costs associated with ownership satisfaction most strongly; and with a dog's aggression and disobedience.
- Dog obedience class attendance did not associate with dog ownership satisfaction.

Introduction

Dog ownership has the potential to support personal development and well-being by means of the dog fulfilling its owner's psychological needs for autonomy, competence, and relatedness (Kanat-Maymon et al., 2016). Dogs, 'on the other side of the leash', benefit too, for instance from enjoying interactions with their owner and humans in general. Dogs actively sought human proximity when interacted with by petting (Feuerbacher and Wynne, 2015) and the presence of a human caretaker lowered stress in dogs facing novel environments (Tuber et al., 1996). However, there is variation in the nature of owner-dog relationships. For instance, dogs can be seen as loving companions or merely as toys or status enhancers, which influences the extent to which both parties benefit from the relationship (Beverland et al., 2008). Dog ownership satisfaction reflects several aspects of the owner-dog relationship such as owner-dog attachment strength (Serpell, 1996). When this attachment strength is compromised it increases the risk of the dog being relinquished (Kwan and Bain, 2013). Yet it remains unclear what makes dog owners (very) satisfied with their dog and here we quantify the relative importance of obvious determinants of such satisfaction, based on known risk factors for dog abandonment such as unwanted dog behaviour, the owner perceived relationship with the dog and attendance to dog obedience classes (Diesel et al., 2008; Duxbury et al., 2003; Patronek et al., 1996; Serpell, 1996). Abandonment as an extreme consequence of ownership dissatisfaction constitutes a serious issue. In the US, millions of animals enter shelters each year and some are even presented there to be euthanized (Kass et al., 2001). For the Netherlands, numbers of more than 12,000 dogs entering shelters were projected, on an estimated population of 1.8 million dogs (Leenstra et al., 2011). Reasons for abandoning a dog and being dissatisfied with owning it may be diverse, including an imbalance between how a dog is expected to behave and actually does (Diesel et al., 2008). Unwanted behaviour, meaning behaviour that is undesired by the dog owner and/or hazardous to others (e.g. biting), is thought to contribute strongly to dog abandonment (Mondelli et al., 2004; Neidhart and Boyd, 2002). Biting people and being perceived as overly active, increased a dog's risk of abandonment in a comparative study with 2,092 people who relinquished their dog to a shelter and 3,434 people who kept their dog (New et al., 2000).

Unwanted behaviour in companion animals is common, at least in the eyes of companion animal owners. Forty-three percent of Dutch companion animal owners reported at least one behaviour problem in their dog or other companion animal (Endenburg and Knol, 1994) and for dogs this percentage may be higher, for example given the 68% of Italian trainee guide dog puppy walkers who reported undesirable behaviour (Gazzano et al., 2008). Aggressive behaviour directed at unfamiliar people was the main complaint in 140 dog owners seeking advice from a veterinary hospital behaviour service (48%),

followed by aggressive behaviour directed at familiar people (43%) and at other dogs (40%) (Herron et al., 2017). The high proportion of cases of dog aggression presented to behavioural clinics underlines how such behaviour is problematic to dog owners. Disobedience is another behaviour in dogs that owners consider problematic, and main behavioural issues reported by 203 Australian dog owners were overexcitement (63%) and jumping up on people (56%; Kobelt et al., 2003). Excessive aggression or disobedience in dogs troubles owners and makes them look for solutions. It is less clear though, what the quantitative impact on ownership satisfaction is of more moderate aggression and/or disobedience in common privately-owned dogs that are not specifically studied for behaving problematically.

Dog ownership satisfaction may be influenced differently in dogs surrendered at shelters and presented at behavioural clinics than in dogs that only moderately express risk factors such as aggression or disobedience. Studying common dogs on owner-dog relationship dimensions, is therefore valuable. Such owner-dog relationship dimensions are often assessed with the Monash Dog Owner Relationship Scales (MDORS; Handlin et al., 2012; Meyer and Forkman, 2014; Rohlf et al., 2010). This tool consists of 28 questions measuring on three subscales (Dwyer et al., 2006). The subscales cover perceived emotional closeness to the dog, perceived costs of owning the dog in terms of effort and financial costs and shared activities between owner and dog (Dwyer et al., 2006). More information on these and other determinants of dog ownership satisfaction in relatively satisfied dog owners, facilitates the identification and use of early warning signals for a compromised owner-dog relationship. Also, dog obedience class attendance is generally thought to improve this relationship, but scientific findings are inconsistent about the effect of such classes on for instance achieved levels of desired dog behaviour (Bennett et al., 2007). Much can be learned about what determines dog ownership satisfaction and which factors prevent the long-term dissatisfaction that obstructs owners and dogs to benefit from their relationship. Knowing what makes owners especially satisfied with owning a dog can be a stepping stone towards strategies in support of an optimal owner-dog relationship.

Here we studied factors that make dog owners less than 'very satisfied' with their dog, focussing on the owner to dog relationship and the dog's behaviour. Our main goal was to identify determinants of ownership satisfaction by means of quantifying associations between ownership satisfaction, owner-dog relationship dimensions (MDORS), unwanted dog behaviour, dog obedience class attendance and use of training aids.

Methods

Questionnaire

Reports by dog owners were used to evaluate candidate determinants of dog ownership satisfaction and to quantify strengths of existing relationships. We collected data via an online questionnaire and participants were recruited via the internet, including websites frequently visited by dog owners, internet fora on dog topics and social media channels such as Facebook. Also, flyers about the online questionnaire were handed out at shelters, veterinary clinics and by dog professionals (dog trainers and dog behavioural therapists). Anyone owning a dog was eligible for the research and we did not practice criteria for inclusion or exclusion.

The online questionnaire introduction explained the purpose of the research and the study did not involve treatments or interventions in the life of respondents or their dogs. The questionnaire was not repeated, meaning it did not interfere significantly with normal daily life and did not include questions that were psychologically stressful. This exempts the study from review by our ethics committee, according to the guidelines of Wageningen University Medical Ethics Review Committee (Medisch Ethische Toetsingscommissie van Wageningen University, METC-WU). Informed consent was not obtained as respondents chose to participate freely via internet and the purpose of the research was stated at the start of the online survey.

Details on the participating dog owners (N=977) and their dogs are presented in the results section. The questionnaire was in Dutch, but see Appendix 1 for the English translation, and consisted of 54 miscellaneous questions on topics such as dog characteristics, way of acquisition, the dog's behaviour and living conditions. Respondents were asked to fill out the survey with one particular dog in mind. Quantitative questions were typically answered on a five-point Likert scale, like a dog's tendency to aggress or disobey. Aggression was assessed by eight questions, on dog behaviour in daily life situations that involved (un)familiar people and dogs, including possessiveness and territoriality. Aggressive behaviour scores were expressed as a percentage of the theoretical maximum, given the number of questions that the participant filled out. For the assessment of dog obedience we followed a similar procedure using the two questions 'Indicate how often your dog comes immediately when called' and 'Indicate how often your dog is overly active by jumping up/pushing against you'. Dog obedience class attendance was measured with the five answer categories 'not at all', '<8 weeks', '2-6 months', '6-12 months' and '>12 months', but for further analyses the scores were expressed on a binary scale with 1 representing the four levels of class attendance and 0 indicating no attendance. There were 28 Monash Dog Owner Relationship Scales (MDORS) questions on the owner-dog relationship, which were taken from Dwyer et al (2006)

and used to assess the owner perceived emotional closeness to the dog ($MDORS^{Close}$), the owner perceived costs of owning the dog (in terms of effort and finance), time and efforts in general ($MDORS^{Cost}$), and the engagement in shared activities ($MDORS^{Shared}$). MDORS scores were calculated for each of the three subscales by combining item scores into a percentage of the theoretical maximum. The $MDORS^{Cost}$ subscale was expressed reversely, with high scores reflecting low perceived costs and a strong owner-dog relationship. Dog ownership satisfaction was assessed by asking 'How satisfied are you with your dog?', with the answer categories being 'not at all satisfied' (1), 'not very satisfied' (2), 'moderately satisfied' (3), 'satisfied' (4) and 'very satisfied' (5). Satisfaction scores were skewed towards high levels of satisfaction and answers were therefore expressed as a binary number with 1 being 'very satisfied' and 0 being 'less than very satisfied'. A total of 977 surveys was analysed, but questions could be left unanswered and sample size varied across questions as indicated in the results section. The MDORS questions were presented as an optional extra and sample size was lowest for tests that involved these items (down to N=889).

Statistical analyses

We used logistic regressions with dog ownership satisfaction as the binary response variate (y), using GenStat (18th edition) software. We tested the associations between dog ownership satisfaction and the owner-dog relationship in a logistic regression model with the three MDORS subscales as explanatory variables with the inclusion of two-way interactions. Interactions that were not significant were omitted from the statistical model. We ran separate logistic regression models on the relation between ownership satisfaction and the scores for a dog's aggressive behaviour and/or disobedience as explanatory variables, again including two-way interaction. Means (± SE) predicted by the logistic regressions are presented for the range of the 50% middle values (the two central quartiles) of the explanatory variables ($MDORS^{Close}$, $MDORS^{Cost}$, $MDORS^{Shared}$, aggression, disobedience). This means that effect sizes in the dependent variables (response variates) were illustrated for the independent variables' range of common values. Also, we tested if the owners' use, or not, of training aids such as food, play, clicker or correction chain explained dog ownership satisfaction. Logistic regressions on ownership satisfaction were done per training aid. Finally, we tested if the response variate dog obedience class attendance, expressed on a binary scale with having attended classes as 1 and never having attended a class as 0, associated with the earlier described explanatory variables MDORS subscales, aggressive behaviour and disobedience, tested in a logistic regression model with main effects only.

An approach, similarly as described above, was used for further analyses of owner perceived relationships, as expressed in the MDORS scores. We ran ANOVAs with the subscale scores for $MDORS^{Close}$, $MDORS^{Cost}$ and $MDORS^{Shared}$ as dependent variables

to test for effects of the independent variables dog aggression and disobedience (two-way ANOVA, including interaction), obedience class attendance (one-way), and training aid use (one-way). Aggression and disobedience were expressed as percentages and the other independent variables were expressed as factors with two levels (yes, no).

To facilitate interpretations based on the logistic regressions and ANOVAs we tested for associations between explanatory variables with Pearson's and Spearman's rank correlations, including the three MDORS subscales, and the dogs' aggressive behaviour and disobedience. Only Spearman's test outcomes are presented as Pearson's tests gave similar results.

Results

Characteristics of participating dog owners and their dogs

The study sample of 977 dog owners consisted mostly of experienced dog owners (74%, *N*=715), owning more than one dog (59%, *N*=572), with 26% being first time owners (*N*=257). We found no statistically significant difference for dog ownership satisfaction level between first time owners and experienced owners. Participants reported on dogs of various breeds with 51% of the dogs being females (209 intact, 272 neutered) and 49% males (274 intact, 192 neutered). The majority of dogs were reported to have a normal energy level, with an average(±SD) 2.1±0.9 on a five-point scale of very calm (score 0) to highly energetic (4). Three quarters of participants walked their dog for more than an hour (75%, *N*=734), on a typical weekday, played more than ten minutes with their dog (76%, *N*=740) and left the dog alone for no more than four hours (78%, *N*=759).

Dog ownership satisfaction and perceived relationship dimensions

Participants (*N*=977) were typically satisfied with their dog, and the average (±SD) dog ownership satisfaction score was 4.7±0.7 on a scale of 1 (lowest: *N*=9; via 2: *N*=5, 3: *N*=34, 4: *N*=191) to 5 (highest, *N*=738), and 0.8±0.4 when expressed on a binary scale, with very satisfied as 1 (*N*=738) and less than very satisfied as 0 (*N*=239). The owner-dog relationship was rated similarly for shared activities and emotional closeness, with average MDORS scores of 68% of the theoretical maximum and rated relatively high for low perceived costs (87%, see Table 1 for details). Associations between MDORS subscale scores were all significant, but explained less than 8% of the variation, with Spearman's rank correlations of r_s=0.25, P<0.001, N=889 for $MDORS^{Close\ versus\ Cost}$, r_s=0.27, P<0.001, N=889 for $MDORS^{Close\ versus\ Shared}$, r_s=0.13, P<0.001, N=889 for $MDORS^{Cost\ versus\ Shared}$.

Table 1–Monash Dog Owner Relationship Scale (MDORS) scores
Average owner perceived relationship scores (MDORS, *N*=889) in a study population of Dutch dog owners derived from an online questionnaire, for the overall sample and split between the highest level of dog ownership satisfaction and less satisfied owners

Monash Dog Owner Relationship Scale (MDORS)	For all respondents - average%±SD (range)	For respondents scoring 1 (very satisfied) - average%±SD (range)	For respondents scoring 0 (less than very satisfied) - average%±SD (range)
$MDOR^{SShare}d$	68.4±11.6%	69.2±11.4%	65.8±12.0%
	(17-100%)	(17-100%)	(28-92%)
$MDORS^{Close}$	68.2±15.5%	69.6±15.6%	64.0±14.5%
	(10-100%)	(10-100%)	(18-100%)
$MDORS^{Cost}$	87.2±10.8%	89.1±9.5%	81.4±12.6%
	(42-100%)	(44-100%)	(42-100%)

The probability of being very satisfied with owning one's dog was significantly associated with all three MDORS subscales in a logistic regression with 889 records (Figure 1). Predicted mean probabilities of being very satisfied increased significantly (logistic regression, P=0.04) from 0.76±0.02 to 0.80±0.02 with $MDORS^{Close}$ scores increasing from 58 to 80%, that is across the range of 50% middle values (the two central quartiles). Similarly, increasing $MDORS^{Shared}$ scores from 61 to 78% raised probabilities on being very satisfied from 0.76±0.02 to 0.80±0.02 (logistic regression, P=0.04). The strongest effect was noted for $MDORS^{Cost}$ and across the range of 81 to 97% the probabilities of being very satisfied increased from 0.71±0.02 to 0.86±0.02 (logistic regression, P<0.001). So, within our sample of mostly satisfied dog owners, dog ownership satisfaction related directly to a good owner to dog relationship and especially to low perceived costs of having the dog.

Aggression and disobedience
Increasing levels of aggressive behaviour significantly lowered the chance of owners being very satisfied with their dog. Increases of this behaviour over the range of middle values (the two central quartiles), that is from 3 to 19% of the theoretical maximum, decreased predicted mean probabilities of being very satisfied from 0.84±0.01 to 0.71±0.02 (on a scale from 0 to 1; logistic regression, P<0.001, *N*=976). The average(±SD) aggression score in the study sample was 12.1±12.6% (range 0-78.1%, *N*=977; Appendix 2 provides details on prevalence of aggression and obedience in the sample).

Obedience scores too, associated significantly with ownership satisfaction with probabilities of being very satisfied increasing from 0.70±0.02 to 0.84±0.01 (on a scale from 0 to 1) with obedience scores increasing from 63 to 88% (logistic regression,

P<0.001, *N*=972). The average(±SD) obedience score in the study sample was 74.4±17.8% (range 0-100%, *N*=977).

Aggressive behaviour and disobedience combined, could be expected to have particularly strong effects on dog ownership satisfaction, which was confirmed by a significant two-way interaction (logistic regression, P=0.005, *N*=974). Figure 2 shows that in relatively disobedient dogs, the inverse relationship between the dogs' aggressive behaviour and owners' satisfaction was linear, whereas it was mirror S-shaped in relatively obedient dogs. In the 50% range of middle values (the two central quartiles) for aggressive behaviour (3 to 19%), dog disobedience lowered ownership satisfaction, but the strength of this association waned with increasing levels of aggression. In dogs showing more serious aggression, with scores over 20%, the influence of dog obedience was predicted to be less relevant to ownership satisfaction. Predictions for extreme cases of aggressive behaviour are speculative as these were rare in the present study population.

Aggressive behaviour and disobedience were tested for associations with MDORS scores as dependent variables in two-way ANOVAs. Neither aggression, disobedience, nor interactions between these, related significantly to $MDORS^{Close}$ or $MDORS^{Shared}$ (P>0.1). Aggression did relate (inversely) to $MDORS^{Cost}$ and over the range of common values for aggression (3-19%) the $MDORS^{Cost}$ percentages decreased with 2% from 88.2±0.4% to 86.4±0.4% ($F_{(1,890)}$=14.0, P<0.001). Similarly, obedience scores over the range of 63-88% associated with a 3% increase in $MDORS^{Cost}$ from 85.8±0.4% to 88.8±0.4% ($F_{(1,890)}$=33.6, P<0.001; P=0.3 for the two-way interaction between aggression and obedience). $MDORS^{Cost}$ was scaled reversely and high owner perceived costs of dog ownership thus coincided with high levels of dog aggression and disobedience.

To test for entanglement of explanatory variables we performed Spearman rank correlations between aggression and disobedience, and between these two variables and the three MDORS subscales. Outcomes explained less than 5% of variance and were significant only for the dog's aggressive behaviour and disobedience (r_s=0.14, *P*<0.001, *N*=889), and $MDORS^{Cost}$ and aggressive behaviour (r_s=-0.15, *P*<0.001, *N*=889) or disobedience (r_s=-0.21, *P*<0.001, *N*=889). The limited strengths of associations between these explanatory variables do not raise major concerns about entanglements determining the interpretation of statistical outcomes. They seem to reflect mainly how the dog's aggressiveness and disobedience lead to higher owner perceived cost.

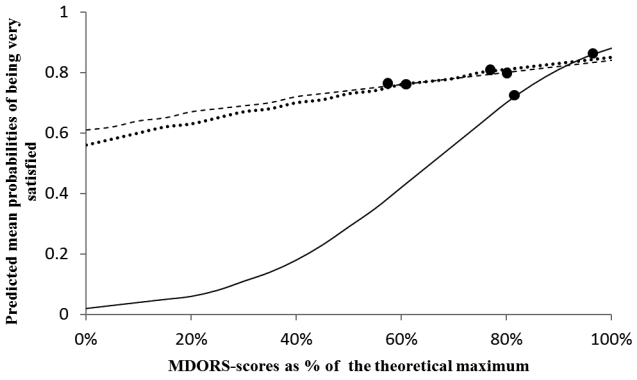


Fig 1. Probabilities of being very satisfied with owning a dog in relation to MDORS scores
Predicted mean probabilities of being very satisfied with owning a dog (y-axis) in 889 Dutch dog owners in relation to their self-reported emotional closeness (dashed line, P=0.04), perceived costs of ownership (solid line, P<0.001) and number of shared activities with the dog (dotted line, P=0.04). The MDORS scores are expressed as percentages of the theoretical maximum and associated significantly with dog ownership satisfaction. The marked points indicate the range of 50% middle scores for each of the MDORS subscales.

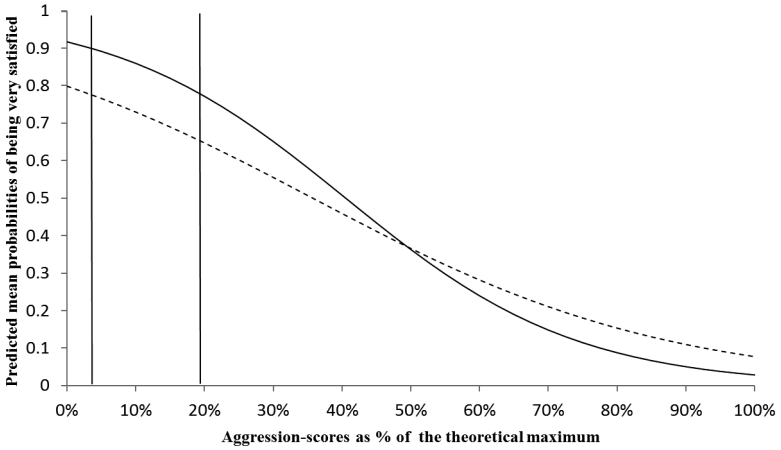


Fig. 2. Probabilities of being very satisfied with owning a dog in relation to the dogs' aggression and disobedience
Predicted mean probabilities of being very satisfied with owning a dog (y-axis) in 974 Dutch dog owners in relation to the dogs' aggression and disobedience in daily life (two-way interaction P<0.05). Behaviour scores are expressed as percentages of the theoretical maximum with aggressions on the x-axis and the two lines representing high obedience (88%, solid line) and low obedience (63%, dashed line), with the two vertical lines indicating the range of 50% middle scores for aggression (3-19%).

Dog obedience class attendance and use of training aids

Most participants had at some time attended dog obedience classes with their dog (78%, *N*=757 out of 971), resulting in an average(±SD) 0.78±0.42 on a binary scale. We tested with logistic regression if dog obedience class attendance (yes versus no) was associated with dog ownership satisfaction, but results were not significant (P=0.3).

Class attendance did not explain variation in perceived costs of dog ownership ($MDORS^{Cost}$ ANOVA P=0.6), but did associate with lower emotional closeness and more shared activities. $MDORS^{Close}$ percentages were a predicted mean 67.6±0.6% for dog owners who had attended obedience classes compared to 70.3±1.1% for those who had not ($F_{(1,890)}$=4.7, P=0.03). $MDORS^{Shared}$ percentages were a predicted mean 69.1±0.4% for owners who had attended classes compared to 65.8±0.8% for those who had not ($F_{(1,884)}$=11.5, P=0.001).

Regarding the use of training aids, most dog owners trained their dogs using play (57%, *N*=559), food (75%, *N*=734) or play and food (89%, *N*=874). A clicker was used by 28% (*N*=276) of the dog owners and a correction chain by 8% (*N*=83). The use of a correction chain (yes versus no) was significantly associated with a reduced probability of being very satisfied with the dog (logistic regression, P=0.005, *N*=976), with predicted mean probabilities dropping from 0.77±0.01 for owners not using correction chains to 0.63±0.05 for those who did. The significant relationship between the use of a correction chain and perceived costs of dog ownership, was in line with this finding. $MDORS^{Cost}$ predicted means (reversed scale) were 84.0±1.3% for dog owners using a correction chain and 87.5±0.4% for those who did not (ANOVA $F_{(1,892)=}$7.6, P=0.006; P>0.1 for $MDORS^{Shared}$ and $MDORS^{Close}$).

No significant associations with dog ownership satisfaction were found for play, food or clicker use. The outcomes of logistic regressions are questionable if there are only few occurrences for (some) combinations of factors, with 10 being a frequently reported minimum. The lowest count here was at least 31, as found for the combination of being less than very satisfied and making use of a correction chain, with all other counts ≥52.

The use of play, food or clicker as training aid did not significantly explain variation in $MDORS^{Cost}$ scores (ANOVA P>0.3), whereas the use of food associated with low emotional closeness and high levels of shared activities. $MDORS^{Close}$ predicted means were 67.6±0.6% for dog owners who used food as a training aid and 70.1±1.0% for those who did not ($F_{(1,894)}$=4.3, P=0.038). $MDORS^{Share}$ predicted means were 68.8±0.5 in owners using food and 67.0±0.8% in those who did not ($F_{(1,888)}$=3.9, P=0.049). Finally, $MDORS^{Close}$ predicted means were 69.0±0.6% for dog owners who used a

clicker as training aid and 66.4±1.0% for those who did not ($F_{(1,894)}$=5.3, P=0.022; P>0.07 for MDORS^{Share}).

Discussion

Knowledge of what determines dog ownership satisfaction may be utilized for strategies to improve the owner-dog relationship, possibly even lowering abandonment rates of dogs (Kwan and Bain, 2013; Serpell, 1996). Here we quantified the effects of several candidate satisfaction determinants from 977 Dutch dog-owner reports. In our typical study sample of mostly satisfied dog owners, the probability of being very satisfied with one's dog was in part explained by the perceived relationship with the dog, in particular with the perceived costs of owning it, and with the dog's aggressive behaviour and disobedience. The latter two factors interacted, with high levels of aggression overshadowing the effects of disobedience on ownership satisfaction. Aggression and disobedience, as main effects, associated with high perceived costs only, in line with the strong relationship between perceived costs and dog-ownership satisfaction. Unexpectedly we did not find dog ownership satisfaction to associate with dog obedience class attendance. Our findings come from a study population of highly satisfied dog owners and do not necessary apply to the more serious levels of dissatisfaction. Most likely this typical sample has affected the quantifications of effects, with a bias towards underestimates, and reduced the power to detect relationships due to the underrepresentation of the severe cases of dissatisfaction. An argument for considering the significant findings applicable to the entire population of Dutch dog owners is the correspondence of outcomes with known reasons for owners to abandon their dog. Nevertheless, the present results should be viewed in the specific context of dog owners who were relatively contended with owning their dog.

We applied a binary divide of dog ownership satisfaction levels, discriminating between being very satisfied and less than that. The reason for this was the high percentage of dog owners (76%) reporting the highest level of satisfaction. The actual situation will be less positive as we assume our study sample of volunteers recruited by mainly (social) media to be skewed towards people with positive opinions about having a dog and thus willing to make the effort of filling out a research questionnaire on dogs. Unintentionally, much research on dog ownership is done with highly engaged dog owners (Rohlf et al., 2010; Van Herwijnen et al., 2018a), because participating in research requires effort, which average or less engaged dog owners are less likely to invest. Presently, science has not found an easy solution to this issue. We expect our research to present a relatively rosy picture of dog ownership satisfaction mainly due to this selection bias. The effect of long known questionnaire response artefacts, such as impression management, acquiescence bias and/or midpoint-responding (Couch and Keniston, 1960; Cronbach, 1946) likely

had a minor effect on our findings. We assume our research topic of factors influencing dog ownership satisfaction, not sensitive to the degree known to influence questionnaire research (Krumpal, 2013). We searched for demographics of the Dutch dog owner population, but we were unable to find statistics that could be used for comparison with our study group. Two hundred and thirty-nine dog owners were less than very satisfied with owning their dog, compared to 738 who were, and such an imbalance potentially causes low counts for combinations of factors in the logistic models. As a rule of thumb 10 outcome events per predictor variable are considered as a minimum, though this is subject to debate with suggestions that the rule can be relaxed (Vittinghoff et al., 2006), actually does not prevent unreliable estimates (Courvoisier et al., 2011) or at least requires further validation (Van Smeden et al., 2016). The minimal number of events in our study was 31 with other counts over 51, giving us little concern about the reliability of the logistic model estimates. The present findings apply to dog owners with relatively high levels of engagement with their dog and dog ownership, but it may be questioned if findings extrapolate to the remainder of the Dutch dog owner population. The associations tested by us were fitted (curvi-)linearly, as there were no strong reasons for deviating from this basic approach. It may be argued that the found effects on the probability of being very satisfied with one's dog may turn out to be different from those on the probability of being very dissatisfied. This seems unlikely though, as the explanatory variables predicting dog ownership satisfaction were selected by us for being known risk factors of dog abandonment. Apparently, a dog's (slight) tendency to aggress or disobey, as well as a dog owner's perception of the costs of owning a dog, determine ownership satisfaction in satisfied owners as well. In this, dog unwanted behaviour and perceived costs of ownership relate directly, with associations existing for both aggression and disobedience. Such association with unwanted behaviour were absent for emotional closeness and amount of shared activities. Consequently, unwanted behaviour and high perceived costs of ownership have potential as early warning signals of a less optimal relationship that could, in the end, result in dog abandonment. Furthermore, these factors can identify points of action for improving the owner-dog relationship before issues have become serious and the owner very dissatisfied.

Dog obedience classes seem an obvious way to prevent misbehaviours in dogs and to build a strong owner-dog relationship. Such classes are designed to increase dog obedience levels and were seen to lower aggressive behaviour when classes were followed with young dogs (Kutsumi et al., 2012). Also, dog obedience class attendance reduced the odds of an adopted dog being returned to the organisation adopting it out (Diesel et al., 2005) and class attendance shortly after acquiring a dog increased the chance of continuing dog ownership (Patronek et al., 1996). Surprisingly, we found no relation between dog obedience class attendance and dog ownership satisfaction or perceived costs. Class attendance did associate with more shared owner-dog activities, which may

in part reflect the shared activity of attending the classes themselves. The unexpected inverse relationship between class attendance and emotional closeness to the dog was weak (P=0.03) and requires further underpinning. Variation in obedience class content and quality likely leads to varying dog outcomes and owner-dog relationship effects. One such variation may involve training aids that are advertised during obedience classes. We found the use of a correction chain to associate with higher perceived costs of ownership and lower dog ownership satisfaction. Weak associations (P≈0.04) were found for the use of food in training, coinciding with more shared activities and lower levels of reported emotional closeness to the dog. Such findings raise questions about how obedience classes teach owners to influence dog behaviour and with what outcomes for the owner-dog relationship. Australian dog owners were surveyed on obedience class experiences and although the 178 owners reported that the classes resulted in better training skills, they did not necessarily provide desired dog behavioural outcomes, for instance with regard to aggression (Bennett et al., 2007). Improving dog training skills in dog owners is important, but it may be that having a well-behaved, non-aggressive, dog and being knowledgeable on or skilled in the use of appropriate training aids, is of greater importance to dog ownership satisfaction.

The highest level of dog ownership satisfaction in our study associated logically with all three measured aspects of the owner-dog relationship, as assessed with the MDORS (Dwyer et al., 2006), but we found an important quantitative variation. Perceived costs changed the probability of being very satisfied with 15% where this was only 4% for shared activities and emotional closeness, across the range of 50% middle values (the two central quartiles). The same factor of perceived costs has been associated with oxytocin levels in ten male Labrador Retrievers (Handlin et al., 2012). The dogs were owned by middle-aged females and perceived costs associated in the expected direction with blood oxytocin levels (r=-0.8), which were in turn related to the owner's oxytocin levels (Handlin et al., 2012). Oxytocin is a neuropeptide that facilitates attachment and bonding in several animal species (Curtis and Wang, 2003; Uvnäs-Moberg, 2005) and stimulates social behaviour (Carter, 1998). Low perceived costs of having a dog thus seem a strong indicator of a good owner-dog relationship, reflecting in oxytocin levels and ownership satisfaction with the dog.

Dog aggression and disobedience associated inversely with ownership satisfaction to a similar degree, with respective decreases in probability of being very satisfied of 13 and 14%, across the range of 50% middle values. A companion animal's behaviour is of major importance to ownership satisfaction. In small animals such as rabbits, mustelids and rodents, unwanted behaviours were associated with lowered ownership satisfaction, notwithstanding high overall mean satisfaction levels of 8.6 out of 10 (Normando and Gelli, 2011). In dogs, good behaviour may be particularly important, as North-

American adopters (*N*=343) of both dogs and cats reported how good behaviour of their animal associated with ownership satisfaction, with associations being stronger for dogs than for cats (Neidhart and Boyd, 2002). Unwanted behaviour is a main reason for relinquishment (Kwan and Bain, 2013; Mondelli et al., 2004; Patronek et al., 1996) and near 60% of dogs were returned for reasons of misbehaviour in a large-scale six-month follow-up study of 4,500 rehomed dogs (15% were returned; Diesel et al., 2008). Some unwanted behaviours may be more disturbing to common dog owners than others. Seventy-five percent of 74 Australian adopters of shelter dogs wished their dog to show less unwanted behaviour, such as that related to fear, but 57% reported to overall be very satisfied with their dog's behaviour (Mornement et al., 2015). Aggression is particularly troublesome behaviour. An inverse relation between aggressive behaviour in dogs and ownership satisfaction was found in a study on 645 Australian dog owners, with owners of friendly (and obedient) dogs being especially satisfied (Howell et al., 2016). Problematic behaviours in dogs may interact when affecting ownership satisfaction. Here we found (dis)obedience to be of little effect when aggression levels were high, nearing scores of 50% of the theoretical maximum. Such high aggression levels are rare. Within the range of common levels the effects of disobedience and aggression were near independent and additive, meaning we found no indications that comorbidity potentiated the impact of single misbehaviours.

Clearly other factors than the ones discussed so far determine dog ownership satisfaction, including the personalities of both owner and dog. Interpersonal relationship satisfaction is reduced by a person's neuroticism, where agreeableness and extraversion increase satisfaction by means of substantiating empathy (Ozer and Benet-Martinez, 2006; Robins et al., 2002; White et al., 2004). Similarity of personality associates with higher relationship satisfaction, more so than does complementarity (Luo and Klohnen, 2005), though inconsistent findings exist (Robins et al., 2002). In the owner-dog relationship similarity of personality may also be advantageous. Dog ownership satisfaction was directly related to owner perceived complementarity for warmth of their dogs and themselves (Zeigler-Hill and Highfill, 2010). The 449 dog owners reported on dog ownership satisfaction, emotional attachment and their dog adding positivity to life. Warmth was considered one of two main components of social behaviour with complementary dominance having no influence on dog ownership satisfaction (Zeigler-Hill and Highfill, 2010). Also, complementarity of owner and dog in willingness to 'share, loving to run outside, acting destructive and getting along with others', explained dog ownership satisfaction in a study on 88 dog owners (Curb et al., 2013).

Prospective dog owners will have expectations of ownership, which may or may not match reality. Candidate adopters of dogs and cats reported that the behaviour of their future companion animal is of prior concern to them (O'Connor et al., 2014). Expectations

of the role pets should play vary with gender, with having children and with ownership experience, as demonstrated in study population 343 adopters of shelter dogs and cats (Kidd et al., 1992) with similar findings in a more recent survey of 877 Australians on their 'ideal dog' (King et al., 2009). Common expectations of a dog's phenotypical traits are about it being medium sized and short haired, having good health and behaving socially and obedient (King et al., 2009). One unrealistic expectation of dog ownership may regard the amount of effort it takes to care for it. An unexpectedly high care effort is a major reason for returning adopted dogs (Diesel et al., 2008) and this matches with the presently found relatively strong relationship between perceived costs and ownership satisfaction.

Unwanted behaviour in the dog was found to coincide with high perceived costs and such behaviour may worsen a suboptimal situation. With an owner already perceiving costs of the relationship as high, the additional effort required to counter unwanted behaviour in the dog, may be insurmountable. The resulting risk of relinquishment makes it of prime concern to prevent and solve such dog behavioural issues at its early stages. The role for dog obedience classes in reaching this objective, may be less straightforward than expected, and it may be questioned if obedience classes today reach their full potential to promote wanted behaviour in dogs and contribute to a satisfying owner-dog relationship.

Appendices

Appendix 1–Questionnaire items

Questionnaire items (excluding Monash Dog Owner Relationship Scale), gathering information on the dog (ownership)

General questions on the dog:

1. Of which breed or type is your dog?

[open]

2. Does your dog have an FCI-pedigree?

[yes/no]

3. Which age is your dog?

[<4 months/4-6 months/6-12 months/1-2 years/2-5years/5-10 years/>10 years]

4. Is your dog female or male?

[female/male]

5. Is your dog intact?

[yes/no]

6. Which coat type does your dog have?

[short, thick coat/short, thin coat/middle length, thick coat/middle length, thin coat/long thick coat/long thin coat]

Questions on dog ownership:

7. How satisfied are you with your dog?

[not at all satisfied/not very satisfied/moderately satisfied/satisfied/very satisfied]

8. Does your dog meet the wishes you had when you bought it?

[yes/no]

9. Which reason for having a dog fits your situation best?

[for company/because it is pretty/for the children/as companion on walks/to practice a dog sport/for guarding purposes/for work, other than guarding/other]

10. How would you type your dog for:

a. energy level

[highly active/active/normal/calm/very calm]

b. stubbornness versus mellowness

[very stubborn/stubborn/normal/mellow/very mellow]

c. stability versus sensitivity?

[very stable/stable/normal/sensitive/very sensitive]

11. How did you prepare for becoming a dog owner?

[not at all/information from relatives/information from breeder/information from internet/reading books/

information from organization/other]

12. How much time was between the decision to have a dog and actually getting it?

[<1 week/1-4 weeks/1-6 months/>6 months]

13. Is this your first dog (being a child younger than 16 years not included)?

[yes/no]

14. Did you grow up as a child younger than 16 years with a dog?

[yes/no]

15. Through which channel did you acquire your dog?

[single nest 'in house' breeder/breeding kennel or shed/store or market/home delivered/shelter/relatives/foreign dog placement organization/Dutch rehoming organization/own breeding/self-obtained from abroad]

16. Did you choose this way of acquiring the dog purposely?

[yes/no]

17. Did you visit the place/organisation where you bought your dog more than once?

[yes/no]

18. Did the seller have a conversation with you > 30 min. upon buying the dog?

[yes/no]

19. Did the seller contact you after acquisition to learn how things are with the dog?

[yes/no]

20. Did you use after care, if provided by the seller?

[yes/no]

21. Did your dog reside at a foster home, before your acquisition of it?

[yes/no]

22. To your knowledge, was your dog ever in a shelter?

[yes/no]

23. What was the age of the dog at acquisition?

[<7 weeks/7-12 weeks/3-6 months/6-12 months/1-2 years/2-5years/5-10 years/>10 years]

24. Was your dog checked for disease or disorder before you acquired it?

[yes/no]

25. Have you ever contemplated rehoming your dog with a relative or via a shelter?

[yes/no]

26. How much did you pay for your dog at acquisition?

[<100 euro/100-200 euro/200-500 euro/500-1000 euro/>1000 euro]

27. If you had another chance of acquiring a dog, would you buy one?

[yes/no]

28. Would it be of a same or different breed or type than you have now?

[yes/no]

29. Is your dog presently suffering from disease or disorder?

[yes/no]

30. Has your dog previously suffered from disease or disorder?

[yes/no]/ If so, which? [open]

31. Indicate how often your dog:

a. Exercises off leash in populated area

b. Exercises off leash outside out-side populated area

c. Comes immediately when called

[never/nearly never/sometimes/often/always]

32. How many dogs live with you, next to the dog you are filling out this survey for?

[0/1/2/>2]

33. Indicate how often your dog:

a. Pulls on leash

b. Pees or poops in the house

c. Runs away

d. Runs after game or stock

e. Runs after bikers/runners/riders

f. Barks/wines/howls when alone

g. Destructs

h. Is overly active by jumping up/pushing against you

i. Is hyperactive or restless

j. Begs for food or attention

k. Steals food

l. Eats poop from other animals

m. Rolls in poop, dead animals or garbage

n. Exhibits strange or repetitive behaviour as chasing its own tail.

[never/nearly never/sometimes/often/always]

34. Indicate how often in below situations your dog shows one or more of these behaviours:

seeks shelter behind your legs or an object, walks away, runs, freezes, whines, shakes or keeps its tail between its legs

a. When at the vet or groomer

b. When nearby other dogs

c. With children

d. With adults

e. When hearing loud noises

f. In traffic or at encountering strange objects

g. In new or unexpected situations

[never/nearly never/sometimes/often/always]

35. Indicate how often in below situations your dog shows one or more of these behaviours:

barking, growling, raising lips, baring teeth, snapping, biting

a. When at the vet or groomer

b. When near its bowl, bone, toy

c. When nearby known dogs in its own home or garden

d. When nearby unknown dogs in its own home or garden

e. When nearby dogs outside its own home or garden

f. Directed at you or family member

g. Directed at children

h. Directed at adults

[never/nearly never /sometimes/often/always]

36. Have you visited a dog school with your dog?

[yes/no]

a. If so, how long?

[1-8 weeks/2-6 months/6-12 months/>1 year]

b. Which training aids were used?

[play/food/clicker/correction chain/other]

37. Does your dog learn what you wish him to, quickly?

[yes/no]

38. Are you able to influence behaviour of your dog with:

a. his normal food,

[yes/no]

b. tasty food,

[yes/no]

c. the promise of playing together or getting a ball?

[yes/no]

39. Is your dog quickly distracted by sounds, smells, things he sees?

[never/nearly never /sometimes/often/always]

40. Are you satisfied with the possibilities of walking the dog nearby your home?

[yes/no]

41. Is it possible to walk 30 minutes or more with the dog within ten minutes walking

distance from you home?

[yes/no]

42. How much time do you spend walking on a weekday with your dog on average?

[<15 min/15-30 min/30-60 min/60-90 min/>90 min]

43. Are you satisfied with community policies on dogs?

[yes/no]

44. How much time is you dog at home alone per week or day on average?

[not at all/<8 hours per week/1-4 hours per day/4-6 hours per day/6-8 hours per day/8-10 hours per day/>10 hours per day]

45. How often do you play with your dog on average?

[not at all/<15 min per week/15-60 min per week/5-10 min per day/10-15 min per day/15-30 min per day/>30 min per day]

46. How often do you take care of your dog's coat?

[not at all/daily/weekly/monthly or less]

47. How often do you de-flea your dog?

[not at all/wearing flea collar/about once per quarter/about once per half year/about once per year]

48. How often do you deworm your dog?

[not at all/about once per quarter/about once per half year/about once per year]

49. How often do you give bones/chewing material to your dog?

[daily/nearly daily/few times per week/once per week/once per month/once per quarter/once per year/never]

50. Does your dog ever go out with a walking service?

[yes/no]

51. Do you clean after your dog in populated area?

[never/nearly never/sometimes/often/always]

52. Do you clean after your dog outside of populated area?

[never/nearly never/sometimes/often/always]

53. Do you put your dog on leash or in heel position when approaching a leashed dog?

[never/nearly never/sometimes/often/always]

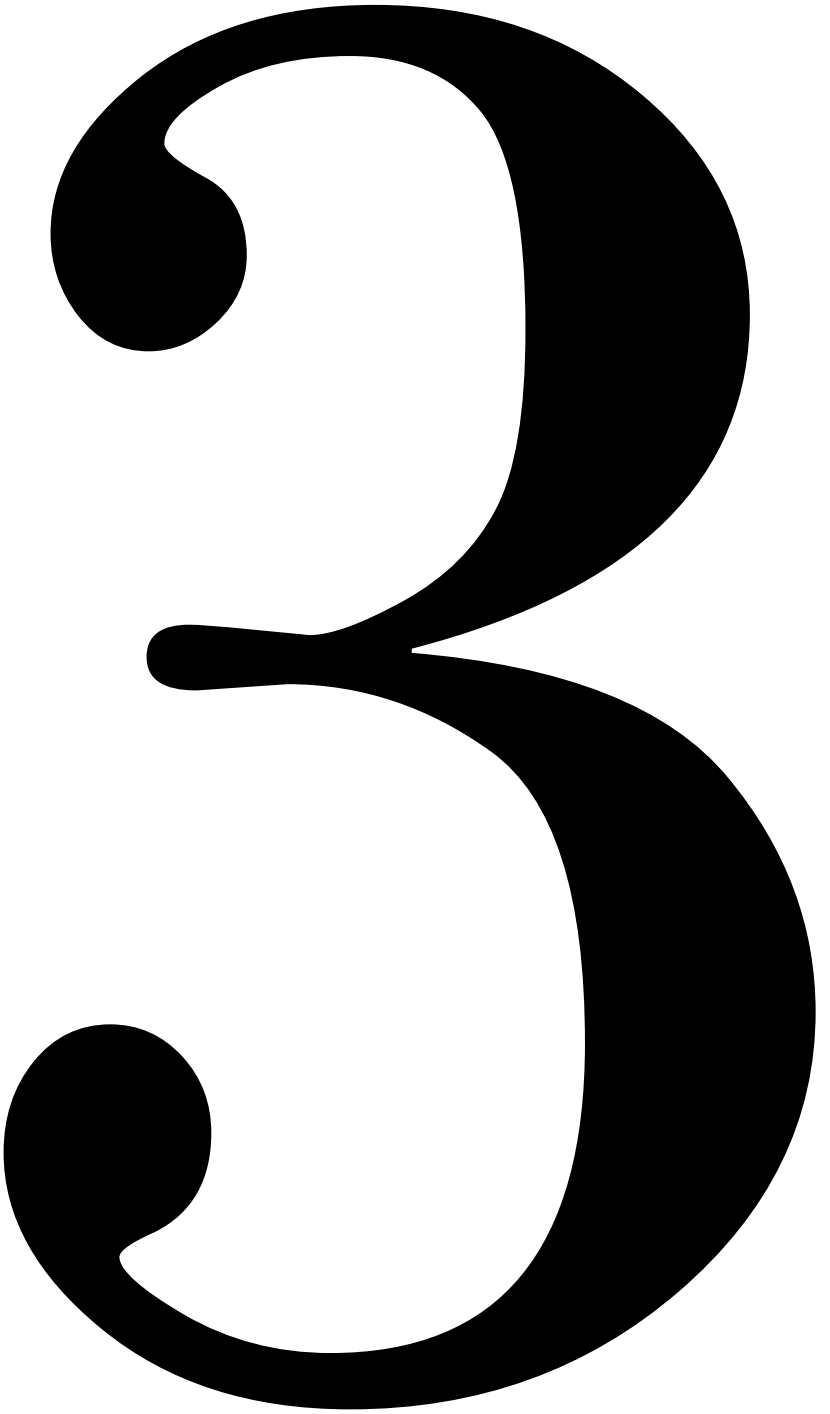
54. Do you put your dog on leash or in heel position when approaching people in recreational

areas?

[never/nearly never/sometimes/often/always]

Appendix 2–Prevalence of dog aggression and obedience in 968 to 972 Dutch dog owners.
Prevalence of dog aggression and two obedience behaviours based on the owner's assessments of different situations (*N*=968 to 972, with precise sample sizes between brackets)

Behaviour	Sometimes, often, or always	Never or nearly never
Aggression at vet/groomer	8% (75)	92% (896)
Aggression near bowl, bone, toy	6% (57)	94% (915)
Aggression towards familiar dog on territory	17% (162)	83% (807)
Aggression towards unfamiliar dog on territory	36% (350)	64% (622)
Aggression towards dog off territory	32% (311)	68% (661)
Aggression towards owner/family member	2% (21)	98% (951)
Aggression towards child	6% (54)	94% (917)
Aggression towards adult	8% (79)	92% (889)
Obedience by coming when called	98% (948)	2% (24)
Disobedience by jumping up/pushing against people	38% (365)	62% (607)



Chapter 3

The existence of parenting styles in the owner-dog relationship

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Abstract

Parents interact with children following specific styles, known to influence child development. These styles represent variations in the dimensions of demandingness and responsiveness, resulting in authoritarian, authoritative, permissive or uninvolved parenting. Given the similarities in the parent to child and owner to dog relationships, we determined the extent to which parenting styles exist in the owner to dog relationship using the existing Parenting Styles and Dimensions Questionnaire for the parent-child relationship and an adapted version for dog owners. Items on the parenting of children/dogs were rated for applicability on a five-point Likert scale by 518 Dutch dog owning parents. Principal Component Analyses grouped parenting propensities into styles, with some marked differences between the findings for children and dogs. Dog-directed items grouped into an authoritarian-correction orientated style, incorporating variation in demandingness and focussing on correcting a dog for behaviour verbally/physically, and in two styles based on authoritative items. An authoritative-intrinsic value orientated style reflected variation in mainly responsiveness and oriented on the assumed needs and emotions of the animal. A second authoritative-item based style, captured variations in demandingness and responsiveness. We labelled this style authoritative-training orientated, as it orientated on manners in teaching a dog how to behave in social situations. Thus, we defined dog-directed parenting styles and constructed a Dog-Directed Parenting Styles and Dimensions Questionnaire along the lines of the existing theoretical framework on parenting styles. We did not find a dog-directed parenting style of being permissive or uninvolved, which we attribute to a study population of devoted dog owners and our findings should be interpreted with this specific study population in mind. We found evidence of dog-directed parenting styles and provide a fundament for determining their possible impact on the different aspects of a dog's life.

Keywords: domestic dog, parenting style, animal-human bond

Highlights

- Child-directed parenting styles are partly reflected in dog-directed parenting styles.
- The authoritarian style shows the strongest correlation between child- and dog-directed parenting,
- Authoritative parenting is different in owner to dog than in parent to child parenting.
- In dogs authoritativeness differentiates in a focus on animal intrinsic value or training.

Introduction

Strategies of parents to raise their children are recognized as parenting styles, reflecting relatively stable patterns in parenting behaviour and goals the caretaker has with parenting the child. Parenting styles are relevant because of their effects on the development and well-being of children. They could exist also in the owner-dog relationship and, possibly, present a pathway to improve dog behaviour and welfare. The dimensions underlying four main parenting styles (Barber, 1996; Baumrind, 1991; Baumrind et al., 1991) are demandingness and responsiveness. Demandingness refers to the monitoring of the child and practicing of confrontive control. Monitoring provides structure, order and predictability, where confrontive control 'teaches a child to behave well' by discouraging disruptive behaviour and enforcing rules in a goal-orientated and reasonable way. Responsiveness represents emotional warmth and supportive actions, reflecting the degree to which a parent responds to the child's needs and wishes. Thus, where demandingness places demands on the child and directs it, responsiveness allows the child to be seen and heard. Demandingness and responsiveness are separate dimensions, not contrasting elements, and it is assumed that optimal parenting is characterized by scoring highly on both dimensions (Baumrind, 2013). Up to seven different parenting styles have been defined (Baumrind et al., 2010; Baumrind, 2013), but here we focus on the three original ones, being authoritarian, authoritative and permissive (indulgent), plus the uninvolved style (Baumrind, 2013). The latter is known as disengaged or neglectful and this style was added to the original three (Maccoby and Martin, 1983). The authoritarian style manifests as being demanding, exerting high levels of control, with low levels of responsiveness (Baumrind et al., 2010). Children are expected to follow the strict rules set by parents, reasoning is not explained and failure to adhere to rules results in punishment. The authoritative style combines strong tendencies in both dimensions of demandingness and responsiveness (Baumrind et al., 2010). High demands are placed on children, which are expected to behave properly, but judgements, values and goals are explained to them and parents are more willing to negotiate. The permissive style involves low levels of demandingness, but strong responsiveness (Baumrind et al., 2010). Children have few rules to follow and little is demanded of them. Lastly, the uninvolved style scores low on both demandingness and responsiveness, resulting in 'least effort parenting'. Few demands are made of the children and communication is minimal on rules as well as on the child's needs and emotions (Baumrind et al., 2013).

To determine the effects of the parenting styles on children, in human psychology the Parenting Styles and Dimensions Questionnaire (PSDQ) is used. The PSDQ was specifically developed to identify parenting practices based on self-reports by parents of (pre)school-aged children (Robinson et al., 1995). The original version, also known as

the Parenting Practices Questionnaire (PPQ), consisted of 62 items (62-PSDQ) and was later shortened to 32 items (32-PSDQ) (Robinson et al., 1995; Robinson et al., 2001). Both measure on the authoritarian, authoritative and permissive parenting style. For the permissive parenting style, which was suggested to measure inconsistency in parenting more than permissiveness, reliability and validity may be limited when using the 32-PSDQ (Olivari, 2013). The uninvolved parenting style was measured less often in studies, and thesis work by Blakely Kimble (2009) defined this style indirectly with existing PSDQ items for the other three parenting styles. She validated measures of uninvolved parenting against parenting practices, maternal depression and interactions with the child at meal times. Factor analysis of a questionnaire filled out by 378 mothers of first grade children revealed associations for uninvolved parenting with items on the use of threats, lack of following through, rejection and lack of discipline and, inversely, with regulation and reasoning. Such aspects of low control and high rejection as characteristics of uninvolved parenting correspond with earlier reports of minimal parenting effort/time (Maccoby and Martin, 1983) and of lax behavioural control as well as rejection (Baumrind, 2013).

Parenting styles influence child development, with the authoritative style being optimal. Academic competence and self-reliance for instance, as measured on a three-point Likert-scale in 4,081 fourteen- to eighteen-year-old US children, was significantly higher in authoritatively parented children than in children parented otherwise (Lamborn et al., 1991). Misconduct scored lower concomitantly, and self-reliance was significantly higher for authoritatively guided children compared to those parented with an authoritarian or uninvolved style (Lamborn et al., 1991). Having one or two authoritative parents protected against delinquency and depression in eight-grade adolescents from 451 US families (Simons and Conger, 2007) and authoritative parenting promoted self-esteem, subjective well-being, secondary education results and continuing education in 1,456 British fifteen-year-olds (Wing Chan and Koo, 2011). Clearly, the style in which children are parented directs their development and well-being, raising the question if the same applies to companion animals like dogs.

Research on the identification of parenting styles and the effects of parenting is abundant in human psychology, but almost non-existent in companion animal sciences (German, 2014). Consequently, we may miss out on opportunities to guide the behavioural development of dogs and improve their well-being. Parenting could play an important role in human-dog interactions as, intraspecific, mothering and nursing style influence later behaviour of guide dogs (Bray et al., 2017) and many people view and treat their dogs similar to children. Almost half of the dog owners (48%) regarded their dog as a child or close companion where the other half (52%) indicated the dog to be 'part of the family', in a US-survey on 343 adopters of cats and dogs (Neidhart and Boyd,

2002). Regarding the dog as a family member was indicated by 93% of 14,004 dog owners in Germany (Kubinyi et al., 2009). The option 'child' was not offered as choice, and options such as 'hobby' (50%) were indicated less frequently than 'family member' (Kubinyi et al., 2009). It remains somewhat speculative what the dog as a family member encompasses precisely, but in 711 dog owners, of which 98% regarded their dog a family member, over 40% celebrated their dog's birthday and shared snacks with them frequently (Voith, 1985). Behaviour of dog owners towards their dogs provides further insights in the nature of the owner-dog bond. The way dog owners talk, show affiliative behaviour and play after separation, led to the suggestion that modern dog ownership can be typed as interspecific parental behaviour (Prato-Previde et al., 2003). Dogs seem to exploit our tendencies towards empathy, nurturing and anthropomorphism, and tap into mechanisms that underlie parent-child relationships (Archer, 1997). This view has been specified by the idea that dogs tap into the oxytocin loop that plays a role in mother-child attachment, based on differential urinary oxytocin levels in dog owners who experienced different durations of intentional eye contact with their dog (Nagasawa et al., 2009). The oxytocin loop is important in both attachment and in (eliciting) caregiving behaviour in infant-parent relationships and if dogs are indeed able to activate oxytocin-based mechanisms of bonding, this provides additional argumentation for owner behaviour directed at dogs to resemble that of parenting behaviour.

Sufficient argumentation exists to assume a correspondence in behaviour patterns that parents show towards children and dogs, but there is need for further scientific evidence. Here we determined styles in the parenting of dogs by using an (adapted) PSDQ, as the existence of dog-directed parenting styles could bring new ways to improve the owner-dog relationship and latter's quality of life. We validate the psychological construct of parenting styles in the owner-dog relationship and determine if parenting styles express similarly or dissimilarly in the relationships of owner to dog as in parent to child.

Methods

Web-based survey

Dog owning parents of at least one child (age not reported) participated in a Dutch language web-based survey, after having been recruited via pet stores, vets, dog schools, human schools, (animal) foodbank organisations, online and hardcopy magazines on (human) parenting as well as on (companion) animals. The online survey's introduction explained the purpose of the research and the study did not involve treatments or interventions in the life of respondents or their dogs. The questionnaire was not repeated, meaning it did not interfere significantly with normal daily life, and did not include questions that were psychologically burdening. This exempts the study from review by our ethics committee, according to the guidelines of Wageningen University Medical

Ethics Review Committee (Medisch Ethische Toetsingscommissie van Wageningen University, METC-WU). Informed consent was not obtained as respondents choice to participate freely via internet and the purpose of the research was stated at the start of the online survey.

The survey ran from May 2016 till November 2016 and included three main parts, with the first consisting of 21 questions (items) on the background of the owner, her/his household and the dog. We did not collect privacy sensitive information for the purpose of our research, such as names and addresses of respondents. The second part contained 62 items on dog-directed parenting, explained below. The third held 62 items on child-directed parenting, being the Parenting Styles and Dimensions Questionnaire (62-PSDQ) developed by Robinson et al. (1995, 2001) for measuring child-directed authoritarian, authoritative and permissive parenting styles along dimensions of demandingness and responsiveness. This 62-item questionnaire was analysed also as the shorter 32-PSDQ. In the 62-PSDQ, 20 items measure the authoritarian style, 27 items the authoritative and fifteen the permissive. In the 32-PSDQ, twelve items measure the authoritarian style, fifteen the authoritative and five the permissive. We calculated the uninvolved style following Blakely Kimble (2009) as well as following Baumrind's (2013) ideas on it representing weak behavioural control and strong rejection (for the items see Appendix 1).

We wanted to validate the child-directed PSDQ for measuring dog-directed parenting and adapted existing items to situations dog owners encounter when raising their dog. For example, the original item 'I spank when my child is disobedient', was reformulated to 'I use a corrective slap when my dog misbehaves' (Appendix 2 lists all items).

Both sets of items on parenting directed at children and dogs were translated into Dutch and pretested with five Dutch native speakers (male and female, aged 39-53 and responsible for the care of both dog and child) to detect possible obscurities in the questions. PSDQ items were measured on a five-point Likert scale, rating the likelihood of scenarios occurring as never (score 0), nearly never (1), neutral (defined as about half of the time, 2), nearly always (3) and always (4). Parenting style scores were calculated following Robinson et al. (1995) by summing scores for items on a same parenting style, with some items being scaled reversely, and expressing the sums as percentages of the theoretical maximum.

Statistical analyses

Statistical analyses were performed with GenStat (18th edition). Item scores were analysed for associations by standard Principal Component Analyses (PCA; Jolliffe, 1986) based on correlation matrices and with the number of principal components set

at five. Principal components are uncorrelated and orthogonal, expressing in patterns of eigenvectors as representations of direction. Scaling is represented by eigenvalues, which we integrated by calculating loadings as eigenvectors multiplied by the square root of eigenvalues. Principal components were not rotated and we regarded loadings ≥ |0.4| as meaningful, indicating that an item fitted into a component, or candidate dimension of parenting. The meaningfulness of a component is indicated by the amount of variance in the data set that it explains. Construct validity was assumed if meaningful components grouped items logically according to the existing framework on child-directed parenting styles. Correlations between scores for parenting styles directed at the child and those directed at the dog were studied both with Pearson's and Spearman's (r_s) rank, resulting in similar outcomes and only the latter are presented. Descriptive results are presented as means ± standard deviations (s.d.), with median values and lower/upper quartile indicated as additional information on parenting style distribution.

We constructed a short Dog-Directed Parenting Styles and Dimensions Questionnaire (DD-PSDQ) based on the statistical outcomes of the first PCA on the dog-directed 32-PSDQ. We dropped four items from this first PCA, retained the other twenty items with loadings ≥ |0.4|. Dropped items associated with a different parenting style than in Robinson's original PSDQ. On the kept items we ran a second PCA and added two items from the 62-PSDQ to create a more balanced set of scales. The two chosen items had the highest loadings of the items additional to the 32-PSDQ. Internal consistency of the newly constructed DD-PSDQ dimensions was tested with Cronbach's alpha.

Results

Participants and their dogs

Dog owning parents of at least one child (age not specified) participated in the study. The number of respondents was 518, but with the occasional items remaining blank (missing values). In the following, percentages are given relative to this total and the precise sample sizes are indicated. The majority of the respondents was female (91%, *N*=470; male: 8%, *N*=43) and more than three quarters (83%, *N*=428) had completed upper secondary education or higher. Age of the respondents was indicated in seven age categories and most belonged to age groups 35-44 years (32%, *N*=164) and 45-54 years (35%, *N*=183). The mean (±s.d.) number of children was 1.7±0.8 on a four-point scale of one to four or more. Most respondents had one child (43%, *N*=205) or two (44%, *N*=213), 9% (*N*=45) had three children and 4% (*N*=19) had four or more.

The mean (±s.d.) number of dogs held by respondents was 1.6±0.9, again on a four-point scale of one to four or more. More than half of the respondents had one dog (58%, *N*=302), 28% (*N*=144) had two, 9% (*N*=44) had three and 5% (*N*=27) had

four or more dogs. Dogs were of varying breeds and the vast majority of dogs had been purchased in part for companionship (92%, *N*=475) and/or walking (66%, *N*=341), 24% (*N*=126) had been bought, also, for partaking in dog sports, 13% (*N*=67) for the owner to feel safer, 7% (*N*=38) for breeding, 7% (*N*=37) for work, 6% (*N*=30) for dog shows, 4% (*N*=23) for animal assisted therapy and 5% (*N*=25) for guarding and/or as resident ('yard-kept') dog, meaning the dog resides mainly at the premises, not indoors. Nearly three quarters of the respondents' dogs were reported to be always inside the house when the owner was inside (71%, *N*=369), for 23% (*N*=121) this was 'mostly' and for 4% (*N*=16) this was 'nearly never' or 'never'.

Parenting style scores by conventional methods

Credibility of the 32-item Parenting Styles and Dimensions Questionnaire (PSDQ) for measuring the three basic parenting styles was confirmed by the analyses of scores for both child- and dog-directed parenting styles. The measures of 32-PSDQ and 62-PSDQ correlated significantly for both child-directed parenting (authoritarian r_s=0.90, P<0.001, authoritative r_s=0.95, P<0.001, permissive r_s=0.79, P<0.001; *N*=518 for all comparisons) and dog-directed parenting (authoritarian r_s=0.94, P<0.001, authoritative r_s=0.95, P<0.001, permissive r_s=0.71, P<0.001; *N*=518 for all comparisons; see Table 1 for the descriptive mean scores of child- and dog-directed parenting). For uninvolved parenting, scores between the Blakely Kimble and Baumrind method correlated again significantly, but at lower levels than the conventionally measured parenting styles (child-directed parenting r_s=0.62, P<0.001, dog-directed parenting r_s=0.35, P<0.001; *N*=518 for all comparisons).

Dog-directed parenting and child-directed parenting styles correlated significantly (32-PSDQ: authoritarian r_s=0.59, P<0.001, authoritative r_s=0.46, P<0.001, permissive r_s=0.44, P<0.001; 62-PSDQ: authoritarian r_s=0.55, P<0.001, authoritative r_s=0.50, P<0.001, permissive r_s=0.48, P<0.001; Blakely Kimble uninvolved r_s=0.49, P<0.001, Baumrind uninvolved r_s=0.31, P<0.001; *N*=518 for all comparisons). For the three basic styles, the correspondence between parenting children and dogs explained in the range of 19-35% of the variation and for the uninvolved style 10-24% of the variation was explained.

Associations between items on parenting styles

Dimensions indicative of parenting styles were found in the Principal Component Analyses (PCA) with sets of 32 and 62 items on the everyday ways in which dog owning parents (*N*=518) parented their children and dogs (mean item scores for dog-directed parenting are available in Appendix 2).

Table 1 – Descriptive mean scores of child- and dog-directed parenting
Dog owning parents (*N*=518) reported on the parenting of their children by answering 62 items of the Parenting Styles and Dimensions Questionnaire (PSDQ) and on their dogs by answering 62 adapted items, both on a five-point Likert scale. Parenting style scores were calculated following standard procedures from both the full 62-item PSDQ and the shortened 32-item version, and expressed as percentage of the theoretical maximum. Presented are the mean child- and dog-directed parenting scores ± s.d. (range), as well as the medians and the threshold values at the lower and upper quartile that demarcate the range of 50% middle values.

Parenting style				
	Dog-32	Child-32	Dog-62	Child-62
Authoritarian	23.2±13.6	14.9±12.3	27.5±12.3	20.7±10.8
	(0-79.2)	(0-79.2)	(2.5-77.5)	(0-78.8)
	20.8	12.5	26.3	18.8
	(12.5-31.3)	(6.3-20.8)	(18.8-35.0)	(13.2-26.3)
Authoritative	70.5±13.0	83.4±12.7	72.4±12.0	83.3±11.9
	(31.7-100)	(0-100)	(27.9-98.1)	(0-100)
	71.7	85.0	73.2	85.2
	(61.7-80.0)	(76.7-93.3)	(64.8-80.6)	(76.9-91.7)
Permissive	23.3±13.7	31.5±16.6	28.2±10.2	28.7±10.6
	(0-75.0)	(0-100)	(3.3-68.3)	(1.7-71.7)
	20.0	30.0	26.7	28.3
	(15.0-30.0)	(20.0-40.0)	(21.7-33.3)	(21.7-35.0)
Uninvolved-Blakely			24.2±9.6	24.2±11.5
			(6.3-54.2)	(0-72.7)
			22.9	25.0
			(16.7-29.2)	(15.9-31.8)
Uninvolved-Baumrind			30.6±6.9	21.6±7.1
			(10.7-56.3)	(4.8-52.4)
			29.8	21.4
			(25.0-35.7)	(16.7-25.0)

On the parenting of children, the items associated as expected (32-PSDQ: authoritative component explaining 23.0% of variation, authoritarian: 15.4%, permissive: 6.0%; for details on loadings see Appendix 3), but a component in correspondence with an uninvolved style was not detected.

For dog-directed parenting, components were found reflecting authoritarian and authoritative parenting (32-PSDQ: authoritarian: 16.3%, authoritative: 10.7% and 8.0%, for details see Table 2; 62-PSDQ: authoritarian: 8.6%, authoritative: 12.8% and 7.3%, for details on loadings see Appendix 4). The authoritarian component

captured items on verbal/physical forcefulness and corrections for unwanted behaviour. Authoritative parenting emerged as two different components in dogs, indicating that authoritative parenting directed at dogs differentiates from human child directed parenting. The first component with items from the original authoritative style explained 10.7% of the variation and captured items of orientation on animal intrinsic value and animal emotions, with respondents varying in taking a dog's needs and emotions as a starting point for parenting practices. Included were items like 'I allow my dog to give input on decisions for instance with regard to the route we follow on walks' and 'I give comfort when my dog is upset'. The second component with items on acting authoritative explained 8.0% of the variation and captured items of orientation on training as a starting point for parenting practices. It held items such as 'I use more or higher value reward (food or toy) when I believe my dog should really do something in a situation' and 'I practice behaviour step by step with my dog, so I am sure he/she understands what I ask of him/her'. The PSDQ items for assessing dog-directed parenting thus grouped as expected into an authoritarian parenting style, but separated into two different styles where it regarded authoritative parenting. One of the latter two styles included items of permissive parenting, but the PCA did not identify a distinct permissive dog-directed parenting style, nor an uninvolved style.

Outcomes from the PCA on 62 dog-directed PSDQ items were in line with the findings based on 32 items, giving us further confidence that the shorter 32-questionnaire is a sound alternative for assessing possible dog-directed parenting styles, and next, we constructed a specific Dog-Directed Parenting Styles and Dimensions Questionnaire.

Dog-Directed Parenting Styles and Dimensions Questionnaire

To construct a Dog-Directed Parenting Styles and Dimensions Questionnaire (DD-PSDQ) we run a second PCA on the dog-directed 32-PSDQ items shown in Table 2, excluding the four items loading on a different parenting style than in Robinson's original PSDQ. This resulted in four main components that included eighteen items loading ≥ |0.4| (Appendix 5). We interpreted the four PCA components as parenting styles that were authoritarian-verbal correction oriented (22% of the variation explained, four items), authoritarian-physical correction oriented (6%, four items), authoritative-intrinsic value orientated (12%, six items) and authoritative-training orientated (8%, four items). We labelled the latter two styles 'authoritative' to indicate that all items in these two styles come from this original parenting style, as defined in earlier research on child-directed parenting. Authoritativeness in dog-directed parenting was found to be distinct from child-directed parenting as it divided in two separate components.

Next, to create a more balanced number of items across three main dimensions, we added the two authoritative-training orientated items from the PCA on the 62-PSDQ

Table 2 – Dog-directed parenting components

Dog owning parents (*N*=518) reported on dog-directed parenting in 32 items adapted from the Parenting Styles and Dimensions Questionnaire (PSDQ). Answers on a five-point Likert scale were analysed by Principal Component Analysis and presented are the loadings ≥ |0.4| and percentages of variation explained by the main components, which represented dimensions of parenting authoritarian, authoritatively-intrinsic value orientated and authoritatively-training orientated.

Item	Variation explained (latent root)		
	16% (5.2) Authoritarian	11% (3.4) Authoritative-intrinsic value orientated	8% (2.6) Authoritative-training orientated
I use a corrective slap when my dog misbehaves.[AN]	-0.67		
I raise my voice to make my dog improve.[AN]	-0.67		
I yell or shout when my dog misbehaves.[AN]	-0.65		
I use physical punishment (for instance a slap or a correction chain) as a way to improve my dog's behaviour.[AN]	-0.64		
I can explode in anger towards my dog when he does something he knows I don't want him to do.[AN]	-0.63		
I grab my dog when he is being disobedient.[AN]	-0.62		
I use a poke of my finger, or short kick to snap my dog out of it when it misbehaves.[AN]	-0.60		
I scold or criticize when my dog's behaviour doesn't meet my expectations.[AN]	-0.58		
I use threats as punishment without feeling need for justification towards my dog.[AN]	-0.51		
When I ask my dog to do something, he should do so, because I said so and I am its boss.[AN*]	-0.47		
I threaten with punishments towards my dog and do not actually do them.[PM!]	-0.42		
I allow my dog to give input on decisions for instance with regard to the route we follow on walks.[AV]		0.68	
I give comfort when my dog is upset.[AV]		0.64	
I spoil my dog.[PM!]		0.57	
I take my dog's desires into account before asking him to do something.[AV]		0.57	
I am responsive to my dog's feelings or needs.[AV]		0.52	
When I ask my dog to do something, he should do so, because I said so and I am its boss.[AN!*]		-0.50	
I encourage my dog to show how it feels, it is allowed to growl for instance, when uncomfortable.[AV]		0.50	

Continue

Continued

Item	Variation explained (latent root)		
	16% (5.2) Authoritarian	11% (3.4) Authoritative-intrinsic value orientated	8% (2.6) Authoritative-training orientated
I give into my dog when he causes a commotion about something or doesn't do something I want it to.[PM!]		0.48	
I take into account my dog's preferences in making plans.[AV]		0.47	
I use more or higher value reward (food or toy) when I believe my dog should really do something in a situation.[AV]			0.66
I practice behaviour step by step with my dog, so I am sure he understands what I ask of him.[AV]			0.60
I think about why rules should be obeyed by my dog.[AV]			0.58
I give praise when my dog is good.[AV]			0.57

[AN]–Authoritarian item in the original PSDQ, [AV]–Authoritative item, [PM] – Permissive item

[!]–Item scoring in a different PSDQ dimension than found originally by Robinson et al. (1995)

*–Item surfacing in two PCA-components

that had the highest loadings of the items additional to the 32-PSDQ. These being 'I practice certain behaviour with my dog before asking this behaviour in a more difficult situation' (loading: 0.70) and 'I channel my dog's misbehaviour into a more acceptable activity' (0.60). So, within the assumed dog-directed style of authoritarian parenting, the use of voice and physical contact varied independently, but for reasons of compatibility with the existing theoretical framework we decided to merge the two independent components into one authoritarian-correction oriented style. To us, these two styles do not reflect differences in the dimension of demandingness, but merely in the way of expressing it verbally or physically. Thus, our end DD-PSDQ consisted of 20 items, eight measuring the authoritarian-correction orientated style, six the authoritative-intrinsic value orientated style and six the authoritative-training orientated style (Table 3). Tests for internal consistency confirmed that the items within each of the three DD-PSDQ dimensions measured the same construct. Cronbach's alphas were 0.80 for the authoritarian-correction orientated style, 0.74 for the authoritative-intrinsic value orientated and 0.77 for the authoritative-training orientated style. The DD-PSDQ parenting styles scored on average 22.5±16.2% (ranging from 0-93.8) for authoritarian-correction orientated, 59.6±19.3% (0-100) for authoritative-intrinsic value orientated and 79.4±16.3% (8.3-100) for authoritative-training orientated. Scores for the newly constructed DD-PSDQ styles correlated significantly with those of the 32-PSDQ on

dog-directed parenting, with r_s=0.94 (P<0.001, *N*=518) for 32-PSDQ authoritarian and DD-PSDQ correction orientated, r_s=0.88 (P<0.001) for 32-PSDQ authoritative and DD-PSDQ intrinsic value orientated, and r_s=0.65 (P<0.001) for 32-PSDQ authoritative and DD-PSDQ training orientated. These relatively high correlations indicate that measures by the DD-PSDQ connect to the original measuring tool (with consistencies as well as marked differences) and, likely, the underlying theoretical framework.

Table 3 – Dog-directed Parenting Styles and Dimensions Questionnaire
The Dog-Directed Parenting Styles and Dimensions Questionnaire (DD-PSDQ) as constructed from the adapted 32-PSDQ with the addition of two elements from the 62-PSDQ to create a more balanced set of scales

Authoritarian – correction orientated
I yell or shout when my dog misbehaves
I scold or criticize when my dog's behaviour doesn't meet my expectations
I can explode in anger towards my dog when he does something he knows I don't want him to do
I raise my voice to make my dog improve
I use physical punishment (for instance a slap or a correction chain) as a way to improve my dog's behaviour
I use a corrective slap when my dog misbehaves
I use a poke of my finger, or short kick to snap my dog out of it when it misbehaves
I grab my dog when he/she is being disobedient
Authoritative – intrinsic value orientated
I allow my dog to give input on decisions for instance with regard to the route we follow on walks
I take my dog's desires into account before asking him to do something
I am responsive to my dog's feelings or needs
I encourage my dog to show how it feels, it is allowed to growl for instance, when uncomfortable
I give comfort when my dog is upset
I take into account my dog's preferences in making plans
Authoritative – training orientated
I give praise when my dog is good
I practice behaviour step by step with my dog, so I am sure he understands what I ask of him
I use more or higher value reward (food or toy) when I believe my dog should really do something in a situation
I think about why rules should be obeyed by my dog
I practice certain behaviour with my dog before asking this behaviour in a more difficult situation
I channel my dog's misbehaviour into a more acceptable activity

Discussion

Here we show how the concept of child-directed parenting styles applies to dog-directed parenting, with distinct differences like the separation into two authoritative styles. We found an expected style of authoritarian dog-directed parenting, but likely our study population of devoted dog owners prevented us from detecting styles of permissive or uninvolved parenting. Adapting an existing child-directed PSDQ for use with dogs without adding any new items facilitates that expected parenting styles resurface in the data, which makes our finding of differences in parenting dimensions directed towards children and dogs especially salient. We confirm that the 32-item Parenting Styles and Dimensions Questionnaire (32-PSDQ) is a valid alternative to its lengthier counterpart of 62 items and demonstrate how it can be re-constructed into a 20-item Dog-Directed Parenting Styles and Dimensions Questionnaire (DD-PSDQ) that shows good internal consistency on its three scales and associates logically with the original 32-PSDQ dimensions of authoritarian and authoritative parenting.

Our finding of dog-directed parenting styles, at least for authoritarian and authoritative parenting, expands on earlier research indicating that dog owners typically experience strong and family-like bonds with their dogs (Kubinyi et al., 2009; Voith, 1985). Similarities between child-directed and dog-directed parenting styles as documented here, indicate consistency of parenting styles. This consistency was shown before over time (Aunola and Nurmi, 2005; Darling and Steinberg, 1993) but not across species, giving rise to a plea for research on interspecies parenting styles (German, 2014). Consistency of parenting styles over time supports the existence of long-term parental attitudes, objectives and patterns of practices, which makes them different from short-term parenting behaviours (Wood et al., 2003). The latter may vary over time, for example as requirements change for the maturing child (Baumrind et al., 2010). We found proof of parenting styles applying to the interspecies owner-dog relationship and detected distinct patterns of dog-directed parenting that are authoritarian-correction orientated and authoritative-intrinsic value/training orientated, resembling parenting styles directed at children without being identical to them. The dissimilarities possibly result from varying orientations that humans have towards dog ownership. Child-directed parenting styles are known to reflect underlying orientations, values and goals of the parent (Baumrind, 2013) and in dog owners, an intrinsic orientation was distinguished from an extrinsic orientation in a small qualitative study of seven thorough in-home interviews. The intrinsically orientated owners viewed their dog as an individual, whereas the extrinsically orientated owners had the dog with the purpose to build their personal identity through exerting control over the dog and/or gaining status from it (Beverland et al., 2008). Intrinsic types of orientations have been categorized as protectionistic and humanistic in a qualitative study on 28 dog owners (Blouin, 2013),

with the extrinsic type resembling a dominionistic orientation. Protectionistic owners view dogs predominantly as animals with their own interests, humanistic owners adopt an anthropomorphic stance and dominionistic owners value animals especially for their uses (Blouin, 2013). The presently found authoritarian-correction orientated style of dog-directed parenting could be driven by a more extrinsic coercive orientation towards dogs, and the two authoritative styles could possibly fit an intrinsic orientation. Further research should clarify how animal orientations and dog-directed parenting styles may be related.

The two dog-directed parenting styles characterized by low demandingness, i.e. permissiveness and uninvolvedness, remained undetected in our analysis. It is important to realise that this does not exclude their existence. We suspect our study population to have held only few dog owners with a permissive or uninvolved parenting style as completing the lengthy survey, which was necessary to address the different aspects for developing a DD-PSDQ, took some effort and commitment. The permissive and uninvolved style are known for making relatively little effort in parenting (Larzelere et al., 2013) and people who minimize efforts in raising their children/dogs are unlikely to fill out an extensive time-consuming questionnaire on the subject of parenting. Alternatively, variation along the dimension of demandingness may be less pronounced in the owner-dog relationship than in the parent-child relationship and the authoritative-intrinsic value orientated parenting style could be the dog-directed variant of permissiveness. Our study does not confirm or rule out dog-directed parenting styles that are permissive or uninvolved as the study population was too particular by the participants' assumed strong commitment to their dogs and having at least one child. An uninvolved style of parenting may have remained unnoticed by us and requires further attention especially as neglect of children is known to associate with that of animals (Ascione et al., 2007; Becker and French, 2004; Volant et al., 2008). Our findings unlikely apply to the whole population of Dutch dog owners and further research is necessary to strengthen and clarify the concept of dog-directed parenting styles.

In our measurement of the parenting styles, we deployed the 32-PSDQ and 62-PSDQ and confirmed the shorter 32-PSDQ as a valid tool amongst the several parenting style measurements that have been used in (human directed) research (Olivari, 2013). The 62-PSDQ was developed originally for the purpose of determining parenting styles through self-report by parents of (pre)school-aged children. It resulted from a study on 534 fathers and 717 mothers answering a 133-item questionnaire. Successive factor analyses organized the 62-items with good internal consistency (Robinson et al., 1995) and the shorter, 32-item version of the PSDQ was produced later on (Robinson et al., 2001). Reliability and validity have been addressed mainly for the 32-PSDQ (Robinson et al., 2001), revealing that the permissive style, which is measured by the least number

of items, scores lowest on reliability (Olivari, 2013). We noticed this too and scores for (child- and dog-directed) permissive parenting showed lower, but still significant, correlations between 32- and 62-PSDQ, than the authoritarian and authoritative styles.

We constructed a 20-item DD-PSDQ that is compact, requires little effort to complete and captures variation in an authoritarian-correction orientated style and in two authoritative styles, with a connection proven to the original 32-PSDQ measuring tool and theoretical framework. For capturing the full spectrum of four parenting styles the 32-PSDQ may yet prove to be the better tool though. As explained, the DD-PSDQ does not capture distinct styles of parenting permissively or uninvolved. Further research with a broad spectrum of dog owners, including those who are less inclined to partake in studies, is needed to determine the existence of permissive and uninvolved styles in dog-directed parenting. Until this is resolved, we suggest to base research on dog-directed parenting on both the 32-PSDQ and the DD-PSDQ. The 32-PSDQ has the potential to capture all four parenting styles, should the styles of permissiveness and uninvolvedness prove to be relevant in dog-directed parenting. The DD-PSDQ is useful especially in measuring variation in dog-directed parenting among common dog owners who vary in responsiveness and to at least some degree in demandingness, though extremes of low demandingness may be missed.

Being able to assess dog-directed parenting styles is a first step to promote appropriate parenting in dogs. In humans, the authoritative parenting style is known to give optimal child outcomes, in terms of high school/academic performance (Lamborn et al., 1991; Wing Chan and Koo, 2011) and high self-reliance/esteem levels (Simons and Conger, 2007; Wing Chan and Koo, 2011). Possibly in dogs also, positive effects on behaviour and welfare can be achieved through authoritative dog-directed parenting. Dog owners often find themselves presented with unwanted behaviour such as aggression and this may challenge a close owner-dog relationship (Endenburg and Knol, 1994; Gazzano et al., 2008; Herron et al., 2009). New ways of preventing such disruptions of the relationship between owner and dog, may be found in steering dog owners towards desired parenting styles. Research on farm animals has already shown beneficial effects for animal welfare of targeting underlying elements of human-animal interactions. Stock handler-animal interactions for instance, improved after cognitive-behavioural intervention procedures with positive effects on the welfare of pigs and cows (Coleman et al., 2000; Hemsworth et al., 1994; Hemsworth et al., 2002). To date, similar studies on improving the human-dog relationship seem lacking. Promoting appropriate parenting of dogs, possibly by targeting underlying elements of the owner-dog relationship, such as animal orientations, may offer opportunities to improve canine quality of life following what is known about child-directed parenting.

Appendices

Appendix 1–Items measuring the uninvolved parenting style.
PSDQ items in the uninvolved style following Baumrind (2013) or Blakely Kimble (2009)

Baumrind (2013) uninvolved style	Parenting style	Element
1. I encourage my child to talk about its troubles.	authoritative	warmth & involvement
3. I know the names of my child's friends.	authoritative	warmth & involvement
5. I give praise when my child is good.	authoritative	warmth & involvement
8. I withhold scolding and/or criticism even when my child acts contrary to my wishes.	permissive	ignoring misbehavior
9. I show sympathy when my child is hurt or frustrated.	authoritative	warmth & involvement
11. I spoil my child.[BK]	permissive	lack of follow through
12. I give comfort and understanding when my child is upset.	authoritative	warmth & involvement
15. I allow my child to annoy someone else.	permissive	ignoring misbehavior
20. I state punishments to my child and do not actually do them.[BK]	permissive	lack of follow through
21. I am responsive to my child's feelings or needs.	authoritative	warmth & involvement
27. I tell my child that we appreciate what it tries or accomplishes.	authoritative	warmth & involvement
33. I am aware of problems or concerns about my child in school.	authoritative	warmth & involvement
34. I threaten my child with punishment more often than actually giving it.[BK]	permissive	lack of follow through
35. I express affection by hugging, kissing, and holding my child.	authoritative	warmth & involvement
36. I ignore my child's misbehavior.	permissive	ignoring misbehavior
38. I carry out discipline after my child misbehaves.	permissive	lack of follow through
39. I apologize to my child when making a mistake in parenting	authoritative	warmth & involvement
41. I give into my child when it causes a commotion about something.[BK]	permissive	lack of follow through
45. I allow my child to interrupt others.	permissive	ignoring misbehavior

Continue

Continued

46. I have warm and intimate times together with my child.	authoritative	warmth & involvement
49. I promise rewards to my child to bring about compliance.	permissive	lack of follow through
Blakely Kimble (2009) uninvolved style		
4. I find it difficult to discipline my child.	permissive	self confidence
10. I punish by taking privileges away from my child with little if any explanations.	authoritarian	non-reasoning/ punitive
11. I spoil my child.[B]	permissive	lack of follow through
13. I yell or shout when my child misbehaves.	authoritarian	verbal hostility
20. I state punishments to my child and do not actually do them.[B]	permissive	lack of follow through
28. I punish by putting my child off somewhere alone with little if any explanations.	authoritarian	non-reasoning/ punitive
34. I threaten my child with punishment more often than actually giving it.[B]	permissive	lack of follow through
41. I give into my child when it causes a commotion about something.[B]	permissive	lack of follow through
54. I use threats as punishment with little or no justification.	authoritarian	non-reasoning/ punitive
56. When my child asks why he/she has to conform, I state: because I said so, or I am your parent and I want you to.	authoritarian	non-reasoning/ punitive
58. I explain the consequences of the child's behavior.	authoritative	reasoning/induction
62. I emphasize the reasons for rules.	authoritative	reasoning/induction

[B] – Item also in Baumrind-measurement of uninvolved style, [BK] – Item also in Blakely Kimble-measurement of uninvolved style

Appendix 2–Overview of PCA-item loadings. Results of loadings after rotation from PCA-analysis for 32/62-PSDQ (Robinson et al., 1995) and new dog-directed parenting styles in 518 Dutch dog owning parents; presented are the loadings ≥ |0.4|.

Item	µ±s.d.	Autho-ritarian 32-items	Autho-ritarian 62-items	Authoritari-an- correc-tion orien-tated (new DD-PSDQ)	Autho-ritative 32-items–intrinsic	Autho-ritative 62-items–intrinsic	Authorita-tive- intrinsic value orien-tated (new DD-PSDQ)	Autho-ritative 32-items–training	Autho-ritative 62-items–training	Authorita-tive- trai-ning orien-tated (new DD-PSDQ)
I use a poke of my finger, or short kick to snap my dog out of it when it misbeha-ves. [AN*]	0.8±1.0	-0.6	0.6	0.7	-	-	-	-	-	-
I use short pulls on the leash or pull back when my dog pulls.[AN]	1.6±1.2	-	0.6	-	-	-	-	-	-	-
I allow my dog to jump up on people, as long as it is friendly. [PM]	0.6±0.9	-	-	-	-	-	-	-	-	-
I have good times together with my dog. [AV*]	3.7±0.5	-	-	-	-	-	-	-	-	-
When two dogs are fighting, I discipline first and think about why it happened later. [AN]	2.1±1.4	-	-	-	-	-	-	-	-	-
I encourage my dog to 'be dog' even when it results in a dirty or wet dog. [AV*]	3.4±0.8	-	-	-	-	-	-	-	0.4	-
I lure my dog with reward to solicit certain behaviour, even when it is misbe-having at that moment.[PM]	2.4±1.3	-	-	-	-	-	-	-	0.5	-
I scold or criticize when my dog's behavi-our doesn't meet my expectations.[AN*]	0.6±0.8	-0.6	0.5	0.8	-	-	-	-	-	-
I show respect for my dog' s needs by encouraging my dog to 'be dog'.[AV*]	3.4±0.8	-	-	-	-	-	-	-	0.4	-
I set strict well-established rules for my dog.[PM]	1.3±1.0	-	-	-	-	-	-	-	-	-
I let my dog know how I feel about its good and bad behaviour.[AV*]	2.9±1.0	-	0.4	-	-	-	-	-	-	-

Continue

Continued

Item	µ±s.d.	Autho-ritarian 32-items	Autho-ritarian 62-items	Authoritari-an- correc-tion orien-tated (new DD-PSDQ)	Autho-ritative 32-items–intrinsic	Autho-ritative 62-items–intrinsic	Authorita-tive- intrinsic value orien-tated (new DD-PSDQ)	Autho-ritative 32-items–training	Autho-ritative 62-items–training	Authorita-tive- trai-ning orien-tated (new DD-PSDQ)
I use threats as punishment without feeling need for justification towards my dog.[AN*]	0.4±0.8	-0.5	0.6	-	-	-	-	-	-	-
I take into account my dog's preferences in making plans.[AV*]	3.0±1.0	-	-	-	0.5	0.4	0.5	-	-	-
When I ask my dog to do something, he should do so, because I said so and I am its boss.[AN*]	2.2±1.2	-0.5	0.6	-	-0.5	-	-	-	-	-
I am unsure on how to solve my dog's misbehaviour.[PM]	0.9±1.0	-	-	-	-	-	-	-	-	-
I practice behaviour step by step with my dog, so I am sure he understands what I ask of him.[AV*]	3.1±1.0	-	-	-	-	-	-	0.6	0.6	0.6
I demand that my dog does things.[AN]	1.5±1.2	-	0.5	-	-	-	-	-	-	-
I channel my dog's misbehaviour into a more acceptable activity.[AV]	3.1±0.9	-	-	-	-	-	-	-	0.6	-
I shove my dog when he is disobedient.[AN]	0.7±0.9	-	0.6	-	-	-	-	-	-	-
I use more or higher value reward (food or toy) when I believe my dog should really do something in a situation.[AV*]	2.9±1.2	-	-	-	-	-	-	0.7	0.5	0.6
I encourage my dog to show how it feels by its body language, I see growling as a signal of my dog's emotion for example.[AV*]	2.0±1.3	-	-	-	0.5	0.4	0.6	-	-	-
I guide my dog by punishment more than by tapping into its natural needs.[AN]	0.3±0.7	-	0.5	-	-	-	-	-	-	-
I know the names of my dog's play mates.[AV]	3.1±1.1	-	-	-	-	-	-	-	-	-
I find it difficult to discipline my dog.[PM*]	0.8±1.0	-	-	-	-	-	-	-	-	-
I give praise when my dog is good.[AV*]	3.7±0.6	-	-	-	-	-	-	0.6	0.6	0.7

Continue

Continued

Item	μ±s.d.	Autho-ritarian 32-items	Autho-ritarian 62-items	Authoritari-an- correc-tion orien-tated (new DD-PSDQ)	Autho-ritative 32-items–intrinsic	Autho-ritative 62-items–intrinsic	Authorita-tive- intrinsic value orien-tated (new DD-PSDQ)	Autho-ritative 32-items–training	Autho-ritative 62-items–training	Authorita-tive- trai-ning orien-tated (new DD-PSDQ)
I use a corrective slap when my dog misbehaves.[AN*]	0.7±1.0	-0.7	0.7	0.8	-	-	-	-	-	-
I play and have fun with my dog.[AV]	3.7±0.6	-	-	-	-	-	-	-	0.5	-
I set consequences when my dog acts contrary to my wishes.[PM]	2.0±1.3	-	-0.4	-	-	-	-	-	-0.4	-
I show sympathy when my dog is hurt or frustrated.[AV]	3.0±1.1	-	-	-	-	0.6	-	-	-	-
I punish by taking away toys from my dog.[AN*]	0.2±0.7	-	-	-	-	-	-	-	-	-
I spoil my dog.[PM*]	2.3±1.1	-	-	-	0.6	0.6	-	-	-	-
I give comfort when my dog is upset.[AV*]	2.5±1.3	-	-	-	0.6	0.6	0.6	-	-	-
I yell or shout when my dog misbehaves.[AN*]	1.1±1.1	-0.7	0.6	0.8	-	-	-	-	-	-
I am easy going and relaxed with my dog.[AV]	3.3±0.8	-	-	-	-	-	-	-	-	-
I allow my dog to greet someone else, regardless of that person's appreciation of dogs.[PM]	1.2±1.2	-	-	-	-	-	-	-	-	-
I practice certain behaviour with my dog before asking this behaviour in a more difficult situation.[AV]	2.9±1.1	-	-	-	-	-	-	-	0.7	-
I raise my voice to make my dog improve.[AN*]	1.9±1.2	-0.7	0.6	0.6	-	-	-	-	-	-
I show patience with my dog.[AV]	3.2±0.8	-	-	-	-	-	-	-	-	-
I grab my dog when it is being disobedient.[AN*]	1.1±1.1	-0.6	0.6	0.5	-	-	-	-	-	-

Continue

Continued

Item	μ±s.d.	Autho-ritarian 32-items	Autho-ritarian 62-items	Authoritari-an- correc-tion orien-tated (new DD-PSDQ)	Autho-ritative 32-items–intrinsic	Autho-ritative 62-items–intrinsic	Authorita-tive- intrinsic value orien-tated (new DD-PSDQ)	Autho-ritative 32-items–training	Autho-ritative 62-items–training	Authorita-tive- trai-ning orien-tated (new DD-PSDQ)
I threaten with punishments towards my dog and do not actually do them.[PM*]	0.3±0.7	-0.4	0.5	-	-	-	-	-	-	-
I am responsive to my dog's feelings or needs.[AV*]	3.2±0.9	-	-	-	0.5	0.4	0.6	-	0.5	-
I allow my dog to give input on decisions for instance with regard to the route we follow on walks.[AV*]	1.6±1.3	-	-	-	0.7	0.6	0.7	-	-	-
I struggle with my dog.[AN]	0.4±0.8	-	-	-	-	-	-	-	-	-
I am confident about training skills towards my dog.[PM]	0.7±0.8	-	-	-	-	-	-	-	-	-
I think about why rules should be obeyed by my dog.[AV*]	3.3±0.9	-	-	-	-	-	-	0.6	0.6	0.6
I am more concerned with own feelings than with my dog's feelings.[AN]	1.1±1.0	-	-	-	-	-	-	-	-	-
I tell my dog 'good dog' when he tries to follow guidance, even if he does not succeed.[AV]	3.0±1.0	-	-	-	-	-	-	-	-	-
I punish by giving my dog 'time out' and walking away if he misbehaves, even if he finds the situation he is in uncomforting.[AN*]	1.1±1.2	-	-	-	-	-	-	-	-	-
I help my dog to understand the impact of its behaviour by offering him choices in situations.[AV*]	1.5±1.3	-	-	-	-	-	-	-	-	-
I am afraid that disciplining my dog for misbehaviour will cause him to like me less.[PM]	0.4±1.0	-	-	-	-	-	-	-	-	-
I take my dog's desires into account before asking him to do something.[AV*]	1.9±1.2	-	-	-	0.6	0.5	0.7	-	-	-

Continue

Continued

Item	µ±s.d.	Autho-ritarian 32-items	Autho-ritarian 62-items	Authoritari-an- correc-tion orien-tated (new DD-PSDQ)	Autho-ritative 32-items–intrinsic	Autho-ritative 62-items–intrinsic	Authorita-tive- intrinsic value orien-tated (new DD-PSDQ)	Autho-ritative 32-items–training	Autho-ritative 62-items–training	Authorita-tive- trai-ning orien-tated (new DD-PSDQ)
I can explode in anger towards my dog when he does something he knows I don't want him to do.[AN*]	0.4±0.7	-0.6	0.6	0.6	-	-	-	-	-	-
I am aware of problems or concerns about my dog that neighbours (may) have.[AV]	1.9±1.5	-	-	-	-	-	-	-	-	-
I threaten my dog with punishment more often than actually giving it.[PM*]	0.4±0.8	-	-	-	-	-	-	-	-	-
I express affection, for instance by rub-bing my dog under its chin.[AV]	3.6±0.7	-	-	-	-	-	-	-	-	-
I ignore my dog's misbehaviour such as chasing game, barking at other people or peeing against stores in a shopping area.[PM]	0.9±1.2	-	-	-	-	-	-	-	-	-
I use physical punishment as a way to improve my dog's behaviour.[AN*]	0.6±1.0	-0.6	0.6	0.8	-	-	-	-	-	-
I carry out discipline after my dog misbehaves.[PM]	1.7±1.2	-	-	-	-	-	-	-	-	-
I feel bad towards my dog when making a mistake in guiding it.[AV]	1.9±1.3	-	-	-	-	-	-	-	-	-
I let my dog know what I expect from him.[AV]	3.2±0.8	-	-	-	-	-	-	-	-	-
I give into my dog when he causes a commotion about something or doesn't do something I want it to.[PM*]	0.8±1.0	-	-	-	-	0.5	-	-	-	-
I think about why my dog does some-thing when it misbehaves.[AV]	3.2±0.9	-	-	-	-	-	-	-	0.6	-

[AN]–Authoritarian item in the original PSDQ, [AV]–Authoritative item in the original PSDQ, [PM]–Permissive item in the original PSDQ, *–32-PSDQ

Appendix 3–32-item child-directed PSDQ Principal Component Analysis.
Dutch dog owning parents (N=518) reported on child-directed parenting in 32 items adapted from the Parenting Styles and Dimensions Questionnaire (PSDQ). Answers on a five-point Likert scale were analysed by Principal Component Analysis and presented are the loadings ≥ |0.4| and percentages of variation explained by the main components, which represented dimensions of parenting authoritatively, authoritarian and permissively.

Item	Variance explained (latent root)		
	23% (7.4) Authoritative	15% (4.9) Authoritarian	6% (1.9) Permissive
I emphasize the reasons for rules.[AV]	0.5		
I encourage my child to talk about the child's troubles.[AV]	0.7		
I give praise when my child is good.[AV]	0.7		
I give comfort and understanding when my child is upset.[AV]	0.8		
I am responsive to my child's feelings or needs.[AV]	0.7		
I give my child reasons why rules should be obeyed.[AV]	0.7		
I help my child to understand the impact of behaviour by encouraging my child to talk about the consequences of his/her own actions.[AV]	0.6		
I have warm and intimate times together with my child.[AV]	0.7		
I show respect for my child' s opinions by encouraging my child to express them.[AV]	0.7		
I explain to my child how I feel about the child's good and bad behaviour.[AV]	0.7		
I explain the consequences of the child's behaviour.[AV]	0.8		
I spank when my child is disobedient.[AN]		0.8	
I punish by taking privileges away from my child with little if any explanations.[AN]		0.4	
I grab my child when he/she is being disobedient.[AN]		0.6	
I punish by putting my child off somewhere alone with little if any explanations[AN]		0.5	
I use physical punishment as a way of disciplining my child.[AN]		0.6	
I slap my child when the child misbehaves.[AN]		0.9	
I use threats as punishment with little or no justification.[AN]		0.4	
I find it difficult to discipline my child.[PM]			-0.4
I spoil my child.[PM]			-0.5
I state punishment to my child and do not actually do them.[PM]			-0.8
I give into my child when the child causes a commotion about something.[PM]			-0.4
I use threats as punishment with little or no justification.[AN!]			-0.4

[AN]–Authoritarian item in the original PSDQ, [AV]–Authoritative item, [PM]–Permissive item
[!]–Item scoring in a different PSDQ dimension than found originally by Robinson et al. (1995)

Appendix 4–62-item dog-directed PSDQ Principal Component Analysis.
Dutch dog owning parents (N=518) reported on dog-directed parenting in 62 items adapted from the Parenting Styles and Dimensions Questionnaire (PSDQ). Answers on a five-point Likert scale were analysed by Principal Component Analysis and presented are the loadings ≥ |0.4| and percentages of variation explained by the main components, which represented dimensions of parenting authoritatively and authoritarian.

Item	Variance explained (latent root)		
	13% (8.0) Authoritative	9% (5.3) Authoritarian	7% (4.5) Authoritative–intrinsic value/ emotion
I practice certain behaviour with my dog before asking this behaviour in a more difficult situation.[AV]	0.7		
I practice behaviour step by step with my dog, so I am sure he understands what I ask of him.[AV]	0.6		
I think about why my dog does something when it misbehaves.[AV]	0.6		
I channel my dog's misbehaviour into a more acceptable activity.[AV]	0.6		
I think about why rules should be obeyed by my dog.[AV]	0.6		
I give praise when my dog is good.[AV]	0.6		
I use more or higher value reward (food or toy) when I believe my dog should really do something in a situation.[AV]	0.5		
I play and have fun with my dog.[AV]	0.5		
I lure my dog with reward to solicit certain behaviour, even when it is misbehaving at that moment.[PM!]	0.5		
I am responsive to my dog's feelings or needs.[AV]	0.5		
I encourage my dog to 'be dog' even when it results in a dirty or wet dog.[AV]	0.4		
I show respect for my dog' s needs by encouraging my dog to 'be dog'.[AV]	0.4		
I set consequences when my dog acts contrary to my wishes.[PM!]	-0.4		
I use a corrective slap when my dog misbehaves.[AN]		0.7	
I use physical punishment (for instance a slap or a correction chain) as a way to improve my dog's behaviour.[AN]		0.6	
I use short pulls on the leash or pull back when my dog pulls.[AN]		0.6	
I grab my dog when he is being disobedient.[AN]		0.6	
I raise my voice to make my dog improve.[AN]		0.6	
I yell or shout when my dog misbehaves.[AN]		0.6	

Continue

Continued

Item	Variance explained (latent root)		
	13% (8.0) Authoritative	9% (5.3) Authoritarian	7% (4.5) Authoritative–intrinsic value/ emotion
When I ask my dog to do something, he should do so, because I said so and I am its boss.[AN]		0.6	
I shove my dog when he is disobedient.[AN]		0.6	
I use threats as punishment without feeling need for justification towards my dog.[AN]		0.6	
I can explode in anger towards my dog when he does something he knows I don't want him to do.[AN]		0.6	
I use a poke of my finger, or short kick to snap my dog out of it when it misbehaves.[AN]		0.6	
I demand that my dog does things.[AN]		0.5	
I guide my dog by punishment more than by tapping into its natural needs.[AN]		0.5	
I scold or criticize when my dog's behaviour doesn't meet my expectations.[AN]		0.5	
I threaten with punishments towards my dog and do not actually do them.[PM!]		0.5	
I let my dog know how I feel about its good and bad behaviour.[AV!]		0.4	
I set consequences when my dog acts contrary to my wishes.[PM!]		-0.4	
I give comfort when my dog is upset.[AV]			0.6
I show sympathy when my dog is hurt or frustrated.[AV]			0.6
I spoil my dog.[PM!]			0.6
I allow my dog to give input on decisions for instance with regard to the route we follow on walks.[AV]			0.6
I give into my dog when he causes a commotion about something or doesn't do something I want it to.[PM!]			0.5
I take my dog's desires into account before asking him to do something.[AV]			0.5
I am responsive to my dog's feelings or needs.[AV]			0.4
I encourage my dog to show how it feels, it is allowed to growl for instance, when uncomfortable.[AV]			0.4
I take into account my dog's preferences in making plans.[AV]			0.4

[AN]–Authoritarian item in the original PSDQ, [AV]–Authoritative item, [PM] – Permissive item

[*]–Item in 32-PSDQ

Appendix 5–Second step 32-item dog-directed PSDQ Principal Component Analysis.
Dutch dog owners (N=518) filled out a 32-item Parenting Styles and Dimensions Questionnaire (PSDQ) adapted for assessing dog-directed parenting styles. Answers on a five-point Likert scale were analysed by Principal Components Analysis, omitting items with loadings < | 0.4 | for the main components. Presented are the final outcomes on eighteen items with loadings ≥ |0.4| and percentages of variation explained by two components of parenting authoritarian-correction orientated (two times four items), one component of authoritative-intrinsic value orientated (six items) and one of authoritative-training orientated (four items), together explaining 48% of variation.

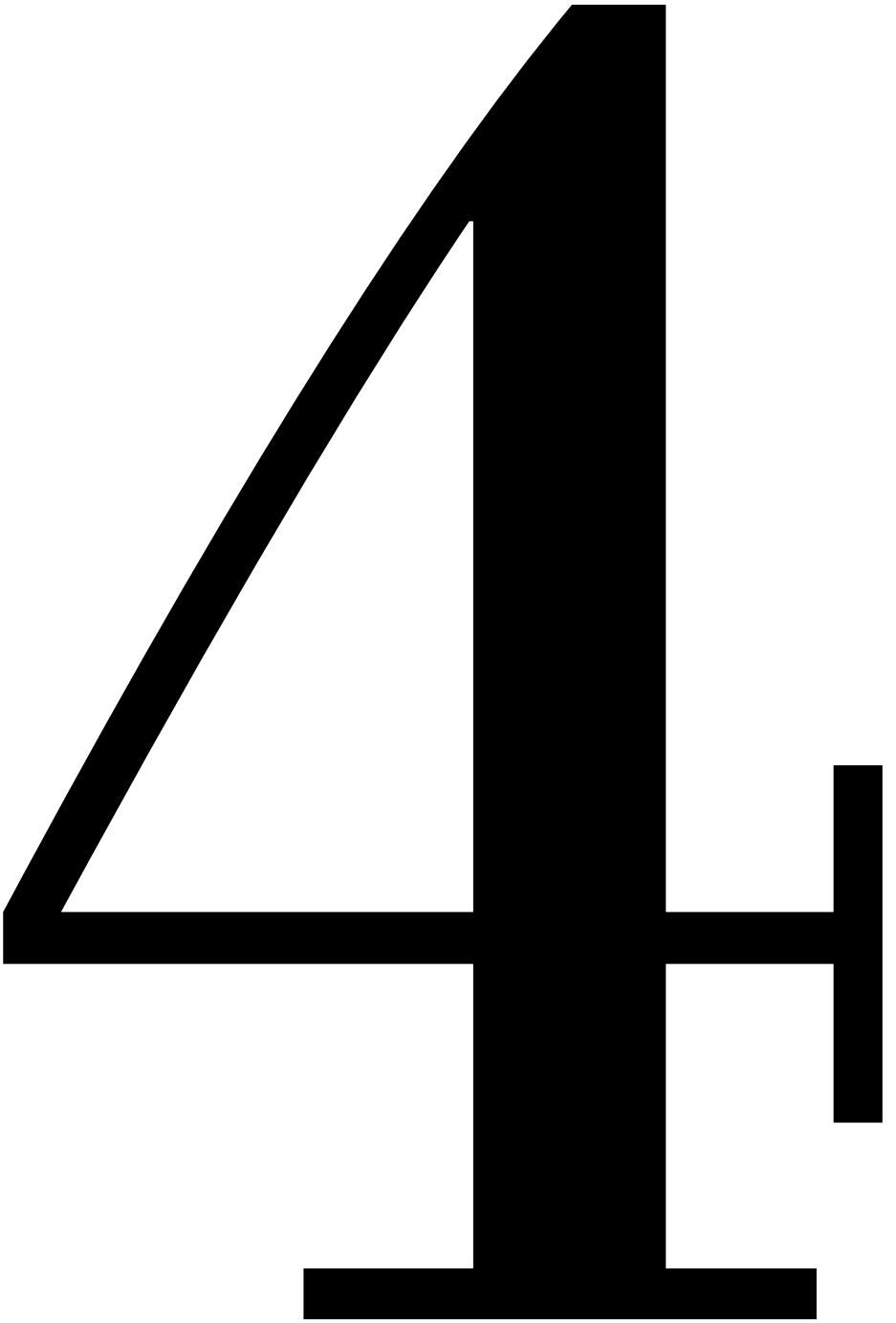
	Variation explained (latent root)			
	22% (4.6) Authoritarian-correction orientated-verbal	6% (1.2) Authoritarian-correction orientated-physical	12% (2.6) Authoritative-intrinsic value orientated	8% (1.8) Authoritative-training orientated
Authoritarian – correction orientated–verbal				
I yell or shout when my dog misbehaves.[AN]	0.76			
I scold or criticize when my dog's behaviour doesn't meet my expectations.[AN]	0.75			
I can explode in anger towards my dog when he does something he knows I don't want him to do.[AN]	0.61			
I raise my voice to make my dog improve.[AN]	0.55			
Authoritarian – correction orientated–physical				
I use physical punishment (for instance a slap or a correction chain) as a way to improve my dog's behaviour.[AN]		0.79		
I use a corrective slap when my dog misbehaves.[AN]		0.75		
I use a poke of my finger, or short kick to snap my dog out of it when it misbehaves.[AN]		0.74		
I grab my dog when he/she is being disobedient.[AN]		0.45		
Authoritative – intrinsic value orientated				
I allow my dog to give input on decisions for instance with regard to the route we follow on walks.[AV]			0.73	
I take my dog's desires into account before asking him to do something.[AV]			0.65	
I am responsive to my dog's feelings or needs.[AV]			0.61	
I encourage my dog to show how it feels, it is allowed to growl for instance, when uncomfortable.[AV]			0.58	
I give comfort when my dog is upset.[AV]			0.55	

Continue

Continued

	Variation explained (latent root)			
	22% (4.6) Authoritarian-correction orientated-verbal	6% (1.2) Authoritarian-correction orientated-physical	12% (2.6) Authoritative-intrinsic value orientated	8% (1.8) Authoritative-training orientated
I take into account my dog's preferences in making plans.[AV]			0.51	
Authoritative – training orientated				
I give praise when my dog is good.[AV]				0.69
I practice behaviour step by step with my dog, so I am sure he understands what I ask of him.[AV]				0.64
I use more or higher value reward (food or toy) when I believe my dog should really do something in a situation.[AV]				0.58
I think about why rules should be obeyed by my dog.[AV]				0.58

[AN–]Authoritarian item in the original PSDQ, [AV–]Authoritative item in the original PSDQ



Chapter 4

Dog-directed parenting styles mirror dog owners' orientations towards animals

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Abstract

Parents raise children in consistent ways, and these parenting styles affect child well-being and societal adjustment. Recently, we identified such parenting styles in the owner-dog relationship. Dog owners of the authoritarian-correction orientated (AUC) type stand out for demandingness. Authoritative dog owners adopt either an intrinsic value orientated style (AUI), of high responsiveness and attention to a dog's needs, or an authoritative-training orientated style (AUT), of high demandingness and responsiveness in teaching a dog how to behave socially. The causes for dog owners to favor certain dog-directed parenting styles are presently unknown. Orientations towards animals could play a role, and these have previously been determined in dog owners, capsulizing views on dog ownership. A dominionistic orientation values the dog for its utility, a humanistic orientation humanizes dogs, and a protectionistic orientation acknowledges the dog's species-specific interests. We wanted to know how these views on dog ownership are associated with dog-directed parenting styles. Therefore, orientations towards animals and dog-directed parenting styles were determined from dog owner reports collected online (N=518). The Likert-scale items regarding the orientations towards animals were grouped using data reduction techniques. The scores for our newly formed orientations were then rank correlated to the dog-directed parenting styles, with all scores expressed as percentages of the theoretical maximum. A dominionistic orientation was associated with AUC, indicating that combined demandingness and non-responsiveness in dog-directed parenting partly results from the owner's perceived need to dominate the dog. A humanistic/protectionistic orientation was associated with AUI, suggesting that the combination of parenting responsiveness and relatively low demandingness is an outcome of humanizing dogs. These findings support the idea that orientations towards animals partly underlie dog-directed parenting styles and may constitute a starting point for guiding owners away from less favorable dog-directed parenting styles.

Keywords: dog, parenting styles, orientations towards animals, human-animal interaction, owner-dog relationship

Introduction

The owner-dog relationship is often associated with positive experiences for owners and dogs, but this is not always the case according to the number of dogs being abandoned (Mondelli et al., 2004; Neidhart and Boyd, 2002), and with behavioral issues (Endenburg and Knol, 1994; Gazzano et al., 2008). Such issues may, in part, be prevented by optimizing the owner-dog relationship following strategies based on what is known from parent-child relationships and child development. The owner-dog relationship resembles the parent-child relationship in a number of ways. For instance, dog owners direct interspecific parental behavior at their dogs, as shown by a study with 25 dog-owner dyads on play, affiliative behavior, and the owner's speech (Prato-Previde, Fallani, and Valsecchi, 2006). In addition, dogs tap into existing mechanisms that underlie parent-child relationships (Archer, 1997) by triggering the "oxytocin loop", which plays a role in parent-child attachment. In a study with 55 dog owners, the duration of mutual eye contact between owner and dog was directly related to the post-interaction urinary oxytocin levels (Nagasawa et al., 2009). The increase in central oxytocin signaling in both the caregiver and care recipient creates a loop that is important in eliciting caregiving behavior in infant-parent relationships. The finding that dogs activate human oxytocin-based mechanisms of bonding further supports that the owner-dog relationship corresponds with the parent-child relationship. Therefore, the human-based concept of parenting styles may provide a valid framework from which to address the owner-dog relationship (Van Herwijnen et al., 2018b).

Parenting styles are consistent interaction patterns between a caregiver and care recipient, such as a parent and child. Parenting styles reflect variations in the dimensions of demandingness and responsiveness. Demandingness refers to the monitoring and practicing of confrontive control. It provides structure and predictability, teaching "how to behave" by discouraging disruptive behavior and enforcing rules (Baumrind, 2013). Responsiveness refers to emotional warmth and supportive actions, tending to someone's needs and wishes (Baumrind, 2013). Demandingness and responsiveness are distinct dimensions. Depending upon the levels of each dimension, a caregiver can be categorized as having a parenting style that is authoritarian, authoritative, permissive, or uninvolved (Baumrind, 2013; Baumrind et al., 2010; Maccoby and Martin, 1983). The authoritarian style is demanding, with high levels of control and low levels of responsiveness. The authoritative style combines strong tendencies from both demandingness and responsiveness. The permissive style involves low levels of demandingness but strong responsiveness. Lastly, the uninvolved style scores low on both demandingness and responsiveness, resulting in "least effort parenting" (Baumrind, 2013; Baumrind et al., 2010; Maccoby and Martin, 1983).

For decades, parenting styles and their effects on children have received interest from scientists (Baumrind, 2013). Recently, we identified dog-directed parenting styles in a study population of 518 Dutch dog owners who had children (Van Herwijnen et al., 2018b). Owner reports were collected using five-point Likert-scale items, from which we found components consistent with parenting styles as well as logical associations between parenting styles directed at children and dogs. Thus, dog-directed parenting styles are relevant in the owner-dog relationship, but not identical to child-directed parenting styles (Van Herwijnen et al., 2018b). Only three dog-directed parenting styles were detected in this study sample. The authoritarian-correction orientated style (AUC) was characterized by high demandingness and a focus on the use of aids/techniques to correct a dog's unwanted behavior, which we refer to as correctional methods. The authoritative-intrinsic value orientated style (AUI) of high responsiveness is focused on the dog's general needs and emotions. The authoritative-training orientated style (AUT) represented both demandingness and responsiveness, with a focus on teaching a dog how to behave (Van Herwijnen et al., 2018b).

Authoritative parenting is considered the most optimal and beneficial to child academic performance and well-being (Lamborn et al., 1991; Simons and Conger, 2007; Wing Chan and Koo, 2011). Similarly, high levels of demandingness and responsiveness in dog-directed parenting may favorably affect dog behavior and well-being, given that the owner-dog relationship resembles that of the parent-child (Archer, 1997; Nagasawa, et al., 2009; Prato-Previde, et al., 2006). To direct dog owners towards optimal parenting styles, it is necessary to address attitudes and views underlying current styles. At present, there is limited information concerning the causes that prompt dog owners to adopt certain parenting styles. Increasing our knowledge of the elements underlying (suboptimal) parenting can help to shape interventions regarding dog-directed parenting styles.

One such element may be a dog owner's general orientation towards animals. Orientations towards animals have been defined based on the distinct ways in which dog owners view and treat animals in general and dogs in particular (Blouin, 2013), without associating this with the framework of parenting styles. Based on 28 in-depth interviews, orientations towards animals were classified as dominionistic, humanistic, and protectionistic (Blouin, 2013). Owners with a dominionistic orientation value their dog for utility, for instance as a guarding dog. Dominionistic owners have a strong view of themselves as the owner/boss, with the dog being inferior. Owners with a humanistic orientation view their dog anthropomorphically and treat it as if it is human. Humanistic owners see themselves more as a parent or friend, being equal to the dog. Owners with a protectionistic orientation view their dog as a companion with its own species-specific interests, considering themselves as guardians or companions to their dogs, which are at

least their equals (Blouin, 2013). These three orientations are in line with findings from earlier studies, although the grouping and labeling of the orientations vary (Beverland et al., 2008; Dotson and Hyatt, 2008; Maher and Pierpoint, 2011; Voith et al., 1992).

Demonstrating how orientations towards animals are associated with dog-directed parenting styles provides insight into how dog owners adopt certain styles with potential welfare consequences. Here, we quantify these relationships using questionnaires. From this, we hope to gain basic knowledge on what may underlie consistent owner-dog interaction patterns to ultimately find ways to help dog owners to adopt parenting styles that support a dog's behavioral adjustments to the human environment, and to optimize the owner-dog relationship.

Methods

General approach and ethical considerations

We tested dog-directed parenting styles for associations with orientations towards animals, using dog owners' self-reports that were collected from an online questionnaire. Orientations towards animals reflect how dog owners view and treat animals in general, particularly dogs. The online questionnaire was filled out once and did not include questions that were psychologically burdening, meaning that it did not interfere significantly with normal daily life. This exempts the study from review by our ethics committee, according to the guidelines of Wageningen University Medical Ethics Review Committee (Medisch Ethische Toetsingscommissie van Wageningen University, METC-WU). Informed consent was not obtained as respondents chose to participate freely via the internet and the purpose of the research was stated at the start of the online survey.

Participant recruitment and the web-based survey

The online survey recruited Dutch dog owners via vets, dog schools, human schools, (animal) foodbank organizations, stores for animal products, and online/hardcopy magazines concerning (human) parenting as well as companion animals. We used the same sample described in an earlier study on dog-directed parenting styles (Van Herwijnen et al., 2018b). This study investigated associations between a person's child- and dog-directed parenting. Consequently, participants were both parents to one or more children as well as owners of one or more dogs.

The survey (in Dutch) ran from May to November 2016 and consisted of multiple parts. The occasional question remained unanswered (missing values), and the precise sample sizes are indicated. The first part of the survey contained 21 questions (items) on the background of the owner, her/his household, and the dog. The second part contained

62 items on dog-directed parenting, measured on a five-point Likert-scale, which rated the likelihood of scenarios occurring as never (score 0), nearly never (1), neutral (defined as about half of the time, 2), nearly always (3), and always (4). These 62 dog-directed parenting items were based on the Parenting Styles and Dimensions Questionnaire (PSDQ) commonly used with children (Robinson et al., 1995) and transformed for use with dogs (Van Herwijnen et al., 2018b). Here, we used the 20 items that make up the Dog-Directed Parenting Styles and Dimensions Questionnaire (DD-PSDQ) and measured the three dog-directed parenting styles that we extracted in our earlier study by means of principal component analysis (Van Herwijnen et al., 2018b). We abbreviate the three styles as AUC for the authoritarian-correction orientated style, AUI for the authoritative-intrinsic value orientated style, and AUT for the authoritative-training style. Cronbach's alphas for each of these styles were calculated in our earlier study and indicated an internal scale consistency of 0.8, 0.7, and 0.8 for AUC, AUI, and AUT, respectively (Van Herwijnen et al., 2018b).

The third part of the survey consisted of 37 items on orientations towards animals in dog owners following Blouin (2013; for all items see Appendix 1). The answers of completely disagree (score 1), disagree (2), agree (3), and completely agree (4) were used to express the applicability of a described situation to the respondent. The items derived from Blouin (2013) addressed the statuses of owned dogs, owner's orientation of self, role of dogs in household, attitudes toward animals, animal rights involvement, dog's home environment (indicating how the dog was housed and where it slept), veterinary visits, views and practices on relinquishment, and reaction to dog's (impending) death.

Statistical analyses

Item scores were summed for the dog-directed parenting styles (AUC, AUI, and AUT) and expressed as percentages of the theoretical maximum, taking into account the occasional unanswered item.

We ran a principal component analysis (PCA) on the 37 items measuring orientations towards animals to see how these items grouped together into index variables (components). Item scores were analyzed for associations using a standard PCA (Jolliffe, 1986) based on correlation matrices, with the number of principal components set at five. Principal components are uncorrelated and orthogonal, using eigenvectors as representations of direction. Scaling is represented by eigenvalues, which we integrated by calculating the loadings as eigenvectors multiplied by the square root of the eigenvalues. Principal components were not rotated and loadings $\geq |0.40|$ indicated that an item fitted within a component. The meaningfulness of a component was indicated by the amount of variation in the dataset that it explained. Meaningfulness was assumed when ≥10% of the variation was explained by the component, with a latent root of ≥1.0. The

PCA methodology suited our purpose of reducing the set of items into index variables (components). However, we can see the merit of the alternative statistical approach of extracting a model for measuring latent variables (factors) in the set of items. Factor analysis produced similar outcomes as the PCA, and the loadings of both data reduction techniques are presented. Components and factors were left unrotated as we value the elemental view of the relationships between items, as this still reveals how items may associate with multiple components or factors. We tested the internal consistency of the scales concerning orientations towards animals derived from the PCA with Cronbach's alpha.

Scores for the PCA components of orientations towards animals were calculated as described for the parenting styles, with summed item scores expressed as percentages of the theoretical maximum. Finally, we quantified associations between the PCA-derived orientations towards animals and dog-directed parenting styles with Spearman's rank correlations, regarding P-values of <0.001 as significant. This was done to separate the more biologically meaningful associations (>1% of variation explained) from weaker ones that reached significance due to the sample size of N=518. Statistical analyses were performed using GenStat (18th edition) software.

Results

Participants and their dogs

Participants in the online survey (N=518) were mostly female (91%, N=470; male: 8%, N=43). More than three quarters (83%, N=428) of participants had completed upper secondary education or higher. The age of the respondents was indicated using seven categories, and most belonged to the age groups of 35-44 (32%, N=164) and 45-54 years (35%, N=183). More than half of the respondents (58%, N=302) had one dog, 28% (N=144) had two, 9% (N=44) had three, and 5% (N=27) had four or more dogs. Dogs were of varying breeds and the majority of dogs had been purchased, at least in part, for companionship (92%, N=475) and/or walking (66%, N=341). Dog-directed parenting style scores were calculated for each respondent as a percentage of the theoretical maximum and were on average (±s.d., range) 22.5±16.2% (0-93.8) for AUC (authoritarian-correction orientated style), 59.6±19.3% (0-100) for AUI (authoritative-intrinsic value orientated style), and 79.4±16.3% (8.3-100) for AUT (authoritative-training orientated style). Overlap between dog-directed parenting styles explained 6 to 12% of the variation, with Spearman's rank correlations (N=518, P<0.001 for all) of r_s=-0.24, r_s=-0.25, and r_s=0.35 for the correlations between AUC and AUI, AUC and AUT, and AUI and AUT, respectively. Additional details concerning the participants, their dogs, and the parenting styles are available in Van Herwijnen et al. (2018b).

Orientations towards animals

Two main components resulted from the PCA on the 37 items regarding orientations towards animals (Table 1). A component composed of humanistic/protectionistic items explained 18.0% of the variation (latent root 6.7), while that of mainly dominionistic items explained 10.0% of the variation (latent root 3.7).

Table 1 – Dog owner's orientations towards animals representing a humanistic/protectionistic and a dominionistic orientation

Dog owners (N=518) reported on 37 items measuring orientations towards animals. Answers on a four-point Likert scale were analyzed by Principal Component Analysis (PCA). We present loadings ≥|0.40| in bold and percentages of variation explained by the first two main components, which represented dimensions of humanistic/protectionistic and dominionistic orientation. A factor analysis identified the same two dimensions and we present the factor loadings between brackets.

	Variance explained (latent root)	
	18% (6.7)	**10% (3.7)**
A dog should be allowed to be dog. PRO	**0.42 (0.40)**	**0.53** (0.13)
A dog should be well behaved at all costs. DOM	0.08 (0.05)	**0.47** (0.26)
A dog should know who is in charge. DOM	0.05 (0.02)	**0.54 (0.49)**
A dog should see the vet when it is ill, not for check-ups. DOM	-0.09 (-0.33)	0.16 (-0.28)
A good dog can be kept outside, it is what they and their coats are made for. DOM	-0.27 (-0.24)	0.33 (0.20)
Animal suffering should be prevented at all costs. PRO	**0.58 (0.47)**	0.27 (-0.09)
Animals and their natural life interest me. PRO	**0.47 (0.41)**	**0.47** (0.03)
Animals deserve love and respect, just like humans. PRO	**0.57 (0.55)**	**0.52** (0.12)
Different types of animals have different purposes. DOM	0.30 (0.26)	**0.52** (0.15)
I believe my dog should be able to show its natural behavior, even if this may bother other people. PRO	0.26 (0.19)	-0.08 (-0.19)
I consider my dog below humans. DOM	-0.39 (-0.29)	**0.53 (0.53)**
I consider my dog equal or superior to humans. PRO	**0.61 (0.46)**	-0.36 **(-0.51)**
I feel a deep respect and concern for animals in general. PRO	**0.66 (0.54)**	0.12 (-0.22)
I love buying accessories for my dog such as pretty leashes or clothes. HUM	0.31 (0.26)	-0.16 (-0.16)
I love my own dog, but I am not very interested in animals and their natural life in general. HUM	-0.28 (-0.24)	-0.16 (0.03)
I see myself as a parent, partner or friend to my dog. HUM	**0.63 (0.51)**	-0.26 **(-0.43)**
I see myself as caretaker, guardian, or companion to my dog. PRO	**0.58 (0.51)**	0.33 (-0.04)
I see myself as owner of, or boss to my dog. DOM	0.01 (0.05)	**0.59 (0.43)**
I support many animal causes through donating money, sharing messages or volunteering. PRO	0.38 (0.28)	-0.03 (-0.16)

Continue

Continued

	Variance explained (latent root)	
	18% (6.7)	**10% (3.7)**
I understand that people relinquish their pet to a shelter, but mine would never go there. HUM	0.07 (-0.05)	0.28 (0.20)
I would pay any amount for surgery that my dog needs. HUM	**0.59 (0.48)**	-0.09 (-0.15)
I would rather have my dog sleep in my bed than outside. HUM	**0.60 (0.45)**	-0.27 **(-0.41)**
If I am in doubt, I would rather visit the vet once too often than once too few times. PRO	**0.51 (0.56)**	0.21 (0.18)
If I support an animal cause, it would be for a dog related cause. HUM	**0.47** (0.35)	-0.04 (-0.20)
If my dog is a threat to my kids or people that come around, I would not keep it. DOM	-0.27 (-0.19)	0.37 (0.35)
If my dog needs surgery, I would weigh costs versus the benefit of surgery for myself, the dog and its role as a dog. DOM	-0.24 (-0.22)	0.25 (0.08)
Many animal causes are all about human emotions. DOM	-0.05 (-0.02)	0.31 (0.16)
My dog is like a child to me. HUM	**0.67 (0.56)**	-0.32 **(-0.45)**
My dog is spoiled. HUM	**0.54 (0.47)**	-0.07 (-0.19)
My dog sleeps where it is 'best' for the dog, this may be indoors or outside. PRO	-0.03 (0.01)	0.32 (0.12)
No other pet can replace my current dog. HUM	**0.50** (0.39)	-0.12 (-0.22)
Regular vet checks are an important part of caring for my dog. HUM	0.36 **(0.69)**	0.14 **(0.50)**
Relinquish a dog can be a good choice if a dog doesn't fit in a home or its purpose. DOM	-0.09 (-0.01)	0.27 (0.19)
Relinquishing a pet is mistreatment. PRO	0.26 (0.15)	-0.02 (-0.13)
The role of my dog is that of cherished child or family member. HUM	**0.65 (0.52)**	-0.26 **(-0.47)**
The role of my dog is that of friend, or companion. PRO	**0.64 (0.56)**	0.16 (0.13)
The role of my dog is to be useful in some capacity, such as for protection, a source of relaxation, preventing rats and the like on the property. DOM	-0.16 (-0.19)	0.11 (0.05)

DOM – Dominionistic item, HUM – Humanistic item, PRO – Protectionistic item

The humanistic/protectionistic component grouped seventeen items, of which eight were humanistic and nine protectionistic. The six highest loading items mainly reflected the role and status of the dog, such as "My dog is like a child to me" (loading of 0.7) and "The role of my dog is that of cherished child or family member" (0.7). One of these six items reflected general attitudes towards animals ("I feel a deep respect and concern for animals in general", 0.7). Thus, this component combined humanistic and protectionistic orientations towards the dog's role, emotional/practical care for the dog, and general interest in animals.

The second component grouped five dominionistic items with three protectionistic items, of which two loaded equally strong or stronger in the first component. The dominionistic items of this second component captured the variation in dog owners concerning the need to dominate the dog, such as "I see myself as owner of, or boss to my dog" (loading of 0.6), "A dog should know who is in charge" (0.5), and "I consider my dog below humans" (0.5). Three items ("A dog should be allowed to be dog", "Animals and their natural life interest me", and "Animals deserve love and respect, just like humans") were associated with both components, which possibly indicates their multi-interpretability and less valid measurement of orientations towards animals in dog owners, raising the question of whether owners have different opinions on "what being a dog" consists of and how best to provide their animal with interest and respect. Running statistical tests without these three items provided similar results (see online supplemental file).

Internal consistencies of the orientation scales were satisfactory, with Cronbach's alphas of 0.9 and 0.7 for the humanistic/protectionistic and dominionistic orientations, respectively. Averages in the study sample (±s.d., range) were 77.1±12.8% (26.6-100) for the humanistic/protectionistic orientation and 84.6±11.1% (25-100) for the dominionistic orientation. There was no significant rank correlation between these two orientations (r_s=-0.04, P=0.4).

Associations between orientations towards animals and dog-directed parenting styles

We calculated Spearman's rank correlations between the two newly constructed orientations towards animals and three dog-directed parenting styles. We found logical associations between AUC and AUI, but not AUT. AUC was directly correlated with the dominionistic orientation, explaining 8% of the variation (r_s=0.29, N=518, P<0.001), and inversely correlated with the humanistic/protectionistic orientation (r_s=-0.17, N=518, P<0.001, 3%). AUI was directly correlated with the humanistic/protectionistic orientation (r_s=0.45, N=518, P<0.001, 20%) and inversely correlated with the dominionistic orientation (r_s=-0.36, N=518, P<0.001, 13%). The variation in AUT parenting, with both high demandingness and responsiveness, was unrelated to the presently used orientations towards animals.

Discussion

Dog-directed parenting styles will, in part, emerge from how dog owners view their dog ownership. Here, we investigated the strengths of the associations between dog-directed parenting styles and orientations towards animals, specifically dogs. In our dataset of 518 self-reports by Dutch dog owners, two orientations towards animals characterized

the participants. The combined humanistic/protectionistic orientation mainly reflected the owners' orientations towards the dog's role as a close family member/friend, the dog's needed care, and general animal concern and respect. The second orientation mainly reflected the dominionistic need to dominate the dog, with some elements of respect for animals and nature. Clear differences emerged in how dog-directed parenting styles were associated with the two orientations. The authoritative-intrinsic value orientated style (AUI) is most strongly and directly related to the humanistic/protectionistic orientation. Meanwhile, the authoritarian-correction orientated style (AUC) is directly related to the dominionistic orientation. These logical associations support the idea that orientations towards animals, in part, underlie the style in which dog owners parent their dogs. The relationships were not overly strong, explaining 20% of the variation or less, and we found no associations with authoritative-training orientated parenting (AUT), meaning that factors other than orientations towards animals play a role in how individual owners tend to interact with their dog.

Our first finding concerning AUI parenting directly relating to the humanistic/protectionistic orientation indicates that humanizing the dog is combined with a dog-directed parenting style that is highly responsive and regards the dog's needs. This aligns with previous studies. For instance, responsiveness to the dog's needs related to viewing the dog as an equal or family member and appreciating it as an individual with species-specific interests, which was evident from seven dog owners who participated in lengthy interviews (Beverland et al., 2008). Humanizing one's dog and being responsive to it coincide, but it remains unclear to what extent this may or may not benefit dogs and owners. Positive effects could come from the owner's willingness to ensure veterinary care and prevent animal suffering at all costs. However, spoiling the dog and seeing it as a child will have drawbacks. Spoiling the dog, for instance, could come with inconsistent interactions and less obedience training, which is related to less well-behaved dogs, at least in a group of dogs weighing less than twenty kg (Arhant et al., 2010). In addition, humanizing the dog likely leads to attributing it human capacities (Epley et al., 2007; Morris et al., 2008; Urquiza-Haas and Kotrschal, 2015), such as a dog's ability to feel and express guilt after eating forbidden foods (Horowitz, 2009). When dog owners incorrectly assume guilt and consequently criticize, scold, or punish the dog that is unaware of wrongdoing, this may harm both the owner-dog relationship and dog welfare (Horowitz, 2009).

Our second finding relates AUC parenting directly to the dominionistic orientation, which could also indicate a risk to the owner-dog relationship and dog welfare. The owner-perceived need to dominate the dog is combined with the owner's demandingness and low responsiveness. Potential risks are in the owner's willingness to use correctional methods, such as "a corrective slap when the dog misbehaves" and "physical punishment

to improve the dog's behavior", in combination with high demandingness and low responsiveness. Additionally, reasons to correct the dog may be frequent in demanding owners. Together, these methods can be worrisome, as opponents of correctional methods indicate that these methods impair a dog's welfare by causing pain, fear, and/or discomfort (Fernandes et al., 2017; Salgirli et al., 2012; Schalke et al., 2007; Schilder and van der Borg, 2004; Ziv, 2017). On the other hand, proponents argue that punishment is a normal part of animal societies (Clutton-Brock and Parker, 1995) and that the methods accomplish desired behavioral outcomes (Salgirli et al., 2012; Schalke et al., 2007). The latter is important because many dogs present their owner with unwanted behaviors (Endenburg and Knol, 1994; Gazzano et al., 2008), and unwanted behaviors may, for instance, result in a dog's abandonment (Mondelli et al., 2004; Neidhart and Boyd, 2002).

With both opponents and proponents bringing forward different arguments, the use of correctional methods is a source of much debate among dog professionals as well as dog owners (Marschark and Baenninger, 2002; Rooney and Cowan, 2011; Todd, 2018). This debate is not unique to dogs. The use of correctional methods with children is also controversial and debated among both professionals and parents (Afifi and Romano, 2017; Benjet and Kazdin, 2003; Gershoff, 2002; Gershoff and Grogan-Kaylor, 2016; Larzelere et al., 2020), with studies likewise reporting opposing outcomes. On the one hand, corporal punishment is linked to child aggression/anxiety (Gershoff et al., 2010; MacKenzie, Nicklas, Waldfogel, Brooks-Gunn et al., 2012), health problems, lower cognitive abilities (Gershoff and Grogan-Kaylor, 2016), children themselves adopting hitting as a conflict resolving strategy (Simons and Wurtele, 2010), and spanked children being more likely to receive harsher forms of corporal punishment (Zolotor et al., 2008). On the other hand, receiving corporal punishment did not predict an adolescent's aggressiveness, delinquency, or psychological well-being after correcting for parental involvement (Simons et al., 1994) and was argued to be beneficial by achieving instant child compliance (Gershoff, 2002; Larzelere and Kuhn, 2005).

Thus, the use of corrective methods and, in particular, corporal punishment remains a subject of much debate in both children and dogs, despite the corporal punishment of children being prohibited in several countries (Gershoff and Bitensky, 2007; Ziegert, 1983), as is the use of electronic devices as correctional methods with dogs (Masson et al., 2018). Presenting data on the outcomes of corporal punishment seems insufficient to conclude the debate. Recently, child researchers have suggested that research attention be directed away from the outcomes of correctional methods. Instead, it has been suggested that focus should be given to how to change the behavior of parents (Afifi and Romano, 2017; MacMillan and Mikton, 2017). Similarly, how to change the behavior

of dog owners deserves more research attention and here orientations towards animals and dog-directed parenting styles are of interest.

Remarkably, a third finding in our study was that AUT was not associated with orientations towards animals. Seemingly, orientations towards animals are not a strong element contributing to dog owners adopting an AUT style, which may indicate that these owners are more open to learning experiences. The dog-directed AUT parenting style is similar to the child-directed authoritative parenting style, which is known to facilitate openness to learning experiences (Baumrind, 2013; Darling and Steinberg, 1993). Children that are parented authoritatively are more likely to grow up parenting authoritatively themselves (Bailey et al., 2009; Belsky et al., 2005; Lomanovska et al., 2017; Scaramella et al., 2008). Consequently, both authoritative parents and their children go through life more open to learning experiences (Lomanovska, et al., 2017). Dog owners with the dog-directed AUT parenting style may likewise be especially keen to learn, including how dogs need to be trained and taught to behave in social situations.

Learning experiences for dog owners, such as how to appropriately interact with or train a dog, can be provided through dog obedience classes and dog professionals (Bennett et al., 2007; Herron et al., 2009). However, dog obedience classes vary widely in structure and content (Deldalle and Gaunet, 2014). Such variations may affect information quality and, thus, which information dog owners can gather. Consequently, dog owners report variations in the training methods that they apply (Blackwell et al., 2008; Herron et al., 2009). Variations in classes may underlie, at least in part, the mixed results reported for the outcomes of these classes (Bennett et al., 2007; Blackwell et al., 2008; Kutsumi et al., 2012; Van Herwijnen et al., 2018a). In addition, class content may or may not facilitate certain dog-directed parenting styles or contribute to underlying orientations towards animals.

Therefore, taking orientations towards animals as a starting point can provide new ways to benefit the owner-dog relationship. Acknowledging humanistic or dominionistic tendencies in these orientations may help to facilitate information uptake by owners and advance the "(correctional) training method debate". The present results do not support the concept that a dog owner's orientation towards their dog may provide an effective way to directly promote AUT and a presumed openness to learning, but this could work indirectly by discouraging alternative parenting styles. How humanistic or dominionistic tendencies should be acknowledged and addressed to find new approaches to benefit the owner-dog relationship is an interesting topic to address in future studies. We indicate that creating a proper basis for interactions between owners and dogs requires an openness to learning experiences that may be hindered by orientations that humanize the dog or prioritize bossing over it.

Future studies should acknowledge that not all questionnaire items used by us seem to validly measure the identified orientations towards animals, as three questionnaire items loaded on both the dominionistic and humanistic/protectionistic orientations towards animals. A possible explanation for this is that these items ("a dog should be allowed to be dog", "animals and their natural life interest me", and "animals deserve love and respect, just like humans") are multi-interpretable and thus less suited to measure a dog owner's orientation. The rotation of components (or factors) could produce an easier interpretation of the outcomes. However, we deliberately chose to make use of the unrotated principle axis structure rather than the rotated simple structure to present the results straightforwardly and to shunt subjectivity about the most appropriate way of rotating. Rotation reduces orthogonality (especially when using oblique rotations), removes the importance of the different factors relative to each other, and, most importantly, clouds the possible existence of a general factor that causes background correlatedness among the variables. Correlations between factors, such as personality traits, are common and may result from methodological artefacts or represent biological meaningful constructs, like super traits (Davies et al., 2015). Both of these could have played a role in our study, as the questionnaire items could have been interpreted in different ways, with answers reflecting the variation in the different dimensions, or the main factor may represent a meaningful general construct that underlies peoples' orientations towards animals. The use of the unrotated principle axis structure allowed us to present our results transparently.

Our sample of dog owners consisted mainly of female respondents. Differences between men and women may exist, qualitatively or quantitatively, concerning orientations towards animals, dog-directed parenting styles, and/or associations between the two. Furthermore, participants made a significant effort to fill out an extensive questionnaire and were likely engaged in the relationship with their dog. This may have caused our study population to diverge from the total population of Dutch dog owners. In addition, it remains to be determined which dog-directed parenting style is optimal for dog welfare and achieving social/well-behaved dogs. Nevertheless, our study stresses the relevance of addressing a dog owner's orientation as a basis for dog-directed parenting styles and a route to educating dog owners on optimally raising and training dogs.

Appendix 1 – Items and characteristics of the dominionistic, humanistic and protectionistic orientation

The characteristics of the dominionistic, humanistic and protectionistic orientation as determined by Blouin (2013) and corresponding items used in our study.

	Humanistic		**Protectionistic**		**Dominionistic**	
	Characteristics	**Items**	**Characteristics**	**Items**	**Characteristics**	**Items**
Status of own dog(s)	elevated status, equal to humans, cherished pet, child	My dog is like a child to me. My dog is spoiled. I love buying accessories for my dog such as pretty leashes or clothes.	elevated status, equivalent or superior to humans	I consider my dog equal or superior to humans. I believe my dog should be able to show its natural behavior, even if this may bother other people. A dog should be allowed to be dog.	below humans	I consider my dog below humans. A dog should be well-behaved at all costs.
Owner's orientation of self	partner, friend	I see myself as a parent, partner or friend to my dog.	caretaker, guardian, companion	I see myself as caretaker, guardian, or companion to my dog.	owner, boss	I see myself as owner of, or boss to my dog.
Role of dog(s) in household	cherished child, best friend	The role of my dog is that of cherished child or family member.	best friend, companion	The role of my dog is that of friend, or companion.	useful in some capacity, such as for protection, entertainment	The role of my dog is to be useful in some capacity, such as for protection, a source of relaxation, preventing rats and the like on the property. A dog should know who is in charge. If my dog is a threat to my kids or people that come around, I would not keep it.
Attitudes toward other animals	concern is with own dog, may be partial to dogs in general, but indifferent to other animals	I love my own dog, but I am not very interested in animals and their natural life in general.	universal concerns for animal welfare	Animals and their natural life interest me. I feel a deep respect and concern for animals in general. Animals deserve love and respect, just like humans.	different types of animals have different purposes, indifferent about animal welfare	Different types of animals have different purposes.

Continue

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Animal advocacy involvement	limited, may give to dog or cat related causes	If I support an animal cause, it would be for a dog related cause.	often volunteer for, and/or give money to animal organizations/causes	I support many animal causes through donating money, sharing messages or volunteering.	rarely, may give to dog or cat related causes	Many animal causes are all about human emotions.
Dog's "home"	usually inside, sleeps in owners' bed or has bed of own	I would rather have my dog sleep in my bed than outside.	varies: inside and/or outside, whatever is "best" for dog	My dog sleeps where it is "best" for the dog, this may be indoors or outside.	often kept outside, varies based on dog's role	A good dog can be kept outside, it is what they and their coats are made for.
Veterinary visits	often, more than once a year and even more for older dogs	Regular vet checks are an important part of caring for my dog.	often, more than once a year and even more for older dogs	If I am in doubt, I would rather visit the vet once too often than once too few times.	rarely, once a year or less	A dog should see the vet when it is ill, not for check-ups.
Relinquishment attitudes and practices	would never relinquish current dog, but may have done so in past, with less cherished pets	I understand that people relinquish their pet to a shelter, but mine would never go there.	would never relinquish, considers this mistreatment	Relinquishing a pet is mistreatment.	likely to relinquish dog if dog becomes inconvenient or problems arise	Relinquish a dog can be a good choice if a dog doesn't fit in a home or its purpose.
Reaction to pet's death or impending death	very difficult, may dissuade from having another dog in the future, likely to attempt to delay pet's death	No other pet can replace my current dog. I would pay any amount for surgery that my dog needs.	very difficult, but has dog's interest in mind when dealing with end of life situations	Animal suffering should be prevented at all cause.	difficult, but dog can be replaced	If my dog needs surgery, I would weigh costs versus the benefit of surgery for myself, the dog and its role as a dog.

Online supplemental file – Dog owner's orientations towards animals representing a humanistic/protectionistic and a dominionistic orientation without the items of "A dog should be allowed to be dog", "Animals and their natural life interest me", "Animals deserve love and respect, just like humans"

Dog owners (n = 518) reported on 37 items measuring orientations towards animals. Answers on a four-point Likert scale were analyzed by Principal Component Analysis (PCA), yet without three items of "A dog should be allowed to be dog", "Animals and their natural life interest me", "Animals deserve love and respect, just like humans", that previously loaded onto both components and may less validly measure on dog owner's orientations towards animals. We present loadings ≥ |0.40| in bold and percentages of variation explained by the first two main components, which represented dimensions of humanistic/protectionistic and dominionistic orientation.

	Variance explained (latent root)	
	18% (6.2)	**9% (3.0)**
A dog should be well behaved at all costs. DOM	0.02	**0.62**
A dog should know who is in charge. DOM	-0.02	**0.67**
A dog should see the vet when it is ill, not for check-ups. DOM	-0.13	0.13
A good dog can be kept outside, it is what they and their coats are made for. DOM	-0.33	0.29
Animal suffering should be prevented at all costs. PRO	**0.51**	0.32
Different types of animals have different purposes. DOM	0.18	**0.49**
I believe my dog should be able to show its natural behavior, even if this may bother other people. PRO	0.27	-0.06
I consider my dog below humans. DOM	**-0.47**	**0.49**
I consider my dog equal or superior to humans. PRO	**0.66**	-0.23
I feel a deep respect and concern for animals in general. PRO	**0.61**	0.19
I love buying accessories for my dog such as pretty leashes or clothes. HUM	0.35	-0.03
I love my own dog, but I am not very interested in animals and their natural life in general. HUM	-0.22	-0.10
I see myself as a parent, partner or friend to my dog. HUM	**0.68**	-0.08
I see myself as caretaker, guardian, or companion to my dog. PRO	**0.50**	0.39
I see myself as owner of, or boss to my dog. DOM	-0.08	**0.69**
I support many animal causes through donating money, sharing messages or volunteering. PRO	0.38	0.05
I understand that people relinquish their pet to a shelter, but mine would never go there. HUM	0.01	0.27
I would pay any amount for surgery that my dog needs. HUM	**0.60**	-0.16
I would rather have my dog sleep in my bed than outside. HUM	**0.64**	-0.16
If I am in doubt, I would rather visit the vet once too often than once too few times. PRO	**0.46**	0.31
If I support an animal cause, it would be for a dog related cause. HUM	**0.48**	0.11

Continue

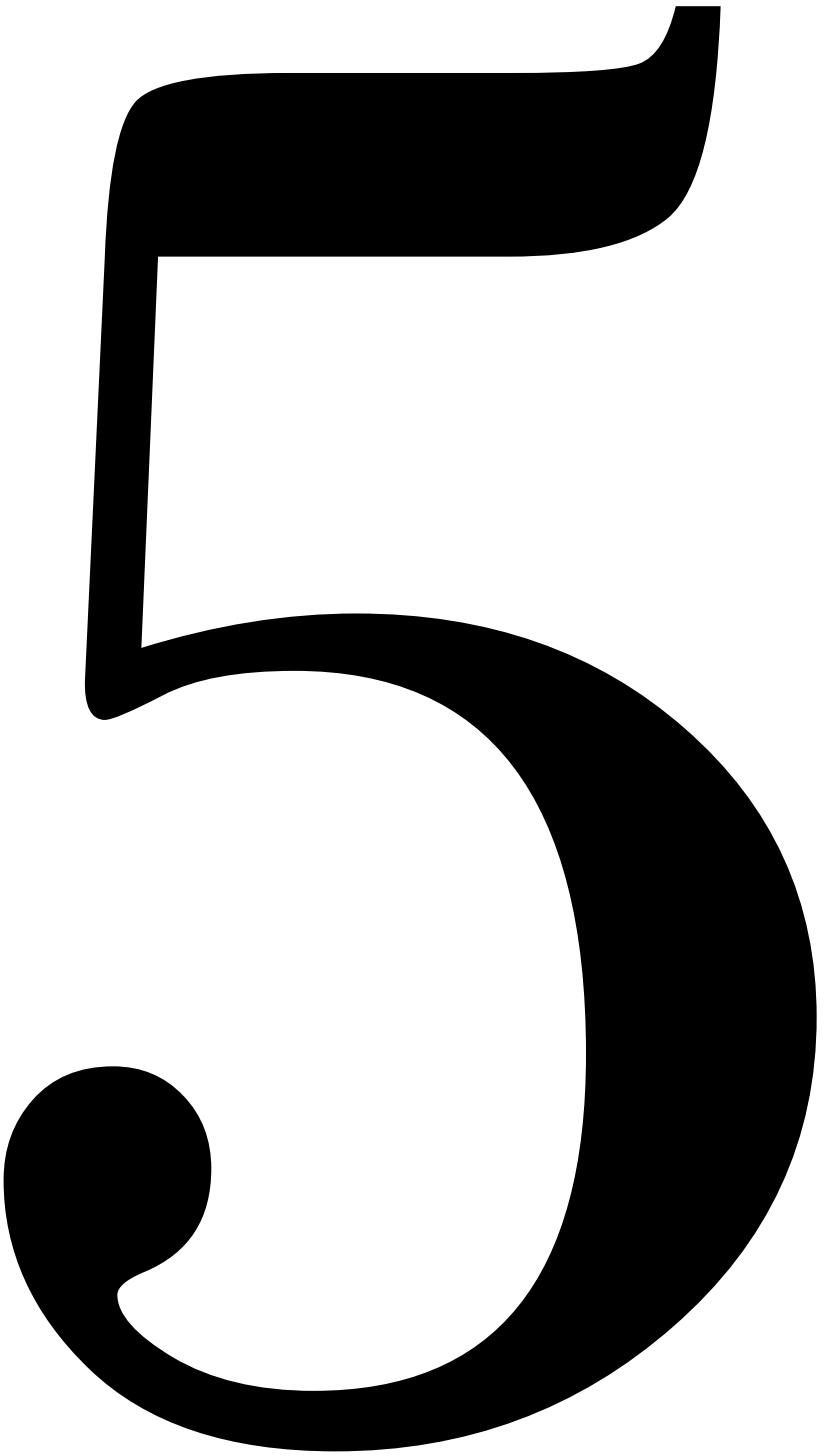
Continued

If my dog is a threat to my kids or people that come around, I would not keep it. DOM	-0.33	0.33
If my dog needs surgery, I would weigh costs versus the benefit of surgery for myself, the dog and its role as a dog. DOM	-0.29	0.19
Many animal causes are all about human emotions. DOM	-0.11	0.30
My dog is like a child to me. HUM	**0.74**	-0.10
My dog is spoiled. HUM	**0.56**	0.10
My dog sleeps where it is 'best' for the dog, this may be indoors or outside. PRO	-0.09	0.31
No other pet can replace my current dog. HUM	**0.53**	0.03
Regular vet checks are an important part of caring for my dog. HUM	0.34	0.22
Relinquish a dog can be a good choice if a dog doesn't fit in a home or its purpose. DOM	-0.15	0.22
Relinquishing a pet is mistreatment. PRO	0.26	0.05
The role of my dog is that of cherished child or family member. HUM	**0.69**	-0.11
The role of my dog is that of friend, or companion. PRO	**0.59**	0.26
The role of my dog is to be useful in some capacity, such as for protection, a source of relaxation, preventing rats and the like on the property. DOM	-0.16	0.13

DOM – Dominionistic item, HUM – Humanistic item, PRO – Protectionistic item

Internal consistencies of the orientation scales were satisfactory with Cronbach's alphas of 0.9 for the humanistic/protectionistic orientation and of 0.7 for the dominionistic orientation.

Spearman's rank correlations between the two newly constructed orientations towards animals without the above mentioned three items and the three dog-directed parenting styles were as follows: AUC correlated directly with the dominionistic orientation, explaining 7% of variation (r_s = 0.27, n = 518, p < 0.001) and inversely with the humanistic/protectionistic orientation (r_s = -0.17, n = 518, p < 0.001, 3%). AUI correlated directly with the humanistic/protectionistic orientation (r_s = 0.45, n = 518, p < 0.001, 20%) and inversely with the dominionistic orientation (r_s = -0.41, n = 518, p < 0.001, 17%). Variation in AUT parenting with both high demandingness and responsiveness was unrelated to the presently used orientations towards animals.



Chapter 5

Parenting styles and behaviours in the owner-dog dyad

Dog-directed parenting styles predict verbal and leash guidance in dog owners and owner-directed attention in dogs

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Abstract

Dog-directed parenting is an aspect of the owner-dog relationship that describes the overarching emotional sphere in which the dog's guidance and training take place. How dog-directed parenting styles express in specific owner-dog interactions is presently unknown. However, such knowledge can help to advise dog owners on appropriate parenting of their dog. Child-directed parenting is regarded appropriate when it is demanding for socially adaptive behaviour as well as responsive to the child's needs. This combination of high demandingness and responsiveness is known as authoritative parenting, which in dog-directed parenting manifests in two ways. Teaching the dog socially adaptive behaviour is key to the authoritative-training orientated style (AUT) and being responsive to the dog's perceived needs and emotions is key to the authoritative-intrinsic orientated style (AUI). A third dog-directed parenting style, the authoritarian-correction orientated style (AUC), of high demandingness and low responsiveness focusses on correcting the dog's undesired behaviour. We determined these three dog-directed parenting styles by an online questionnaire and tested the styles for associations with owner and dog behaviours. The behaviours were scored as the owner-dog dyads walked a short course with distractions (treats and balls) that dogs should ignore (N=40) or when they had a ten-minute break together (N=36). Nine out of 49 behavioural observations, such as verbally praising or correcting the dog and leash tensions, related significantly (comparison-wise two-tailed $P<0.05$) to the parenting styles and Spearman rank correlations explained up to 30% of the variance. The self-report-based dog-directed parenting styles related logically to the way owners actually interacted with their dogs, verbally and by leash. AUI and AUT parenting related directly to verbally praising the dog. AUC parenting related directly to verbally correcting the dog and to leash tensions. Also, AUC parenting related inversely and AUT parenting directly to the dog frequently looking at its owner during the course with distractions. Thus, we find evidence that verbal communication and leash tensions are telling about dog-directed parenting styles and, possibly, constitute meaningful manifestations to address in educational interventions for dog owners. We see potential merit in moving AUC parenting dog owners away from leash-related guidance towards verbal praise-based guidance and a more authoritative dog-directed parenting style.

Keywords: dogs, owner-dog relationship, parenting styles

Introduction

Generally, the owner-dog relationship benefits both partners, given that dog ownership comes with human health gains (Cutt et al., 2007; Mubanga et al., 2017) and the dog population is much larger than that of its ancestor the wolf (Hindrinkson et al., 2017; Mech, 2007; Murray et al., 2010; Rowan and Kartal, 2018). The UK alone harbours an estimated ten million dogs, based on the 31% of UK-households owning a dog (Murray et al., 2010). Yet, the full potential of relationship benefits is not always achieved and disturbed relationships involve undesired dog behaviours. Undesired dog behaviours are consequential because of their impact and prevalence. Reportedly, 73% of Finnish dogs show undesired behaviours (Salonen et al., 2020) and 41% of Australian dogs aggressed to humans or animals (Howell et al., 2016). Aggression is particularly impactful and was estimated to be the reason behind 58% of companion animal relinquishments (including dogs) in a review of 192 studies (Coe et al., 2014). Generally, undesired behaviours were a reason behind 10-18% of dog euthanasia cases (Lambert et al., 2015) and more prominent in shelter-relinquished dogs than in dogs in continued ownership (New et al., 2000). Undesired dog behaviours and their consequences could be prevented, at least in part, by appropriate dog-directed parenting. Appropriate parenting presumably combines demandingness for a dog's socially adaptive behaviour with responsiveness to its species-specific needs. This based on what is known about demandingness and responsiveness as underlying dimensions of child-directed parenting styles (Baumrind, 2013).

Parenting styles comprise the overarching emotional sphere in which interactions take place between a caregiver, such as a parent or a dog owner, and a care receiver, such as a child or a dog (Baumrind, 2013; Van Herwijnen et al., 2018, Smetana, 2017). Combining sufficient demandingness and responsiveness creates an authoritative parenting style that stimulates socially adaptive behaviour in children and benefits child wellbeing and the parent-child relationship (Lamborn et al., 1991; Neel et al., 2018; Simons and Conger, 2007; Wing Chan and Koo, 2011; Wissink et al., 2006). Parenting lacking demandingness and responsiveness is neglectful or uninvolved. The authoritarian parenting style is high in demandingness but low in responsiveness and in this its opposite is the permissive parenting style (Baumrind, 2013). Parenting styles offer a framework to study long-term social interaction patterns, also between owner and dog as their relationship has resemblance to that of parent and child. For instance, dogs seem to tap into the oxytocin feedback loop (Nagasawa et al., 2009; Nagasawa et al., 2015) that underlies parent-child bonding (Feldman et al., 2010; Francis et al., 2002). Also, dog owners direct 'baby talk' at their dogs (Prato-Previde et al., 2006). Further support for the owner-dog relationship resembling the parent-child relationship (but not being identical to it) comes from the similarities in patterns of functional magnetic resonance

imaging (fMRI)-brain activation and similarities in ratings of excitement (arousal) and pleasantness (valence) in fourteen mothers who viewed their own child and dog versus an unfamiliar child and dog (Stoeckel et al., 2014). In dog owners, so far three dog-directed parenting styles have been identified (Van Herwijnen et al., 2018), using an adaptation of the original Parenting Styles and Dimensions Questionnaire (PSDQ, Robinson et al., 1995; Van Herwijnen et al., 2018). The authoritarian-correction orientated style (AUC) reflects high demandingness, low responsiveness, and the reported use of correctional methods, such as shouting, using a slap or a correctional chain. The authoritative parenting style diverges into two styles. The authoritative-intrinsic value orientated style (AUI) combines high responsiveness with a focus on the dog's species-specific needs and emotions, like allowing a dog to growl and express how it feels. The authoritative-training orientated style (AUT) combines high demandingness, high responsiveness and a focus on teaching the dog how to behave socially through the use of praise and a step-by-step approach for teaching the dog new behaviours. A permissive style was not found in this study sample that consisted mainly of females and presumably highly engaged dog owners (Van Herwijnen et al., 2018). The neglectful style was not part of the original PSDQ and is studied less often (Olivari et al., 2013).

Using parenting styles as a framework to study long-term interaction patterns between owner and dog is new. To further the framework, we studied how the questionnaire-determined dog-directed parenting styles of AUC, AUI and AUT express in owner-dog interactions. Our study set up consisted of a course with 'treat-and-ball' distractions and of spending 'breaktime' together in a waiting room. We expected the more demanding treat-and-ball course to reflect task performance-related behaviour indicative of parental demandingness. We expected the breaktime to reflect more spontaneous behaviour indicative of parental responsiveness. Based on insights from child-directed parenting we predict that AUI and AUT associate directly with praising the dog and AUC with correcting it.

Methods

Web-based survey and participant recruitment

Dog owners answered an online questionnaire that we constructed to assess dog-directed parenting styles, and by which we recruited participants for subsequent behavioural tests. The outcomes of the questionnaire were used to test for associations with specific owner/dog behaviours. The 2,010 Dutch dog owners who filled out the questionnaire had responded to our adverts online, in dog magazines and in press releases of national and regional newspapers. The twenty dog-directed parenting style items were measured on a five-point Likert scale, rating the likelihood of scenarios occurring as never (score 0), nearly never (1), neutral (defined as about half of the time, 2), nearly always (3) and

always (4). The parenting style of AUC (authoritarian-correction orientated style) was measured with eight items, the parenting styles of AUI (authoritative-intrinsic value orientated style) and AUT (authoritative-training orientated style) were both measured with six items. Questionnaire respondents indicated their willingness to participate in behavioural tests and 41 participants visited our research facility (Carus, Wageningen University and Research) in the period from February 2018 to November 2018.

Treat-and-ball course and breaktime observations

The two behavioural tests that we performed with owner-dog dyads were conducted to establish how owners and dogs interacted when performing a task by walking a 'treat-and-ball' (distraction) course or when being together in a waiting room during a break. Two separate rooms were used at Carus research facility (Wageningen University and Research). For the treat-and-ball course owners were instructed to walk their leashed dog without interruptions through a room of 6.3x6.5 meters that contained the treat and ball distractions. We used tape on the floor to mark the walking route: a squared path of sixteen meters. The positions for the twelve treats and eight tennis balls were also marked with tape. These positions were 20 centimetres from the marked walking route, with the treats and balls at opposing sides as follows. In each corner of the squared walking route two treats were place to the outer side of the square and one ball inside the square. At each centre part of a square side one treat was placed inside the square and one ball at the outer side.

The room was equipped with Axis® M10 network cameras in the four corners of the ceiling and one loudspeaker. The procedures were explained to the participating owner just before entering the room. The owner was asked to prevent the dog from touching, mouthing or eating the treats or balls and to prevent this as he/she would do so in normal life. The objective of this instruction was to elicit the owner's 'normal life' dog guidance behaviours. The dog itself was still able to touch, mouth or eat the objects, depending on the owner's guidance and the dog's response to this guidance. We therefore chose tennis balls that were made for dogs to play with (Kong®) and low-allergenic treats (Caniland® Soft Ostrich Snack Grainfree). Upon the start, the owner was given a standard two-meter leash. This leash was used instead of the owner's own leash as to standardize the leash length. The owner attached this leash to the dog's own collar. After this the dyad entered the testing room through a door to walk the square with distractions once and leave the room through the same door. This was repeated three times. In between these three times, after the dyad left the room, the experimenter ensured that all treats and balls were in their original positions. After completion of all test elements and observations, the dogs were allowed to eat the treats and/or play with the balls, as their owners saw fit.

For the second behavioural test–the breaktime observations -, the procedure was simple, as here our intention was to study spontaneous owner-dog interactions in a relaxed situation. The owner was led into the waiting room, was offered coffee or tea and we explained that the dog could be off-leash as soon as the researcher had left the room. The purpose of the ten-minute break was not explained to the owner other than that it was intended to relax owner and dog, and they could do as they liked. The room was sized 5.1x7 meters and furnished with a chair and table. On the table we placed coffee, tea and magazines. Next to the table there was a blanket for the dog to lie on and several dog toys were on the floor. This room held two cameras positioned in view of the participants and directed at the chair-table setting.

Data collection and statistical analysis

The behaviour of the 41 owner-dog dyads was videotaped and digital recordings were analysed using focal sampling continuous recording with Noldus Observer® XT-software. A total of 25 behaviours was recorded for the treat-and-ball course and of 30 behaviours for the breaktime, using the behaviours as listed in Appendix 1. Table 1 provides a sample and shows the behaviours that associated significantly with dog-directed parenting styles. Behaviours were observed as either point events, expressed as rate per minute or as states of behaviours, expressed as percentage of observation time.

Table 1 – Ethogram of owner and dog behaviours

Ethogram of the behaviours of the owners and their dogs that associated with dog-directed parenting styles (and see Appendix 1 for all observed behaviours). 'Point' indicates the behaviours that were observed as point events and expressed as rate per minute. 'State' indicates the behaviours that were observed as states and expressed as percentage of observation time.

Treat-and-ball	
Dog look at owner (point)	Dog directs nose towards owner <3 sec
Leash snap (point)	Upon interest shown by dog in object, person or location: owner strains or shortens the leash of the dog and/or takes one or more step(s) away from an object, person or location. Straining/shortening movement starts with an accelerated movement of the hand/arm of the owner.
Leash tension (state)	Leash held by owner and attached to dog forms a straight line from owner to dog >3 sec.
Verbal praise (point)	Owner uses voice in soft and/or high pitch manner uttering kind words such as 'good dog', 'well done'.
Verbal correction (point)	Harsh, sharp, intense voice lower frequency such as 'No', 'Eh eh'.
Breaktime	
Close meter (state)	Dog <1 meter of owner >3 sec.
Dog at owner (state)	Dog has nose pointed in the direction of owner >3 sec.
Laying head down (state)	Dog lays down in ventral or lateral position, all four legs and belly contact the floor and the head contacts floor and/or forepaws.
Verbal praise (point)	Owner uses voice in soft and/or high pitch manner uttering kind words such as 'good dog', 'well done'.

Behaviours for the treat-and-ball course were summed over the three times this course was walked. Behaviours that rarely occurred were omitted from further analyses, which were point behaviours that on average happened less than 0.01 times per minute and state behaviour that occurred less than 1% of the observation time. Such rare behaviours were found only for the treat-and-ball course and concerned Collar snap, Collar steady, Foot correction, Hand move and Bark (and see Appendix 1 for a description of these behaviours). We merged two behaviours that both reflected a lack of leash tension, being Leash floor (leash held by owner and attached to dog lays on/drags the floor >3 sec) and Leash bow (leash held by owner and attached to dog does not lay on/drag the floor or forms a straight line, but is arched >3 sec). Consequently, for further analyses nineteen behaviours remained for the treat-and-ball course and 30 behaviours for the breaktime. Breaktime observations were not available for five participants and one treat-and-ball course recording was lost due to technical issues. Thus, we processed observations on 40 participants for the treat-and-ball and on 36 participants for the breaktime.

Parenting style scores were calculated following Van Herwijnen et al. (2018) by summing scores for items on a same parenting style and expressing the sums as percentages of the theoretical maximum. Statistical analyses were done with Spearman rank correlations for testing relationships between the three dog-directed parenting styles and the behaviours of owners and dogs during the two standardized situations. We also calculated Spearman rank correlations between the three parenting styles as to quantify the overlap between these. We did not control for familywise error rates and maintained the significance level at two-tailed P-values <0.05, meaning that the statistical outcomes will readily identify patterns of interest but require further validation in more specified hypothesis-driven experiments. Our main interest was in how single behaviours related to parenting styles, but in addition we reduced the set of behaviours that correlated with parenting styles into the main pattern(s). For this we performed a Principal Component Analysis (PCA, Jolliffe 1986) on nine behaviours and three parenting styles of the 35 dyads that completed both behavioural tests. PCA-components were based on correlations matrices underlying item scores and expressed in patterns of loadings, with the latter ranging from -1 to +1. We regarded loadings > | 0.5 | as an indication that an item fitted into a component and present the two (first) components as these explained more than 10% of variance (latent roots > 1.0).

Ethical statement

The Animal Care and Use Committee of Wageningen University and Research evaluated the behavioural tests and considered these outside the category of animal experiments that require licencing. Participants to the behavioural tests were explained that they could end the test at any time, should they see any reason for this. They signed an informed consent for videotaping the sessions and use thereof for scientific and educational/

presentational purposes. Options were on videotaping as such and the use thereof for educational/scientific presentations either within Wageningen University and/or outside this institute.

Participants and parenting styles

The participating dog owners and their dogs were characterized as follows (N=41, of which N=40 did the treat-and-ball and N=36 the breaktime). Participating dog owners were 88% female (N=36), 12% male (N=5). The majority (90%; N=37) had completed upper secondary education or higher. Age of the participants was indicated in seven categories, 7% was 18-25 years old (N=3), 17% 25-35 years (N=7), 20% 35-45 years (N=8), 24% 45-55 years (N=10), 27% 55-65 years (N=11) and 5% was 65 years or older (N=2). Their dogs were aged between 6 months and 12 years, representing a variety of breeds and mixes, with the dog's weight classes ranging from less than five kilos to 41-50 kilogrammes. Pedigree dogs (N=21) and non-pedigree dogs (N=20) were distributed near evenly. Slightly more female dogs participated (N=12 neutered and N=9 intact) than male dogs (N=9 neutered and N=9 intact; 2 missing values).

The dog-directed parenting style scores, calculated as a percentage of the theoretical maximum of 100%, were an average (± standard deviation, range) 26.1±18.2% (0-68.8) for AUC (authoritarian-correction orientated style), 65.2±17.5% (29.2-100) for AUI (authoritative-intrinsic value orientated style) and 81.1±15.7% (33.3-100) for the AUT (authoritative-training orientated style). For female owners only (N=36), these scores were 24.4±17.4% (0-62.5) for AUC, 66.6±17.2% (29.2-100) for AUI and 83.7±12.9% (45.8-100) for AUT. For the dog-directed parenting styles, 23% of variation explained the inverse relationship between AUC and AUI (r_s=-0.48, P=0.002, N=41). No significant association was found between AUC and AUT (r_s=-0.26, P=0.10, N=41) or AUI and AUT (r_s=0.25, 0.12, N=41).

Results

Owner and dog behaviours during the treat-and-ball-course and the breaktime

We outline the averages (±standard deviations, ranges) for those owner and dog behaviours during the treat-and-ball course and the breaktime behaviours that associated with the dog-directed parenting styles (see Appendix 2 for all behaviours). During the treat-and-ball course dogs tended to be on a tight leash, with the leash in a straight line from owner to dog for more than three seconds (63.0±32.3% of the observation time, 0-100, Leash tension). This common tight leash may have resulted from the owner's guidance of the dog, the dog's pulling, or both. Leash snaps involved the owner straining/shortening the leash and stepping away when the dog showed interest in an object, which occurred on

average 2.3±3.0 (0-12.4) times per minute (rpm). Owners verbally praised their dogs at 6.7±7.0 rpm (0-26.4, Verbal praise) and verbally corrected it at 4.0±4.0 rpm (0-17.7, Verbal correction). The frequency of a dog looking at its owner was 5.5±5.4 rpm (0-19.7, Dog look at owner) during the treat-and-ball course. Such owner-dog interactions occurred at lower rates during the breaktime with an average 0.4±0.6 rpm (0-2.6, Verbal praise) for verbally praising the dog and 0.5±0.4 rpm (0-2.0, Dog look at owner) for the dog's looking at its owner. Most of the breaktime the owners sat (86.5±13.7%, 44.5-100, Sitting) and they payed attention to the dog for 26.7±22.4% (0.5-85.1, Orientation owner at dog) of the breaktime. Likewise, the dogs payed attention to their owners for a similar amount of time 27.2±20.1% (3.0-74.3, Dog at owner). On average, dogs tended to stay near the owner and were within one-meter distance for 64.9±31.2% (10.2-100, Close meter) of the ten-minute breaktime. Relaxation by the dog's laying its head down averaged at 10.2±17.6% (0-74.1, Laying head down).

Rank correlations between parenting styles and owner/dog behaviours

Analysing the data on treat-and-ball course (N=40) and breaktime (N=36) separately, we quantified associations between the dog-directed parenting style scores and the owner/dog behaviours with Spearman rank correlations (for an overview of the outcomes see Table 2). Particularly the owner behaviours of verbally praising the dog, verbally correcting it and leash tensions related to the parenting styles of AUC (authoritarian-correction orientated style), AUI (authoritative-intrinsic value orientated style) and AUT (authoritative-training orientated style), explaining up to nineteen percent of variance. For the dog's behaviour the most telling behaviour was the dog looking at the owner, explaining up to 30% of variance.

AUC related to verbal expressions by owners in the expected directions: directly to verbally correcting the dog and inversely to verbally praising it (r_s=0.42, P=0.008, Verbal correction, treat-and-ball; r_s=-0.43, P=0.006, Verbal praise, treat-and-ball). AUC related directly also to leash tension (r_s=0.32, P=0.047, Leash tension, treat-and-ball) and inversely to the dog's looking at the owner (r_s=-0.55, P<0.001, Dog look at owner, treat-and-ball), to the dog's staying close to the owner when off the leash (r_s=-0.47, P=0.004, Close meter, breaktime) and to the dog's laying head down during the breaktime (r_s=-0.34, P=0.043, Laying head down, breaktime).

AUI contrasted AUC for verbal expressions as AUI related directly to verbally praising the dog (r_s=0.44, P=0.005, Verbal praise, treat-and-ball) and inversely to verbally correcting it (r_s=-0.35, P=0.029, Verbal correction, treat-and-ball). Also, AUI related inversely to leash snaps (r_s=-0.43, P=0.005, Leash snap, treat-and-ball) and inversely to the dog's looking at the owner during the breaktime (r_s=-0.33, P=0.049, Dog at owner, breaktime).

Table 2–Spearman rank correlations between dog-directed parenting styles and owner/dog behaviours

Dog owners and their dogs (*N*=41) were tested in a treat-and-ball course (*N*=40) and during the breaktime (*N*=36). Spearman rank correlations were calculated between the dog-directed parenting styles and the observed owner/dog behaviours (P<0.05).

Treat-and-ball	**AUC parenting**	**AUI parenting**	**AUT parenting**
Dog look at owner	r_s=-0.55 (P<0.001)	-	r_s=0.33 (P=0.004)
Leash snap	-	r_s=-0.43 (P=0.005)	-
Leash tension	r_s=0.32 (P=0.047)	-	-
Verbal praise	r_s=-0.43 (P=0.006)	r_s=0.44 (P=0.005)	-
Verbal correction	r_s=0.42 (P=0.008)	r_s=-0.35 (P=0.029)	-
Breaktime	**AUC parenting**	**AUI parenting**	**AUT parenting**
Close meter	r_s=-0.47 (P=0.004)	-	-
Dog at owner	-	r_s=-0.33 (P=0.049)	-
Laying head down	r_s=-0.34 (P=0.043)	-	-
Verbal praise	-	-	r_s=0.35 (P=0.037)

AUT related directly to dog's looking frequently at the owner during task performance (r_s=0.33, P=0.004, Dog look at owner, treat-and-ball) and to verbally praising the dog during the breaktime (r_s=0.35, P=0.037, Verbal praise, breaktime).

Main pattern of associations between dog-directed parenting styles and owner/dog behaviours

To highlight the main pattern(s) of associations between dog-directed parenting styles and owner/dog behaviours, we ran a Principal Component Analysis (PCA, N=35) and here report the two explanatory components (Table 3). The outcomes emphasized how during the course with distractions AUC parenting (loading of -0.8) combined with verbally correcting the dog (Verbal correction, treat-and-ball, -0.6) and that this opposed the combination of authoritative parenting (AUI/AUT, 0.6), verbally praising the dog (Verbal praise, treat-and-ball 0.7) and the dog's looking at the owner (Dog look at owner, treat-and-ball, 0.7). This first component explained 29% of variance (latent root 3.4). The second component seemed of little importance since it explained substantially less variance (14%, latent root 1.7) and grouped only two behavioural parameters that did not fit in the first component. It related AUI (0.6) inversely with the breaktime behaviours of the dog's duration of looking at the owner and the owner's verbal praising of the dog (Dog at owner/Verbal praise, breaktime, -0.7).

Table 3–Main pattern of associations between dog-directed parenting styles and owner/dog behaviours

To highlight the main pattern(s) of associations between three dog-directed parenting styles and nine owner/dog behaviours we performed Principal Component Analyses (PCA). We tested data from 35 owner-dog dyads that walked through a treat-and-ball course and spent breaktime together. We regarded loadings > | 0.5 | as meaningful and we present the two components on which one or more dog-directed parenting styles loaded and that explained more than 10% of variance and with a latent root > 1.0.

	Component 1 (28.6% of variance, latent root 3.4)	**Component 2 (14.3% of variance, latent root 1.7)**
AUC parenting	**-0.79**	0.18
AUI parenting	**0.59**	**0.56**
AUT parenting	**0.64**	0.04
Dog look at owner–Treat-and-ball	**0.73**	-0.21
Leash snap–Treat-and-ball	-0.40	-0.19
Leash tension–Treat-and-ball	-0.30	0.22
Verbal praise–Treat-and-ball	**0.74**	0.12
Verbal correction–Treat-and-ball	**-0.62**	0.00
Close meter–Breaktime	0.19	-0.42
Dog at owner–Breaktime	-0.12	**-0.74**
Laying head down–Breaktime	0.41	0.17
Verbal praise–Breaktime	0.34	**-0.68**

Discussion

Parenting styles are known to affect the wellbeing of children and the quality of the parent-child relationship (Lamborn et al., 1991; Neel et al., 2018; Simons and Conger, 2007; Wing Chan and Koo, 2011; Wissink et al., 2006), making it interesting to know how these styles work out in the owner-dog relationship. Here we explored how dog-directed parenting styles express in specific owner-dog interactions. Dog owners with known dog-directed parenting styles walked their dog through a treat-and-ball course and were observed when having a ten-minute break with their dog, representing conditions that we presumed to trigger parental demandingness and responsiveness respectively. This notion was supported by the overall higher level of verbal dog guidance during the treat-and-ball course than during the breaktime. The owner behaviours that were most telling about the dog-directed parenting styles occurred during this treat-and-ball course and these were verbally correcting or praising the dog, next to leash tensions. Owners that scored relatively high for AUC (authoritarian-correction orientated) parenting tended to verbally correct the dog instead of praising it and walked with relatively higher leash tensions. Contrasting this, owners that scored relatively high for AUI (authoritative-intrinsic value orientated) parenting tended to verbally praise the dog. Concerning the

dog's behaviour, relatively high frequencies of looking at the owner combined with owners that scored relatively high for AUT (authoritative-training orientated) parenting and this contrasted AUC parenting.

Thus, verbally correcting and praising the dog during task performance together with leash tensions are particularly indicative of dog-directed parenting styles. Here, AUC and AUI are opposites and, seemingly, conducive to rather fixed ways of interacting with dogs compared to the more flexible ways of AUT parenting. This as AUT parenting did not relate to any of the behaviours that owners showed during task performance, indicating variability across such owners. Dog-directed parenting styles may affect dogs in maintaining (eye) contact with their owner, although our interpretations come from associations of which the underlying causalities are unknown and it cannot be excluded that dog behaviour underlies the dog owner's parenting.

Noteworthy was that only a small spectrum of behaviours related to the parenting styles, with more verbal than physical behaviours. Possibly the latter was contributed to by our mostly female study group. Indeed, female owners talked for longer duration and with shorter latency than male owners upon return to the dog in a separation/reunion-based testing situation (Prato-Previde et al., 2006). If generally females are more vocal when interacting with dogs this may underly the higher level of verbal than physical behaviours in our study. Differences between female and male dog owners have been scarcely studied. Females displayed more positive animal attitudes, including about animal protectionism (Herzog, 2007), reported to have more trainable, sociable, less bold dogs (Kubinyi et al., 2009), whereas males reported to have more disobedient dogs (Bennett and Rohlf, 2007). Thus, gender differences in dog ownership may exist and these deserve more research attention as owner-dog studies often unintentionally include high percentages of female participants. For example, even higher percentages than our 88% females were reported for studies using similar online recruitment: 93% females of 3,080 respondents (Norman et al., 2020) and 91% females of 653 respondents (Volsche and Gray, 2016). Interestingly, study methods of in-person approach of dog owners, for instance during park-dog walks or when visiting veterinary clinics, resulted in lower percentages of female respondents of 70% (Hiby et al., 2004) and 67% (Blackwell et al., 2008). These approaches could therefore benefit future studies that wish to include higher percentages of male dog owners.

Alternatively or additionally to our high percentage of female study participants using verbal behaviours rather than physical behaviours, the here found behavioural levels could be affected by our (videotaped) research setting. Generally, research participation affects participants' behaviours, although the extent at which it does so is difficult to measure (McCambridge et al., 2014). For videotaped research settings specifically

the change in participant behaviour may compromise validity. This as videotaped participants tend to behave more according to what they think the researcher expects, as seen in videotaped hospital personnel behaving more formal and without jokes (Latvala et al., 2000). Unintentionally, in our study we could have prompted similar 'behaving as expected' through directing the attention of our participants to the videotaping via the videotaping-consent form, which we deemed necessary for ethical reasons. This could have affected the participants' levels of physical behaviours directed at the dog.

Next to owner behaviours we were interested in the dog's and we found maintaining (eye) contact of particular interest as it related inversely to AUC parenting and directly to AUT parenting. Although we cannot imply causality, AUT parenting is training orientated and previous studies indicate that training a dog increases the dog's looking at the owner. As an example, dogs with high levels of obedience training displayed high frequencies of looking at the owner in the two minutes before commencing a series of obedience exercises (Mongillo et al., 2016). Such looking behaviour may be trained in relatively short time spans and Border Collies looked at their owner with shorter latencies and for longer durations following five minutes of clicker training only, with a minimum of twenty reinforced clicks (Wallis et al., 2015). If AUT parenting indeed increases a dog's looking at the owner this could make the dog more susceptible to social support and helpful communication. Assumingly, through this looking the dogs solicit owner support and receive cues to solve problems or assess the threat levels of novelties by a mechanism of social referencing (Merola et al., 2014; Müller et al., 2015). Indeed, when confronted with an unsolvable task, dogs looked at their caretaker with shorter latencies and for longer durations than did socialized wolves (Miklósi et al., 2003). The unsolvable task involved pulling a rope that previously, but no longer, led to receiving a piece of meat. After a median one minute of effort, seven out of nine dogs looked back at their caretaker, whereas two out of nine wolves did (Miklósi et al., 2003). In another unsolvable task experiment, the reactions of dogs and toddlers were compared when the manipulation of a container ceased to offer a reward. Both the dogs and the toddlers increased their gaze alternation between the container and their caretaker (Marshall-Pescini et al., 2013). Next to providing support, the dog's looking at the owner may make it appear more cooperative and likeable in the eyes of to the owner (Roth and Jensen, 2015). Finally, a dog's looking at the owner comes with attentiveness that may facilitate desired behaviours and/or prevent the development of undesired behaviours (McGreevy et al., 2017; Payne et al., 2017).

It is quite possible that a dog's undesired behaviour and/or inattentiveness makes an owner opt for AUC parenting. However, the finding that looking at the owner relates inversely to AUC and directly to AUT, points to the latter as the more effective way to encourage desired dog behaviours. This as looking at an owner increases the opportunity

of gaining a dog's attention to request and reward desired behaviours (McGreevy et al., 2017; Payne et al., 2017) and this comes with the benefits of the dog being seen as more cooperative by its owner (Roth and Jensen, 2015) and allowing gentler guidance, as in the loudness of voice and roughness of physical contact (Schilder and Vinke, 2015). For AUI parenting our study presents less-clear indications for its relevance to desired dog behaviours. We found owners relatively high in AUI to verbally praise the dog often and to use few leash snaps and verbal corrections, in line with this style reflecting a focus on a dog's needs and emotions. However, AUI parenting was not related to a dog's frequent looking at the owner during task performance nor to the duration of looking at the owner during the breaktime. This raises the question if this style, for instance through a lack of demandingness, represents missed opportunities in parenting of the dog.

We point out that the present study identified patterns of interest. However, these were only partly in line with a priori predictions and do not evidence casual relationships or hypotheses. The direction of found relationships remain speculative and we did not control for familywise error rates as to limit type 2 errors (β), thus accepting a higher risk of type 1 errors (α). Our findings seem logical but do require further validation in more specified hypothesis-driven experiments.

The present study links desirable behaviours in both dog owners and their dogs to parenting ways that are known to work well in the parent-child relationship. Thus, the targeting of dog-directed parenting styles in educational interventions for dog owners, such as dog obedience classes, seems valuable. Through addressing parenting styles educational interventions can target patterns of behaviour in an owner, as well as the emotional sphere in which a dog's guidance takes place. This may add value to the mere teaching of mechanical training skills and offering of dog knowledge. How educational interventions for dog owners can address such parenting styles effectively remains to be studied and this study area could advance intervention effectiveness, the owner-dog relationship and ultimately benefit dog welfare.

Appendices

Appendix 1 – Ethogram of all observed owner and dog behaviours
Ethogram of all observed owner (1a and 1c) and dog (1b and 1d) behaviours during the treat-and-ball course (1a and 1b) and the breaktime (1c and 1d)

1a) Fifteen owner behaviours scored as point or state behaviours during the treat-and-ball course

Point behaviours	
Collar snap	Upon interest shown by dog in object, person or location: owner holds the collar of the dog and/or moves the dog away from this object, person or location by applying force to the collar. The force application and movement start with an accelerated movement of the hand/arm of the owner.
Collar steady	Upon interest shown by dog in object, person or location: owner holds the collar of the dog and/or moves the dog away from this object, person or location by applying force to the collar. The force application and movement steadily increase pressure, without an accelerated start of the movement of the hand/arm of the owner.
Foot correct	Owner uses (part of) his/her leg, or foot to touch the dog with a certain degree of force, such as poking, pushing, kicking.
Hand correct	Owner uses (part of) his/her hand, or arm to touch the dog with certain degree of force, such as poking, slapping, hitting, pushing, jerking/ squeezing (skin).
Leash snap	Upon interest shown by dog in object, person or location: owner strains or shortens the leash of the dog and/or takes one or more step(s) away from an object, person or location. Straining/shortening movement starts with an accelerated movement of the hand/arm of the owner.
Leash steady	Upon interest shown by dog in object, person or location: owner strains or shortens the leash of the dog and/or takes one or more step(s) away from an object, person or location. Straining/shortening movement steadily increases pressure, without an accelerated start of the movement of the hand/arm of the owner.
Physical instruction	Neutral use of body (hand, arm, foot, leg) in a steady way, applying limited pressure, with the objective to move dog and/or to change the dog's position.
Physical praise hard	Owner initiates contact using (part of) the hand to touch the dog with some force applied through for instance patting, causing the dog to move more than two centimetres aside as the force is applied. The dog may be put off balance because of force applied.
Physical praise soft	Owner initiates contact using (part of) the hand to touch the dog with low levels of pressure/force, such as gently placing hand, softly patting, stroking. The body of the dog does not move more than two centimetres aside through (pressure/force of the) hand touch and the dog is not put off balance, but can easily maintain its position if it wishes to do so.
Verbal instruction	Neutral use of voice by owner towards dog, normal frequency, regarding command or instruction, no soft and/or high pitch manner uttering kind words such as 'good dog', 'well done' and no harsh, sharp, intense voice lower frequency than verbal correct. Included in verbal instruction: hand signals without physical contact.

Continue

Continued

Verbal praise	Owner uses voice in soft and/or high pitch manner uttering kind words such as 'good dog', 'well done'.
Verbal correct	Harsh, sharp, intense voice lower frequency such as 'No', 'Eh eh'.
State behaviours	
Leash bow#	Leash held by owner and attached to dog does not lay on/drag the floor or forms a straight line, but is arched >3 sec.
Leash floor#	Leash held by owner and attached to dog lays on/drags the floor >3 sec.
Leash tension	Leash held by owner and attached to dog forms a straight line from owner to dog >3 sec.

#As Leash bow and Leash floor similarly reflected absence of leash tension, we combined these two scores for further analysis, Leash floor was scored in one owner-dog combination only.

1b) Ten dog behaviours scored as point (only) behaviours during the treat-and-ball course

Point behaviours	
Bark	Loud and regular barking that is often repeated (1–2 barks per second).
Contact ball	Dog makes contact with ball with nose or paw.
Contact food	Dog makes contact with food with nose or paw.
Dog at ball	Dog moves 2 steps or more in the direction of the ball (if continued: every 3 sec are scored as 1 event).
Dog at food	Dog moves 2 steps or more in the direction of the food (if continued: every 3 sec scored as 1 event).
Dog look at owner	Dog directs nose towards owner <3 sec.
Hand move	Dog makes movement away from approaching hand of owner.
High pitched	Peeping, whining, yelling or howling.
Panting	Breathing in high frequency, which is mostly accompanied by the protrusion of the tongue.
Sniffing floor	Dog is sniffing with nose pointed toward floor; sudden action and <3 sec.

1c) Twelve owner behaviours scored as point or state behaviours during breaktime observations

Point behaviours	
Physical instruction	Neutral use of body (hand, arm, foot, leg) in a steady way, applying limited pressure, with the objective to move dog and/or to change the dog's position.
Physical praise hard	Owner initiates contact using (part of) the hand to touch the dog with some force applied through for instance patting, causing the dog to move more than two centimetres aside as the force is applied. The dog may be put off balance because of force applied.
Physical praise soft	Owner initiates contact using (part of) the hand to touch the dog with low levels of pressure/force, such as gently placing hand, softly patting, stroking. The body of the dog does not move more than two centimetres aside through (pressure/force of the) hand touch and the dog is not put off balance, but can easily maintain its position if it wishes to do so.

Continue

Continued

Verbal instruction	Neutral use of voice by owner towards dog, normal frequency, regarding command or instruction, no soft and/or high pitch manner uttering kind words such as 'good dog', 'well done' and no harsh, sharp, intense voice lower frequency than verbal correct. Included in verbal instruction: hand signals without physical contact.
Verbal praise	Neutral use of voice by owner towards dog, normal frequency, regarding command or instruction, no soft and/or high pitch manner uttering kind words such as 'good dog', 'well done' and no harsh, sharp, intense voice lower frequency than verbal correct. Included in verbal instruction: hand signals without physical contact.
Verbal correct	Harsh, sharp, intense voice lower frequency such as 'No', 'Eh eh'.
State behaviours	
Orientation owner at magazine	Owner has head directed at magazine >3 sec.
Orientation owner at dog	Owner has head directed at dog >3 sec.
Orientation owner unknown	Owner does not have head directed at dog or magazine >3 sec.
Owner sitting	Owner has hind quarters on the chair and bended legs.
Owner standing	Owner has two legs on the floor with body upright; the owner may move two steps from its original position.
Owner walking around	Owner is walking, standing upright and moving at least two steps from the original position.

1d) Eighteen dog behaviours scored as point or state behaviours during breaktime observations

Point behaviours	
Dog look at owner	Dog directs nose towards owner <3 sec.
Dog body to owner	Dog body (any part of torso or paws) in contact with owner <3 sec.
Bark	Loud and regular barking that is often repeated (1–2 barks per second).
High pitched	Peeping, whining, yelling or howling.
Sniffing floor	Dog is sniffing with nose pointed toward floor; sudden action and <3 sec.
State behaviours	
Close contact	Dog body (any part of torso or paws) in contact with owner >3 sec.
Close meter	Dog <1 meter of owner >3 sec.
Dog at door	Dog has nose pointed in the direction of door >3 sec.
Dog at object	Dog has nose pointed in the direction of object such as toy >3 sec.
Dog at owner	Dog has nose pointed in the direction of owner >3 sec.
Dog at unknown	Dog does not have nose pointed toward owner or object or door >3 sec.
Laying head down	Dog lays down in ventral or lateral position, all four legs and belly contact the floor and the head contacts the floor and/or forepaws.

Continue

Continued

Laying head not down	Dog lays down in ventral or lateral position, all four legs and belly contact the floor and the head does not contact the floor and/or forepaws.
Play object	Any vigorous or galloping gaited behaviour of dog directed toward a toy or other object >3 sec; including chewing, biting, shaking from side to side, scratching or batting with the paw, chasing rolling balls and tossing using the mouth. These movements are not made in the direction of the owner, the owner is not holding or throwing an object. Although, the dog may take the objects into its mouth, destruction is not included in this category.
Play owner	Any vigorous or galloping gaited behaviour of dog directed at the owner >3 sec. The dog may or may not have a toy or other object in its mouth or touch/ move it with paws, in the direction of the owner. The owner may be holding the toy/object at the other end than the dog does. It may include chewing, biting, shaking from side to side, scratching or batting with the paw, chasing rolling balls and tossing using the mouth. Although, the dog may take the objects into its mouth, destruction is not included in this category.
Dog sitting	Dog has hind quarters on the floor and stretched forelegs supporting the front of the body.
Dog standing	Dog has all four paws on floor with legs upright and extended supporting the body; the dog may move one step from its original position.
Dog walking	Dog is walking, at least more than one step with each paw.

Appendix 2 – Owner and dog behaviours

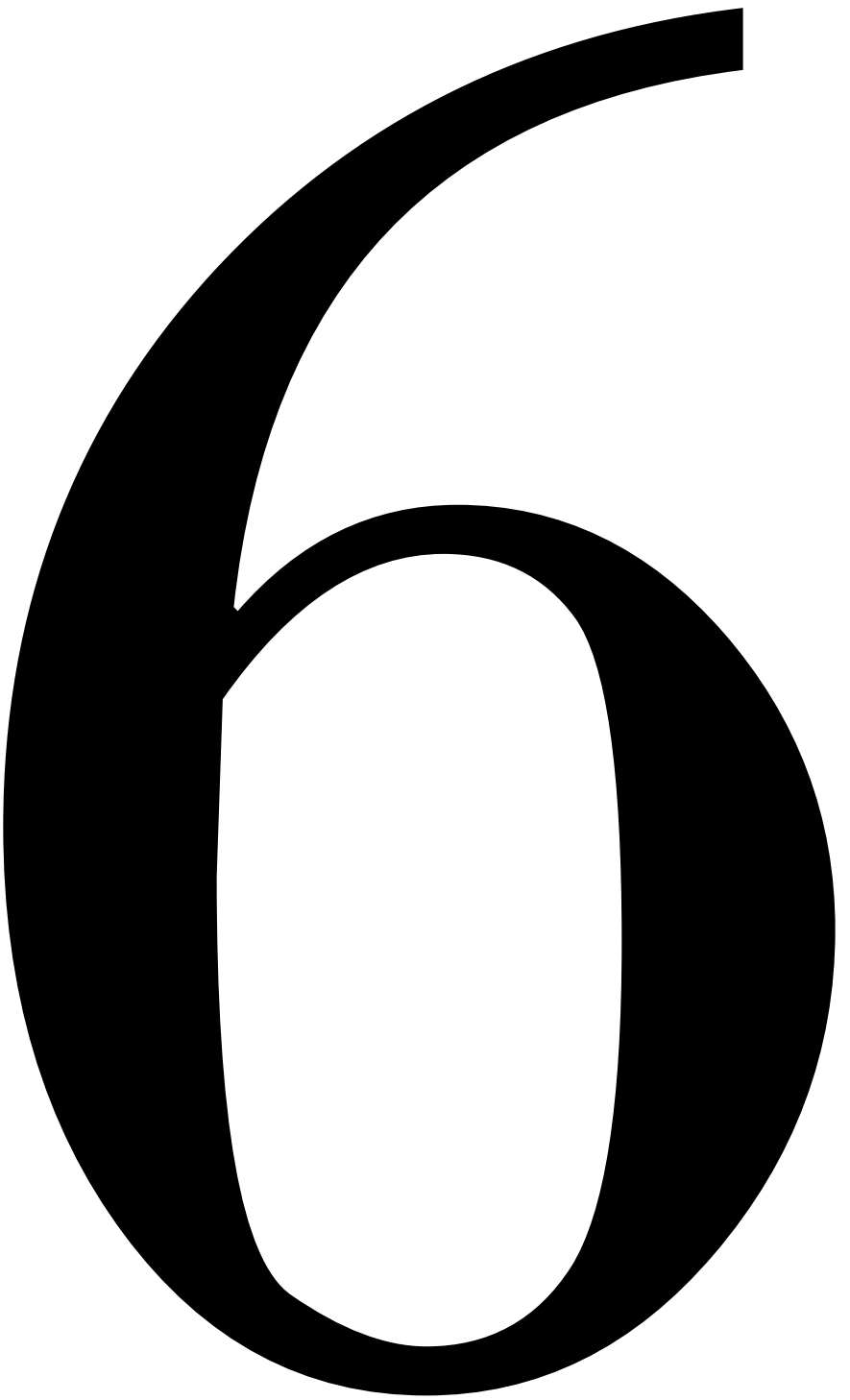
Average and standard deviation (range) of the owner and dog behaviours during a treat-and-ball course (over all three runs) and during breaktime in 41 owner-dog dyads, occurring ≥0.01 for point behaviours (rate per minute) and ≥1% for state behaviours (percentage of observation time).

Treat-and-ball course behaviours	**μ±s.d. (range)**	**Breaktime behaviours**	**μ±s.d. (range)**
Contact ball (point)	0.45±1.14 (0-6.30)	Bark (point)	0.04±0.16 (0-0.70)
Contact food (point)	0.18±0.43 (0-1.74)	Close contact (state)	8.56±21.39 (0-89.27)
Dog at ball (point)	3.32±3.05 (0-15.30)	Close meter (state)	64.90±31.19 (10.21-99.98)
Dog at food (point)	1.73±1.96 0-8.76)	Dog at door (state)	7.73±12.72 (0-43.52)
Dog look at owner (point)	5.50±5.38 (0-19.70)	Dog at object (state)	15.86±27.50 (0-94.22)
Hand correct (point)	0.02±0.13 (0-0.82)	Dog at owner (state)	27.17±20.12 (3.02-74.32)
High pitched (point)	0.20±0.94 (0-5.74)	Dog at unknown (state)	49.25±27.82 (0.50-93.34)
Leash bow-floor (state)	35.50±31.82 (0-98.86)	Dog body to owner (point)	0.06±0.22 (0-1.30)
Leash snap (point)	2.26±2.98 (0-12.40)	Dog look at owner (point)	0.52±0.41 (0-2.00)
Leash steady (point)	8.03±3.26 (2.36-17.71)	Dog sitting (state)	15.47±23.01 (0-88.08)

Continue

Continued

Leash tension (state)	63.01±32.30 (0-100)	Dog standing (state)	24.11±14.58 (2.30-61.88)
Panting (point)	7.16±5.26 (0-13.69)	Dog walking (state)	19.79±16.72 (1.71-64.07)
Physical instruction (point)	0.32±0.61 (0-1.93)	High pitched (point)	0.18±0.40 (0-1.80)
Physical praise hard (point)	0.02±0.12 (0-0.79)	Laying head down (state)	10.19±17.59 (0-74.12)
Physical praise soft (point)	0.03±0.20 (0-1.26)	Laying head not down (state)	26.19±24.50 (0-89.16)
Sniffing ground (point)	4.25±3.36 (0-13.59)	Orientation owner at dog (state)	26.74±22.43 (0.47-85.06)
Verbal instruction (point)	14.66±7.89 (0-28.23)	Orientation owner at magazine (state)	9.68±20.97 (0-91.94)
Verbal praise (point)	6.70±6.99 (0-26.36)	Orientation owner unknown (state)	63.58±27.00 (3.36-96.98)
Verbal correct (point)	3.97±4.04 (0-17.71)	Owner sitting (state)	86.46±13.68 (44.47-100)
		Owner standing (state)	7.13±9.08 (0-34.09)
		Owner walking around (state)	6.12±8.66 (0-34.94)
		Physical instruction (point)	0.03±0.06 (0-0.30)
		Physical praise hard (point)	0.03±0.12 (0-0.70)
		Physical praise soft (point)	1.13±1.86 (0-7.45)
		Play object (state)	8.40±23.80 (0-98.57)
		Play owner (state)	6.06±16.60 (0-84.97)
		Sniffing ground (point)	0.39±0.38 (0-1.90)
		Verbal instruction (point)	0.95±1.30 (0-5.99)
		Verbal praise (point)	0.40±0.58 (0-2.59)
		Verbal correct (point)	0.08±0.17 (0-0.88)



Chapter 6

Rein sensor leash tension measurements in owner-dog dyads navigating a course with distractions

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Abstract

Consistent owner-dog interaction patterns such as dog-directed parenting styles could reflect in the leash tension applied when walking a dog. Rein sensors are commonly used to measure tension applied to a horse's bit and our research aim was to evaluate the performance of this methodology for measuring leash tension. We evaluated the consistency of leash tension measurements in owner-dog dyads walking a food-distraction course and a more complex zigzag object-distraction course to confirm our prediction that the more challenging course would trigger increased leash tension. Leash tension sample points were averaged per owner-dog dyad per course and we used Restricted Maximum Likelihood (REML) to analyze leash tensions for effects of course difficulty and dog body weight. In 24 participating owner-dog dyads leash tension was an average (±standard deviation) 18.29±14.03 newtons. Leash tensions were 1.6 times higher ($P<0.001$) during the more challenging second course than during the easier first one and variation between owner-dog dyads was consistent across the two courses (rank correlation of 0.63, $P=0.001$, $N=24$). Our findings support the usefulness of rein sensors for measuring leash tension, with potential applications in studies on the owner-dog relationship such as how leash exerted levels of control relate to dog-directed parenting styles.

Keywords: rein sensor; leash pressure; dog; dog-owner relationship

Short communication

Leashed dogs seemingly habituate to wearing harnesses as well as head and neck collars, even after wearing them for only 20 minutes (Ogburn et al., 1998, Haug et al., 2002, Grainger et al., 2016). However, the restraint imposed by leashes does affect a dog's gait and behavior. Leash tension and the way it is applied translates into specific pressure distributions on a dog's body, as measured earlier with pressure strips placed underneath three different harnesses in eight guide dogs (Peham et al., 2013). Pressure mat measurements revealed how the forelimb weight shifted away from the leash in dogs weighing less than twelve kilos (Keebaugh et al., 2015) and such leash-related gait asymmetry was found also in a study group of 66 dogs of various breed sizes (Fahie at al., 2018). Next to affecting a dog's gait, leash-restraint affects a dog's behavior. Leash-restrained walking associated with less sniffing of other dogs in a data set of 1,870 recorded spontaneous dog-dog interactions (Řezáč et al., 2011). More importantly, leash-restrained dogs threat displayed twice as much towards other dogs, for instance through baring teeth, growling or snarling (Řezáč et al., 2011). Finally, the restricted freedom of movement causes some dogs to leash pull, which was reported by 69% of 192 dog owners (Blackwell et al., 2008) and is a common annoyance to dog owners. Clearly, leash tension matters, both to dogs and their owners. We searched for a tool to validly measure leash tension during everyday life situations of owners walking their dog, for use in future owner-dog relationship studies. Leash tension measurements could provide information on the mutual relationship between owner and dog, reflecting consistent owner-dog interaction patterns such as dog-directed parenting styles. So far, rein sensors have been used to measure applied weight on a horse's bit during horse training (Dumbell et al., 2018). We aimed to evaluate the performance of IPOS Technology© rein sensor methodology to measure leash tension.

The performance of the rein sensor was assessed by identifying suitable read-out parameters and by testing if walking a more difficult object-distraction course would indeed trigger increased leash tension as compared to a more easily navigated food-distraction course. Both courses were set out in the same indoor location, a dog training hall. On site the IPOS Technology© rein sensor was calibrated using weights of 820 to 4260 grams. Participating dog owners (N=24) filled out an intake survey answering questions on for instance the dog's breed, age, gender and obedience class attendance. Thereafter, the dog's body weight was measured by one of the experimenters. The owner-dog dyad then entered the indoor training hall. The first ('food-distraction') course was a twelve-meter straight path with pieces of dried chicken as distractions placed at fixed positions at either side of the path. The second more tricky ('object-distraction') course was a zigzag path of twelve meters along objects such as balls, fake dogs, food bowls and odd-shaped objects. The dog owners were instructed to guide their dogs through

the course without the dog touching food or objects, but in their own time and way of handling the dog. In line with this, the garment and leash were used that the dogs were walked with normally. Garments were either a flat collar around the dog's neck or a standard harness around the dog's torso. Leashes were leather or canvas leashes between 1.5 and 2.0 meters in length. The rein sensor, a device of 45 millimeters by 100 millimeters by 16 millimeters and weighing 68 grams, was attached between the dog's garment and leash. The top part of the rein sensor was attached to the D-ring of the collar or harness with a pin and screw system. Onto the bottom part of the rein sensor the spring hook of the leash was clipped, which normally would be clipped directly onto the D-ring of the collar or harness. Attachment of the device was done for all dogs by the same person and the recordings were started at the same time the owner started the first course by starting the device via a tablet application. The recordings were streamed wireless from the rein sensor to a tablet on which the data was stored per dog. Leash tensions in grams were stored at rates over 10 times per second, expressed as newtons by multiplying recordings in kilograms by 9.8, and we averaged these recorded tensions per dog per course. Coefficients of variation were calculated based on averages per dog per course. Restricted Maximum Likelihood (REML) was used to test for interaction effects of a dog's body weight and course on leash tension. The REML-data set included 48 records of average leash tensions for each of the 24 dogs for each of the two courses. Body weight and course were fitted as a co-variate and owner-dog dyads made up the random component. With a Spearman rank correlation we tested how average leash tension associated between courses and consistently characterized owner-dog dyads. Statistical analyses were done using GenStat (18th edition) software.

The intake survey revealed that all owner-dog dyads had previously attended dog obedience classes. Dogs varied widely in breed and were aged half a year to ten years old. The dogs' average body weight was 22.5±10.7 (5.5-39.4) kilograms. Eighteen dogs were male, six were female. The times to complete the two courses was an average (±standard deviation, range) of 224±53 (125-344) seconds. Especially at the start some owners walked their dog more quickly than others. The average leash tension (±standard deviation, range) across dogs and courses was 18.29±14.03 (1.16-60.16) newtons. The average coefficient of variation for within-dog leash tension was 1.33 (0.65-2.84), as based on an average number of 4,321±2,312 (2,011-18,204) samples. The REML-predicted means (±standard errors) for leash tensions were 1.6-fold higher ($F_{1,22}$=17.4, P<0.001) for the second course (22.40±2.61) than the first course (14.17±2.61 newtons), as based on an average number (±standard deviation) of 5,253±2,886 second course samples and 3,388±885 first course samples. REML-effects for the dog's body weight (P=0.06) or an interaction between course and body weight (P=0.1) were not significant. Owner-dog dyads differed in a consistent way, as evident from a Spearman rank correlation of

r_s=0.63 (P<0.001, *N*=24) between leash tensions during the first and second course, explaining 40% of variance.

In our owner-dog study with dogs of several breeds and sizes, rein sensor leash tension measurements detected consistent variation between owner-dog dyads. We conclude that the rein sensor is a useful tool for gathering quantitative leash tension information as our findings support its reliability and validity. Respectively, the two leash tension measurements per owner-dog dyad correlated and in line with expectations the tensions were higher when dyads had to navigate the more difficult of two courses. This allows for future studies to use rein sensors in determining how leash tensions characterize owner-dog interactions. Specifically, further development and validation of rein sensor methodology to measure leash tension can identify how dog-directed parenting styles reflect in owner-exerted leash control or, alternatively, a dog's leash-pulling. Discriminating between parts of leash tension that are attributable to the owner versus the dog is a challenging issue to address in future studies.

Chapter 7

Permissive parenting of the dog associates with dog overweight in a survey among 2,303 Dutch dog owners

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Abstract

Overweight dogs are at increased risk of health issues and it is up to the dog owner to uphold successful weight management. In children, overweight relates to their parent's style of parenting and we predicted a similar association in the owner-dog relationship given our recent detection of dog-directed parenting styles. If styles in parenting dogs indeed associate with a dog's overweight, these may provide action points for effective weight management. For 2,303 Dutch dog owners, answers on their dog's (nine-point scale) body condition scores were compared to ways of parenting the dog. We used an adapted version of the 32-item Parenting Styles and Dimensions Questionnaire and compared the distributions of dog counts across aggregated body condition score categories of underweight (scores one to three), healthy-weight (scores four and five) and overweight/obese (scores six to nine) with Chi-square tests across the quartiles of a given parenting style. Overweight dogs were overrepresented in the quartile of dog owners with the highest level of permissive parenting, which is in line with findings on parenting styles and overweight in children. Our results indicate that strategies to promote proper weight management in dogs could benefit from addressing a dog owner's permissiveness in parenting his/her dog.

Keywords: owner-dog relationship; overweight; obesity; One Health; parenting style

Introduction

Overweight in dogs reduces quality of life (Endenburg et al., 2018; Yam et al., 2016) by causing serious health problems such as musculoskeletal disorders, neoplasia and disturbances of normal endocrine functions (German et al., 2010; Loftus and Wakshlag 2015). One way of assessing overweight is by means of body condition score measurement, which is a subjective, non-invasive method that has been validated with dual-energy X-ray absorptiometry, bioelectrical impedance and thoracic radiography of subcutaneous fat (German et al., 2010; Linder et al., 2013; Mawby et al., 2004). Body condition score measurements combine visual inspection with palpation of the dog. On a nine-point scale the body condition score measurement expresses the broader categories of underweight (scores one to three), healthy-weight (scores four and five) and overweight/obese (scores six to nine), with six and seven indicating overweight and eight and nine indicating obesity (Burkholder, 2000; German et al., 2006; Santarossa et al., 2017).

Overweight in dogs has been studied for many years, covering aspects of its epidemiology, pathophysiology, management and comorbidity in dog and owner (Chandler et al., 2017; Courcier et al., 2010; German, 2006; Loftus and Wakshlag 2015; Lund et al., 2006; McGreevy et al., 2005; Sandøe et al., 2014). Also, owner aspects of feeding and exercising have been researched. Findings indicate owner effects on the dog's weight. For instance, overweight dogs, more so than healthy-weight dogs, were found to be fed semi-moist food (Courcier et al., 2010), homemade foods, table scraps such as bread, meat, pasta, sausage (Sallander et al., 2010) and snacks/treats (Bland et al., 2009; Courcier et al., 2010; Robertson, 2003). Next to feeding differences, overweight dogs were found to have lower exercise levels Bland et al., 2009; German, 2006; Robertson, 2003. If dog owners vary considerably in how they feed and exercise their dog (German, 2006; Courcier et al., 2010), how they view and relate to it may be key to this. For instance, owners of overweight dogs were more likely to see them 'as a baby' and allow them to sleep on the bed (German et al., 2017). Also, owners of overweight dogs tended to value the dog less for exercise, work and/or protection purposes but spoke to it more and on a larger variety of subjects (Kienzle et al., 1998).

Differences in how owners see and treat their dog can be studied through the recently discovered dog-directed parenting styles (German, 2014; Van Herwijnen et al., 2018b) and in humans associations exist between parenting styles and a child's overweight (Shloim et al., 2015). Parenting styles encompass the overarching 'emotional climate' in the relationship between a care provider such as a dog owner and a care receiver such as a dog (Van Herwijnen et al., 2018b). This emotional climate is characterized by variation in dimensions of responsiveness and demandingness (Baumrind, 2013). Responsiveness

is about recognising the needs and emotions of the care receiver. Demandingness is about providing boundaries, exerting control and monitoring of behaviour and performance (Baumrind, 2013). Scoring high on both responsiveness and demandingness is described as an authoritative style of parenting, which is considered as balanced and most optimal (Baumrind, 2013). The permissive style is characterized by high levels of responsiveness and low levels of demandingness, reflecting unbalanced parenting. Another form of unbalanced parenting is the authoritarian style with high levels of demandingness and low levels of responsiveness (Baumrind, 2013). Similar styles of dog-directed parenting reflect the differences in responsiveness and demandingness with added reflections of correction, intrinsic value or training orientations towards a dog's parenting (Van Herwijnen et al., 2018b).

Findings on child-directed parenting suggest that permissive parenting promotes overweight (Shloim et al., 2015) and in the owner-dog relationship this may work for example by an eagerness to please the dog with food (high responsiveness) without a counterbalancing demandingness regarding exercise and, ultimately, body condition scores. This study aims to test a presumed influence of dog owners on dog overweight, focussing on parenting styles directed at the dog. Revealing associations between dog-directed parenting styles and body condition scores in dogs may point out new weight management strategies as to promote healthier dogs.

Methods

General approach and ethical considerations

We tested how dog-directed parenting styles associated with dog weight status, as reflected in body condition scores. Our sample consisted of dog owners recruited via advertising online and in hardcopy dog magazines, with press releases in national and regional news channels, including newspapers. Participants filled out a web-based survey on a private computer, at home or elsewhere, so without social pressure to provide certain answers. Anyone owning a dog and caring for it at for least half of the time was eligible to participate in the study. Caring for the dog was described as walking/training the dog, feeding the dog and performing other husbandry tasks. Additional criteria, such as fluency in Dutch were not made. The aim of the survey was explained to participants generally, without mentioning the specific element of a dog's weight status. Specifically, the aim was explained as 'each dog owner having his/her own view on the dog and on raising it; and Wageningen University and Research wishing to study people's views on raising the dog and possible outcomes thereof for the dog and the relationship with the dog'.

The survey was taken once, did not include questions that were psychologically burdening, meaning it did not interfere significantly with normal daily life. This exempted the study from review by our ethics committee, according to the guidelines of Wageningen University Medical Ethics Review Committee (Medisch Ethische Toetsingscommissie van Wageningen University, METC-WU).

Survey

The web-based survey was in Dutch and gathered information on dog and owner characteristics such as gender, age and dog-directed parenting styles between August 2017 and September 2018. Sample sizes were not estimated through power calculations before making the survey available online and we did not predetermine a survey period. However, 95% of the data was collected in the first three months after starting the survey advertisement. Parenting styles were measured with 32 parenting style items on a five-point Likert scale, rating the likelihood of scenarios occurring as never (score zero), nearly never (one), neutral (defined as about half of the time, two), nearly always (three) and always (four). These items were based on the Parenting Styles and Dimensions Questionnaire (32-PSDQ) commonly used with children (Robinson et al., 1995) and transformed for use with dogs (Van Herwijnen et al., 2018b). Here we used the 32 items measuring on the three 'original' parenting styles of authoritative, authoritarian and permissive parenting, as to facilitate comparisons of our study outcomes with similar studies done with children. We did an additional analysis using the twenty items that make up the previously determined dog-directed parenting styles (DD-PSDQ) of authoritative-training orientated, authoritative-intrinsic value orientated and authoritarian-correction orientated parenting and which largely overlap the 32 items, but for the addition of two items as described in the earlier mentioned study by Van Herwijnen et al. (2018b) and Appendix 3 lists these parenting style questions in English and Dutch. For each parenting style the scores were calculated by combining item scores into a percentage of the theoretical maximum of 100%. Note that we did not study associations with the parenting style of uninvolvedness as the original child-directed measurement tools did not measure on this style (Olivari et al., 2013).

Body condition scores were measured on a scale of one to nine. Scores one to three represented underweight, four and five healthy-weight, six and seven overweight and eight and nine obesity. Dog owners were presented with pictures and descriptions of body condition scores as propagated by the World Small Animal Veterinary Association (WSAVA) in their nutrition toolkit, as for the owners to determine their dog's weight status (see Appendix 3 for details). Thus, they assessed their dog's body condition score themselves, based on this text- and image-based instruction. The answering of questions in the survey was not mandatory and as a consequence unanswered questions represent missing values.

Statistical analyses

The survey data was checked for replicates via the combination of the dog's name and postal code, which we used to label the data recognisably, while allowing participants to participate anonymously. We determined if dog counts for the body condition score categories underweight (scores one to three), healthy-weight (scores four and five) and overweight/obese (scores six to nine) were spread differently over the first, second, third and fourth quartile of the parenting style scores. For the classification of body condition scores into these three categories, we followed earlier studies using the same range of body condition scores (Burkholder, 2000; German et al., 2006; Santarossa et al., 2017) and we opted for this approach as our participants dogs' weights were not evenly spread over all body condition score categories, resulting in low counts in some categories. As our interest was to study if overweight in dogs associates with parenting styles, following findings in child-directed studies, we used a simple approach of Chi-square tests to test for a relationship between our categorical variables of weight and styles. Our survey was designed to establish the relation between a dog's body condition scores and dog-directed parenting styles.

Therefore, we opted for Chi-square test to allow presentation of results based on basic statistical analysis, without investigating effects multiple explanatory variables on a dog's body condition score, for which our survey was not designed. Chi-square tests outcomes were evaluated with the threshold of significance set at $P<0.001$. This instead of $P<0.05$ to separate the more biologically meaningful associations from weaker ones that reached significance by the large sample size (N=2,302). With the Chi-square tests, we present standardized residuals to identify the cells with the largest contribution to the Chi-square test results. We mark residuals $|>2|$ bold as this threshold is commonly accepted as a sufficiently large deviation between observed and expected values (Sharpe, 2015). To check for possible overlap between the parenting styles, we calculated Spearman's rank correlations as to provide insight into the basic characteristics of our study sample. Statistical analyses were performed with GenStat (18th edition) software.

Results

Participants and their dogs

The study sample included 2,303 dog owners who filled out the online survey between August 2017 and September 2018. The participants' dogs were of varying breeds and 60% (*N*=1,372) had a pedigree (*N*=908 non-pedigree; *N*=23 missing values). Table 1 presents the descriptive data on participants and their dogs and Fig 1 visualizes distribution of owner-reported underweight (BCS 1-3), healthy-weight (BCS 4-5) and overweight/obese (BCS 6-9) dogs.

Table 1 – Descriptive data of the participants and their dogs

Characteristic	Descriptive data		
Owner gender	Female: 86% (*N*=1,971)	Male: 16% (*N*=317)	Missing values: *N*=15
Owner age	Under 25 years: 7% (*N*=162)	25-35 years: 21% (*N*=462)	35-45 years: 19% (*N*=421)
	45-55 years: 31% (*N*=681)	55-65 years: 18% (*N*=392)	65 years or older: 5% (*N*=113)
			Missing values: *N*=72
Parenting style score medians (ranges) for 'original' 32-PSDQ	Authoritative style: 75.0% (20.0-100%)	Authoritarian style: 22.9% (0-83.3%)	Permissive style: 25.0% (0-91.7%)
Parenting style score medians (ranges) for DD-PSDQ	Authoritative-training orientated style: 87.5% (8.3-100%)	Authoritarian-correction orientated style: 23.0% (0-84.4%)	Authoritative-intrinsic value orientated style: 65.0% (4.2-100%)
Dog gender and status	Female neutered: 28% (*N*=608)	Female intact: 20% (*N*=432)	
	Male neutered: 21% (*N*=463)	Male intact: 31% (*N*=693)	Missing values: *N*=107
Dog size	Under 5 kilos: 3% (*N*=79)	5-10 kilos: 12% (*N*=284)	10-20 kilos: 20% (*N*=457)
	20-30 kilos: 30% (*N*=691)	30-40 kilos: 23% (*N*=516)	40-50 kilos: 8% (*N*=191)
	50 kilos or more: 4% (*N*=80)		Missing values: *N*=5
Dog body condition score (BCS)	BCS 1: <1% (*N*=2)	BCS 2: <1% (*N*=15)	BCS 3: 18% (*N*=410)
	BCS 4: 24% (*N*=554)	BCS 5: 51% (*N*=1,173)	BCS 6: 4% (*N*=100)
	BCS 7: 2% (*N*=40)	BCS 8: <1% (*N*=5)	BCS 9: <1% (*N*=4)
	Underweight (BCS 1-3): 18.5% (*N*=427)	Healthy-weight (BCS 4-5): 75% (*N*=1,727)	Overweight/obese (BCS 6-9): 6.5% (*N*=149)
Dog walking time per day	30 minutes or less:	30-60 minutes: 6% (*N*=136)	60-90 minutes: 23% (*N*=524)
	1% (*N*=16)		
	90 minutes or more: 71% (*N*=1,617)		Missing values: *N*=10

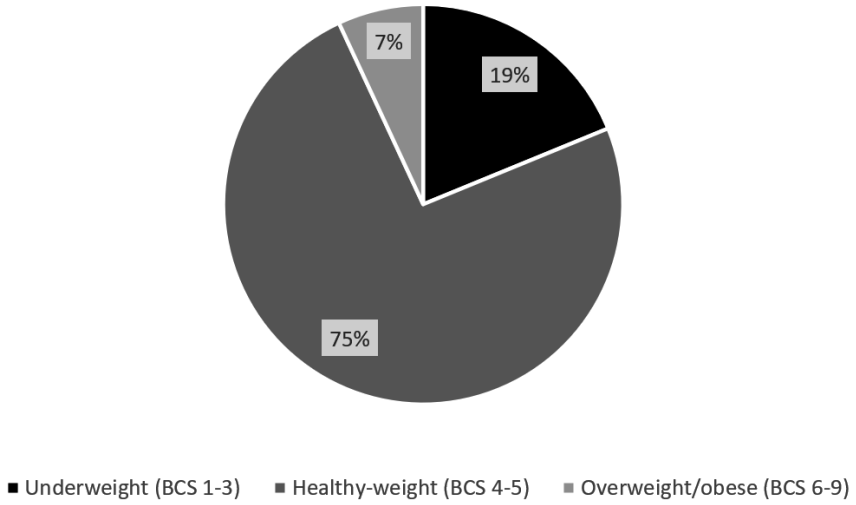


Fig 1. Distribution of owner-reported dog weight.
Percentage of owner-reported underweight (BCS 1-3; *N*=427), healthy-weight (BCS 4-5; *N*=1,727) and overweight/obese (BCS 6-9; *N*=149) dogs as percentage of total number of dogs (*N*=2,303).

We checked for overlap between the three original parenting styles of authoritative, authoritarian and permissive parenting (32-PSDQ), between the DD-PSDQ and between the 32-PSDQ and DD-PSDQ and found correlations in line with the earlier study done by us. The Spearman's rank correlations are provided in Appendix 1.

Parenting style scores and body condition score categories

We used Chi-squares to test if the dog count distribution across the three main body condition score categories (underweight, healthy-weight and overweight/obese) differed between the four levels of each of the dog-directed parenting styles of the first, second, third and fourth quartile of parenting style scores. The association between body condition score and parenting was significant at the level of $P<0.001$ only for permissive parenting. Here, the number of overweight dogs was higher than expected for the higher (fourth) quartile of permissive style scores and lower than expected for the lower (first) quartile of permissive style scores ($\chi^2=33.8$, $P<0.001$, $df=6$, $N=2,303$; see Table 2 and Appendix 2 presents all counts).

Table 2 – Counts of underweight, healthy-weight, overweight/obese dog body condition scores per quartiles of an owner's permissive parenting style scores
A dog's body condition score (BCS) being underweight (grouping body condition scores one to three), healthy-weight (score four and five) or overweight/obese (score six to nine) was calculated to fall into an owner's first to fourth quartile of parenting style scores for each of the three parenting styles of authoritative, authoritarian and permissive parenting. Chi-square tests for these frequencies were significant only for permissive parenting and we present counts (residuals), marking in bold the observed counts that deviate (residual |>2|) from expected counts (χ^2=33.8, P<0.001, df=6, *N*=2,303; all other P>0.001).

	Underweight *(BCS 1-3)*	**Healthy-weight** *(BCS 4-5)*	**Overweight/obese** *(BCS 6-9)*
Permissive style score 0-19%	121 (1.62)	441 (0.51)	**20 (-3.44)**
Permissive style score 19-25%	138 (1.72)	488 (-1.21)	40 (-0.58)
Permissive style score 25-35%	87 (-1.64)	420 (1.80)	32 (-0.57)
Permissive style score 35-92%	81 (-1.89)	378 (-1.03)	**57 (4.80)**

Discussion

Overweight dogs are at increased risk of poor health and it is important that dog owners adopt effective long-term weight management as part of a healthy owner-dog relationship. As an element of this owner-dog relationship, dog-directed parenting could express in the weight management of dogs, similarly to child-directed parenting associating with a child's weight. Indeed, we found that dog owners who reported to be strongly permissive in their dog-directed parenting were more likely to own a dog that was overweight (i.e. body condition scores above six on a scale of one to nine).

Our finding that permissive dog-directed parenting associates with higher weight in dogs corresponds with findings on child-directed parenting and children's weight in a review of 23 cross-sectional studies, seven longitudinal and one randomized control trial (Shloim, 2015). As an example, a regression coefficient of 0.35 was found for permissiveness and the child's higher weight (P<0.05), thus explaining twelve percent of variation in child weight after controlling for factors such as parent affect, parent weight and child temperament (Hughes et al., 2008). This in a survey on 718 parents, of which 240 parented permissively (Hughes et al., 2008). Where some studies report the permissive style to even double a child's chances on overweight (Rhee et al., 2006), other studies however report mixed results for the associations between a child's weight and parenting styles in general (Sokol et al., 2017; Vollmer and Mobley, 2013). This indicates a need for more causal evidence (Ventura and Birch, 2008) as the influence of the parenting environment on a child's weight status is complex (Rhee, 2008), though probably existent. Child-directed parenting styles were seen to combine logically with several child-directed feeding/exercise behaviours (Barradas et al., 2007; Blissett, 2011; Collins et al., 2014; Jago et al., 2011; Kimiecik and Horn, 2012; Lopez et al., 2018;

Schary et al., 2012). Specifically, parental permissiveness combined with poorer quality of children's diets, less monitoring of food intake, less meal-time structure and fewer food rules (Blissett, 2011; Collins et al., 2014; Lopez et al., 2018), and with higher levels of sedentary behaviour in the form watching television (Jago et al., 2011). Contrastingly, parental authoritativeness combined with more rules in place regarding 'television-time' (Barradas et al., 2007; Schary et al., 2012). Finally, parental demandingness, which lacks in permissive parenting, combined with a child's higher perceived abilities to exercise (Kimiecik and Hornm 2012), increasing the chances of sufficient exercise being a part of daily routines.

There is a proposed mechanism through which parenting styles affect weight statuses on the long-term, at least in children (Grolnik and Farkas, 2002; Moilanen et al., 2015; Olvera and Power, 2009; Shloim et al., 2015). Parenting styles are thought to affect weight status in children through influencing the child's mechanisms of self-regulation/control (Grolnik and Farkas, 2002; Moilanen et al., 2015; Olvera and Power, 2009; Shloim et al., 2015). Self-regulation/control are regulatory responses that need to be practiced and developed during childhood and adolescence (Grolnik and Farkas, 2002; Moilanen et al., 2015) Their development is facilitated by authoritative parenting that combines parental demandingness and responsiveness. Firstly, appropriate parental demandingness ensures that the child is given tasks it can fulfil and this is combined by the parent monitoring/controlling the outcomes of these tasks. This allows the child to practice the tasks, which could be about eating vegetables or being active instead of sitting behind the television or tablet. When the child performs the tasks successfully and repeatedly, the proper food/exercise habits become internalized. Secondly, the development of self-regulation/control is facilitated by responsiveness. Responsiveness ensures that a child's innate hunger/satiation signals are not overruled by parental constraints (Grolnik and Farkas, 2002; Sokol et al., 2017). An example of parental constraint is obligatory finishing a meal when the child feels satiated already. The consequence may be diminished satiation recognition over time, leading to overeating by lack of self-regulation. Assumingly, the balance in parental demandingness *and* responsiveness allows children to develop appropriate self-regulated/controlled habits.

Self-regulation/control as an underlying factor of healthy food/exercise habits will be of lesser importance to dogs than it is to children. A child, when moving into adulthood, will increasingly self-regulate/control food and exercise behaviour as it becomes more and more independent (Francis and Susman, 2009; Tsukayama et al., 2010). A dog, however, remains dependent on its owner throughout its life. For instance, the owner's regulation of food provision will determine the dog's food intake more than a dog's self-regulation, if access to food is not freely provided to the dog. Consequently, demanding dog owners are unlikely to have a similar long-term effect on a dog as demanding parents

have on a child. Overruling a dog's innate hunger/satiation signals or suppressing a dog's internal exercise motivation will not affect an adult dog's weight status if the dog's food/exercise habits are still controlled by the owner during the dog's adult life. This probably explains why we did not find a relationship between the parenting styles that are high in demandingness (authoritarian, authoritative) and the dog's body condition scores.

Although dog-directed parental demandingness may not be a major factor in the dog's weight status when strong, apparently it does play a significant role when weak and in presence of high responsiveness levels, as seen in permissive parenting. Similarly to parent-child situations (Blissett, 2011; Collins et al., 2014; Lopez et al., 2018), in owner-dog situations a lack of demandingness could result in providing low quality diets to the dogs, in a lack of household rules on food giving and in a sedentary/minimal exercise life style. When low demandingness is combined with high responsiveness as in permissive parenting, this may make dog-owners feed their dog according to its food giving requests, with frequent snack/treat giving (Robertson, 2003). The increased number of overweight/obese dogs in the quartile of our most permissive owners may be explained in this way. Future studies have to unravel how permissive dog-directed parenting actually expresses in the feeding and exercising of dogs in the way that builds up unwanted levels of adipose tissue.

How parental demandingness may or may not factor in a dog's weight status remains open to further studying. We found the dog's body condition scores to be unrelated to the DD-PSDQ styles. Apparently, the construct of these three styles, that are oriented as authoritarian-correction, authoritative-training and authoritative-intrinsic value, fails to sensitively detect variation in a dimension of weak demandingness *and* responsiveness. Presumably, this mirrors the characteristics of our study sample. Compassionate dog owners, who are mainly female, educated and willing to make the effort to participate in research, may only rarely display extremely weak parental demandingness and/or responsiveness. Recruiting participants of these most interesting parenting style types is complex, but necessary for a complete picture of dog-directed parenting styles and possible consequences thereof. The compassion or at least willingness to invest in the dog through exercise in our study population becomes clear from the relatively high percentage of owners walking their dogs for 90 minutes or more daily. Our study sample held mainly dogs that were reportedly normal weight. Our found percentage of 75% is higher than the 64% of dogs reported to be normal weight in a study on 3,185 European dog owners (underweight: 19% versus 14%; overweight/obese: 7% versus 22%) as measured on a body condition scores ranging from 1-5 (Muñoz-Prieto et al., 2018). Additionally, a limitation of our study is it being based on dog owner self-reports. We supported valid body condition score assessments by providing both clear textual descriptions as well as graphics on the nine possible body condition scores, but owner

reports may have been inaccurate or biased towards reporting lower body condition scores. Previous studies indicated that dog owners underreport their dog's weight. For instance, 44% of 680 dogs' body condition scores were misinterpreted by their owners, as compared to veterinarians, with 77% of the discrepancies being underestimations (Courcier et al., 2011). Seemingly, using a body condition score measurement does not improve underestimation, as in another study 65% of 110 owners incorrectly estimated the dog's weight status regardless whether they did or did not use a body condition score measurement (Eastland-Jones et al., 2014). Underestimation and underreporting would particularly affect our study when entangled with parenting styles. This would be an interesting topic for future studies on a dog's weight and parenting styles, as we are unaware of studies that have looked into this. High demandingness could come with considering it important to have a 'perfect weight dog', thus influencing reporting of body condition scores through a mechanism of social desirability. Follow-up studies could address this issue by involving expert rates on the dogs' body condition scores.

Particularly longer-term weight management in dogs seems challenging (Endenburg et al., 2018; German et al., 2012; White et al., 2011). Further studies could investigate if addressing permissiveness in dog owners may help them to resist a dog's food giving requests, to adhere to proper exercise schemes and consequently facilitate a dog's healthy weight. Veterinarians could consequently tailor their advice to the owner and indicate alternative ways for the owner to be responsive in a healthy way. Examples are playful active interactions, allowing the dog to do so-called 'nose work', search games and the like. Dogs are known to enjoy working with the owner and for daily food rations (McGowan et al., 2014), a concept generally known as contrafreeloading (Inglis et al., 1997). The strong parental responsiveness in permissive dog owners may coincide with a strong willingness to invest in their dog. Weight management strategies could tap into this while recognising such owners' particular pitfalls.

Conclusion

Overweight dogs were overrepresented in the group of dog owners that scored highest for permissive dog-directed parenting. The combination of weak parental demandingness with strong responsiveness seems to hamper effective weigh management in dogs, challenging us to look at how to optimally support such dog owners when we ask them to feed the dog less calories and up their exercise time. Promoting the appropriate levels of demandingness and responsiveness towards dogs may help dog owners persist in those feeding/exercise behaviours that benefit a dog's healthy weight, quality of life and longevity.

Appendices

Appendix 1–Spearman rank correlations between the parenting styles directed at the dog
Spearman rank correlations were calculated between the original 32-PSDQ parenting styles of authoritative, authoritarian and permissive parenting and the DD-PSDQ parenting styles determined in the previous study by Van Herwijnen et al., 2018 of authoritative-training orientated, authoritative-intrinsic value orientated and authoritarian-correction orientated parenting (*N*=2,303, P<0.001 for all).

	Authoritative style	**Authoritarian style**	**Permissive style**
Authoritative style	-	r_s=-0.27	r_s=0.18
Authoritarian style	r_s=-0.27	-	r_s=0.12
Permissive style	r_s=0.18	r_s=0.12	-

	Authoritative-training orientated style	**Authoritative-intrinsic value orientated style**	**Authoritarian-correction orientated style**
Authoritative-training orientated style	-	r_s=0.27	r_s=-0.27
Authoritative-intrinsic value orientated style	r_s=0.27	-	r_s=-0.24
Authoritarian-correction orientated style	r_s=-0.27	r_s=-0.24	-

	Authoritative-training orientated style	**Authoritative-intrinsic value orientated style**	**Authoritarian-correction orientated style**
Authoritative style	r_s=0.58	r_s=0.85	r_s=-0.25
Authoritarian style	r_s=-0.24	r_s=-0.29	r_s=0.93
Permissive style	r_s=-0.17	r_s=0.30	r_s=0.13

Appendix 2–Counts of underweight, healthy-weight, overweight/obese dog body condition scores per quartiles of an owner's parenting style scores

A dog's body condition score (BCS) being underweight (grouping body condition scores one to three), healthy-weight (score four and five) or overweight/obese (score six to nine) was calculated to fall into an owner's first to fourth quartile of parenting style scores for each of the three parenting styles of authoritative, authoritarian and permissive parenting and the additionally analysed specific styles of authoritative-training orientated, authoritative-intrinsic value and authoritarian-correction orientated parenting. Chi-square tests for these frequencies were significant only for permissive parenting (χ^2=33.8, P<0.001, df=6, *N*=2,303; all other P>0.001).

	Underweight *(BCS 1-3)*	**Healthy-weight** *(BCS 4-5)*	**Overweight** *(BCS 6-9)*
Authoritative style score 20.00-66.67%	108 (-0.08)	441 (0.17)	37 (-0.18)
Authoritative style score 66.67-75.00%	115 (-0.04)	460 (-0.70)	47 (1.29)
Authoritative style score 75.00-81.67%	97 (-0.40)	410 (0.57)	33 (-0.39)
Authoritative style score 81.67-100%	107 (0.51)	416 (-0.02)	32 (-0.77)
Authoritarian style score 0-14.58%	111 (0.02)	455 (0.72)	32 (-1.29)
Authoritarian style score 14.58-22.92%	116 (0.38)	464 (0.80)	29 (-2.00)
Authoritarian style score 22.92-33.33%	112 (0.30)	436 (-0.79)	43 (0.92)
Authoritarian style score 33.33-83.33%	88 (-0.73)	372 (-0.78)	45 (2.52)
Permissive style score 0-18.75%	121 (1.62)	441 (0.51)	20 (-3.44)
Permissive style score 18.75-25.00%	138 (1.72)	488 (-1.21)	40 (-0.58)
Permissive style score 25.00-35.00%	87 (-1.64)	420 (1.80)	32 (-0.57)
Permissive style score 35.00-91.67%	81 (-1.89)	378 (-1.03)	57 (4.80)
Authoritative-training orientated style score 8.33-75.00%	111 (-1.13)	488 (0.06)	51 (1.68)
Authoritative-training orientated style score 75.00-87.50%	141 (-0.54)	590 (0.06)	55 (0.74)
Authoritative-training orientated style score 87.50-91.67%	60 (0.79)	222 (-0.10)	15 (-1.07)
Authoritative-training orientated style score 91.67-100%	115 (1.16)	427 (-0.05)	28 (-1.74)
Authoritative-intrinsic value orientated style score 4.17-50.00%	123 (1.37)	447 (-0.57)	33 (-1.16)
Authoritative-intrinsic value orientated style score 50.00-65.00%	78 (-3.06)	432 (2.04)	42 (1.25)
Authoritative-intrinsic value orientated style score 65.00-75.00%	119 (0.92)	439 (-1.28)	43 (0.79)
Authoritative-intrinsic value orientated style score 75.00-100%	107 (0.70)	409 (-0.13)	31 (-0.87)
Authoritarian-correction orientated style score 0-12.50%	148 (0.85)	569 (0.06)	41 (-1.45)
Authoritarian-correction orientated style score 12.50-21.88%	99 (-0.63)	433 (1.38)	29 (-1.44)
Authoritarian-correction orientated style score 21.88-31.25%	88 (1.09)	318 (-0.73)	26 (-0.42)
Authoritarian-correction orientated style score 31.25-84.38%	92 (-1.30)	407 (-0.78)	53 (3.43)

Appendix 3–Questionnaire items

For this survey-based research we tested the association between a dog owner's parenting style directed at the dog and the dog's body condition scores. **Parenting style** questionnaire items follow Van Herwijnen et al., 2018*. **Body condition scores** were measured with pictures and descriptions of body condition scores-chart as propagated by the World Small Animal Veterinary Association (WSAVA) in their nutrition toolkit, and follow: https://www.wsava.org/WSAVA/media/Arpita-and-Emma-editorial/Body-Condition-Score-Dog.pdf.

**Reference: Van Herwijnen IR, van der Borg JA, Naguib M, Beerda B. The existence of parenting styles in the owner-dog relationship. PLoS ONE. 2018;13:e0193471.*

Parenting style questionnaire items follow Van Herwijnen et al., 2018:

I allow my dog to give input on decisions for instance with regard to the route we follow on walks.

I am responsive to my dog's feelings or needs

I can explode in anger towards my dog when he does something, he knows I don't want him to do.

I channel my dog's misbehaviour into a more acceptable activity.

I encourage my dog to 'be dog' even when it results in a dirty or wet dog.

I encourage my dog to show how it feels, it is allowed to growl for instance, when uncomfortable.

I find it difficult to discipline my dog.

I give comfort when my dog is upset.

I give into my dog when he causes a commotion about something or doesn't do something, I want it to.

I give praise when my dog is good.

I grab my dog when he/she is being disobedient.

I have good times together with my dog.

I help my dog to understand the impact of its behaviour by offering him choices in situations.

I let my dog know how I feel about its good and bad behaviour.

I practice behaviour step by step with my dog, so I am sure he understands what I ask of him.

I practice certain behaviour with my dog before asking this behaviour in a more difficult situation.

I punish by giving my dog 'time out' and walking away if he misbehaves, even if he finds the situation he is in uncomforting.

I punish by taking away toys from my dog.

I raise my voice to make my dog improve.

I scold or criticize when my dog's behaviour doesn't meet my expectations.

I show respect for my dog' s needs by encouraging my dog to 'be dog'.

I spoil my dog.

I take into account my dog's preferences in making plans.

I take my dog's desires into account before asking him to do something.

I think about why rules should be obeyed by my dog.

I threaten my dog with punishment more often than actually giving it.

I threaten with punishments towards my dog and do not actually do them.

I use a corrective slap when my dog misbehaves.

I use a poke of my finger, or short kick to snap my dog out of it when it misbehaves.

I use more or higher value reward (food or toy) when I believe my dog should really do something in a situation.

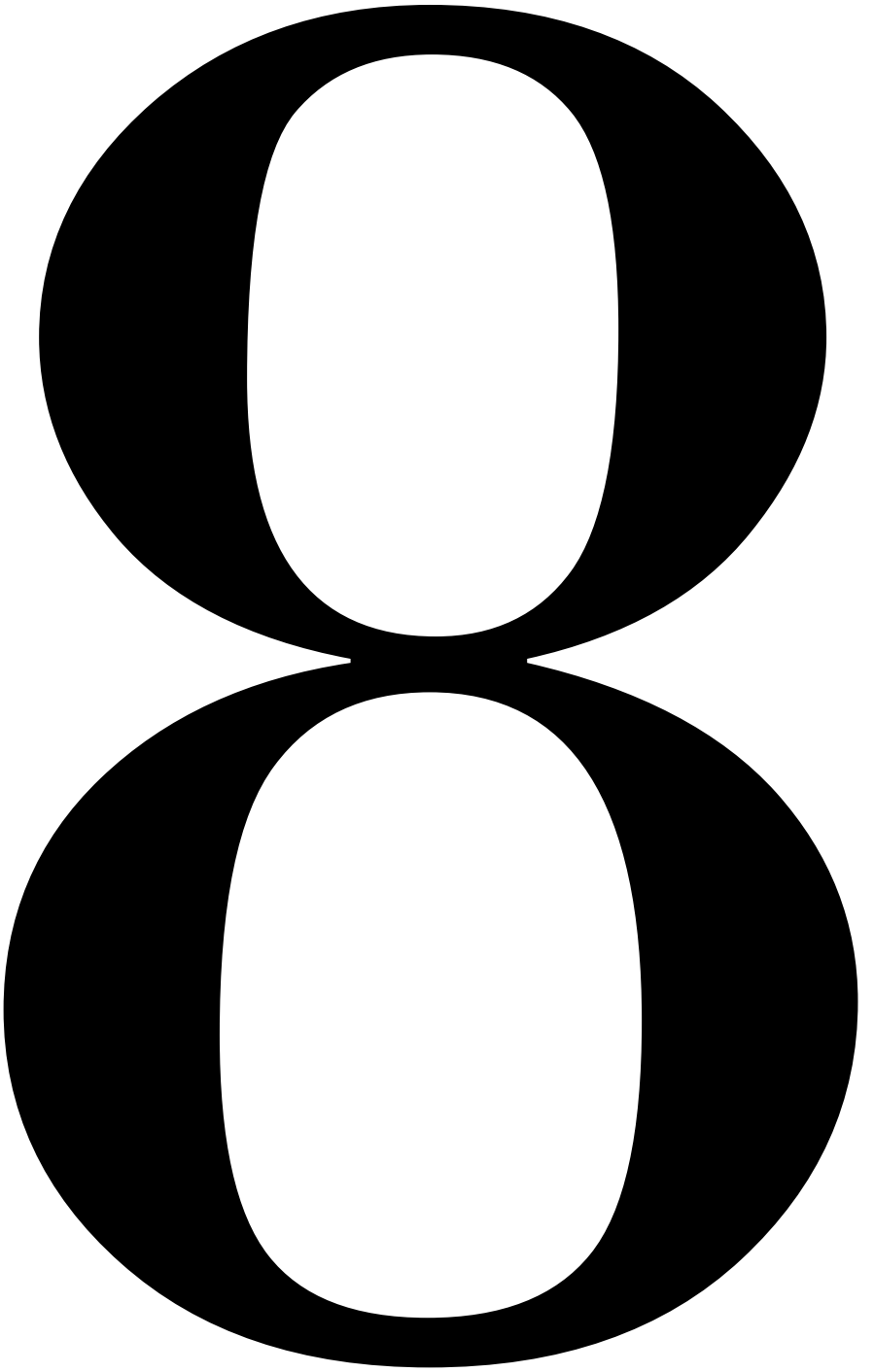
I use physical punishment (for instance a slap or a correction chain) as a way to improve my dog's behaviour.

I use threats as punishment without feeling need for justification towards my dog.

I yell or shout when my dog misbehaves.

When I ask my dog to do something, he should do so, because I said so and I am its boss.

Body condition scores were measured with pictures and descriptions of body condition scores-chart as propagated by the World Small Animal Veterinary Association (WSAVA) in their nutrition toolkit, and follow: https://www.wsava.org/WSAVA/media/Arpita-and-Emma-editorial/Body-Condition-Score-Dog.pdf.



Chapter 8

Dog-directed parenting styles, dog ownership satisfaction and the owner perceived relationship with the dog

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Abstract

Dogs are popular companion animals in today's Western society and often considered a member of the family. How dogs are parented, that is interacted with and 'raised', will likely affect their welfare as dogs needs to adapt to a human-determined environment. Such dog-directed parenting may relate to an owner's satisfaction and perceived relationship with the dog. Here we studied these possible relations in 2,305 Dutch dog owners. Outcomes of five-point Likert scale questions regarding three dog-directed parenting styles were related to dog ownership satisfaction, and to the MDORS (Monash Dog Owner Relationship) scales of owner perceived closeness to the dog, costs of ownership and amount of shared activities. We expressed dog ownership satisfaction binary, discriminating being highly satisfied from less so, as our participants were largely satisfied with dog ownership. Logistic regression models predicted probabilities of this binary response variate for each of the three explanatory parenting style variables. For MDORS, ANOVAs - including two-way interactions of the independent (parenting style) variables - predicted means for the three dependent variables. Authoritarian-correction orientated parenting (AUC), characterized by high demandingness and use of correctional training methods, combined with lower probabilities of highly satisfied ownership and with less favourable predicted means for perceived costs of dog ownership. Authoritative-intrinsic value orientated parenting (AUI), characterized by high responsiveness and a focus on the dog's needs and feelings, combined with more favourable predicted means for closeness and shared activities, such as being with the dog when relaxing. Finally, authoritative-training orientated parenting (AUT), characterized by elements of demandingness and responsiveness and a focus on training the dog how to behave socially, combined with costs in the opposite direction of AUC. Possibly, parenting with a focus on training the dog how to behave socially, protects dog owners from feeling burdened by their dog ownership and future studies could address if a dog's levels of (un)desired behaviour moderate this relation. Our study indicates that authoritative parenting benefits and authoritarian parenting disadvantages a dog owner's satisfaction and perceived relationship with the dog. Encouraging dog owners to parent authoritative instead of authoritarian seems a promising strategy to support owner-dog relationships.

Keywords: dog-directed parenting styles, dog ownership satisfaction, perceived relationship, Monash Dog Owner Relationship Scale (MDORS)

Highlights

- Authoritarian-correction orientated parenting combined with lesser dog ownership satisfaction.
- Perceived costs indicated a more negative relationship with the dog at higher levels of authoritarian-correction orientated parenting and a more positive relationship at higher levels of authoritative-training orientated parenting.
- Authoritative-intrinsic value orientated parenting combined with higher perceived closeness and activity sharing with the dog.

Introduction

Humans and dogs may have co-evolved (Schleidt and Shalter, 2003) and in present times the dog is often considered as part of the family (Blackstone, 2014; Irvine and Cilia, 2017; Power, 2008) with the care provided to the dog resembling parental care (Archer, 1997; Prato-Previde et al., 2003; Prato-Previde et al., 2006; Voith, 1985). Although the family member role may provide the dog with benefits, such as through resource provision, it also challenges the dog as it needs to adapt to human-controlled surroundings and far-reaching human guidance. The struggle to adapt may lead to undesired behaviours, which are unfortunately common. For instance, aggression was seen in 72% of dogs, and separation anxiety in 14% of dogs, in a retrospective evaluation of 1,644 dog medical records (Bamberger and Houpt, 2006) and 73% of 13,700 Finnish dogs displaying some kind of problematic behaviour such as noise sensitivity, fear, impulsivity or aggression (Salonen et al., 2020).

Although undesired by the owner, undesired behaviours may not be abnormal for the dog as a species. Indeed, destructiveness was the most frequent complaint of dog owners, as listed by 433 veterinary practitioners (Fatjó et al., 2006). However, applying pressure to objects as to make them smaller, as is done when destroying something, is normal behaviour for canines (Dessem, 1989) and their biting strength contributes to the damage caused. Biting force ranges from 147–946 Newton or even from 524–3417 Newton when measured at the second molar (Ellis et al., 2008), although obviously depending on factors such as a dog's weight or its skull shape (Ellis et al., 2009). Thus, the canine species is known for its considerable 'chewing capacity'. Nevertheless, in a human-determined surrounding such species specific capacities can be undesired and pose welfare risks to a dog as undesired behaviour in dogs is a reason for shelter relinquishment and euthanasia (Coe et al., 2014; Lambert et al., 2015). Between 10-34% of shelter relinquishment cases and between 10-18% of euthanasia cases were calculated to result from undesired behaviours in a systematic review and meta-analysis of fourteen studies from several countries (Lambert et al., 2015). Such dire consequences may in part be prevented by appropriate parenting of the dog, given that in humans child-directed parenting affects societal adjustment and educational outcomes in children (Lamborn et al., 1991; Kaufmann et al., 2000; Simons and Conger, 2007; Spera, 2005; Wing Chan and Koo, 2011), with a moderating role for parent-child relationship quality (Bronte-Tinkew et al., 2006; Steele and McKinney, 2019). For instance, levels of undesired behaviours, including aggression, were lowest in adolescents parented authoritatively and this combined with high (parent-child) relationship quality (N=2,732 late adolescents, that is 18-25 years; Steele and McKinney, 2019). Relationship quality was operationalized through survey questions on conflict, involvement, structure and regard for each other. It seems that way in which children are parented intertwines with the

quality of the parent-child relationship and this raises the question if the same is true for owners and dogs.

For the owner-dog partnership, relationship quality can be measured through the straight-forward measurement of ownership satisfaction (Curb et al., 2013; Van Herwijnen et al., 2018a) or with the often-used Monash Dog Owner Relationship Scales (MDORS, Dwyer et al., 2006; for applications see Handlin et al., 2012; Meyer and Forkman, 2014; Rohlf et al., 2010). The MDORS measures a dog owner's scores for the subscales of perceived emotional closeness ($MDORS^{Close}$), of perceived costs of owning the dog in terms of effort and financial costs ($MDORS^{Cost}$) and of shared activities between owner and dog ($MDORS^{Shared}$; Dwyer et al., 2006). We are interested in the possible associations between these owner-dog relationship quality aspects and dog-directed parenting. Dog-directed parenting was previously defined by three styles in a sample of 518 Dutch dog owners (Van Herwijnen et al., 2018b), which were later on linked to dog owners' orientations towards animals (Van Herwijnen et al., 2020a). The authoritarian-correction orientated parenting style (AUC) of high demandingness and use of correctional methods combined with owners bossing over the dog (Van Herwijnen et al., 2018b; Van Herwijnen et al., 2020a). The authoritative-intrinsic value orientated parenting style of high responsiveness and a focus on the dog's general needs and emotions, combined with the humanizing of the dog (Van Herwijnen et al., 2018b, Van Herwijnen et al., 2019). The authoritative-training orientated parenting style, reflecting high demandingness *and* responsiveness and focussing on teaching a dog how to behave was unrelated to strong orientations towards animals (Van Herwijnen et al., 2018b, Van Herwijnen et al., 2020a). We aim to assess and quantify the associations between these three parenting styles and indicators of the owner-dog relationship quality. If a dog owner's parenting of the dog indeed associates with ownership satisfaction or perceived relationship (MDORS subscales) this increases our understanding of owner-dog relationship quality and can provide action points for improving it.

Methods

General approach and ethical considerations

We tested how dog-directed parenting styles associated with dog ownership satisfaction and the owner-dog relationship scales of emotional closeness, perceived costs of ownership and shared owner-dog activities. Our sample consisted of dog owners recruited via advertising online and in hardcopy dog magazines, with press releases in national and regional news channels, including newspapers. Participants filled out a web-based survey on a private computer, at home or elsewhere, so without social pressure to provide certain answers. Anyone owning a dog and caring for it at for least half of the time was

eligible to participate in the study. Caring for the dog was described as walking/training the dog, feeding the dog and performing other husbandry tasks.

The survey was taken once, did not include questions that were psychologically burdening, meaning it did not interfere significantly with normal daily life. This exempted the study from review by our ethics committee, according to the guidelines of Wageningen University Medical Ethics Review Committee (Medisch Ethische Toetsingscommissie van Wageningen University, METC-WU).

Survey

The web-based survey was in Dutch and gathered information on dog and owner characteristics such as gender, age, perceived relationship with the dog and dog-directed parenting styles. The latter were assessed with the twenty items of the Dog-Directed Parenting Styles and Dimensions Questionnaire (DD-PSDQ; Van Herwijnen et al., 2018b). Participants rated statements on dog-directed parenting for the likelihood of occurring in their daily life on a five-point Likert scale that ranged from never (score zero), nearly never (one), neutral (defined as about half of the time, two), nearly always (three) to always (four). The parenting style of authoritarian-correction orientated parenting (AUC) was assessed with eight items and six items each assessed the authoritative-intrinsic value orientated parenting style (AUI) and authoritative-training orientated parenting style (AUT). For each parenting style the scores were calculated by combining item scores into a percentage of the theoretical maximum of 100%.

Dog ownership satisfaction was assessed by asking 'How satisfied are you with your dog?', with the answer categories being 'not at all satisfied' (score one), 'not very satisfied' (two), 'moderately satisfied' (three), 'satisfied' (four) and 'very satisfied' (five). Satisfaction scores were skewed towards high levels of satisfaction and answers were therefore expressed as a binary number with one being 'very satisfied' and zero being 'less than very satisfied'.

The 28 Monash Dog Owner Relationship Scales (MDORS) questions on the owner-dog relationship were taken from Dwyer et al. (2006) and used to assess the owner perceived emotional closeness to the dog ($MDORS^{Close}$; ten items), the owner perceived costs of owning the dog (in terms of effort, time and finance; $MDORS^{Cost}$; nine items), and the engagement in shared activities ($MDORS^{Shared}$; nine items). MDORS scores were calculated for each of the three subscales by combining item scores into a percentage of the theoretical maximum. The $MDORS^{Cost}$ subscale was expressed reversely, with high scores reflecting low perceived costs and a strong owner-dog relationship.

Generally, questions could be left unanswered and consequently the occasional question remained unanswered (missing values) and the precise sample sizes are indicated in the results section.

Statistical analyses

We tested the associations between the owners' dog-directed parenting style and dog ownership satisfaction in a logistic regression model with the three parenting styles as explanatory (independent) variables (expressed as a percentage of the theoretical maximum of 100%) and ownership satisfaction as the binary response (dependent) variate, using GenStat (18th edition) software. We included two-way interactions and performed backward elimination of those interactions that were not significant ($P \geq 0.05$). Means (±SE) predicted by the logistic regressions are presented for the range of the 50% middle values (the two central quartiles) of the independent variables (AUC, AUI, AUT). This means that effect sizes in the dependent variables were illustrated for the ranges of common values for the independent variables.

Next, we ran ANOVAs with the subscale scores for MDORS^{Close}, MDORS^{Cost} and MDORS^{Shared} as dependent variables to test for effects of the independent variables of the three dog-directed parenting styles (AUC, AUI, AUT). Two-way interactions were part of the statistical model, with backward elimination of those that were not significant ($P \geq 0.05$), and ANOVA predicted means (±SE) are again presented for the range of the 50% middle values (the two central quartiles) of the independent variables (AUC, AUI, AUT).

Results

Participants and their dogs

Dutch dog-owners (*N*=2,305) were recruited via online and hardcopy advertising. The majority of the respondents were female (86%, *N*=1,971; male: 14%, *N*=319; missing values *N*=15). More than three quarters (79%, *N*=1,821) had completed upper secondary education or higher. Age of the respondents was indicated in seven categories and most belonged to age group 45-55 years (31%, *N*=681), with distribution over the other age groups as follows: <25 years (8%, *N*=162), 25-35 years (21%, *N*=462), 35-45 years (19%, *N*=422), 55-65 years (18%, *N*=392), >65 years (5%, *N*=114; missing values *N*=72). Dogs were of varying breeds and sizes, with 32% (*N*=693) intact males, 21% (*N*=464) neutered males, 20% (*N*=432) intact females and 28% (*N*=609) neutered females (missing values *N*=107). Dog-directed parenting style scores were calculated for each respondent as a percentage of the theoretical maximum on the particular parenting style and were on average (±SD, range) 23.1±15.7% (0-84.4) for AUC, 63.1±18.2% (4.2-100) for AUI and 83.2±13.3% (8.3-100) for AUT. Associations between parenting

style scores were all significant, but explaining less than 10% of the variation. Spearman's rank correlations (N=2,305, P<0.001 for all) were r_s=-0.24 for AUC and AUI, r_s=-0.27 for AUC and AUT, and r_s=0.27 for AUI and AUT.

Parenting styles and satisfaction with dog ownership

Dog owners (N=2,305) filled out an online questionnaire using five-point Likert scale answers, which were transferred to the binary division of very satisfied dog ownership and less than very satisfied. Satisfaction with dog ownership was generally high with an average (±SD) dog ownership satisfaction score of 4.72±0.55 on a scale of one (lowest: N=9; via two: N=5, three: N=49, four: N=493) to five (highest, N=1,748; one missing value). Expressed on a binary scale, this was 0.76±0.43 with very satisfied as one (N=1,748) and less than very satisfied as zero (N=556).

The probability of being very satisfied with dog ownership associated only with AUC parenting as a main effect (logistic regression P=0.02, N=2,304, with P-values of 0.45 for AUI and 0.64 for AUT, no two-way interactions). The predicted mean (±SE) probability of being very satisfied decreased from 0.79±0.01 to 0.75±0.01 across the range of 50% middle values for AUC (i.e. from 13 to 31%).

Parenting styles and owner perceived relationship with the dog

Dog owners (N=2,305) filled out an online questionnaire using five-point Likert scale answers, which were combined into scores for the three dog-directed parenting styles and the three MDORS-subscales. MDORS-subscale scores were calculated for each respondent as a percentage of the theoretical maximum and were on average (±SD, range) 75.9±16.3% (12.5-100) for $MDORS^{Close}$, 86.7±11.7% (16.7-100) $MDORS^{Cost}$ and 72.1±11.1% (19.4-100) for $MDORS^{Shared}$. Associations between MDORS-subscale scores were all significant (P<0.001 for all, N=2,303), but again explaining less than 10% of the variation: Spearman's rank r_s=0.23 for $MDORS^{Close\ versus\ Cost}$, r_s=0.30 for $MDORS^{Close\ versus\ Shared}$, r_s=0.09 for $MDORS^{Cost\ versus\ Shared}$.

To quantify the strengths of the associations between the parenting styles and the MDORS-subscales we ran ANOVAs with the subscale scores for $MDORS^{Close}$, $MDORS^{Cost}$ and $MDORS^{Shared}$ as dependent variables and the three dog-directed parenting styles as independent variables. First, we present outcomes for the significant main effects of the parenting styles (P<0.05; Table 1) within the range of common scores (the two central quartiles ranged from 13-31% for AUC, 50-75% for AUI, 75-92% for AUT). The predicted mean scores for $MDORS^{Close}$ increased with 1% across the range of common values for AUC ($F_{1,2301}$=9.8, P=0.002), increased with 6% for AUI ($F_{1,2301}$=150.1, P<0.001) and increased with 2% for AUT ($F_{1,2301}$=19.3, P<0.001). $MDORS^{Cost}$ decreased with 2% across the range of common values for

AUC ($F_{1,2301}$=76.2, P<0.001) and, increased with 1% for AUT ($F_{1,2301}$=17.7, P<0.001). Finally, $MDORS^{Shared}$, increased with 3% for AUI ($F_{1,2299}$=62.8, P<0.001) and increased 2% increase for AUT ($F_{1,2299}$=55.0, P<0.001).

Associations between AUC parenting and emotional closeness or perceived costs were modified in a favourable direction by strong AUT parenting, whereas such modifying

Table 1 – ANOVA predicted means for MDORS-subscales associating with parenting styles
Differences in predicted means±SE for the three MDORS-subscales in 2,305 Dutch dog owning parents as dog-directed parenting (20 items of the dog-directed parenting styles on a five-point Likert scale) increases over the area of the two central quartiles of parenting style scores (50% middle scores). Presented are the main effects (ANOVA three-way with two-way interactions, P<0.05, df=1,2299/2301).

	AUC (13% to 31%)	**AUI (50% to 75%)**	**AUT (75% to 92%)**
$MDORS^{Close}$	1.4 75.4±0.4 76.8±0.4 (0.08 per 1% increase, P=0.002, $F_{1,2301}$=9.8)	5.9 73.1±0.4 79.0±0.4 (0.24 per 1% increase, P<0.001, $F_{1,2301}$=150.1)	1.8 75.3±0.4 77.1±0.4 (0.11 per 1% increase, P<0.001, $F_{1,2301}$=19.3)
$MDORS^{Cost}$	-2.4 88.1±0.3 85.7±0.3 (-0.13 per 1% increase, P<0.001, $F_{1,2301}$=76.2)	-	1.3 86.1±0.3 87.4±0.3 (0.08 per 1% increase, P<0.001, $F_{1,2301}$=17.7)
$MDORS^{Shared}$	-	2.7 71.0±0.3 73.7±0.3 (0.11 per 1% increase, P<0.001, $F_{1,2299}$=62.8)	2.0 71.4±0.3 73.4±0.3 (0.12 per 1% increase, P<0.001, $F_{1,2299}$=55.0)

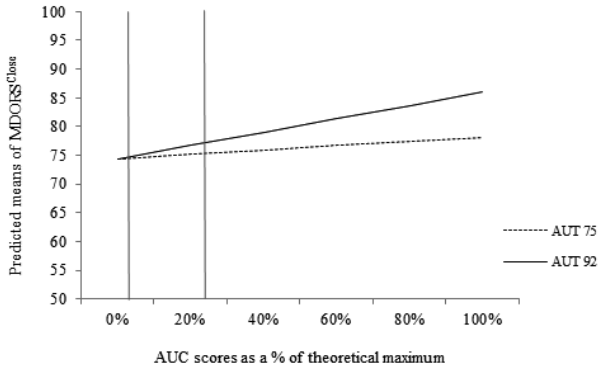


Figure 1. Predicted mean scores for a dog owner's emotional closeness to his/her dog ($MDORS^{Close}$, y-axis) in a study sample of 2,305 Dutch dog owners. Scores are in relation to the owner's degree of parenting authoritarian-correction orientated (AUC; x-axis, range of 50% middle scores is 13-31%) as well as authoritative-training orientated (AUT at 75%; dashed line, at 92%; solid line). Represented is the significant two-way interaction effect (ANOVA P=0.002).

effects of AUI worked out unfavourably for perceived costs. The direct relation between AUI parenting and shared activities was strengthened by strong AUC parenting. Specifically, the significant two-way interactions indicated that the direct relationship of AUC with MDORS^{Close}, was strengthened by higher AUT scores ($F_{1,2298}$=9.7, P=0.002; Figure 1). The inverse relationships of AUC with MDORS^{Cost} was strengthened by higher AUI scores ($F_{1,2298}$=5.0, P=0.03; Figure 2a) and weakened by higher AUT scores ($F_{1,2298}$=13.2, P<0.001; Figure 2b). The direct relationships of AUT with MDORS^{Shared} was strengthened by high AUC scores ($F_{1,2296}$=7.3, P=0.007; Figure 3).

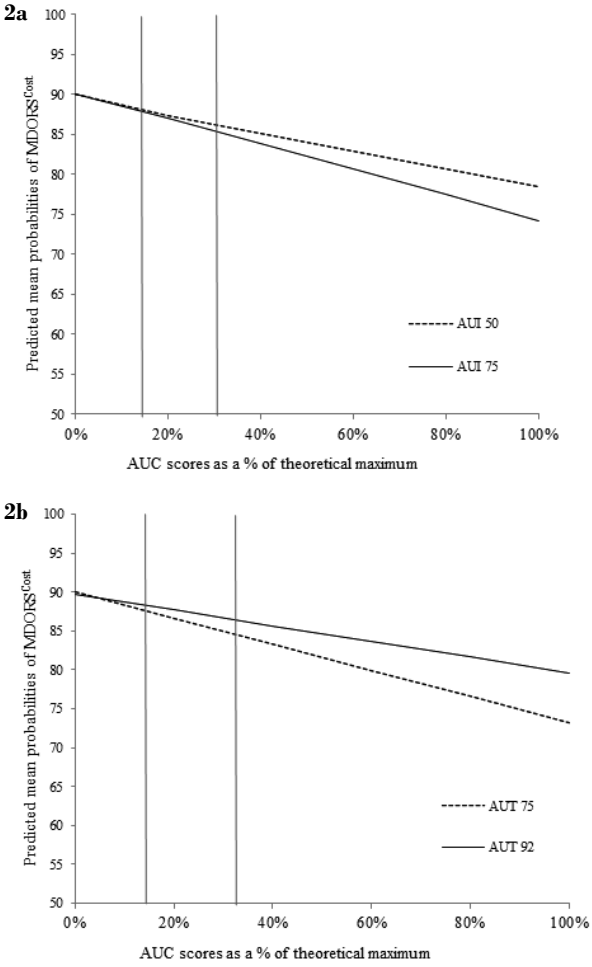


Figure 2a/b. Predicted mean scores for a dog owner's perceived costs of dog ownership (MDORS^{Cost}, y-axis) in a study sample of 2,305 Dutch dog owners. Scores are in relation to these owner's degree of parenting authoritarian-correction orientated (AUC; x-axis, range of 50% middle scores is 13-31%) as well as authoritative-intrinsic value orientated (AUI; figure 2a; at 50%; dashed line, at 75%; solid line) respectively authoritative-training orientated (AUT; figure 2b; at 75%; dashed line, at 92%; solid line). Represented are the significant two-way interaction effects (ANOVA P<0.05).

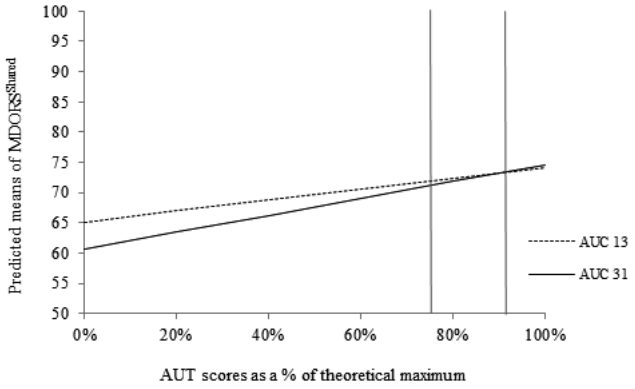


Figure 3. Predicted mean scores for a dog owner's shared activities with his/her dog (MDORS^{Shared}, y-axis) in a study sample of 2,305 Dutch dog owners. Scores are in relation to the owner's degree of parenting authoritative-training orientated (AUT; x-axis, range of 50% middle scores is 75-92%) as well as authoritarian-correction orientated (AUC at 13%; dashed line, at 31%; solid line). Represented is the significant two-way interaction effect (ANOVA P=0.007).

Discussion

Dog-directed parenting styles reflect long-term interaction patterns between owner and dog, which we expected to relate to an owner's satisfaction with dog ownership and aspects of the owner-dog relationship such as perceived closeness to the dog, costs of dog ownership and shared activities between owner and dog. Indeed, in our study sample of mainly satisfied dog owners who tended to use authoritative-training orientated (AUT) parenting, we found logical associations between parenting styles and a dog owner's satisfaction/perceived relationship with the dog. Less than full satisfaction with dog ownership was more probable in owners parenting authoritarian-correction orientated (AUC) more, with high perceived costs of dog ownership being a candidate factor of importance. Contrary, owners more strongly parenting AUT perceived relatively few costs of dog ownership, indicating better relationship quality. Interestingly, outspoken parenting (read high scores), irrespective of which style, combined with higher perceived closeness to the dog, and this applied most to authoritative-intrinsic value orientated (AUI) parenting. The found associations explained only limited amounts of variation and dog-directed parenting styles thus appear to be a distinct part of the complex construct that is the owner-dog relationship. The overall picture supports that parenting authoritative, rather than authoritarian, contributes to a good owner-dog relationship.

Our study associates a reduction in the quality of the owner-dog relationship with parenting dogs in an authoritarian style. This AUC parenting style is characterized by the use of corrections to counter a dog's undesired behaviours. The use of corrections, like punishment-based dog collars, relates to lower owner satisfaction with overall

dog behaviours and in particular leash-walking behaviours (Kwan and Bain, 2013). Generally, the use of corrections is a source of much debate among dog owners and dog professionals (Marschark and Baenninger, 2002; Rooney and Cowan, 2011; Todd, 2018). Discussing the usefulness of corrections and the effects these have on dog welfare is valuable (Ziv, 2017) and here we see that relationship quality should be a factor in this discussion. The practicing of AUC and use of corrections that are implicit to this, related to both relationship quality indicators of ownership satisfaction and higher perceived costs of dog ownership. The owner-dog relationship is complex and owners' responses to undesired behaviours in their dog could for instance underlie the association of AUC with lesser relationship quality. Indeed, dogs trained with corrections, such as verbally telling off the dog or shaking/smacking it, had a higher score for human/dog-directed aggression than dogs not trained with corrections (Blackwell et al., 2008). It remains speculative if such aggression is causal or consequential to an owner's use of corrections. An argument for considering dog aggression as the consequence is that corrections are known to elicit aggression, such as seen in when an owner hits/kicks, grabs or shakes the dog (Herron et al., 2009). Also, AUC parenting associates with the propensity to boss over the dog (Van Herwijnen et al., 2020a), which likely results in ofttimes correcting a dog, even before it has developed patterns of (un)desired behaviours.

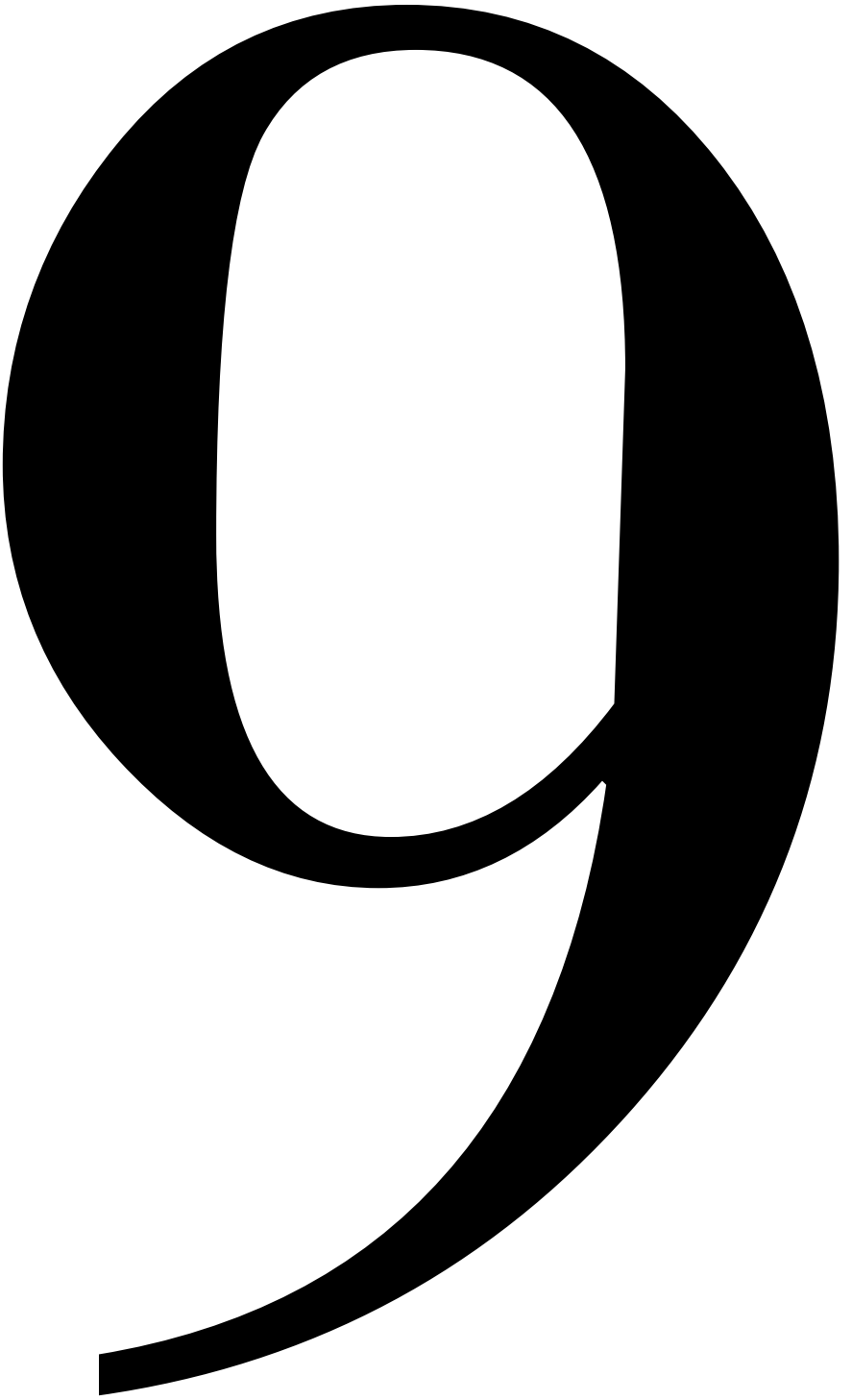
AUI parenting associated with owner-dog relationship quality as expected, with AUI type of dog owners feeling closer to the dog and, to a lesser extent, sharing many activities with it. AUI parenting comes with tendencies to humanize the dog (Van Herwijnen et al., 2020a) and such humanizing associated with owners reporting favourably on the interaction with their dog (Vink and Dijkstra, 2019). Perceived closeness and shared activities clearly add to a fulfilling owner-dog relationship. However, together with the associated humanizing of the dog these aspects could come with spoiling activities and inconsistent interactions. Inconsistent interactions and less obedience training combined with higher levels of undesired behaviours, at least in dogs weighing less than twenty kilograms (Arhant et al., 2010). Such undesired behaviours can put a dog at risk of relinquishment (Coe et al., 2014; Lambert et al., 2015). Also, humanizing a dog could lead to attributing it human-like capacities that it does not have (Epley et al., 2007; Morris et al., 2008; Urquiza-Haas and Kotrscha, 2015), such as feeling guilt (Horowitz, 2009). This can lead to misunderstandings and disillusionment, resulting in lower owner-dog relationship quality (Horowitz, 2009). Consequently, how AUI style owners express their closeness and have shared activities with the dog will matter. This may explain why we did not find AUI to associate with dog ownership satisfaction or perceived costs, which we consider key indicators of the owner-dog relationship (Van Herwijnen et al, 2018a).

AUT parenting particularly seems conducive to a good owner-dog relationship, as owners who scored high in AUT parenting reported favourably on all three relationship aspects. This included low perceived costs of dog ownership, regarding time and effort spent on the dog, and mitigating the unfavourable association that AUC parenting had with these costs. Dog owners will not parent one-dimensionally only and we found some evidence for interactions between parenting styles regarding associations with relationship quality aspects. For example, the associations between emotional closeness or perceived costs and AUC parenting were modified favourably by strong AUT parenting. This is further support for AUT parenting as the best style of the three. AUT parenting is characterized by balancing demandingness and responsiveness in parenting as well as by a focus on teaching the dog how to behave socially (Van Herwijnen et al., 2018b). Teaching a dog how to behave in our human-determined environment can logically be expected to benefit the owner, the dog, and their relationship. A dog's (un)desired behaviour is likely to be a major factor underlying the presently found relationships between dog-directed parenting and the owner-dog relationship. Undesired dog behaviours are of serious concern to owners and may lead to a dog's shelter relinquishment/euthanasia (Coe et al., 2014; Lambert et al., 2015; New et al., 2000). Contrary, desired dog behaviours were key when owners described their 'ideal dog', such as in it being social towards children, adults and other animals, it being obedient, well-trained and easy to manage (Diverio et al., 2016; King et al., 2009). Also, desired behaviours related to the owner's attachment to the dog (or cat; Serpell, 1996). AUT may facilitate such desired dog behaviours through a focus on a dog's training. Recognising the importance of teaching dogs specific behaviour and how to behave in general in a human-driven environment, is reminiscent of the authoritative child-directed parenting that facilitates openness to learning experiences (Bailey et al., 2009; Belsky et al., 2005; Darling & Steinberg, 1993; Lomanovska et al., 2017; Scaramella et al., 2008).

The main limitation of our study was its study sample of presumably highly engaged dog owners, since they were overall highly satisfied with dog ownership and made the effort to partake in the extensive questionnaire on their dog. Also, the owners parented to a high degree AUT or AUI, rather than AUC. The relatively homogeneous study population of committed dog owners is expected to have made us underestimate the strength of found effects and miss some that exist in reality. Another limitation is that findings are based on self-reports and, for example, AUC owners who report a lower quality relationship with the dog may merely do so as they consider it of less importance. People with more coercive inter-human interaction patterns are known to value the goal obtainment through relationships, and the instrumental value of relationships, more so than the social value of relationships (Hawley et al., 2009). AUC owners fit this more coercive and goal orientated profile, valuing their dogs more for their instrumental worth (Van Herwijnen, 2020a). Consequently, the need for social approval may be lower and social

approval needs are known to affect social desirability in survey answering (Adams et al., 2005; Crowne and Marlow, 1960; Martin, 1984).

We found indications that dog-directed parenting styles affect owner-dog relationship quality. This based on the found associations in owner self-reports, which need yet to be confirmed for causality and ideally in more heterogenous study population of dog owners. Promoting AUT parenting and steering dog owners away from AUC parenting, may contribute to improved dog ownership relationship quality and poses a logical action point for educational interventions.



Chapter 9

The effectiveness of an online parenting and an online training educational intervention in changing dog-directed parenting styles

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Abstract

Well-behaved dogs tend to have a good owner relationship, with low risk of relinquishment, and common ways to strengthen desirable behaviour are socialization and training. However, more encompassing manners in dealing with a dog may be important too. Dog-directed parenting styles are expected to influence well-behavedness of the dog, following what is known from child-directed parenting. In dog-directed parenting, at least three styles exist. The authoritarian-correction orientated (AUC) style reflects high levels of demandingness and a focus on correcting undesired dog behaviour, but it seems less optimal than the authoritative styles. The authoritative-intrinsic value orientated (AUI) style is strong in responsiveness and focuses on the dog's needs and emotions. The authoritative-training orientated (AUT) style is assumed optimal as it is high in demandingness and responsiveness, with a focus on teaching a dog how to behave socially. Educating dog owners to adopt this style of parenting could improve the owner-dog relationship and aid in making dogs well-behaved, which raises the question of how to do this effectively. We aimed to assess the effectiveness of two online educational interventions in changing self-report-based dog-directed parenting styles in dog owners. The interventions consisted of learning materials in the form of an online slide presentation and three videos. Learning content dealt with parenting or, as a standard for comparison, training. Eighty-eight dog owners reported on their dog-directed parenting styles before and after participating in this educational intervention, whereby they were randomly assigned to the intervention on parenting or training. Linear mixed models (Restricted Maximum Likelihood, REML) were used to test for the fixed effects of phase (pre/post-intervention), intervention (parenting/training content), (previous) obedience class attendance and the interaction between these. Predicted means (±SE) for AUC decreased from 12.0±1.0 to 8.8±1.0% of the maximum score after both interventions (REML phase effect $P<0.001$). AUT predicted means increased most after being presented with the educational intervention based on training content, from 82.7±1.8 to 88.3±1.8% (REML phase intervention interaction effect $P=0.006$). Recent, that is within the past two years, obedience class attending participants had higher pre-intervention AUT scores ($P<0.001$) and increased less in AUT than non-(recent) attenders post-intervention, and this regardless of the intervention content (REML phase class intervention effect $P=0.034$). Our educational interventions apparently worked out favourably on dog-directed parenting, but in an unexpected way. Learning material on training was as effective or even more so than material directly targeting parenting. One explanation could be that, at least in our study sample of owners that parented to a high degree AUT, training views and practices are an important part of the broader construct that we label parenting. Another explanation could be that the optimal parenting content for educational interventions needs yet to be developed. Educational intervention on dog-directed parenting is likely to be most effective in those owners who have the most room for improvement, and involving such owners in future studies and education programs is a major challenge to address.

Keywords: dogs, owner-dog relationship, parenting styles, educational intervention, training

Introduction

The education of dog-owners on bringing up dogs is typically focussed on training, but owners may benefit additionally from advice on more general ways of interacting with dogs as expressed in dog-directed parenting styles. Presently, the education of dog owners targets mainly the training of the dog (Pfaller-Sadovsky et al., 2019), including training the dog to be calm when left alone or obey commands to sit, stay or heel (Braem and Mills, 2010; Deldalle and Gaunet, 2014; Kutsumi et al., 2012; Pfaller-Sadovsky et al., 2019). Scientific research has evaluated the outcomes of different training methods, comparing methods based strongly on reinforcement or punishment (Braem and Mills, 2010; Deldalle and Gaunet, 2014). Clearly, it is important that dog owners become knowledgeable and skilled in training their dog. However, dog owners interact with their dog in other ways than training and are open to receive guidance on these alternatives as seen in their expectations on the outcomes of dog obedience classes including improved confidence in handling and understanding the dog in a range of situations (Bennett et al., 2007). This specific expectation scored an average sixteen on a scale of twenty, compared to only thirteen for expectations on improvements of the dog's behaviour (N=178; Bennett et al., 2007). The more general ways of interacting with dogs express in so-called dog-directed parenting styles, which indicate an overall emotional sphere of demandingness and responsiveness in long-term interactions (Baumrind et al., 2013; Van Herwijnen et al., 2018b).

Three dog-directed parenting styles were discriminated in a sample of 518 Dutch dog-owners. These resembled the original child-directed parenting styles, but were not identical and differences will in part reflect dog owners' orientations towards animals (Van Herwijnen et al., 2018b; Van Herwijnen et al., 2020a). Of these three styles, the authoritarian-correction orientated (AUC) dog-directed parenting style is characterized by high demandingness and a focus on correcting a dog's undesired behaviour. It associates with a dominionistic orientation towards animals and an inclination to boss over the dog. The two other dog-directed parenting styles compare with the original child-directed authoritative style. The authoritative-intrinsic value orientated (AUI) style of high responsiveness focuses on the dog's general needs and emotions. This style associates with a humanistic/protectionistic orientation and humanizing of dogs. The authoritative-training orientated (AUT) style combines high demandingness with high responsiveness and focuses on teaching a dog how to behave. It is unrelated to orientations towards animals and may reflect a dog owner's openness to learning, including how to train and guide the dog (Van Herwijnen et al., 2018b; Van Herwijnen et al., 2020a). Communication about favourable dog-directed parenting styles, and/or orientations towards animals, are expected to help owners in establishing a good owner-

dog relationship, and strategies to accomplish this good relationship warrant further investigation.

In dog-directed parenting the optimal parenting style has yet to be established unequivocally, but authoritative styles of parenting are the likely candidates as in child-directed parenting authoritativeness benefits a child's academic performance and wellbeing (Lamborn et al., 1991; Simons and Conger, 2007; Wing Chan and Koo, 2011). Children benefit from the high levels of demandingness and responsiveness that define parental authoritativeness and the same may be true for dogs (Chapter 8, this thesis). We expect dog behaviour and wellbeing to improve by parenting AUI and in particularly AUT. Both these dog-directed authoritative styles are measured with survey items derived from the original child-directed authoritative style (Robinson et al., 1995). The dog-directed AUT similarly groups survey items measuring on both dimensions of demandingness and responsiveness whereas AUI groups items on responsiveness only (Van Herwijnen et al., 2018b). This indicates that AUT most strongly resembles the original authoritative style that benefits children and, therefore, is the most likely candidate for optimal dog-directed parenting. It measures on both parenting dimensions and teaches a care dependent 'how to behave in society' (through demandingness) as well as allowing it to be 'seen and heard' (through responsiveness; Baumrind et al., 2013). When a care dependent is guided with low levels of both demandingness and responsiveness, the parenting style is called uninvolved, which has the least favourable outcomes (Baumrind et al., 2013). This uninvolved style was not detected in our study population of compassionate dog owners, which we assumed from their voluntary participation in the research, but may exist in reality (Van Herwijnen et al., 2018b). There is reason to assume that dogs benefit from receiving parenting in the style that combines high demandingness and responsiveness. The logical next step would then be to promote such parenting and here we aim to assess the effectiveness of an education intervention on dog-directed parenting styles.

Educational interventions can be viewed as informing activities that aim to influence how a person thinks, feels and/or acts towards a certain topic (Plomp and Nieveen, 2013; Wilkes and Bligh, 1999). Since the proper educational intervention on dog-directed parenting is yet unknown, child-directed parenting educational interventions may offer a starting point. Such interventions have been delivered effectively in various formats, from online formats to group courses or personal consultations (De Graaf et al., 2008a; De Graaf et al., 2008b; Fletcher et al., 2011; Nowak and Heinrichs, 2008; Tellegen and Sanders, 2013; Wilson et al., 2012). Online presentation of parenting education was evidenced to be effective in a meta-analysis of twelve studies with 1,615 parents and 740 children (Nieuwboer et al., 2013). Much-used content for parenting educational interventions is the Triple P Positive Parenting Program®. This program aims

to increase parental knowledge and skills and is embedded in psychological theories on social learning and theories on behavioural cognition and development (Sanders, 1999). Its effectiveness has been studied in non-eventful and more turbulent family situations, such as in families with physically/mentally challenged children. Meta-analyses of the studies confirmed effects of the Triple P program on parental knowledge and skills. Also, child behaviour and wellbeing were affected positively by the program and the parent-child relationship was improved (De Graaf et al., 2008a; De Graaf et al., 2008b; Fletcher et al., 2011; Nowak and Heinrichs, 2008; Sanders et al., 2014; Tellegen and Sanders, 2013; Wilson et al., 2012). One meta-analysis included 101 studies with a total of 16,099 families analysed (Sanders et al., 2014). Structural equation modelling approaches produced effect sizes that were expressed as Cohen's d. The largest effect sizes were found for parenting practices (d=0.58), parenting satisfaction and efficacy (d=0.52) and child behaviour (d=0.50). The smaller effect sizes were found for parental adjustment (d=0.34) and the parent-child relationship (d=0.23; Sanders et al., 2014). The established effectiveness of Triple P Positive Parenting Program®, also when offered online, made us decide to adopt its five key parenting points for an educational intervention on dog-directed parenting.

Dog owners use a variety of sources to become educated on dog ownership. Books, internet, relatives, television and dog professionals (breeders, trainers and veterinarians) were reported to be used as information sources about training by 140 dog owners (Herron et al., 2009). Online information has the potential to reach a broad audience, for example in comparison to when information is provided in dog obedience classes. Obedience classes seem to attract a certain type of dog owner, being someone with a relatively high household annual income who thought through acquiring his/her dog (Rohlf et al., 2010). This subpopulation of owners may contain relatively few who practice suboptimal dog-directed parenting and who would likely benefit most from advice. Online educational interventions may reach a relevant target group that obedience classes reach to a lesser degree. For the present study we therefore decided to make use of online educational interventions.

Educating dog owners on the guiding principles of the Triple P Positive Parenting Program® is expected to direct them towards dog-directed parenting styles high in both demandingness and responsiveness. We test this by comparing dog-directed parenting style scores before and after an online educational intervention that consists of a slide presentation and three videos. The intervention with content on the five key principles of parenting is compared to one with content on conventional training practices. As (previous) dog obedience class attendance could affect a dog owner's parenting already, we also test how this attendance factors in when we offer our online interventions. We predict the parenting educational intervention to decrease tendencies towards

authoritarian parenting and increase those towards authoritative parenting. The training educational intervention is predicted to affect parenting styles minimally, but for possible increases in AUT parenting. Obedience class attendance is predicted by us to mainly affect AUT, as both focus on teaching a dog how to behave. If online educational interventions can make dog owners use appropriate dog-directed parenting styles, this opens new ways for helping dog owners with good practices in raising dogs and interacting with them.

Methods

Web-based intervention and participant recruitment

We recruited participants via online channels, including social media channels of companion animal stores and veterinarian clinics, resulting in 88 Dutch dog owners participating in this online study. The research consisted of an intake survey on general information about dog and owner, and on the owner's dog-directed parenting style. Twenty parenting style questions were answered on a five-point Likert scale, rating the likelihood of scenarios occurring as never (score 0), nearly never (1), neutral (defined as about half of the time, 2), nearly always (3) and always (4). Parenting style scores were calculated following Van Herwijnen et al. (2018b) by summing scores for questions on a same parenting style and expressing the sums as percentages of the theoretical maximum of 100%. General information included information on obedience class attendance and discriminated between four levels of never attended, exclusively attended before two years ago, exclusively attended recently (in the past two years), attended in the recent two years *and* before.

The intake survey channelled participants to the online intervention website of which the internet address could be saved to revisit it at a convenient time. Participants were randomly directed to content on parenting or training. Both interventions consisted of a 33 slides presentation, explaining on parenting or training a dog (depending on the assigned intervention), and three informative videos in which a female presenter provided further details. The videos featured the same female presenting the information and were made with assistance of Dutch Cell Dogs, a Dutch charity. The parenting educational intervention addressed five key parenting points; 1) providing a safe and stimulating environment, 2) focussing on desired behaviour, 3) setting and enforcing clear rules, 4) having realistic expectations, 5) providing relaxedness and quiet time. These key points, were based on child-directed parenting educational intervention, as detailed in the introduction. As these key points are not commonly used in the education of dog owners, the content of these key points was discussed with five experts in the field who were accredited by Certipet, a Dutch accrediting body of animal behavioural therapists that follows guidelines of the Association for the Study of Animal Behaviour

(ASAB) accreditation scheme. The experts rated the content of the key points from the intervention for correctness and relevance on a five-point Likert scale with an average (±SD, range) 4.3±0.7 (3.8-4.6). The training educational intervention regarded five key training points; 1) how a dog learns, 2) the importance of timing when training a dog, 3) using proper rewards in training, 4) using a bridge signal in training, 5) teaching a dog a bridge signal and how to touch/lay down. Pretesting of all the learning materials was done with ten dog owners.

Participants that partook in the online educational intervention were asked to fill out the post-intervention survey within two weeks after they had accessed the learning materials. If a participant had not filled out this post-intervention survey after two weeks, they were reminded once to do so, unless they partook anonymously.

The post-intervention survey held the same parenting style questions as answered in the pre-intervention, but ordered differently. To check if participants had actually taken the online intervention, we added ten simple multiple-choice questions (four two-choice and six three-choice). An example of such a question was 'Which two types of dogs are addressed at the start of the intervention?'. We excluded seven participants from further analyses as they scored less than 50% correct answers. The remainder of participants scored on average (±SD, range) 85.6±12.7% (60-100%).

The survey was available online in January and February 2019. The only inclusion criterium was for a participant to be the main caretaker of the dog, by caring (feeding, walking, etc.) for the dog for at least half of the time.

Statistical analysis

Dog-directed parenting style scores were analysed for the fixed effects 'phase' (pre or post intervention), 'intervention' (parenting or training content) and the two-way interaction between these, using linear mixed models (i.e. the Restricted Maximum Likelihood, REML, in GenStat® 18th edition) and presenting predicted means ± SE for the parenting styles. Dog owners were included as the random component to account for repeated measures (see below for the full model description, including the overall predicted mean *u* and residual *e*).

$$Y_{xyz} = u + Phase_x + Intervention_y + Phase_x.Intervention_y + Owner_z + e_{xyz}$$

Additionally, we evaluated how obedience class attendance affected the outcomes. Obedience class attendance was expressed as the four levels of never attended, exclusively attended before two years ago, exclusively attended recently (in the past two years),

attended in the recent two years and before, and added as a fixed effect to the statistical model described above, including all possible interactions, making the model:

$$Y_{wxyz} = u + Phase_w + Intervention_x + Class_y + Phase_w.Intervention_x + Phase_w.Class_y + Intervention_x.Class_y + Phase_w.Intervention_x.Class_y + Owner_z + e_{wxyz}$$

As obedience class attendance in this model was seen to affect AUT, we tested pre-intervention scores for this parenting style as dependent variable to test for effects of the independent variable obedience class attendance with ANOVA and present predicted means ± SE for this parenting style only.

To provide basic insight into our data Spearman rank correlations were calculated for each of the dog-directed parenting styles. We regarded $P<0.05$ as the level of significance for all statistical tests.

Ethical statement

The online survey's introduction explained the purpose of the research. Informed consent for participation was not obtained as participants chose to participate freely via internet and the purpose of the research was stated at the start of the online survey. Questionnaire participants could opt to remain anonymous. The Wageningen University & Research' Social Sciences Ethics Committee (SEC) approved the research proposal on December 11th 2018, agreeing that the proposal dealt with ethical issues in a satisfactory way and complied with the Netherlands Code of Conduct for Research Integrity. SEC reviews a research project with regard to 1) fair and respectful treatment of humans involved as subjects of research, in terms of inconvenience, consent, and privacy; 2) professional handling of data on human research subjects; 3) acceptability of potential risks caused by the study. Potential risks are assessed in the light of the scientific and societal importance of the study.

Results

Participants and dog-directed parenting styles

Eighty-eight dog owners completed the two online surveys, one before and one after the educational intervention, of which 39 received information on parenting and 49 on training. Participating dog owners were mainly female (83%, *N*=73) and the majority had completed upper secondary education or higher (87%; *N*=76). Age of the participants was indicated in seven categories and 11% (*N*=9) was 18-25 years old, 14% (*N*=12) 25-35 years, 11% (*N*=9) 35-45 years, 32% (*N*=27) 45-55 years, 25% (*N*=21) 55-65 years and 8% (*N*=7) was 65 years or older (3 missing values). Their dogs were of various ages, breeds and mixes, with a near equal distribution of female and male dogs

(28%, *N*=24 female neutered, 22%, *N*=19 female intact, 23%, *N*=20 male neutered, 28%, *N*=24 male intact; 1 missing value). Obedience classes were attended in the recent two years and before by 61% (*N*=52) of participants. These classes were exclusively attended recently, that is in the past two years, by 9% *(N*=8) of participants, exclusively attended before two years ago by 21% (*N*=18) and never by 8% (*N*=7; 3 missing values).

The dog-directed parenting style scores pre-intervention averaged (±SD, range) 12.0±9.3% (0-40.6%) for the authoritarian-correction orientated (AUC) style, 67.9±17.4% (16.7-95.8%) for the authoritative-intrinsic value orientated (AUI) style and 83.5±13.5% (45.8-100%) for the authoritative-training orientated (AUT) style (and see Appendix 1 for the descriptive statistics per educational intervention group). Overlap between the dog-directed parenting styles (pre-intervention) explained up to 26% of variation, with an inverse relationship between AUC and AUI (Spearman's rank r_s=-0.40, P<0.001, *N*=88) and a direct relationship between AUI and AUT (r_s=0.51, P<0.001, *N*=88). No association was found between AUC and AUT (P=0.6).

Effects of educational interventions on dog-directed parenting styles

The effects of the online educational interventions on the three dog-directed parenting styles were tested with a linear mixed model (REML) that included the fixed effects phase (pre-/ post-intervention), intervention (parenting/training content) and the interaction between these. Three significant outcomes were identified. Firstly, AUC decreased from a pre-intervention predicted mean (±SE) 12.0±1.0 to 8.8±1.0% post-intervention (phase effect $F_{1,84}$=12.9, P<0.001). For this parenting style we found no significant effect of intervention or the interaction between phase and intervention (P>0.2). Secondly, AUT increased from a pre-intervention predicted mean 83.5±1.4 to 86.7±1.4% post-intervention (phase effect $F_{1,84}$=15.7, P<0.001). However, this effect was mainly for the intervention that provided content on training content: 82.7±1.8 pre-intervention to 88.3±1.8% post-intervention (increase of 5.6%, $F_{1,84}$=7.8, P=0.006; parenting content: 84.4±2.0 pre-intervention to 85.1±2.0% post-intervention). For AUI no significant effects were found (P>0.1).

Effects of obedience class attendance

Additionally, we evaluated how obedience class attendance had an effect on parenting style scores and added this attendance to the described statistical model, including all possible interactions. Obedience class attendance was expressed as the four categories of never attended, exclusively attended before two years ago, exclusively attended recently (in the past two years), attended in the recent two years and before. AUC predicted means were not seen affected by obedience class attendance. For AUT an interaction effect was found for the fixed effects of phase (irrespective of intervention type) and obedience class attendance ($F_{3,72}$=3.0, P=0.034). The predicted means pre- and post-intervention

differed at each obedience class attendance category, with a larger increase in predicted means from pre- to post-intervention in those owners that did not (recently) attend obedience classes than in those attending recently (also). Specifically, for 'never attended' the scores increased 11.0% from pre-intervention predicted mean (±SE) 66.0±5.0 to 77.1±5.0% post-intervention, for 'exclusively attended before two years ago' the scores increased 6.2% from pre-intervention 80.3±2.9 to 86.4±2.9% post-intervention, for 'exclusively attended recently (in the past two years)' the scores increased 3.2% from pre-intervention 84.6±4.4 to 87.8±4.4% post-intervention, and for 'attended in the recent two years and before' the scores increased 1.3% from pre-intervention 87.0±1.7 to 88.3±1.7% post-intervention.

As AUT in the REML-model also showed significance for the fixed effect of obedience class attendance only ($F_{3,72}$=4.9, P=0.004), we ran an ANOVA with AUT as dependent variable to test for effects of the independent variable obedience class attendance. Particularly recent class attendance predicted higher pre-intervention mean scores ($F_{3,81}$=5.9, P<0.001). Specifically, predicted mean was 66.7±4.8% for those who 'never attended', 79.9±3.0% for 'exclusively attended before two years ago', 84.9±4.5% for 'exclusively attended recently (in the past two years)', and 86.8±1.8% for 'attended in the recent two years and before'.

Discussion

The owner-dog relationship will benefit from a knowledgeable dog owner that interacts with the dog in an appropriate emotional sphere, as reflected in dog-directed parenting styles. Here we found that dog-directed parenting styles were altered following an online educational intervention consisting of a slide presentation and three videos. Surprisingly, the educational content on training was as effective, or even more so, than the content on parenting. The scores for the presumed less favourable AUC (authoritarian-correction orientated) style decreased after the educational intervention, regardless of the content dealing with parenting or training. The scores for the favourable authoritative-training orientated (AUT) style increased only after the intervention with training content. Attendance to dog obedience classes was seen to affect the latter style of AUT only and non(recent)-attenders of these classes were affected more by our educational intervention than recent attenders. This confirmed in part our hypotheses and proved that parenting styles can be affected by online educational interventions. However, which content is optimal needs yet to be defined.

Educational interventions in dog owners seem understudied (Philpotts et al., 2019). As an example, Atenstaedt and Jones (2011) searched six major electronic databases and 47 other databases and websites, but could not find controlled trials or observational

studies on interventions regarding their topic of interest, i.e. dog waste in public areas. Also, for the prevention of dog bites, several authors concluded a lack of studies on educational interventions (Chapman et al., 2000; Duperrex et al., 2009). A rare educational intervention that was studied, and which worked, promoted a child's 'safe behaviour' around dogs, such as not approaching an eating dog (Wilson et al., 2003). Five-year-old children were targeted through modelling and storytelling based on photographs and puppets. Also, their parents were targeted with information brochures and seen an important factor in improving child safety around dogs (Wilson et al., 2003). Parental supervision and reactions regarding this safety were not seen affected by a dog bite prevention program in another study (Morrongiello et al., 2013). Obedience classes could be considered a specific form of educational intervention, typically providing content mainly on a dog's training. Obedience classes have been studied for effectiveness, however, not so much for outcomes in the owner as done in our study, but rather for those in the dog like its (un)desired behaviour. For instance, undesired dog behaviours were reported less by obedience class attenders, in a longitudinal study following 51 owners of dogs from six to twelve months old (Thompson et al., 2010). Also, the obedience class attenders had dogs that responded better to given commands than non-class attenders, in a study on 142 young dogs of approximately four months old (Kutsumi et al., 2012). Earlier studies compared training methods used in obedience classes for effects on (un)desired dog behaviours presenting valuable insights on relations between these methods and a dog's behaviours (Blackwell et al., 2008; Herron et al., 2009). Knowing how obedience classes, and methods used during these classes, affect dogs are valuable, as we need science to determine how obedience classes affect dog outcomes. Just as relevant are the *owner* outcomes of obedience classes and other educational interventions targeting dog owners. It is therefore worrisome that these owner outcomes seem presently understudied (Philpotts et al., 2019).

Also, our findings indicate that much can be learned on the content that optimally benefits the owner-dog relationship. This as we expected the educational intervention with parenting to be most effective in altering parenting styles. Surprisingly, we found both content on training *and* parenting to affect the less optimal AUC (authoritarian-correction orientated) parenting style. Content on training also affected the AUT (authoritative-training orientated) style. This indicates that, in our study sample of owners that parented to a high degree AUT, training views and practices, form a significant aspect of the broader construct of dog-directed parenting styles. This was apparent already by the existence of a distinct authoritative parenting style strongly oriented on training. Alternative explanations could be found in our study sample or the content of our educational interventions. Our study sample's dog owners already parented to a high degree AUT, were mainly female, and likely were engaged with dog ownership as they partook in effort-requesting research. Owners that are engaged in

their dog ownership may invest more in gathering information on how to parent their dog. Similar to the here found effect of (recent) obedience class attendance dampening AUT improvements, previously gathered info on how to create an optimal emotional sphere to guide the dog can dampen effects of offered parenting content. The content of our parenting educational intervention was based on child-directed parenting program content. Although this child-directed program was extensively researched in the parent-child relationship (De Graaf et al., 2008a; De Graaf et al., 2008b; Fletcher et al., 2011; Nowak and Heinrichs, 2008; Tellegen and Sanders, 2013; Wilson et al., 2012), the adapted version for the owner-dog relationship was new. Alternative approaches to develop and deliver content, may render different outcomes of educational interventions. Finally, changes in parenting style scores, although favourable and in the expected directions, were small. The changes may not have been caused solely by the intervention content and could in theory partly result from repeated answering of questions or other unintended time effects. This applies specifically when both interventions, i.e. on parenting and training, were followed by similar changes, like for the AUC style. Intervention-induced increases in AUT may be considered sound as these were dependent on the content of the educational intervention. In addition, there is an argument for face validity. The content of the educational intervention was based on existing theory about good (parenting, training) interactions and constructed to change the dog-directed parenting styles in the way that these did.

Recently, educational interventions for dog owners were deemed more effective when targeting not only the dog owner's knowledge and understanding, but also underlying value patterns (Philpotts et al., 2019) and dog-directed parenting styles can help to direct the attention towards values and goals in dog-directed parenting. Through addressing parenting styles, obedience classes can broaden their scope to not only the dog and its behaviour but also to the owner and his or her parenting of the dog. Presently, obedience classes are not always seen to contribute to dog ownership satisfaction (Van Herwijnen et al., 2018a) or desired dog behavioural outcomes, for instance with regard to aggression (Bennett et al., 2007). Whereas such behavioural outcomes are important to the owner-dog relationship and the dog's welfare. Addressing the emotional sphere in which a dog's guidance takes place, as is done with the addressing of dog-directed parenting styles, could be a next step in the advancement of obedience classes. Historically, obedience classes were more 'correctional method orientated' (Hiby et al., 2004; Greenebaum, 2010; Ziv, 2017). In recent years they have become 'more responsive towards the dogs' (Hiby et al., 2004; Greenebaum, 2010; Ziv, 2017). Directly addressing the dog owner's parenting seems in line with this development. Changing content of obedience classes may help to prevent undesired dog behaviours, which is of considerable importance. Undesired behaviours are common in dogs, and 203 dog owners living in a suburban area reported 63% of dogs to behave overexcited, 56% jumped up at people, 38%

rushed at people or dogs and 32% barked excessively (Kobelt et al., 2003). Such undesired behaviours may lead to a dog's abandonment. Between 10-34% of shelter relinquishment cases were calculated to result from undesired behaviours in a systematic review and meta-analysis of fourteen studies from several countries (Lambert et al., 2015). Undesired behaviours are the prime reason for relinquishment, making up 34% of the reasons in a study on 2,806 dogs that were relinquished to fourteen shelters (Diesel et al., 2010) and 24% of 2,230 dogs relinquished to twelve shelters (Salman et al., 2000). Next to shelter relinquishment, euthanasia risk increases for dogs showing undesired behaviours, with 10-18% of euthanasia cases being estimated to be caused by undesired behaviours (Lambert et al., 2015). New ways of influencing dog behaviours could result from addressing a dog owner's parenting style. Offering dog owners insights into establishing an optimal emotional sphere may facilitate a dog's learning of desired behaviours as well as generally affecting dog welfare and helping the owner reach his/her goals in the day to day guidance of the dog.

A broader study sample could have revealed stronger effects of our interventions. Likely, the effectiveness of educational interventions on parenting styles diverges with the current parenting styles of the participants. Even though we offered the interventions online as to reach a broad audience through easy access, we did not manage to include a full representative sample of dog owners including many of those with unfavourable parenting styles. This hiatus points out both the challenge and the importance of targeting and reaching a broad audience. Perhaps on-site approaches (e.g. house-visits), as done with stock handlers, are necessary for the inclusion of for instance less-engaged dog owners. Stockmen working with cows and pigs were targeted with an educational intervention on the farms where they worked with the animals on a daily base (Coleman et al., 2000; Hemsworth et al., 1994; Hemsworth et al., 2002). Similarly, dog owners could be targeted at locations where they likely reside on a daily base, such as dog parks, or where they reside at a lower frequency, such as veterinary clinics.

It may be questioned if an online approach as used by us suffices to educate dog owners on their dog-directed parenting styles. Added elements may be needed such as group discussion and on-paper materials for an optimal intervention outreach. Online approaches can be effective though, based on present and earlier findings on online child-directed parenting programs (Nieuwboer et al., 2013). Interestingly, remote/digital consultation on a dog's undesired behaviour rendered similar results as in-person consultation (Cottam et al., 2008; Dodman et al., 2005). However, format and content of the intervention will matter and allowing participants face to face interactivity will likely benefit outcomes. Thus, an interactive online variant of the Triple P Positive Parenting Program® (N=60) was more effective in decreasing disruptive child behaviour and increasing parenting confidence, than the standard online program (N=56).

Participants reported high satisfaction levels for the interactive program (Sanders et al., 2012). Conceivably, adding interaction opportunities to an online educational intervention increases intervention effects. Our study highlights the opportunity that lies in creating effective interventions that appeal to a broad audience of (prospective) dog owners.

It remains to be substantiated further which dog-directed parenting style is optimal for dog welfare and for achieving well-adapted and well-behaved dogs. Our study presents evidence that dog-directed parenting styles can be influenced by educational interventions and that such educational interventions can, at least in part, be provided online. So far, obedience classes and other educational interventions for dog owners seem understudied for their effectiveness in optimizing the owner-dog relationship and particularly the owner's behaviour towards the dog. There is need for more studies on the effects and effectiveness of obedience classes and alternative educational interventions directed at dogs and particularly their owners.

Appendix 1 – Descriptive statistics parenting styles

From answers on 20 dog-directed parenting style items, we calculated per respondent the scores as a percentage of the theoretical maximum of one hundred percent. Average and standard deviation (range) of the dog-directed parenting styles for the total sample of 88 dog owners and per educational intervention subsample (*N*=39 parenting educational intervention and *N*=49 training educational intervention) are presented here before and after the intervention.

Dog-directed parenting style	Total sample (*N*=88) – pre-intervention	Parenting educational intervention (*N*=39) – pre-intervention	Training educational intervention (*N*=49) – pre-intervention	Total sample (*N*=88) – post-intervention	Parenting educational intervention (*N*=39) – post-intervention	Training educational intervention (*N*=49) – post-intervention
Authoritarian-correction orientated (AUC)	12.0±9.3% (0-40.6)	11.7±9.1% (0-40.6)	12.3±9.5% (0-34.4)	8.9±9.4% (0-56.3)	7.2±7.7% (0-31.3)	10.3±10.5% (0-56.3)
Authoritative-intrinsic value orientated (AUI)	67.9±17.4% (16.7-95.8)	68.2±16.7% (20.8-95.8)	67.7±18.1% (16.7-95.8)	68.0±18.6% (10.0-100)	70.5±18.2% (10.0-100)	66.1±18.8% (16.7-95.8)
Authoritative-training orientated (AUT)	83.5±13.5% (45.8-100)	84.4±12.9% (50.0-100)	82.7±14.1% (45.8-100)	86.9±11.5% (50.0-100)	85.1±11.9% (54.2-100)	88.3±11.1% (50.0-100)

10

Chapter 10

General discussion

Humans and dogs, which side is the 'other side' of the leash?

Dogs are expected to behave in accordance to social standards of human societies, even when this diverges from their species specific behaviour. Dogs, being at 'the other side' of the leash, benefit from living with humans by being allocated resources (Ha and Campion, 2019). Dog owners in turn benefit from dogs by improved (mental) health. Owners of dogs, and other companion animals, had 15% less annual doctor visits in a longitudinal study on 9,723 German and 1,246 Australian health panel participants (Headey and Grabka, 2007). The mechanisms behind these health benefits include social support and stress relief, but are not fully understood yet (Beck, 2013). However, the owner-dog relationship is not all 'puppies and sunshine', as apparent from dog to human biting incidents (Quirk, 2012; Spiegel, 2000) and from dogs being abandoned or euthanised for reasons of undesired behaviours (Coe et al., 2014; Lambert et al., 2015). Dogs commonly show behaviours that are undesired by the owner or the owner's environment. In study population of 13,700 dogs, 73% were reported by their owner to display some kind of problematic behaviour such as noise sensitivity, fear, impulsivity or aggression (Salonen et al., 2020). A mean number of eleven potentially undesired behaviours were reported per dog in a study with 192 owners (Blackwell et al., 2008). The most serious undesired behaviour is aggression and 41% of dogs aggressed towards adults, children or other animals (Howell et al., 2016). This in a representative sample of 975 respondents to a market research survey distributed online on companion animal management practices (Howell et al., 2016).

The issue of undesired behaviours in dogs could be resolved, at least in part, by optimal guidance and training of dogs by their owners at 'the other side' of the leash, or rather the relationship. Dog behaviour has a genetic component (MacLean et al., 2019; Saetre et al., 2006), but it is widely accepted that also dog owners strongly influence their dog's behaviour and behavioural development. How dog owners give shape to long-term interaction patterns with their dogs, along so-called parenting styles, has been understudied so far. Recent research with dogs rendered us many insights into their social learning and cognitive abilities (Arden et al., 2016; Lea and Osthaus, 2018), but in the area of human to dog interactions much remains obscure. This is unfortunate as this human side of the leash is the route to assimilate appropriate dog handling skills and scientific insights gathered in the past years on the dog's side of the leash. Today, dog owners may interact with their dogs in manners that are promoted in a variety of information sources. Books, breeders, internet, relatives, television, trainers and veterinarians are such sources, at least for training methods, as reported by 140 dog owners (Herron et al., 2009). Likely the quality of these sources varies, as reflected in books on dog training offering conflicting content (Browne et al., 2017). The content of sources on dog knowledge and skills therefore needs addressing. This applies not only

to 'what' dog owners do when they interact with their dog, but also 'how' (Schilder and Vinke, 2105), that is the emotional sphere in which interactions takes place.

In an effort to expand our understanding of optimal long-term interaction patterns between owner and dog, we chose to study dog-directed parenting styles. We argued how the optimisation of the owner-dog relationship is relevant in **Chapter 2** and studied if parenting styles are of importance to the emotional sphere of guiding and raising dogs, as these styles were previously seen indicative for the emotional sphere of guiding and raising children (Baumrind, 2013). We found three dog-directed parenting styles in our study samples of (presumed) highly engaged dog owners in **Chapter 3**, and detail how orientations toward animals underlie only two of these styles in **Chapter 4**. We revealed how the dog-directed parenting styles associated with relational and dog outcomes in **Chapters 5, 7, and 8**. We suggested a new measurement tool in the owner-dog relationship in **Chapter 6** and tested two educational interventions for dog owners in **Chapter 9.** The chapters reflect a balance in scientific interest towards not only the dog's side of the leash, but also the human's. Dog-directed parenting styles offer a new route to help owners become knowledgeable and skilled in their dog ownership. Addressing the human caregiving system in general, and parenting styles in particular, may help dog owners to care enough and appropriately, to the benefit of the owner-dog relationship and dog welfare.

Is there a need to study the human side of the owner-dog relationship more?

Dog ownership offers benefits to both dogs (Ha and Campion, 2019) and humans (Beck, 2013; Headey and Grabka, 2007), but the relationship can also have detrimental effects. For instance through dogs being relinquished (Coe et al., 2014; Lambert et al., 2015) and humans bitten (Quirk, 2012; Spiegel, 2000). It is therefore surprising that little is known today on what determines dog owners' satisfaction with the dog exactly. In **Chapter 2** dog ownership satisfaction was noted to be unrelated to dog obedience class attendance. Higher levels of the undesired behaviours aggression and disobedience, which are obvious target behaviours in obedience classes, did relate to higher probabilities of being less than very satisfied with the dog. The absence of detectable effects of obedience class attendance on ownership satisfaction corresponded with previous studies that reported mixed results on the outcomes of dog obedience class attendance (Bennett et al., 2007; Blackwell et al., 2008; Kutsumi et al., 2012; Thompson et al., 2010). Positive outcomes of dog obedience classes showed as higher dog command response levels following six weeks of obedience classes (Kutsumi et al., 2012). Positive outcomes also showed as lower rates of undesired behaviour in young dogs that attended classes than in those that did not (Thompson et al., 2010). Also,

we found in **Chapter 9** higher AUT levels in owners that recently followed classes. However, attending obedience classes did not significantly affect undesired behaviour in dogs of 192 owners, of which 88% reported to have received some form of training (Blackwell et al., 2008), and many dog owners attending obedience classes indicated not to have reached desired dog behavioural outcomes (Bennett et al., 2007). These mixed results indicate a need for science-based education materials and methods to improve owner-dog interaction patterns, given that the effectiveness of dog obedience classes seems less than expected. Increasing dog obedience class effectiveness calls for attention to the human side of the leash, like the processes that facilitate adoption of dog knowledge and skills and the factors that make dog owners contented with these classes and their outcomes.

Scientific interest in the topic of helping dog owners to become skilled and knowledgeable appears to be minimal so far. More so than the owners, the dogs were the focus of studies on obedience class attendance and training (techniques). Studies on dog outcomes, regarding welfare (Deldalle and Gaunet, 2014; Haverbeke et al., 2008; Salgirli, 2008; Schalke et al., 2007; Schilder and Van der Borg, 2004) or desired dog behaviour (Arhant et al., 2010; Ben Alexander et al., 2011; Blackwell et al., 2008; Hiby et al., 2004; Hoummady et al., 2016; Rooney and Cowan, 2011), outnumber the incidental study on owner outcomes (Bennett et al., 2007). More recently, a study on dogmanship, defined as 'dog handling ability', did address the importance of an owner's knowledge and skills (McGreevy et al., 2017; Payne et al., 2015; Payne et al., 2017) and attention was given to professionals such as veterinarians for being skilled animal handlers who can help animal owners to become skilled handlers too (Payne et al., 2015). A review study on dogmanship and horsemanship (Payne et al., 2015) was used to later on define important aspects of dogmanship (McGreevy et al., 2017; Payne et al., 2017), like an ability to gain the dog's attention and use proper reward timing (Payne et al., 2017). The importance of timing as a feature of dogmanship was reiterated and extended with clear communicative signalling, with the authors pointing out that presently we know little about what constitutes an individual's ability to interact with dogs and train them (McGreevey et al., 2017). Furthermore, in a guest editorial on the topic of dogmanship (and horsemanship) scientists indicated that next to the 'what' of animal handling ability, also the 'how' is of importance to owner-dog interaction quality (Schilder and Vinke, 2015). For instance, the dog owner's gentleness or roughness in interactions may be relevant in how the dog is handled (Schilder and Vinke, 2015).

Thus, several scientists recently raised the importance of an owner's dog knowledge and skills, and dog-directed parenting styles could form an opening towards optimizing these. Such dog-directed parenting styles have the potential of targeting the sum of owner interactions as well as 'how' the owner interacts. Parenting styles are known

as the overarching emotional sphere in which guidance and training take place (Baumrind, 2013) and are known as a multidimensional approach (Power, 2013). The multidimensional approach provides a comprehensive picture of parenting (Mandara, 2003). Consequently, targeting parenting styles in dog owner educational interventions, such as dog obedience classes, may be an effective way to promote optimal owner-dog interactions and to increase the dog's levels of desired behaviour.

Parenting styles apply to the owner-dog relationship, but does science apply to all owner-dog relationships?

Before targeting dog-directed parenting styles with educational interventions, we needed to know if parenting styles apply to the owner-dog relationship and, if so, what makes dog owners adopt a certain parenting style. In **Chapter 3,** we identified three dog-directed parenting styles. The found styles indicated similarities between dog-directed parenting and child-directed parenting, but also differences. Similarly to child-directed parenting, the dog-directed parenting varied in levels of parental demandingness and responsiveness, which forms an interesting basis to address in future educational interventions. The differences between child- and dog-directed parenting styles could in part be based on a dog owner's orientation to animals as demonstrated in **Chapter 4**. A humanistic/protectionistic orientation towards animals, reflecting levels of humanizing the dog, combined with the authoritative-intrinsic value orientated (AUI) parenting style that reflects mainly responsiveness and focusses on a dog's perceived needs and emotions. Contrastingly, the dominionistic orientation towards animals, reflecting levels of perceived need to boss over the dog, combined with the authoritarian-correction orientated (AUC) parenting style that captures variation in demandingness and focusses on verbally/physically correcting a dog's undesired behaviours. Such relations between orientations towards animals and the third, authoritative-training orientated (AUT) parenting style were not found. This style captures variation in demandingness *and* responsiveness, and focuses on teaching a dog how to socially behave (see Fig 1). The latter style may reflect a particular openness to learning experiences, also those regarding dog knowledge and skills.

Such an openness to learning experiences is characteristic to authoritative child-directed parenting (Darling & Steinberg, 1993). Openness to learning experiences is passed on to children through intergenerational effects: parents who were parented authoritatively during their own childhood, parent to a higher degree authoritatively as a parent during adulthood (Bailey et al., 2009; Belsky et al., 2005; Lomanovska et al., 2017; Scaramella et al., 2008). Thus, a positive cycle of learning is created, even though other factors such as contextual stressors and support and personality also influence how a person parents (Lomanovska et al., 2017). Consequently, in those parented authoritatively, an openness

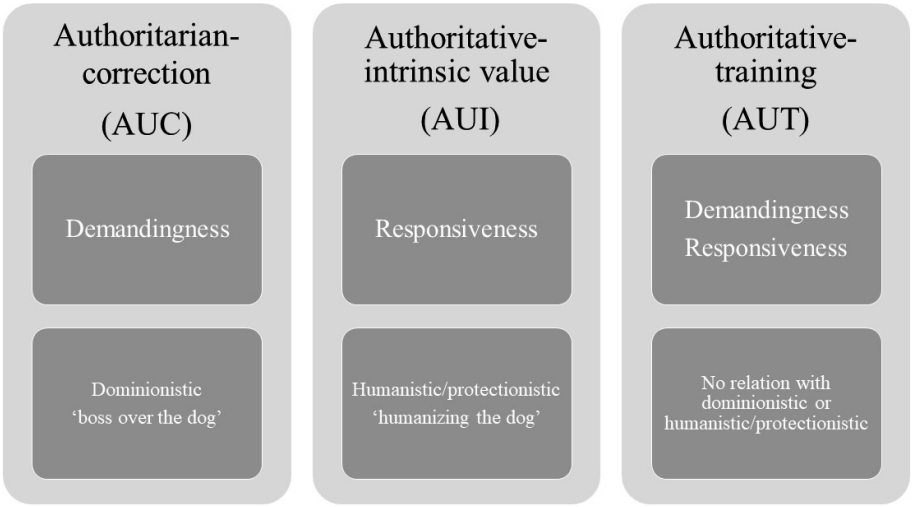

Figure 1 – Characteristics of the three dog-directed parenting styles of authoritarian-correction orientated parenting (AUC), authoritative-training orientated parenting (AUT) and authoritative-intrinsic value orientated parenting (AUI)

to learning experiences helps not only them, but also those in their care. Authoritative parenting may be directed at either child or dog, judging from the found associations between child- and dog-directed parenting styles. Dog owners characterized by an authoritative-training orientated parenting style, may have been authoritatively parented themselves and thus likely exhibit an openness to learning experiences. Openness to learning experiences and facilitating these was seen in managers that were parented authoritatively during their childhood (Eldad and Benatov, 2018). These managers were more aware of their employee's need to learn. Similarly, AUT dog owners may be more aware of their dog's need to learn how to behave in a human-driven environment. Thus, discouraging parenting styles other than AUT is expected to stimulate the latter and hence facilitate an openness to learning experiences. This allows dog owners to readily take up dog knowledge and skills during education.

Our finding that parenting styles are relevant to the owner-dog relationship thus offers new routes to improve this liaison. Apparently parenting styles apply to the owner-dog relationship, but we need to address that science may not apply to all owner-dog relationships. This as our studies unintentionally involved mainly female dog owners, who were likely actively involved with their dog ownership for they partook in lengthy questionnaires and/or in time-consuming behavioural tests. Female participation percentages ranged from 83% to 91%. This studying of mainly female and strongly engaged owners will have influenced our findings, like that we probably missed effects that do exist in a more heterogenous population of dog owners who more commonly

practice poor parenting. Surprisingly, to date few studies are available on gender effects in owner-dog interactions. Gender effects are expected, as women show higher levels of positive animal attitudes than men, for instance regarding animal protectionism (Herzog, 2007). Also, in (child-directed) parenting the outcomes differed between the parenting by mothers and fathers (Hoeve et al., 2011). Neglectful (uninvolved) parenting by fathers, but not when done by mothers, related to delinquency in the fourteen- to 22-year old sons, in a cross-sectional longitudinal research on 330 Dutch families with five-year intervals between measurements. If parenting outcomes differ between mothers and fathers in child-directed parenting, the same may be true for female and male dog owners and dog-directed parenting outcomes. The studying of mainly female owners is not unique to our studies, and we point out that owner-dog interaction studies could benefit from including higher percentages of male respondents. Many studies on dog owners include mainly female respondents, with percentages of up to 85-93% females when respondents are recruited predominantly via social media and the internet (Bennett and Rohlf, 2007; Norman et al., 2020; Volsche and Gray, 2016). In-person approach of dog owners, for instance during park-dog walks or when visiting veterinary clinics may lower the percentage of female participants somewhat as these recruitment procedures involved only 67-70% females (Blackwell et al., 2008; Hiby et al., 2004).

Our study participants parented to a high degree authoritatively, with averages ranging from 60 to 68% for AUI and even 79 to 84% for AUT (in comparison AUC: 12 to 26%). This may have resulted in ceiling effects (or floor effects in case of AUC), generally known to affect survey variables and analyses thereof (Austin and Brunner, 2003; Wang et al., 2009). Furthermore, these common high levels of authoritative parenting will have reflected limited variation in comparison to the variation in the entire population of Dutch dog owners. Our lack of discovering an uninvolved or clear permissive parenting style could indicate that we did not reach a sufficiently broad and diverse sample of dog owners. We will have missed those dog owners that are less interested in their dog ownership and/or less engaged with parenting their dog. This omission is worrisome as these owners are likely to benefit the most from educational interventions on dog-directed parenting. It poses a major challenge to reach these owners in future research. In-person approaches may help to engage a diverse group of dog owners to partake in research, and study methods may have to be adapted to improve ease of use. Our studies pinpoint some of these lower-effort methods such as a leash tension measurement instrument (**Chapter 6**) and a shortened DD-PSDQ questionnaire. Lower-effort methods could also result from for instance measuring on AUT parenting only and comparing dog owners which parent to higher and lower degree AUT. This would limit the number of questions posed to dog owners and possibly contribute to a more diverse study sample.

Solutions for involving a more diverse group of dog owners in research would have practical use too. Presently, education on dog ownership, such as in dog obedience classes, seems to attract a certain type of dog owner; one with a relatively high household annual income who had a good level of thought about acquiring the dog (Rohlf et al., 2010). As discussed in **Chapter 9**, targeting a broad and diverse range of dog owners can increase the success of educational interventions, including dog obedience classes. Difficult to reach dog owners could be contacted by in-person/on-site approaches used earlier with animal livestock handlers. Livestock handlers working with cows and pigs, were approached on the farms where they worked on a daily base and there they partook in an educational intervention (Coleman et al., 2000; Hemsworth et al., 1994; Hemsworth et al., 2002). Similarly, dog owners could be contacted at locations that are visited by most type owners, such as in dog parks or veterinary clinics. Engaging a wider range of dog owners in science and educational interventions will serve those owner-dog partnerships that can benefit the most.

Are parenting styles the optimal route to help dog owners become more knowledgeable and skilled in their dog ownership?

In our study samples of engaged dog owners we found meaningful associations between dog-directed parenting styles and variables in both owners and dogs. For example, favourable associations existed for low perceived costs of dog ownership with AUT and emotional closeness to the dog with AUI. An unfavourable association existed between reduced satisfaction with dog ownership and AUC (**Chapter 8**). These self-report based associations were supported by behavioural observations on owners and dogs (**Chapter 5).** We found AUI and AUT to associate with dog owners verbally praising their dogs, whereas AUC associated with verbally correcting the dog and applying leash tension. These differences in guidance possibly affect the dog, as AUT associated with the dogs looking relatively often at their owners. A dog looking at its owner is deemed important for receiving owner support in a challenging human-determined environment (Merola et al., 2014; Müller et al., 2015) and the dog paying attention to the owner is the starting point for teaching the dog desired behaviours (Payne et al., 2017). The causality of such dog behaviour and dog owners' parenting styles remains speculative at this stage as our studies identified associations that require further validation. However, the various outcomes from our studies are compatible and consistent with existing theories on raising children and/or dogs, giving some confidence in the way we interpreted these.

Clearly, much needs yet to be studied with regard to dog-directed parenting styles. Future prospective studies could produce more causal evidence on the consequences of dog-directed parenting styles. Of interest is how the concept fits within the broader construct of the owner-dog relationship and overlaps or separates from aspects like

adopted training methods. Generally, the concept of parenting styles has been found to have useful strengths. These strengths are in the typological approach combining a focus on cases and variables and capturing parenting more comprehensively than when considering separate parenting behaviours (Mandara, 2003). Notwithstanding these strengths of using parenting styles as a concept for studying the owner-dog relationship, weaknesses will also exist alike those identified in child-directed studies (Smetana, 2017). Firstly, a closer scrutiny of the dimensions underlying parenting styles could strengthen the scientific base as several scientists indicated that alternative dimensions could exist, next to the original dimensions of demandingness and responsiveness (O'Connor, 2002; Power, 2013). Examples are a 'structure dimension' that assesses the degree to which parents provide children with a predictable, organized, consistent environment and a 'cognitive stimulation dimension', that assesses the degree to which parents use verbal and non-verbal interaction and stimulation (Power, 2013). Both could be relevant to dog-directed parenting as well. Secondly, a challenging aspect of child-directed parenting is the distinction between behavioural and psychological control. This distinction is made in the dimension of demandingness and it separates into the ('behavioural') controlling of behaviours of a care dependent and the ('psychological') controlling of thoughts and feelings. Such a distinction may be of importance as behavioural control is thought beneficial, but psychological control is thought disadvantageous in child-directed parenting (Barber, 1996; Smetana, 2017). The intrusiveness of psychological control associated with unfavourable child behavioural outcomes, showing as problematic behaviour (e.g. school misconduct) and hyperactivity in a cohort study on 600 eight- to ten-year-old children (Kuppens and Ceulemans, 2019). Although intrusiveness could disadvantage a dog, it may be difficult to measure in this species. This as it is measured on aspects of for instance invalidating feelings and constraining verbal expressions of the care dependent (Kuppens and Ceulemans, 2019). Thirdly and finally, as a side note on methodology, other factors outside of the domain of parenting styles could be studied to deepen our understanding of the human side of the owner-dog relationship. How for instance does owner perceived emotional closeness, which relates directly to AUI (**Chapter 8)**, factor into the owner-dog relationship and with which consequences? Although emotional closeness foreseeably benefits the owner-dog relationship, emotional closeness was not seen to relate to health care behaviours directed at the dog in a survey on 1,016 dog owners, whereas shared activities were (Rohlf et al., 2012). Furthermore, emotional closeness did not relate with the dog's attachment behaviour in behavioural tests with twenty owner-dog dyads (Rehn et al., 2014), leaving the question open if owner perceived emotional closeness and dog perceived emotional closeness align. Thus, the foreseeable positive effects of emotional closeness have not been substantiated and may even instil certain dog welfare risks. Human food sharing may ensue from an owner's perceived emotional closeness to the dog and such sharing of human foods relates directly to a dog's overweight (Bland et al.,

2009; Courcier et al., 2010; Robertson, 2003). We found in **Chapter 7** that permissive dog-directed parenting associated with higher weight statuses in dogs. This raises the question if addressing emotional closeness and/or parental permissiveness can increase successfulness of dog weight management programs. Clearly, much can be studied on the owner-dog relationship, including the methods of study themselves and our studies offer some interesting new questions to address.

Balancing scientific interest towards not only the dog's side of the leash, but also the human's

In this thesis we show how parenting styles apply to the owner-dog relationship. We detail how dog owners may come to adopt certain parenting styles, we indicate which owner/dog behavioural, relational and dog weight variables may relate to the parenting styles, and we explain new behavioural measurement/surveys tools that can advance the studying of the owner-dog relationship. In our opinion, the science of human dog relationships could benefit from addressing not mainly the dog outcomes but also the owner outcomes of education for dog owners. Finally, we stress the importance of diverse study samples of dog owners, including when evaluating or implementing educational interventions for building knowledge and skills in dealing with dogs. Balancing scientific focus on dogs at one 'side of the leash' and owners at the other side, is an important step forwards in helping owners care appropriately for their dog. This to the benefit of the owner's relationship with his/her dog and the dog's welfare.

References

Adams SA, Matthews CE, Ebbeling CB, Moore CG, Cunningham JE, Fulton J, et al. The effect of social desirability and social approval on self-reports of physical activity. Am J Epidem. 2005;161(4):389-98.

Afifi TO, Romano E. Ending the spanking debate. Child Abuse Negl. 2017;71:3-4.

Akey JM, Ruhe AL, Akey DT, Wong AK, Connelly, CF, Madeoy J, et al. Tracking footprints of artificial selection in the dog genome. Proc Natl Acad Sci. 2010;107(3):1160-1165.

Archer J. Why do people love their pets? Evol Hum Behav. 1997;18:237-259.

Arden R, Bensky MK, Adams MJ. A review of cognitive abilities in dogs, 1911 through 2016: more individual differences, please!. Curr Dir Psychol Sci. 2016;25(5):307-312.

Arhant C, Bubna-Littitz H, Bartels A, Futschik A, Troxler J. Behaviour of smaller and larger dogs: Effects of training methods, inconsistency of owner behaviour and level of engagement in activities with the dog. Appl Anim Behav Sci. 2010;123(3-4):131-142.

Ascione FR, Weber CV, Thompson TM, Heath J, Maruyama M, Hayashi K. Battered pets and domestic violence: Animal abuse reported by women experiencing intimate violence and by non-abused women. Violence Against Women. 2007;13(4):354-373.

Atenstaedt RL, Jones S. Interventions to prevent dog fouling: a systematic review of the evidence. Public Health. 2011;125(2):90-92.

Aunola K, Nurmi JE. The role of parenting styles in children's problem behavior. Child Dev. 2005;76(6):1144-1159.

Austin PC, Brunner LJ. Type I error inflation in the presence of a ceiling effect. Am Stat. 2003;57(2):97-104.

Axelsson E, Ratnakumar A, Arendt ML, Maqbool K, Webster MT, Perloski M, et al. The genomic signature of dog domestication reveals adaptation to a starch-rich diet. Nature. 2013;495(7441):360-364.

Bailey JA, Hill KG, Oesterle S, Hawkins JD. Parenting practices and problem behavior across three generations: monitoring, harsh discipline, and drug use in the intergenerational transmission of externalizing behavior. Dev Psychol. 2009;45:1214–1226.

Bamberger M, Houpt KA. Signalment factors, comorbidity, and trends in behavior diagnoses in dogs: 1,644 cases (1991–2001). J Am Vet Med Assoc. 2006;229(10):1591-1601.

Barber BK. Parental psychological control: revisiting a neglected construct. Child Dev. 1996;67(6):3296-3319.

Barber, BR, Xia M. The centrality of control to parenting and its effects. In: Larzelere RE, Sheffield Morris A, Harrist AW, editors. Authoritative Parenting. Synthesizing Nurturance and Discipline for Optimal Child Development (1st ed). Washington: American Psychological Association; 2013. pp. 61-87.

Barradas DT, Fulton JE, Blanck HM, Huhman M. Parental influences on youth television viewing. J Pedriatr. 2007;151:369-373.

Baumrind D. The influence of parenting style on adolescent competence and substance use. J Early Adolesc. 1991;11(1):56-95.

Baumrind D. Authoritative parenting revisited: history and current status. In: Larzelere RE, Sheffield Morris A, Harrist AW, editors. Authoritative Parenting. Synthesizing Nurturance and Discipline for Optimal Child Development. Washington: American Psychological Association; 2013. pp.11-34.

Baumrind D, Lazelere RE, Owens EB. Effects of preschool parents' power assertive patterns and practices on adolescent development. Parent Sci Pract. 2010;10:157-201.

Beck AM. The human-dog relationship: a tale of two species. In: Macpherson C, Meslin FX, Wandeler A, editors. Dogs, zoonoses and public health, second edition. Ontario: WHO Collaborating Centre; 2013. pp.1-16.

Becker F, French L. Making the links: child abuse, animal cruelty and domestic violence. Child Abuse Rev. 2004;13:399-414.

Belsky J, Jaffee SR, Sligo J, Woodward L, Silva PA. Intergenerational transmission of warm-sensitive-stimulating parenting: a prospective study of mothers and fathers of 3-yearolds. Child Dev. 2005;76:384–396.

Ben-Alexander M, Friend T, Haug L. Obedience training effects on search dog performance. Appl Anim Behav Sci. 2011;132(3-4):152-159.

Benjet C, Kazdin AE. Spanking children: The controversies, findings, and new directions. Clin Psychol Rev. 2003;23(2):197-224.

Bennett PC, Cooper N, Rohlf VI, Mornement K. Factors influencing owner satisfaction with companion-dog-training facilities. J Appl Anim Welf Sci. 2007;10(3):217-241.

Bennett PC, Rohlf VI. Owner-companion dog interactions: Relationships between demographic variables, potentially problematic behaviours, training engagement and shared activities. Appl Anim Behav Sci. 2007;102(1-2):65-84.

Bensky MK, Gosling SD, Sinn DL. The world from a dog's point of view: A review and synthesis of dog cognition research. In: Brockman HJ, editor. Advances in the Study of Behavior. Oxford: Academic Press; 2013. pp. 209-406.

Beverland MB, Farrelly F, Ching Lim EA. Exploring the dark side of pet ownership: status- and control-based pet consumption. J Bus Res. 2008;61:490-496.

Blackstone A. Doing family without having kids. Sociol Compass. 2014;8(1):52-62.

Blackwell EJ, Twells C, Seawright A, Casey RA. The relationship between training methods and the occurrence of behavior problems, as reported by owners, in a population of domestic dogs. J Vet Behav. 2008;3(5):207-217.

Blakely Kimble AB. The Parenting Styles and Dimensions Questionnaire: a reconceptualization and validation. Thesis approved by Hubbs-Tait L, submitted to the Faculty of the Graduate College of the Oklahoma State University in July 2014. Stillwater: Oklahoma State University; 2009.

Bland IM, Guthrie-Jones A, Taylor RD, Hill J. Dog obesity: owner attitudes and behaviour. Prev Vet Med. 2009;92:333-340.

Blissett J. Relationships between parenting style, feeding style and feeding practices and fruit and vegetable consumption in early childhood. Appetite. 2011;57:826-831.

Blouin DD. Are dogs children, companions or just animals? Understanding variations in people's orientations towards animals. Anthrozoös. 2013;26(2):279-294.

Bowlby J. Parent-child attachment and healthy human development. London: Routledge; 1988.

Braem MD, Mills DS. Factors affecting response of dogs to obedience instruction: A field and experimental study. Appl Anim Behav Sci. 2010;125(1-2):47-55.

Branson SM, Boss L, Cron S, Turner DC. Depression, loneliness, and pet attachment in homebound older adult cat and dog owners. J Mind Med Sci. 2017;4(1):1-13.

Bray EE, Sammel MD, Cheney DL, Serpell JA, Seyfarth RM. Effects of maternal investment, temperament, and cognition on guide dog success. Proc Acad Nat Sci. 2017;114(34):9128-9133.

Brito PQ. The "Digitalisation" of Youth: How Do They Manage and Integrate Digital Technologies?. In Handbook of Research on Digital Media and Advertising: User Generated Content Consumption. Hershey: IGI Global, 2011. pp. 345-373.

Bronte-Tinkew J, Moore KA, Carrano J. The father-child relationship, parenting styles, and adolescent risk behaviors in intact families. J Fam Issues. 2006:27(6):850-881.

Browne CM, Starkey NJ, Foster TM, McEwan JS. Examination of the accuracy and applicability of information in popular books on dog training. Society Anim. 2017;25(5):411-435.

Burkholder WJ. Use of body condition scores in clinical assessment of the provision of optimal nutrition. J Am Vet Med Assoc. 2000;217:650-654.

Burnham, D, Kitamura C, Vollmer-Conna U. What's new, pussycat? on talking to babies and animals. Science. 2002;296(5572):1435.

Carter CS. Neuroendocrine perspectives on social attachment and love. Psychoneuroendocrinology. 1998;23(8):779-818.

Chandler M, Cunningham S, Lund EM, Khanna C, Naramore R, Patel A, et al. Obesity and associated comorbidities in people and companion animals: A One Health perspective. J Comp Pathol. 2017;156:296-309.

Chapman S, Cornwall J, Righetti J, Sung L. Preventing dog bites in children: randomised controlled trial of an educational intervention. Br Med J. 2000;320(7248):1512-1513.

Chatel C, Morillas-Torne M, Marti-Henneberg J, Esteve A. Patterns of population and urban growth in Southwest Europe: 1920-2010. J Urban Hist. 2017;43(6):1021-1040.

Clutton-Brock TH, Parker GA. Punishment in animal societies. Nature. 1995;373(6511):209-216.

Coe JB, Young I, Lambert K, Dysart L, Nogueira Borden L, Rajić A. A scoping review of published research on the relinquishment of companion animals. J Appl Anim Welf Sci. 2014;17(3):253-273.

Coleman GJ, Hemsworth PH, Hay M, Cox M. Modifying stockperson attitudes and behaviour towards pigs at a large commercial farm. Appl Anim Behav Sci. 2000;66:11-20.

Collins L, Asher L, Summers J, Diesel G, McGreevy P. Welfare epidemiology as a tool to assess the welfare impact of inherited defects on the pedigree dog population. Anim Welf. 2010;19(S1):67-75.

Collins C, Duncanson K, Burrows T. A systematic review investigating associations between parenting style and child feeding behaviours. J Hum Nutr Diet. 2014;27:557-568.

Coppinger R, Coppinger L. Dogs, a new understanding of canine origin, behaviour and evolution. Chicago: University of Chicago Press; 2001.

Cottam N, Dodman NH, Moon-Fanelli AA, Patronek GJ. Comparison of remote versus in-person behavioral consultation for treatment of canine separation anxiety. J Appl Anim Welf Sci. 2008;11(1):28-41.

Couch A, Keniston K. Yeasayers and naysayers: Agreeing response set as a personality variable. J Abnorm Soc Psychol. 1960;60:151-174.

Courcier EA, Mellor DJ, Thomson RM, Yam PS. An epidemiological study of environmental factors associated with canine obesity. J Small Anim Pract. 2010;51:362-367.

Courcier EA, Thomson RM, Mellor DJ, Yam PS. A cross sectional study of the prevalence and risk factors for owner misperception of canine body shape in first opinion practice in Glasgow. Prev Vet Med. 2011;102:66-74.

Courvoisier DS, Combescure C, Agoritsas T, Gayet-Ageron A, Perneger TV. Performance of logistic regression modeling: beyond the number of events per variable, the role of data structure. J Clin Epidemiol. 2011;64:993-1000.

Criss MM, Larzelere RE, Introduction. In: Larzelere RE, Sheffield Morris A, Harrist AW, editors. Authoritative Parenting. Synthesizing Nurturance and Discipline for Optimal Child Development (1st ed). Washington: American Psychological Association; 2013. pp. 3-8.

Cronbach LJ. Response sets and test validity. Educ Psychol Meas. 1946;6:475-494.

Crowne DP, Marlowe D. A new scale of social desirability independent of psychopathology. J Consult Psychol. 1960;24:349-354.

Curb LA, Abramson CI, Grice JW, Kennison SM. The relationship between personality match and pet satisfaction among dog owners. Anthrozoös. 2013;26(3):395-404.

Curtis JT, Wang Z. The neurochemistry of pair bonding. Curr Dir Psychol Sci. 2003;12(2):49-53.

Cutt H, Giles-Corti B, Knuiman M, Burke V. Dog ownership, health and physical activity: A critical review of the literature. Health Place. 2007;13(1):261-272.

Darling N, Steinberg L. Parenting style as context: An integrative model. Psychol Bull. 1993;113(3):487-496.

Davies SE, Connelly BS, Ones DS, Birkland AS. The General Factor of Personality: The "Big One," a self-evaluative trait, or a methodological gnat that won't go away?. Pers Individ Differ. 2015;81:13-22.

Davis SJ, Valla FR. Evidence for domestication of the dog 12,000 years ago in the Natufian of Israel. Nature. 1978;276(5688):608-610.

Dawson M. Reviewing the critique of individualization: The disembedded and embedded theses. Acta Sociol. 2012;55(4):305-319.

De Graaf I, Speetjens P, Smit F, De Wolff M, Tavecchio L. Effectiveness of the Triple P Positive Parenting Program on Behavioral problems in children: a meta-analysis. Behav Modif. 2008a;32(5):714-735.

De Graaf I, Speetjens P, Smit F, De Wolff M, Tavecchio, L. Effectiveness of the Triple P Positive Parenting Program on Parenting: a meta-analysis. Fam Relat. 2008b;57(5):553-566.

Deldalle S, Gaunet F. Effects of 2 training methods on stress-related behaviors of the dog (Canis familiaris) and on the dog-owner relationship. J Vet Behav. 2014;9(2):58-65.

Dessem, DEAN. Interactions between jaw-muscle recruitment and jaw-joint forces in Canis familiaris. J Anatomy. 1989;164:101-121.

Diesel G, Brodbelt D, Pfeiffer DU. Characteristics of relinquished dogs and their owners at 14 rehoming centers in the United Kingdom. J Appl Anim Welf Sci. 2010;13(1):15-30.

Diesel G, Pfeiffer DU, Brodbelt D. Factors affecting the success of rehoming dogs in the UK during 2005. Prev Vet Med. 2008;84(3):228-241.

Diverio S, Boccini B, Menchetti L, Bennett PC. The Italian perception of the ideal companion dog. J Vet Behav. 2016;12:27-35.

Dodman NH, Smith A, Holmes D. Comparison of the efficacy of remote consultations and personal consultations for the treatment of dogs which are aggressive towards their owners. Vet Rec. 2005;156(6):168-170.

Dotson MJ, Hyatt EM. Understanding dog-human companionship. J Bus Res. 2008;61:457-466.

Dufva T, Dufva M. Grasping the future of the digital society. Futures. 2019;107:17-28.

Dumbell L, Lemon C, Williams J. A systematic literature review to evaluate the tools and methods used to measure rein tension. J Vet Behav. 2018;29:1-11.

Duperrex O, Blackhall K, Burri M, Jeannot E. Education of children and adolescents for the prevention of dog bite injuries. Cochrane Database Syst Rev. 2009;2:1-25.

Duxbury MM, Jackson JA, Line SW, Anderson RK. Evaluation of association between retention in the home and attendance at puppy socialization classes. J Am Vet Med Assoc. 2003;223(1):61-66.

Dwyer F, Bennett PC, Coleman GJ. Development of the Monash Dog Owner Relationship Scale (MDORS). Anthrozoös. 2006;19(3):243-256.

Eastland-Jones RC, German AJ, Holden SL, Biourge V, Pickavance LC. Owner misperception of canine body condition persists despite use of a body condition score chart. J Nutr Sci. 2014;3:1-5.

Eldad R, Benatov J. Adult attachment and perceived parental style may shape leadership behaviors. Leader Organ Dev J. 2018;39(2):261-275.

Ellis JL, Thomason J, Kebreab E, France J. Calibration of estimated biting forces in domestic canids: comparison of post-mortem and in vivo measurements. J Anatomy. 2008;212(6):769-780.

Ellis JL, Thomason J, Kebreab E, Zubair K, France J. Cranial dimensions and forces of biting in the domestic dog. J Anatomy. 2009;214(3):362-373.

Endenburg N, Knol BW. Behavioural, household, and social problems associated with companion animals: opinions of owners and non-owners. Vet Q. 1994;16:130-134.

Endenburg N, Soontararak S, Charoensuk C, Van Lith HA. Quality of life and owner attitude to dog overweight and obesity in Thailand and the Netherlands. BMC Vet Res. 2018;14:1-19.

Epley N, Waytz A, Cacioppo JT. On seeing human: a three-factor theory of anthropomorphism. Psychol Rev. 2007;114(4):864-886.

Fahie M, Cortez J, Ledesma M, Su Y. Pressure Mat Analysis of Walk and Trot Gait Characteristics in 66 Normal Small, Medium, Large, and Giant Breed Dogs. Front. Vet. Sci. 2018;5(256):1-7.

Fatjó J, Ruiz-De-La-Torre JL, Manteca X. The epidemiology of behavioural problems in dogs and cats: a survey of veterinary practitioners. Anim Welf. 2006;15(2):179-185.

Feldman R. The neurobiology of mammalian parenting and the biosocial context of human caregiving. Horm Behav. 2016;77:3-17.

Feldman R. The neurobiology of human attachments. Trends Cogn Sci. 2017;1(2):80-99.

Feldman R, Bakermans-Kranenburg MJ. Oxytocin: a parenting hormone. Curr Opin Psychol. 2017;15:13-18.

Feldman R, Gordon I, Schneiderman I, Weisman O, Zagoory-Sharon O. Natural variations in maternal and paternal care are associated with systematic changes in oxytocin following parent-infant contact. Psychoneuroendocrinology. 2010;35(8):1133-1141.

Feng LC, Howell TJ, Bennett PC. How clicker training works: comparing reinforcing, marking, and bridging hypotheses. Appl Anim Behav Sci. 2016;181:34-40.

Fernandes JG, Olsson IAS, Vieira de Castro AC. Do aversive-based training methods actually compromise dog welfare?: A literature review. Appl Anim Behav Sci. 2017;196:1-12.

Feuerbacher EN, Wynne CD. Shut up and pet me! Domestic dogs (Canis lupus familiaris) prefer petting to vocal praise in concurrent and single-alternative choice procedures. Behav Process. 2015;110:47-59.

Fletcher R, Freeman E, Matthey S. The impact of behavioural parent training on fathers' parenting: a meta-analysis of the Triple P Positive Parenting Program. Fathering. 2011;9(3):291-312.

Fox R, Gee NR. Great expectations: changing social, spatial and emotional understandings of the companion animal–human relationship. Soc Cult Geogr. 2019;20(1):43-63.

Francis LA, Susman EJ. Self-regulation and rapid weight gain in children from age 3 to 12 years. Arch Pediatr Adolesc Med. 2009;163:297-302.

Francis DD, Young LJ, Meaney MJ, Insel TR. Naturally occurring differences in maternal care are associated with the expression of oxytocin and vasopressin (V1a) receptors: gender differences. J. Neuroendocrinol. 2002;14:349-353.

Gácsi M, Győri B, Miklósi Á, Virányi Z, Kubinyi E, Topál J, et al. Species-specific differences and similarities in the behavior of hand-raised dog and wolf pups in social situations with humans. Dev Psychobiol. 2005;47(2):111-122.

Gácsi M, Topál J, Miklósi Á, Dóka A, Csányi V. Attachment behavior of adult dogs (Canis familiaris) living at rescue centers: forming new bonds. J Comp Psychol. 2001;115(4):423-431.

Gazzano A, Maritia C, Sighieria C, Duccia M, Ciceronib C, McBride EA. Survey of undesirable behaviours displayed by potential guide dogs with puppy walkers. J of Vet Behav. 2008;3(3):104-113.

George C, Solomon J. Attachment and caregiving: The caregiving behavioral system. In: Cassidy J, Shaver P, editors. Handbook of attachment: Theory, research, and clinical applications. New York: Guilford Press; 1999. pp. 649-670.

Gergely A, Faragó T, Galambos Á, Topál J. Differential effects of speech situations on mothers' and fathers' infant-directed and dog-directed speech: An acoustic analysis. Sci Rep. 2017;7(1):1-10.

German AJ. The growing problem of obesity in dogs and cats. J Nutr. 2006;136:1940S-1946S.

German AJ. Style over substance: what can parenting styles tell us about ownership styles and obesity in companion animals? Br J Nutr. 2014;113:S72-S77.

German AJ, Blackwell E, Evans M, Westgarth C. Overweight dogs are more likely to display undesirable behaviours: results of a large online survey of dog owners in the UK. J Nutr Sc. 2017;6:1-6.

German AJ, Holden SL, Morris PJ, Biourge V. Comparison of a bioimpedance monitor with dual-energy x-ray absorptiometry for noninvasive estimation of percentage body fat in dogs. Am J Vet Res. 2010;71:393-398.

German AJ, Holden SL, Morris PJ, Biourge V. Long-term follow-up after weight management in obese dogs: the role of diet in preventing regain. Vet J. 2012;192:65-70.

German AJ, Holden SL, Moxham GL, Holmes KL, Hackett RM, Rawlings JM. A simple, reliable tool for owners to assess the body condition of their dog or cat. J Nutr. 2006;136:2031S-2033S.

German AJ, Ryan VH, German AC, Wood IS, Trayhurn P. Obesity, its associated disorders and the role of inflammatory adipokines in companion animals. Vet J. 2010;185:4-9.

Gershoff ET. Corporal punishment by parents and associated child behaviors and experiences: a meta-analytic and theoretical review. Psychol Bull. 2002;128(4):539-579.

Gershoff ET, Bitensky SH. The case against corporal punishment of children: Converging evidence from social science research and international human rights law and implications for US public policy. Psychol Public Policy Law. 2007;13(4):231-272.

Gershoff ET, Grogan-Kaylor A. Spanking and child outcomes: Old controversies and new meta-analyses. J Fam Psychol. 2016;30(4):453-469.

Gershoff ET, Grogan Kaylor A, Lansford JE, Chang L, Zelli A, Deckard K, et al. Parent discipline practices in an international sample: Associations with child behaviors and moderation by perceived normativeness. Child Dev. 2010;81(2):487-502.

Gonzales NA, Cauce AM, Friedman RJ, Mason CA. Family, peer, and neighborhood influences on academic achievement among African-American adolescents: One-year prospective effects. Am J Community Psychol. 1996;24(3):365-387.

González Ramírez M, Landero Hernández R. Benefits of dog ownership: Comparative study of equivalent samples. J Vet Behav: Clin Appl Res. 2014;9(6):311-315.

Grainger J, Wills AP, Montrose VT. The behavioral effects of walking on a collar and harness in domestic dogs (Canis familiaris). J Vet Behav. 2016;14:60-64.

Greenebaum JB. Training dogs and training humans: Symbolic interaction and dog training. Anthrozoös. 2010;23(2):129-141.

Grolnick WS, Farkas M. Parenting and the development of children's self-regulation. In: Bornstein, MH, editor. Handbook of Parenting: Volume 5: Practical Issues in Parenting. Hove: Psychology Press; 2002. pp. 89-110.

Guastella G, Oueslati W, Pareglio S. Patterns of Urban Spatial Expansion in European Cities. Sustain. 2019;11(2247):1-15.

Ha J, Campion T. Dawn of the dog: Evolutionary theory and the origin of modern dogs (Canis familiaris). In: Ha J, Campion T, editors. Dog behavior: Modern science and our canine companions. London: Academic Press Elsevier; 2019. pp. 1-32.

Handlin L, Nilsson A, Ejdebäck M, Hydbring-Sandberg E, Uvnäs-Moberg K. Associations between the psychological characteristics of the human-dog relationship and oxytocin and cortisol levels. Anthrozoös. 2012;25(2):215-228.

Haug LI, Beaver BV, Longnecker MT. Comparison of dogs' reactions to four different head collars. Appl Anim Behav Sci. 2002;79:53-61.

Haverbeke A, Laporte B, Depiereux E, Giffroy JM, Diederich C. Training methods of military dog handlers and their effects on the team's performances. Appl Anim Behav Sci. 2008:113(1-3);110-122.

Hawley PH, Shorey HS, Alderman PM. Attachment correlates of resource-control strategies: Possible origins of social dominance and interpersonal power differentials. J Soc Personal Relation. 2009;26(8):1097-1118.

Hayward JJ, Castelhano MG, Oliveira KC, Corey E, Balkman C, Baxter TL, et al. Complex disease and phenotype mapping in the domestic dog. Nature Comm. 2016;7(10460):1-11.

Headey B, Grabka MM. Pets and human health in Germany and Australia: National longitudinal results. Soc Indic Res. 2007;80:297–311.

Hemsworth PH, Coleman GJ, Barnett JL. Improving the attitude and behaviour of stockpersons towards pigs and the consequences of the behaviour and reproductive performance of commercial pigs. Appl Anim Behav Sci. 1994;39:349-362.

Hemsworth PH, Coleman GJ, Barnett JL, Borg S, Dowling S. The effects of cognitive behavioural intervention on the attitude and behaviour of stockpersons and the behaviour and productivity of commercial dairy cows. J Anim Sci. 2002;80:68-78.

Henderson S. Spending on pets: "Tails" from the Consumer Expenditure Survey. Beyond the Numbers, Washington: Bureau of Labor Statistics; 2013. pp. 1-6.

Herbeck YE, Gulevich RG, Shepeleva DV, Grinevich VV. Oxytocin: coevolution of human and domesticated animals. Russian Journal of Genetics: Appl Res. 2017;7(3):235-242.

Herron ME, Shofer FS, Reisner IR. Survey of the use and outcome of confrontational and non-confrontational training methods in client-owned dogs showing undesired behaviours. Appl Anim Behav Sci. 2009;117:47-54.

Herzog HA. Gender differences in human–animal interactions: A review. Anthrozoös. 2007;20(1):7-21.

Hiby EF, Rooney NJ, Bradshaw JWS. Dog training methods: their use, effectiveness and interaction with behaviour and welfare. Anim Welf. 2004;13(1):63-70.

Hindrikson M, Remm J, Pilot M, Godinho R, Stronen AV, Baltrūnaité L, et al. Wolf population genetics in Europe: a systematic review, meta-analysis and suggestions for conservation and management. Biol Rev. 2017;92(3):1601-1629.

Hoeve M, Dubas JS, Gerris JRM, Van der Laan PH, Smeenk, W. Maternal and paternal parenting styles: unique and combined links to adolescent and early adult delinquency. J Adolesc. 2011;34:813-827.

Hofmeister H. Individualisation of the life course. Int Soc Sci J. 2013:64(213-214):279-290.

Horowitz A. Disambiguating the "guilty look": Salient prompts to a familiar dog behaviour. Behav Process. 2009;81(3):447-452.

Hoummady S, Péron F, Grandjean D, Cléro D, Bernard B, Titeux E, et al. Relationships between personality of human–dog dyads and performances in working tasks. Appl Anim Behav Sci. 2016;177:42-51.

Howell TJ, Mornement K, Bennett PC. Pet dog management practices among a representative sample of owners in Victoria, Australia. J Vet Behav. 2016;12:4-12.

Huber A, McMahon CA, Sweller N. Efficacy of the 20-week circle of security intervention: Changes in caregiver reflective functioning, representations, and child attachment in an Australian clinical sample. Infant Ment Health J. 2015;36(6):556-574.

Hughes SO, Shewchuk RM, Baskin ML, Nicklas TA, Qu H. Indulgent feeding style and children's weight status in preschool. J Dev Behav Pediatr. 2008;29:403-418.

Inglis IR, Forkman B, Lazarus J. Free food or earned food? A review and fuzzy model of contrafreeloading. Anim Behav. 1997;53:1171-1191.

Irvine L, Cilia L. More-than-human families: Pets, people, and practices in multispecies households. Sociol Compass. 2017;11(2):e12455.

Jago R, Davison KK, Thompson JL, Page AS, Brockman R, Fox KR. Parental sedentary restriction, maternal parenting style, and television viewing among 10-to 11-year-olds. Pediatr. 2011;128:572-578.

Jezierski T, Adamkiewicz E, Walczak M, Sobczyńska M, Górecka-Bruzda A, Ensminger J, et al. Efficacy of drug detection by fully-trained police dogs varies by breed, training level, type of drug and search environment. Forensic Sci Int. 2014;237:112-118.

Jolliffe IT. Principal Components Analysis. New York: Springer-Verlag; 1986.

Kanat-Maymon Y, Antebi A, Zilcha-Mano S. Basic psychological need fulfilment in human-pet relationships and well-being. Pers Individ Dif. 2016;92:69-73.

Kass PH, New JC, Scarlett JM, Salman MD. Understanding animal companion surplus in the United States: Relinquishment of nonadoptables to animal shelters for euthanasia. J Appl Anim Welf Sci. 2001;4(4):237-248.

Kaufmann D, Gesten E, Santa Lucia RC, Salcedo O, Rendina-Gobioff G, Gadd R. The relationship between parenting style and children's adjustment: The parents' perspective. J Child Fam Stud. 2000;9(2):231-245.

Keebaugh AE, Redman-Bentley D, Griffon DJ. Influence of leash side and handlers on pressure mat analysis of gait characteristics in small-breed dogs. J Am Vet Med Assoc. 2015;246:1215-1221.

Kidd AH, Kidd RM, George CC. Successful and unsuccessful pet adoptions. Psychol Rep. 1992;70(2):547-561.

Kienzle E, Bergler R, Mandernach A. A comparison of the feeding behavior and the human–animal relationship in owners of normal and obese dogs. J Nutr. 1998;128:2779S-2782S.

Kimiecik JC, Horn TS. Examining the relationship between family context and children's physical activity beliefs: The role of parenting style. Psychol Sport Exerc. 2012;13:10-18.

King T, Marston LC, Bennett PC. Describing the ideal Australian companion dog. Appl Anim Behav Sci. 2009;120(1):84-93.

Knight S, Edwards V. In the company of wolves: the physical, social, and psychological benefits of dog ownership. J Aging Health. 2008;20(4):437-455.

Kobelt AJ, Hemsworth PH, Barnett JL, Coleman GJ A survey of dog ownership in suburban Australia-conditions and behaviour problems. Appl Anim Behav Sci. 2003;82(2):137-148.

Kotrschal K. How wolves turned into dogs and how dogs are valuable in meeting human social needs. People Anim: Inter J Res Pract. 2018;1(1):1-20.

Krumpal I. Determinants of social desirability bias in sensitive surveys: a literature review. Qual Quant. 2013;47:2025-2047.

Kubinyi E, Pongrácz P, Miklósi Á. Dog as a model for studying conspecific and heterospecific social learning. J Vet Behav. 2009;4(1):31-41.

Kubinyi E, Turcsán B, Miklósi A. Dog and owner demographic characteristics and dog personality trait associations. Behav Process. 2009;81(3):392–401.

Kuppens S, Ceulemans E. Parenting Styles: A Closer Look at a Well-Known Concept. J Child Fam Studies. 2019;28(1):168-181.

Kutsumi A, Nagasawa M, Ohta M, Ohtani N. Importance of puppy training for future behaviour of the dog. J Vet Med Sci. 2012;75(2):141-149.

Kwan JY, Bain MJ. Owner attachment and problem behaviors related to relinquishment and training techniques of dogs. J Appl Anim Welf Sci. 2013;16(2):168-183.

Lambert K, Coe J, Niel L, Dewey C, Sargeant JM. A systematic review and meta-analysis of the proportion of dogs surrendered for dog-related and owner-related reasons. Prev Vet Med. 2015;118(1):148-160.

Lamborn SD, Mounts NS, Steinberg L, Dornbusch SM. Patterns of competence and adjustment among adolescents from authoritative, authoritarian, indulgent and neglectful families. Child Dev. 1991;62:1049-1065.

Larson G, Karlsson EK, Perri A, Webster MT, Ho SY, Peters J, et al. Rethinking dog domestication by integrating genetics, archeology, and biogeography. Proc Natl Acad Sci. 2012;109(23):8878-8883.

Larzelere RE, Gunnoe ML, Roberts MW, Lin H, Ferguson CJ. Causal Evidence for Exclusively Positive Parenting and for Timeout: Rejoinder to Holden, Grogan-Kaylor, Durrant, and Gershoff (2017). Marriage Fam Rev. 2020;56:1-33.

Larzelere RE, Kuhn BR. Comparing child outcomes of physical punishment and alternative disciplinary tactics: a meta-analysis. Clin Child Fam Psychol Rev. 2005;8(1):1–37.

Larzelere RE, Sheffield Morris A, Harrist AW. Authoritative Parenting. Synthesizing Nurturance and Discipline for Optimal Child Development. 1st ed. Washington: American Psychological Association; 2013.

Latvala E, Vuokila-Oikkonen P, Janhonen S. Videotaped recording as a method of participant observation in psychiatric nursing research. J Adv Nurs. 2000;31(5):1252-1257.

Lea SE, Osthaus B. In what sense are dogs special? Canine cognition in comparative context. Learn Behav. 2018;46(4):335-363.

Leenstra FR, Neijenhuis F, Hanekamp WJA, Vermeij I. Staat van het Dier 2. Wageningen: Wageningen UR Livestock Research; 2011.

Leonard JA, Vila C, Wayne RK. Legacy lost: genetic variability and population size of extirpated US grey wolves (Canis lupus). Mol Ecol. 2005;14(1):9-17.

Linder DE, Freeman LM, Sutherland-Smith J. Association between subcutaneous fat thickness measured on thoracic radiographs and body condition score in dogs. Am J Vet Res. 2013;74:1400-1403.

Loftus JP, Wakshlag JJ. Canine and feline obesity: a review of pathophysiology, epidemiology, and clinical management. Vet Med. 2015;6:49-60.

Lomanowska AM, Boivin M, Hertzman C, Fleming AS. Parenting begets parenting: A neurobiological perspective on early adversity and the transmission of parenting styles across generations. Neurosci. 2017;342:120-139.

Lopez NV, Schembre S, Belcher BR, O'Connor S, Maher JP, Arbel R, et al. Parenting styles, food-related parenting practices, and children's healthy eating: A mediation analysis to examine relationships between parenting and child diet. Appetite. 2018;128:205-213.

Lund EM, Armstrong PJ, Kirk CA, Klausner JS. Prevalence and risk factors for obesity in adult dogs from private US veterinary practices. Int J Appl Res Vet Med. 2006;4:177-186.

Luo S, Klohnen EC. Assortative mating and marital quality in newlyweds: a couple-centered approach. J Pers Soc Psychol. 2005;88(2):304-326.

Maccoby EE, Martin JA. Socialization in the context of the family: Parent-child interaction. In: Mussen, PH, Hetherington EM, editors. Handbook of child psychology: Vol.4, Socialization, personality, and social development. 4th ed. New York: Wiley; 1983. pp.1006-1017.

MacKenzie MJ, Nicklas E, Waldfogel J, Brooks-Gunn J. Corporal punishment and child behavioural and cognitive outcomes through 5 years of age: Evidence from a contemporary urban birth cohort study. Infant Child Dev. 2012;21(1):3-33.

MacLean E, Snyder-Mackler N, Serpell J. Highly heritable and functionally relevant breed differences in dog behavior. BioRxiv. 2019;286:1-18.

MacMillan HL, Mikton CR. Moving research beyond the spanking debate. Child Abuse Negl. 2017;71:5-8.

Maher J, Pierpoint H. Friends, status symbols and weapons: the use of dogs by youth group and youth gangs. Crime Law Soc Change. 2011;55:405-420.

Mahrer N, Holly L, Luecken L, Wolchik S, Fabricius W. Parenting style, familism, and youth adjustment in mexican american and european american families. J Cross Cult Psychol. 2019;50(5):659-675.

Mandara J. The typological approach in child and family psychology: A review of theory, methods, and research. Clin Child Fam Psychol Rev. 2003;6(2):129-146.

Mariti C, Carlone B, Ricci E, Sighieri C, Gazzano A. Intraspecific attachment in adult domestic dogs (Canis familiaris): Preliminary results. Appl Anim Behav Sci. 2014;152:64-72.

Mariti C, Ricci E, Zilocchi M, Gazzano A. Owners as a secure base for their dogs. Behav. 2013;150(11):1275-1294.

Marschark ED, Baenninger R. Modification of instinctive herding dog behavior using reinforcement and punishment. Anthrozoös. 2002;15(1):51-68.

Marshall-Pescini S, Colombo E, Passalacqua C, Merola I, Prato-Previde E. Gaze alternation in dogs and toddlers in an unsolvable task: evidence of an audience effect. Anim Cogn. 2013;16(6):933-943.

Martin HJ. A revised measure of approval motivation and its relationship to social desirability. J Person Assess. 1984;48(5):508-519.

Masson S, Vega SDL, Gazzano A, Mariti C, Da Graça Pereira G, Halsberghe C, et al. Electronic training devices: discussion on the pros and cons of their use in dogs as a basis for the position statement of the European Society of Veterinary Clinical Ethology (ESVCE). J Vet Behav. 2018;25:71-75.

Mawby DI, Bartges JW, d'Avignon A, Laflamme DP, Moyers TD, Cottrell T. Comparison of various methods for estimating body fat in dogs. J Am Anim Hosp Assoc. 2004;40:109-114.

McCambridge J, Witton J, Elbourne DR. Systematic review of the Hawthorne effect: new concepts are needed to study research participation effects. J Clin Epidem. 2014;67(3):267-277.

McGowan RT, Rehn T, Norling Y, Keeling LJ. Positive affect and learning: exploring the "Eureka Effect" in dogs. Anim Cogn. 2014;17:577-587.

McGreevy P, Starling M, Payne E, Bennett P. Defining and measuring dogmanship: A new multidisciplinary science to improve understanding of human-dog interactions. Vet J. 2017;229:1-5.

McGreevy PD, Thomson PC, Pride C, Fawcett A, Grassi T, Jones B. Prevalence of obesity in dogs examined by Australian veterinary practices and the risk factors involved. Vet Rec. 2005;156:695-702.

Mech LD. Annual arctic wolf pack size related to arctic hare numbers. Arctic. 2007;60(3):309-311.

Merola I, Prato-Previde E, Lazzaroni M, Marshall-Pescini S. Dogs' comprehension of referential emotional expressions: familiar people and familiar emotions are easier. Anim Cogn. 2014;17(2):373-385

Meyer I, Forkman B. Dog and owner characteristics affecting the dog-owner relationship. J Vet Behav. 2014;9(4):143-150.

Miklósi Á, Kubinyi E, Topál J, Gácsi M, Virányi Z, Csányi V. A simple reason for a big difference: wolves do not look back at humans, but dogs do. Curr Biol. 2003;13(9):763-766.

Mlacnik E, Bockstahler BA, Müller M, Tetrick MA, Nap RC, Zentek J. Effects of caloric restriction and a moderate or intense physiotherapy program for treatment of lameness in overweight dogs with osteoarthritis. J Am Vet Med Assoc. 2006;229(11):1756-1760.

Moilanen KL, Rasmussen KE, Padilla-Walker LM. Bidirectional associations between self-regulation and parenting styles in early adolescence. J Res Adolesc. 2015;25:246-262.

Mondelli F, Prato Previde E, Verga M, Levi D, Magistrelli S, Valsecchi P. The bond that never developed: adoption and relinquishment of dogs in a rescue shelter. J Appl Anim Welf Sci. 2004;7(4):253-266.

Mongillo P, Pitteri E, Candaten M, Marinelli L. Can attention be taught? Interspecific attention by dogs (Canis familiaris) performing obedience tasks. Appl Anim Behav Sci. 2016;182:30-37.

Mornement KM, Coleman GJ, Toukhsati SR, Bennett PC. Evaluation of the predictive validity of the Behavioural Assessment for Re-homing K9's (BARK) protocol and owner satisfaction with adopted dogs. Appl Anim Behav Sci. 2015;167:35-42.

Morris PH, Doe C, Godsell E. Secondary emotions in non-primate species? Behavioural reports and subjective claims by animal owners. Cogn Emot. 2008;22(1):3-20.

Morrongiello BA, Schwebel DC, Stewart J, Bell M, Davis AL, Corbett MR. Examining parents' behaviors and supervision of their children in the presence of an unfamiliar dog: Does The Blue Dog intervention improve parent practices? Accid Anal Prev. 2013;54,108-113.

Mubanga M, Byberg L, Nowak C, Egenvall A, Magnusson PK, Ingelsson E, et al. Dog ownership and the risk of cardiovascular disease and death–a nationwide cohort study. Sci Rep. 2017;7(1):1-9.

Müller CA, Schmitt K, Barber AL, Huber L. Dogs can discriminate emotional expressions of human faces. Curr Biol. 2015;25(5):601-60.

Muñoz-Prieto A, Nielsen LR, Dąbrowski R, Bjørnvad CR, Söder J, Lamy E, et al. European dog owner perceptions of obesity and factors associated with human and canine obesity. Sci Rep. 2018;8(1):1-10.

Murray JK, Browne WJ, Roberts MA, Whitmarsh A, Gruffydd-Jones TJ. Number and ownership profiles of cats and dogs in the UK. Vet Rec. 2010;166(6):163-168.

Nagasawa M, Kikusui T, Onaka T, Ohtta M. Dog's gaze at its owner increases owner's urinary oxytocin during social interaction. Horm Behav. 2009;55:434-441.

Nagasawa M, Mitsui S, En S, Ohtani N, Ohta M, Sakuma Y, et al. Oxytocin-gaze positive loop and the coevolution of human-dog bonds. Science. 2015;348(6232):333-336.

Neel MLM, Stark AR, Maitre NL. Parenting style impacts cognitive and behavioural outcomes of former preterm infants: A systematic review. Child Care Health Dev. 2018;4(4):507-515.

Neidhart L, Boyd R. Companion Animal Adoption Study. J Appl Anim Welf Sci. 2002;5(3):175-192.

New JC, Salman MD, King M, Scarlett JM, Kass PH, Hutchison JM. Characteristics of shelter-relinquished Animals and their owners compared with Animals and their owners in U.S. pet-owning households. J Appl Anim Welf Sci. 2000;3(3):179-201.

Nicholas F, Wade C, Williamson P. Disorders in pedigree dogs: Assembling the evidence. Vet J. 2010;183(1):8-9.

Nieuwboer CC, Fukkink RG, Hermanns JM. Online programs as tools to improve parenting: A meta-analytic review. Child Youth Serv Rev. 2013;35(11):1823-1829.

Norling AY, Keeling L. Owning a dog and working: a telephone survey of dog owners and employers in Sweden. Anthrozoös. 2010;23(2):157-171.

Norman C, Stavisky J, Westgarth C. Importing rescue dogs into the UK: reasons, methods and welfare considerations. Vet Rec. 2020;186:248.

Normando S, Gelli D. Behavioral complaints and owners' satisfaction in rabbits, mustelids, and rodents kept as pets. J Vet Behav. 2011;6(6):337-342.

Nowak C, Heinrichs N. A comprehensive meta-analysis of Triple P-Positive Parenting Program using hierarchical linear modeling: Effectiveness and moderating variables. Clin Child Fam Psychol Rev. 2008;11(3):114-144.

O'Connor TG. Annotation: The effects' of parenting reconsidered: findings, challenges, and applications. J Child Psychol Psychiatry. 2002;43(5):555-572.

O'Connor R, Coe JB, Niel L, Jones-Bitton A. Exploratory study of adopters' concerns prior to acquiring dogs or cats from animal shelters. Soc Anim. 2014;25(4):362-383.

Odendaal JS, Meintjes RA. Neurophysiological correlates of affiliative behaviour between humans and dogs. Vet J. 2003;165(3):296-301.

Ogburn P, Crouse S, Martin F, Houpt K. Comparison of behavioral and physiological responses of dogs wearing two different types of collars. Appl Anim Behav Sci. 1998;61:133-142.

Olivari MG, Tagliabue S, Confalonieri E. Parenting Style and Dimensions Questionnaire: a review of reliability and validity. Marriage Fam Rev. 2013;49:465-490.

Olsen SF, Yang C, Hart CH, Robinson CC, Wu P, Nelson DA, et al. Maternal psychological control and preschool children's behavioural outcomes in China, Russia, and the United States. In: Barker BK, editors. Intrusive Parenting: How psychological control affects children and adolescents. Washington: American Psychological Association; 2001. pp. 235-262.

Olvera N, Power TG. Brief report: parenting styles and obesity in Mexican American children: a longitudinal study. J Pediatr Psychol. 2009;35:243-249.

Ovodov ND, Crockford SJ, Kuzmin YV, Higham TF, Hodgins GW, Van der Plicht J. A 33,000-year-old incipient dog from the Altai Mountains of Siberia: evidence of the earliest domestication disrupted by the Last Glacial Maximum. PloS one. 2011;6(7):e22821.

Ozer DJ, Benet-Martinez V. Personality and the prediction of consequential outcomes. Annu Rev Psychol. 2006;57:401-421.

Packer RM, Hendricks A, Tivers MS, Burn CC. Impact of facial conformation on canine health: brachycephalic obstructive airway syndrome. PloS one. 2015;10(10):e0137496.

Palestrini C, Previde EP, Spiezio C, Verga M. Heart rate and behavioural responses of dogs in the Ainsworth's Strange Situation: a pilot study. Appl Anim Behav Sci. 2005;94(1):75-88.

Palmer R, Custance D. A counterbalanced version of Ainsworth's Strange Situation Procedure reveals secure-base effects in dog–human relationships. Appl Anim Behav Sci. 2008;109(2):306-319.

Parker HG, Dreger DL, Rimbault M, Davis BW, Mullen AB, Carpintero-Ramirez G, et al. Genomic analyses reveal the influence of geographic origin, migration, and hybridization on modern dog breed development. Cell Rep. 2017;19(4):697-708.

Patronek GJ, Glickman LT, Beck AM, McCabe GP, Ecker C. Risk factors for relinquishment of dogs to an Animal shelter. J Am Vet Med Assoc. 1996;209:572-581.

Payne E, Bennett PC, McGreevy PD. Current perspectives on attachment and bonding in the dog–human dyad. Psychol Res Behav Manag. 2017a;8:71-79.

Payne E, Bennett PC, McGreevy PD. DogTube: An examination of dogmanship online. J Vet Behav. 2017b:17:50-61.

Payne E, Boot M, Starling M, Henshall C, McLean A, Bennett P, et al. Evidence of horsemanship and dogmanship and their application in veterinary contexts. Vet J. 2015;204(3):247-254.

Peham C, Limbeck S, Galla K, Bockstahler B. Pressure distribution under three different types of harnesses used for guide dogs. Vet J. 2013;98:e93-e98.

Perri A. A wolf in dog's clothing: Initial dog domestication and pleistocene wolf variation. J Archaeol Sci. 2016;68:1-4.

Pfaller-Sadovsky N, Medina L, Dillenburger K, Hurtado-Parrado C. We Don't Train in Vain: A Systematic Review and Meta-Analysis of Human and Canine Caregiver Training. J Appl Anim Welf Sci. 2019;22:1-37.

Philpotts I, Dillon J, Rooney N. Improving the Welfare of Companion Dogs-Is Owner Education the Solution? Anim. 2019;9(662):1-22.

Plomp T, Nieveen N. Educational design research: An introduction. Enschede, The Netherlands: SLO, Netherlands Institute for Curriculum Development; 2013.

Powell L, Guastella AJ, McGreevy P, Bauman A, Edwards KM, Stamatakis, E. The physiological function of oxytocin in humans and its acute response to human-dog interactions: A review of the literature. J Vet Behav. 2019;30:25-32.

Power E. Furry families: making a human–dog family through home. Soc Cult Geogr. 2008;9(5):535-555.

Power TG. Parenting dimensions and styles: a brief history and recommendations for future research. Child Obes. 2013;9(s1):1-14.

Prato-Previde E, Custance DM, Spiezio C, Saratini F. Is the dog-human relationship an attachment bond? An observational study using Ainsworth's strange situation. Behav. 2003;140:225-254.

Prato-Previde E, Fallani G, Valsecchi P. Gender differences in owners interacting with pet dogs: an observational study. Ethology. 2006;112(1):64-73.

Price EO. Behavioral development in animals undergoing domestication. Appl Anim Behav Sci. 1999;65(3):245-271.

Quirk JT. Non-fatal dog bite injuries in the USA, 2005-2009. Public Health. 2012;126:300-302.

Rankin BH, Quane JM. Social contexts and urban adolescent outcomes: The interrelated effects of neighborhoods, families, and peers on African-American youth. Social Probl. 2002;49(1):79-100.

Rehn T, Lindholm U, Keeling L, Forkman B. I like my dog, does my dog like me? Appl Anim Behav Sci. 2014;150:65–73.

Řezáč P, Viziová P, Dobešová M, Havlíček Z, Pospíšilová D. Factors affecting dog–dog interactions on walks with their owners. Appl Anim Behav Sci. 2011;134:170-176.

Rhee KE. Childhood overweight and the relationship between parent behaviors, parenting style, and family functioning. Ann Am Acad Pol Soc Sci. 2008;615:11-37.

Rhee KE, Lumeng JC, Appugliese DP, Kaciroti N, Bradley RH. Parenting styles and overweight status in first grade. Pediatr. 2006;117:2047-2054.

Rilling JK. The neural and hormonal bases of human parental care. Neuropsychologia. 2011;51(4):731-747.

Robertson ID. The association of exercise, diet and other factors with owner-perceived obesity in privately owned dogs from metropolitan Perth, WA. Prev Vet Med. 2003;58:75-83.

Robins RW, Caspi A, Moffitt TE. It's not just who you're with, it's who you are: Personality and relationship experiences across multiple relationships. J Pers. 2002;70(6):925-964.

Robinson CC, Mandleco B, Olsen SF, Hart CH. Authoritative, authoritarian and permissive parenting practices: development of a new measure. Psychol Rep. 1995;77:819-830.

Robinson CC, Mandleco B, Olsen SF, Hart CH. The parenting styles and dimensions questionnaire. In: Perlmutter BF, Touliatos J, Holden GW, editors. Handbook of family measurement techniques. Vol.3. Instruments & index. Sage: Thousand Oaks, 2001. pp.319-321.

Rohlf VI, Bennett PC, Toukhsati S, Coleman G. Why do even committed dog owners fail to comply with some responsible ownership practices? Anthrozoös. 2010;23(2),143-155.

Rohlf VI., Bennett PC, Toukhsati S, Coleman G. Beliefs underlying dog owners' health care behaviors: results from a large, self-selected, internet sample. Anthrozoös. 2012;25(2):171-185.

Rooney NJ, Cowan S. Training methods and owner-dog interactions: Links with dog behavior and learning ability. Appl Anim Behav Sci. 2011;132(3-4):169-177.

Roth LS, Jensen P. Assessing companion dog behavior in a social setting. J Vet Behav. 2015;10(4):315-323.

Rowan A, Kartal T. Dog population & dog sheltering trends in the United States of America. Anim. 2018;8(5):68-88.

Saetre P, Strandberg E, Sundgren PE, Pettersson U, Jazin E, Bergström TF. The genetic contribution to canine personality. Genes Brain Behav. 2006;5:240–248.

Salgirli Y. Comparison of Stress and Learning Effects of Three Different Training Methods: Electronic Training Collar, Pinch Collar and Quitting Signal, doctoral dissertation. Hannover: University of Veterinary Medicine Hannover; 2008.

Salgirli Y, Schalke E, Boehm I, Hackbarth H. Comparison of learning effects and stress between 3 different training methods (electronic training collar, pinch collar and quitting signal) in Belgian Malinois Police Dogs. Rev Med Vet. 2012;163:530-535.

Sallander M, Hagberg M, Hedhammar Å, Rundgren M, Lindberg JE. Energy-intake and activity risk factors for owner-perceived obesity in a defined population of Swedish dogs. Prev Vet Med. 2010;96:132-141.

Salman MD, Hutchison J, Ruch-Gallie R, Kogan L, New Jr JC, Kass PH, Scarlett JM. Behavioral reasons for relinquishment of dogs and cats to 12 shelters. J Appl Anim Welf Sci. 2000;3(2):93-106.

Salonen M, Sulkama S, Mikkola S, Puurunen J, Hakanen E, Tiira K, et al. Prevalence, comorbidity, and breed differences in canine anxiety in 13,700 Finnish pet dogs. Sci Rep. 2020;10(2962):1-11.

Sanders MR. Triple P-Positive Parenting Program: Towards an empirically validated multilevel parenting and family support strategy for the prevention of behavior and emotional problems in children. Clin Child Fam Psychol Rev. 1999;2(2):71-90.

Sanders MR, Baker S, Turner KM. A randomized controlled trial evaluating the efficacy of Triple P Online with parents of children with early-onset conduct problems. Behav Research Therapy. 2012;50(11):675-684.

Sanders MR, Kirby JN, Tellegen CL, Day JJ. The Triple P-Positive Parenting Program: A systematic review and meta-analysis of a multi-level system of parenting support. Clin Psychol Rev. 2014;34(4):337-357.

Sandøe P, Kondrup SV, Bennett PC, Forkman B, Meyer I, Proschowsky HF, et al. Why do people buy dogs with potential welfare problems related to extreme conformation and inherited disease? A representative study of Danish owners of four small dog breeds. PloS one. 2017;12(2):e0172091.

Sandøe P, Palmer C, Corr S, Astrup A, Bjørnvad CR. Canine and feline obesity: a One Health perspective. Vet Rec. 2014;175:610-616.

Santarossa A, Parr JM, Verbrugghe A. The importance of assessing body composition of dogs and cats and methods available for use in clinical practice. J Am Vet Med Assoc. 2017;251:521-529.

Scaramella LV, Neppl TK, Ontai LL, Conger RD. Consequences of socioeconomic disadvantage across three generations: parenting behavior and child externalizing problems. J Fam Psychol. 2008;22:725–733.

Schalke E, Stichnoth J, Ott S, Jones-Baade R. Clinical signs caused by the use of electric training collars on dogs in everyday life situations. Appl Anim Behav Sci. 2007;105:369–380.

Schary DP, Cardinal BJ, Loprinzi PD. Parenting style associated with sedentary behaviour in preschool children. Early Child Dev Care. 2012;182:1015-1026.

Schilder MBH, Van der Borg JAM. Training dogs with help of the shock collar: short and long term behavioural effects. Appl Anim Behav Sci. 2004;85:319–334.

Schilder MBH, Vinke CM. Horsemanship, dogmanship and humanship. The Vet J. 2015;205:331-332.

Schleidt WM, Shalter MD. Co-evolution of humans and canids. An alternative view of dog domestication: Homo Homini Lupus?. Evol Cogn. 2003;9(1):57-72.

Serpell JA. Evidence for an association between pet behavior and owner attachment levels. Appl Anim Behav Sci. 1996;47:49-60.

Sharpe D. Your chi-square test is statistically significant: now what?. Pract Assess Res Eval. 2015;20:1-20.

Shloim N, Edelson LR, Martin N, Hetherington MM. Parenting styles, feeding styles, feeding practices, and weight status in 4–12 year-old children: A systematic review of the literature. Front Psychol. 2015;6:1-20.

Simons LG, Conger RD. Linking mother-father differences in parenting to a typology of family parenting styles and adolescent outcomes. J Fam Issues. 2007;28(2):212-241.

Simons RL, Johnson C, Conger RD. Harsh corporal punishment versus quality of parental involvement as an explanation of adolescent maladjustment. J Marriage Fam. 1994;56(3):591-607.

Simons DA, Wurtele SK. Relationships between parents' use of corporal punishment and their children's endorsement of spanking and hitting other children. Child Abuse Negl. 2010;34(9):639-646.

Smetana JG. Current research on parenting styles, dimensions, and beliefs. Curr Opin Psychol. 2017;15:19-25.

Sokol RL, Qin B, Poti JM. Parenting styles and body mass index: a systematic review of prospective studies among children. Obes Rev. 2017;18:281-292.

Spera C. A Review of the Relationship Among Parenting Practices, Parenting Styles, and Adolescent School Achievement. Edu Psychol Rev. 2005;17(2):125-146.

Spiegel IB. A pilot study to evaluate an elementary school-based dog bite prevention program. Anthrozoös. 2000;13:164-173.

Steele EH, McKinney C. Emerging adult psychological problems and parenting style: Moderation by parent-child relationship quality. Pers Indiv Dif. 2019;146:201-208.

Stoeckel LE, Palley LS, Gollub RL, Niemi SM, Evins AE. Patterns of brain activation when mothers view their own child and dog: An fMRI study. PloS one. 2014;9(10):e107205.

Tellegen CL, Sanders MR. Stepping Stones Triple P-Positive Parenting Program for children with disability: A systematic review and meta-analysis. Res Dev Disabil. 2013;34(5):1556-1571.

Thompson KF, McBride EA, Redhead E. Training engagement and the development of behavior problems in the dog: A longitudinal study. ABSTRACT. J Vet Behav. 2010;5(1):57.

Todd Z. Barriers to the adoption of humane dog training methods. J Vet Behav. 2018;25:28-34.

Tsukayama E, Toomey SL, Faith MS, Duckworth AL. Self-control as a protective factor against overweight status in the transition from childhood to adolescence. Arch Pediatr Adolesc Med. 2010;164:631-635.

Tuber DS, Hennessy MB, Sanders S, Miller JA. Behavioral and glucocorticoid responses of adult domestic dogs (Canis familiaris) to companionship and social separation. J Comp Psychol. 1996;110(1):103-108.

Urquiza-Haas EG, Kotrschal K. The mind behind anthropomorphic thinking: attribution of mental states to other species. Anim Behav. 2015;109:167-176.

Uvnäs-Moberg K, Arn I, Magnusson D. The psychobiology of emotion: The role of the oxytocinergic system. Int J Behav Med. 2005;12(2):59-65.

Van Bommel L, Johnson C. Good dog! using livestock guardian dogs to protect livestock from predators in Australia's extensive grazing systems. Wildlife Res. 2012;39(3):220-229.

Van Herwijnen IR, Van der Borg JAM, Naguib M, Beerda B. Dog-directed parenting styles mirror dog owners' orientation towards animals. Anthrozöos, in submission. 2020a.

Van Herwijnen, IR, Van der Borg JAM, Naguib M, Beerda B. Dog ownership satisfaction determinants in the owner-dog relationship and the dog's behaviour. PloS one. 2018a;13(9):e0204592.

Van Herwijnen IR, Van der Borg JAM, Naguib M, Beerda B. Rein sensor leash tension measurements in owner-dog dyads navigating a course with distractions. J Vet Behav. 2020b;35:45-46.

Van Herwijnen IR, Van Der Borg JAM, Naguib M, Beerda B. The existence of parenting styles in the owner-dog relationship. PloS one. 2018b;13(2):e0193471.

Van IJzendoorn MH, Juffer F, Duyvesteyn MG. Breaking the intergenerational cycle of insecure attachment: A review of the effects of attachment-based interventions on maternal sensitivity and infant security. J Child Psychol Psychiatry. 1995;6(2):225-248.

Van Smeden M, De Groot JAH, Moons KGM, Collins GS, Altman DG, Eijkemans MJC, et al. No rationale for 1 variable per 10 events criterion for binary logistic regression analysis. BMC Med Res Methodol. 2016;16:1-12.

Ventura AK, Birch LL. Does parenting affect children's eating and weight status? Int J Behav Nutr Phys Act. 2008;5:1-15.

Vink L, Dijkstra A. The Psychological processes involved in the development of a high-quality relation with one's dog. Hum Anim Interact Bull. 2019;(7)1:38-57.

Virányi Z, Gácsi M, Kubinyi E, Topál J, Belényi B, Ujfalussy D, et al. Comprehension of human pointing gestures in young human-reared wolves (Canis lupus) and dogs (Canis familiaris). Anim Cogn. 2008;11(3):373-387.

Vittinghoff E, McCulloch CE. Relaxing the Rule of Ten Events per Variable in Logistic and Cox Regression. Am J Epidemiol. 2006;165(6):710-718.

Voith V. Attachment of people to companion animals. Vet Clin North Am Small Anim Pract. 1985;15:289-296.

Voith V, Wright JC, Danneman PJ. Is there a relationship between canine behavior problems and spoiling activities, anthropomorphism, and obedience training? Appl Anim Behav Sci. 1992;34(3):263-272.

Volant AM, Johnson JA, Gullone E, Coleman GJ. The relationship between domestic violence and animal abuse. J Interpers Violence. 2008;23(9):1277-1295.

Vollmer RL, Mobley AR. Parenting styles, feeding styles, and their influence on child obesogenic behaviors and body weight. A review. Appetite. 2013;71:232-241.

Volsche S, Gray P. "Dog Moms" Use Authoritative Parenting Styles. Hum Anim Interact Bull. 2016;4:1-16.

Wallis LJ, Range F, Müller CA, Serisier S, Huber L, Virányi Z. Training for eye contact modulates gaze following in dogs. Anim Behav. 2015;106:27-35.

Wang L, Zhang Z, McArdle JJ, Salthouse TA. Investigating ceiling effects in longitudinal data analysis. Multivariate Behav Res. 2009;43(3):476-496.

Westgarth C, Christley RM, Jewell C, German AJ, Boddy LM, Christian HE. Dog owners are more likely to meet physical activity guidelines than people without a dog: An investigation of the association between dog ownership and physical activity levels in a UK community. Sci Rep. 2019a;9(1):1-10.

Westgarth C, Christley RM, Marvin G, Perkins E. The responsible dog owner: the construction of responsibility. Anthrozoös. 2019b;32(5):631-646.

Westgarth C, Pinchbeck GL, Bradshaw JW, Dawson S, Gaskell RM, Christley RM. Factors associated with dog ownership and contact with dogs in a UK community. BMC Vet Res. 2007;3(1):5-14.

White JK, Hendrick SS, Hendrick C. Big five personality variables and relationship constructs. Pers Individ Dif. 2004;37(7):1519-1530.

White GA, Hobson-West P, Cobb K, Craigon J, Hammond R, Millar KM. Canine obesity: is there a difference between veterinarian and owner perception? J Small Anim Pract. 2011;52:622-626.

White R, Zeiders KH, Gonzales NA, Tein JY, Roosa MW. Cultural values, US neighborhood danger, and Mexican American parents' parenting. J Fam Psychol. 2013;27(3):365-375.

Wilkes M, Bligh J. Evaluating educational interventions. Br Med J. 1999;318(7193):1269-1272.

Wilson F, Dwyer F, Bennett PC. Prevention of dog bites: Evaluation of a brief educational intervention program for preschool children. J Community Psychol. 2003;31(1):75-86.

Wilson P, Rush R, Hussey S, Puckering C, Sim F, Allely CS, et al. How evidence-based is an evidence-based parenting program'? A PRISMA systematic review and meta-analysis of Triple P. BMC Medicine. 2012;10(1):1-16.

Wing Chan T, Koo A. Parenting style and youth outcomes in the UK. Eur Sociol Rev. 2011;27(3):385-399.

Wissink IB, Dekovic M, Meijer AM. Parenting behavior, quality of the parent-adolescent relationship, and adolescent functioning in four ethnic groups. J Early Adolesc. 2006;26(2):133-159.

Wood JJ, McLeod BD, Sigman M, Hwang WC, Chu BC. Parenting and childhood anxiety: Theory, empirical findings, and future directions. J Child Psychol Psychiatry. 2003;44(1):134-151.

Wynne CD. What is special about dog cognition?. Curr Dir Psychol Sci. 2016;25(5):345-350.

Yam PS, Butowski CF, Chitty JL, Naughton G, Wiseman-Orr ML, Parkin T, et al. Impact of canine overweight and obesity on health-related quality of life. Prev Vet Med. 2016;127:64-69.

Zasloff RL, Kidd AH. Loneliness and pet ownership among single women. Psychol Rep. 1994;75(2):747-752.

Zeigler-Hill V, Highfill L. Applying the interpersonal circumplex to the behavioral styles of dogs and cats. Appl Anim Behav Sci. 2010;124(3):104-112.

Ziegert KA. The Swedish prohibition of corporal punishment: a preliminary report. J Marriage Fam. 1983;45(4):917-917.

Ziv G. The effects of using aversive training methods in dogs – A review. J Vet Behav. 2017;19:50-60.

Zolotor AJ, Theodore AD, Chang JJ, Berkoff MC, Runyan DK. Speak softly-and forget the stick: Corporal punishment and child physical abuse. Am J Prev Med. 2008;35(4):364-369.

Summary

Since its domestication the dog's living environment, including its opportunity to perform species specific behaviour, has been largely human-determined. Although the dog as a species seemingly adapted itself to this human-determined environment, aspects of modern life in Western societies can challenge the welfare of individual dogs. For instance, living without conspecifics and being left alone during an owner's working hours can result in welfare compromising separation related behaviour in dogs. Also, species specific behaviour, such as defending home territory, can result in undesired biting incidents. Generally, undesired dog behaviours challenge the dog's welfare and pressure the owner-dog relationship, with these pressures increasing as the dog increasingly takes on a role as 'surrogate family member or child'. Consequentially, it becomes even more relevant to guide dog owners towards optimal long-term interaction patterns with their dogs. These interaction patterns will determine owner-dog relationship quality, a dog's levels of (un)desired behaviours and its welfare. The long-term interaction patterns can be studied in the form of parenting styles, which were previously studied extensively in the parent-child relationship for societal and child cognitive/emotional outcomes. Four styles diverge in the underlying dimensions of demandingness–as in exerting levels of monitoring and control–and responsiveness–as in showing levels of support and warmth. When these two dimensions are high in parenting, the authoritative parenting style optimizes child outcomes. When both styles are low, uninvolved parenting challenges the child in its development. A third style, the authoritarian style, is demanding, but lacks responsiveness and a fourth, permissive, style is responsive, but lacks demandingness. Thus, diverseness in parenting styles reflects a parent's caregiving and as the human caregiving system was seen triggered by dogs, studying how parenting styles affect the owner-dog relationship can shed a new light on optimizing this evolutionary liaison. Therefore, we endeavoured to establish if and how dog-directed parenting styles affect the owner-dog relationship quality. After the general introduction in **Chapter 1**, we first addressed the need to study this relationship quality in a new way in **Chapter 2**, defining quality through measures of dog ownership satisfaction and the owner's perceived relationship with the dog in terms of (emotional) closeness, costs of caring for the dog and shared activities, such as being with the dog when relaxing. These three perceived relationship aspects are often measured with the so-called Monash Dog Owner Relationship Scales (MDORS) and we quantified associations between these MDORS-aspects, ownership satisfaction, undesired dog behaviour, and dog obedience class attendance. Nine hundred seventy-seven Dutch dog owners answered online questions on five-point Likert scales. Their answers were compared using logistic regressions and ANOVA's and we found the likeliness of an

owner being less than very satisfied with dog ownership to associate most strongly with costs of ownership. Also, costs of ownership related directly to a dog's aggression and/or disobedience. Interestingly, the latter two behaviours, but not obedience class attendance, combined with lesser dog ownership satisfaction. This is surprising as obedience classes are thought to contribute to satisfying dog-owner relationships. Possibly, the training methods taught affect obedience class outcomes, as choke chain use was seen to combine with higher perceived costs and lesser satisfaction in our study, although we cannot indicate the direction of this association due to our retrospective study set up. Our findings provided argumentation for studying owner-dog relationship quality in a new way. Particularly, we were interested in how dog owners guide their dogs longer term and to which avail. In **Chapter 3** we therefore studied parenting styles as a new way to look at owner to dog guidance. To establish if parenting styles exist in this particular relationship, we adapted the Parenting Styles and Dimensions Questionnaire from parent-child studies to apply to dog owners. Five hundred eighteen Dutch parents that also owned one or more dogs, answered questions, again on five-point Likert scales and Principal Component Analyses (PCA) grouped their parenting propensities into styles. Resulting components indicated similarities, but also differences in styles directed at children and dogs. An authoritarian-correction orientated (AUC) style captured variation in demandingness and focussed on verbally/physically correcting a dog's undesired behaviours. This AUC style was alike the original child-directed authoritarian style in reflecting demandingness. The original child-directed authoritative style differentiated when directed at dogs. An authoritative-intrinsic value orientated (AUI) style captured variation in mainly responsiveness and oriented on the assumed dog needs/emotions. An authoritative-training orientated (AUT) style captured variation in demandingness *and* responsiveness, and orientated on teaching a dog how to socially behave. No permissive or uninvolved style surfaced in the PCA, which could be attributed to our sample of likely highly engaged dog owners. However, for measurement of the found authoritarian and two authoritative styles, the Dog-Directed Parenting Styles and Dimensions Questionnaire was constructed as a survey tool. This provided a fundament for further studying of the dog-directed parenting styles and in **Chapter 4** we researched what makes dog owners adopt certain dog-directed parenting styles. Orientations towards animals, capsulizing mainly views on dog ownership, could play a role and we determined two such orientations in the same study population of 518 dog owners, again using a PCA. Firstly, a dominionistic orientation expressed an owner-felt need to boss over the dog and valuing the dog for its utility. Secondly, a combined humanistic/protectionistic orientation expressed levels of humanizing the dog and levels of animal respect. Spearman rank correlations revealed how the dominionistic orientation combined with the AUC style. Apparently, high demandingness and use of correctional methods results from bossing over the dog. Furthermore, the humanistic/protectionistic orientation associated with the AUI style. Seemingly, high responsiveness and regard for

the dog's feelings/needs result from humanizing the dog. Found associations between orientations and styles were not overly strong. However, the clear difference between the AUC and AUI style indicates that orientations towards animals can in part affect how dog owners adopt certain parenting styles. A logical next question addressed by us in **Chapter 5** was if parenting styles express in certain owner/dog behaviours. We surveyed 41 owners on their dog-directed parenting styles and observed their behaviours and those of their dogs during a more demanding distraction course and a more relaxed breaktime setting. Particularly owner behaviours were seen to combine with the styles, such as the owner's verbal praising of the dog relating directly to the AUI/AUT style and inversely to the AUC style. The latter style related directly to verbal corrections and leash pressures. These style-related behavioural differences in the owner may affect a dog's behaviour. Particularly, we found a dog's looking at the owner to associate directly with the AUT style and inversely with the AUC style during the demanding distraction course. With leash tensions established as one of the attention points, future studies would benefit from an objective measure of leash tensions. Hence, in **Chapter 6** an equine measurement tool for rein tension was piloted in 24 owner-dog dyads walking a food-distraction course and a more complex zigzag object-distraction course as to identify such an objective measurement tool. We averaged leash tension sample points per owner-dog dyad per course and used Restricted Maximum Likelihood (REML) to test our prediction of the second, more challenging course, triggering increased leash tension, accounting for the dogs' body weight differences. Indeed, leash tensions were 1.6 times higher during the more challenging course, supporting that this equine 'rein sensor' is applicable for measuring leash tension in the owner-dog relationship. Next to indicating a tool for objective measurement of leash tensions, we also wanted to indicate if dog-directed parenting styles could foreseeably affect a dog's physique. Such physical effects are known in the parent-child relationship for a child's weight status, that is being underweight, healthy-weight or overweight/obese. To investigate if similar physical effects could be at play in the owner-dog relationship, we associated a dog owner's style of parenting his/her dog with the reporting on the dog's weight in **Chapter 7**. Again, we used questionnaires, but this time our study sample consisted of dog owners independent of parenting children. Also, this sample was larger with 2,303 Dutch dog owners answering questions on parenting styles and their dog's weight as measured through (nine-point scale) 'Body Condition Scores' (BCS). The BCS were categorised in underweight (scores one to three), healthy-weight (scores four and five) and overweight/obese (scores six to nine) and with Chi-square tests overweight/obese dogs were found overrepresented in the quartile of dog owners with the highest level of permissive parenting. This finding corresponded with parent-child studies, where permissive parenting combined with child overweight. Likely, not only weight management in the child, but also in the dog, can benefit from moving the care provider away from less permissive styles of parenting. Physical factors, such as consequential to a dog's weight,

will affect dog welfare. However, dog welfare is also determined by the owner perceived relationship with the dog. Therefore, in **Chapter 8** we studied the owner's satisfaction and MDORS-perceived relationship with the dog again, and this time we related these relationship quality factors to dog-directed parenting style outcomes, in our sample of 2,305 Dutch dog owners. The AUC style was the only style to result in higher predicted mean probabilities of being less than very satisfied with dog ownership through logistic regression. Also, the AUC style combined with less favourable scores on the MDORS perceived relationship aspect of costs, through ANOVA's. Thus, owners high in AUC seemed at a higher risk of lesser relationship quality. Contrary, the AUI style combined with MDORS-aspects of closeness and shared activities, such as being with the dog when relaxing. More importantly, the AUT style combined with more favourable scores on costs of caring for the dog. Parenting the dog to a high degree AUT, thus focussing on teaching a dog how to socially behave, may protect dog owners from feeling burdened by their dog ownership and this makes it even more interesting to study if owners can be facilitated in adopting this style. Therefore, our final study was on the effectiveness of educational interventions in changing a dog owner's parenting style. In **Chapter 9** we tested two online educational interventions, both consisting of an online slide presentation and three informative videos, but offering either parenting or training content. The 88 participating dog owners were randomly assigned to this parenting or training content and effects of the intervention were tested with REML incorporating the fixed effects of phase (pre/post-intervention), content (parenting/training) and the interaction between these. In our sample of owners that largely parented with the AUT style, the AUC style was seen lowered by both parenting and training content and the AUT style was seen increased by training content only. Thus, online educational interventions could benefit long term owner-dog interactions, but the optimal content needs to be defined yet. An interesting point for future studies is reaching those owners that need education most. So far, educational interventions as well as effectiveness studies thereof seem challenged to reach a broad study sample, including lower educational levels and equal numbers of males as females. All of the studies done by us likewise held large proportions of highly educated females and this is not unique to our research as detailed in the general discussion in **Chapter 10.** Notwithstanding this challenge, and our lack of finding permissive and uninvolved styles of parenting which may affect dog welfare and the owner-dog relationship quality more so than our found styles of AUC, AUI and AUT, the establishment of these styles offers new ways of looking at the evolutionary bond between owner and dog. We found distinct styles of parenting the dog, in line with child-directed parenting styles, with differences in part contributable to an owner's orientation towards the dog. Also, in our study sample of highly engaged owners we found logical associations with owner and dog behaviours, dog outcomes of weight, and relational aspects of satisfaction, costs, closeness and shared activities between owner and dog. Finally, we demonstrated that dog-directed parenting

styles were susceptible to (online) educational intervention effects, even in populations that seemingly already parent at high levels of demandingness and responsiveness. This opens doors to benefitting the owner-dog relationship and dog welfare in those owners that are not yet so highly engaged with their dog's guidance. How to reach and involve such owners, that may be less inclined to partake in studies, needs to be understood better as to reach our ultimate goal of optimized owner-dog relationships.

Samenvatting

Sinds de domesticatie van de hond, wordt diens leefomgeving grotendeels bepaald door de mens. De hond heeft zich aangepast aan dit leven met en nabij de mens. Echter, zijn aanpassingsvermogen aan het moderne leven in Westerse samenlevingen lijkt grenzen te kennen. Zo kan het alleen laten van de hond tijdens werkdagen van diens eigenaar bijdragen aan scheiding-gerelateerde problemen, zeker bij die honden die zonder soortgenoten leven. Bovendien kan soort-specifiek gedrag, zoals het verdedigen van het territorium, leiden tot ongewenste bijtincidenten. Bijtincidenten, maar ook ander ongewenst hondengedrag, vormen een risico voor hondenwelzijn en de eigenaar-hond relatie. Temeer omdat de hond in toenemende mate de rol krijgt toebedeeld van familielid of kind en dus letterlijk en figuurlijk dichtbij de mens leeft. Als gevolg daarvan wordt het nog relevanter om de hondenhouder te begeleiden naar optimale lange termijn interactiepatronen met de hond. Deze interactiepatronen bepalen mede de kwaliteit van de eigenaar-hond relatie, het ontstaan/verergeren van (on)gewenst hondengedrag en de mate waarin de hond in welzijn leeft. Lange termijn interactiepatronen in de eigenaar-hond relatie kunnen worden bestudeerd aan de hand van opvoedstijlen. Dergelijke opvoedstijlen zijn eerder uitgebreid bestudeerd in de ouder-kindrelatie en staan bekend om hun invloed op de cognitie, emotie en maatschappelijke aangepastheid van opgroeiende kinderen. Vier opvoedstijlen reflecteren twee onderliggende dimensies. De dimensie van controle betreft het uitoefenen van controle en monitoring. De dimensie van responsiviteit betreft het bieden van ondersteuning en warmte. Wanneer deze twee dimensies beide sterk vertegenwoordigd zijn in een opvoedstijl, wordt gesproken van een gezaghebbende opvoedstijl. De gezaghebbende opvoedstijl staat bekend om optimale uitkomsten van de opvoeding voor kind en maatschappij. Zijn beide dimensies zwak vertegenwoordigd in een opvoedstijl? Dan daagt een niet-betrokken opvoedstijl het kind uit in zijn ontwikkeling. Een derde opvoedstijl, de autoritaire opvoedstijl, is controlerend, maar mist responsiviteit. De vierde tot slot–de permissieve opvoedstijl–is responsief, maar ontbeert controle.

De diversiteit in opvoedstijlen weerspiegelt hoe zorg van een ouder voor een kind wordt vormgegeven. Aangezien eerdere studies aantonen dat het menselijke zorgsysteem door honden wordt geactiveerd, is het zinvol te bestuderen of en zo ja hoe opvoedstijlen van toepassing zijn op de eigenaar-hond relatie. Kennis over 'hondgerichte opvoedstijlen' kan nieuw licht werpen op het optimaliseren van deze evolutionair diepgewortelde relatie. Daarom onderzoeken we in dit promotietraject of en zo ja hoe, hondgerichte opvoedstijlen de kwaliteit beïnvloeden van de eigenaar-hond relatie. Na de algemene inleiding in **Hoofdstuk 1**, bespreken we eerst de noodzaak tot het op nieuwe wijze

bestuderen van de kwaliteit van de eigenaar-hond relatie in **Hoofdstuk 2**. Daarbij operationaliseren we 'kwaliteit' middels tevredenheid met hondenbezit en middels scores op de zogenaamde 'Monash Dog Owner Relationship Scales' (MDORS). MDORS brengt de eigenaar-hond relatie in beeld doordat eigenaren scoren hoe ze de volgende drie aspecten waarderen: emotionele nabijheid tot de hond, kosten van zorg voor de hond en gedeelde activiteiten met de hond, zoals bij de hond zijn tijdens ontspanningsmomenten. De betreffende drie MDORS-aspecten, alsmede ongewenst hondengedrag en het volgen van gehoorzaamheidscursus met de hond, relateren we in de eerste studie aan de tevredenheid met hondenbezit. De online antwoorden van negenhonderd zevenenzeventig Nederlandse hondeneigenaren op vijf-punt Likertschalen vergelijken we met behulp van logistische regressies en variantieanalyse (ANOVA's) en we vinden de sterkste relatie tussen zeer tevreden hondenbezit en (lage) ervaren kosten van zorg voor de hond. De ervaren kosten van zorg voor de hond en de tevredenheid met hondenbezit laten een minder rooskleurig beeld zien als er sprake is van meer ongewenst hondengedrag bij de hond. Specifiek het ongewenste hondengedrag van agressie en/of ongehoorzaamheid relateert aan hogere ervaren kosten en verminderd zeer tevreden hondenbezit. Tegen de verwachting in blijkt het volgen van gehoorzaamheidscursus met de hond niet te relateren aan tevredenheid met hondenbezit. Dit terwijl de gangbare mening is dat deze cursussen daaraan bijdragen. Mogelijk beïnvloedt de gebruikte trainingsmethode de uitkomsten van gehoorzaamheidscursus, omdat in onze studie het gebruik van slipkettingen relateert aan lagere tevredenheidsscores en hogere ervaren kosten van zorg voor de hond, hoewel de richting van de relatie niet geduid kan worden middels onze retrospectieve studie.

De uitkomsten van deze eerste studie vormen argumentatie om de kwaliteit van de eigenaar-hond relatie op een nieuwe manier te onderzoeken. In het bijzonder zijn we geïnteresseerd in lange termijn interacties tussen hondeneigenaar en hond. In **Hoofdstuk 3** bestuderen we daarom of opvoedstijlen, welke lange termijn interacties reflecteren, in deze relatie van toepassing zijn. We maken daarbij gebruik van een vragenlijst over opvoedstijlen/dimensies uit ouder-kind-onderzoeken, welke door ons toepasbaar wordt gemaakt voor eigenaar-hond situaties. Vijfhonderdachttien Nederlandse ouders die ook één of meer honden bezitten, beantwoorden vragen, opnieuw op vijf-punt Likertschalen. Een Principale Componenten Analyse (PCA) groepeert de verkregen informatie over hondenopvoeding in een drietal hondgerichte opvoedstijlen. De gevonden PCA-componenten wijzen op overeenkomsten, maar ook op verschillen tussen opvoedstijlen gericht op kind en op hond. Een autoritaire correctie-georiënteerde (AUC) opvoedstijl reflecteert variatie in controle, met een focus op verbaal/fysiek corrigeren van ongewenst hondengedrag. Deze AUC-opvoedstijl is vergelijkbaar met de originele, kindgerichte, autoritaire opvoedstijl. In tegenstelling tot de autoritaire opvoedstijl, zien we bij de hondgerichte gezaghebbende opvoedstijl een differentiatie ten

opzichte van de kindgerichte opvoedstijl. De hondgerichte gezaghebbende opvoedstijl splitst zich namelijk. Deze splitsing resulteert in een gezaghebbende-intrinsieke waarde georiënteerde (AUI-) opvoedstijl, welke variatie reflecteert in voornamelijk responsiviteit, met een focus op veronderstelde behoeften/emoties bij de hond. Een tweede gezaghebbende opvoedstijl is training georiënteerd (AUT) en reflecteert variatie in controle en responsiviteit met een focus op het aanleren van gewenst gedrag aan de hond. De permissieve en niet-betrokken opvoedstijlen worden in dit onderzoek niet gevonden. Mogelijk kan dit worden toegeschreven aan onze steekproef van waarschijnlijk zeer betrokken hondeneigenaren. Voor het meten van de gevonden autoritaire en twee gezaghebbende opvoedstijlen, maken we de zogenoemde 'Dog-Directed Parenting Styles and Dimensions Questionnaire' (DD-PSDQ) als enquêtemiddel voor vervolgonderzoek.

Deze DD-PSDQ biedt een fundament voor het verder bestuderen van hondgerichte opvoedstijlen en in **Hoofdstuk 4** beschouwen we wat bij hondeneigenaren meespeelt als zij zich een opvoedstijl aanmeten. Oriëntaties ten opzichte van dieren, met name honden, spelen daarbij mogelijk een rol. Daarom bepalen we de aanwezigheid van deze zogenaamde dieroriëntaties in de eerder gebruikte studiepopulatie van 518 hondeneigenaren, opnieuw met behulp van een PCA. We vinden een 'dominerende dieroriëntatie' en een gecombineerde 'humaniserende/beschermende dieroriëntatie'. De eerste dieroriëntatie reflecteert de behoefte van de eigenaar de baas te zijn over zijn hond alsmede een nutswaarde van de hond voor diens eigenaar. De tweede dieroriëntatie reflecteert de neiging tot vermenselijking van de hond en niveaus van respect voor dieren. Spearman rang correlaties duiden vervolgens hoe de dominerende dieroriëntatie relateert aan de AUC-opvoedstijl. In de opvoeding van de hond zijn inzet van controle en correctiemethoden blijkbaar gerelateerd aan de behoefte van de eigenaar om de baas over de hond te zijn. Daarnaast duiden de rang correlaties dat de humaniserende/beschermende oriëntatie relateert aan de AUI-opvoedstijl. Het lijkt erop dat responsiviteit en het centraal stellen van de gevoelens/behoeften van de hond bij diens opvoeding het gevolg zijn van het humaniseren van de hond. Hoewel de relaties tussen dieroriëntaties en opvoedstijlen niet zeer sterk zijn, duidt het verschil tussen AUC en AUI erop dat dieroriëntaties, deels, beïnvloeden hoe hondeneigenaren zich bepaalde opvoedstijlen aanmeten.

Een logische vervolgvraag is dan ook of opvoedstijlen zich tonen in bepaald gedrag van de eigenaar/hond. **Hoofdstuk 5** beschrijft daarom hoe hondgerichte opvoedstijlen samenhangen met observaties van verschillende gedragingen getoond door 41/36 eigenaar-hond combinaties tijdens een parcours met afleiding en tijdens een ontspannen pauzetijd. Met name het gedrag van de eigenaar in deze twee situaties blijkt samen te hangen met de hondgerichte opvoedstijlen. Zo relateert gezaghebbend opvoeden (AUI/AUT) aan het verbale belonen van de hond. De AUC-opvoedstijl relateert

juist aan verbale reprimandes en aan riemspanningen. Deze opvoedstijl-afhankelijke gedragsverschillen bij de hondeneigenaar kunnen het gedrag van de hond beïnvloeden. Zo relateert het hondengedrag 'oogcontact zoeken met de eigenaar' direct aan de AUT-opvoedstijl, maar indirect aan de AUC-opvoedstijl tijdens het parcours met afleiding.

In dit onderzoek vinden we dat riemspanningen, dat wil zeggen de mate van spanningen die op een hondenriem staan, ertoe doen. Daarom zouden toekomstige studies baat kunnen hebben bij een objectieve maat voor dergelijke riemspanningen. In **Hoofdstuk 6** testen we een uit de paardenwereld afkomstig teugelspanning-hulpmiddel als mogelijk objectief meetinstrument voor eigenaar-hond riemspanningen. Dit doen we bij 24 eigenaar-hond combinaties die twee parcoursen doorlopen: een parcours met enkel voedselafleiding en een lastiger zigzag parcours met objectafleiding. De gemeten riemspanningen worden door ons gemiddeld over elke eigenaar-hond combinatie en per parcours en we gebruiken Restricted Maximum Likelihood (REML) om onze voorspelling te toetsen dat het tweede, lastiger, parcours meer riemspanningen geeft, rekening houdend met de verschillen in lichaamsgewicht bij de honden. De riemspanningen blijken inderdaad ruim anderhalf keer groter tijdens het tweede parcours, wat een indicatie geeft dat het teugelspanning-hulpmiddel toepasbaar is als objectieve testmogelijkheid voor het meten van riemspanningen in de eigenaar-hond relatie.

Naast onze interesse in eigenaar-hond gedragsparameters en objectieve testmogelijkheden daarvoor, ligt onze interesse ook bij fysieke parameters die beïnvloed kunnen worden door hondgerichte opvoedstijlen. Een logische keuze is het onderzoeken van de fysieke parameter van lichaamsgewicht van de hond. Dit omdat vanuit kindgericht onderzoek bekend is dat overgewicht bij een kind kan relateren aan de opvoedstijl van de ouder. Daarom relateren we in **Hoofdstuk 7** de hondgerichte opvoedstijl van de eigenaar aan het gewicht van de hond, meer specifiek aan de zogenaamde 'Body Condition Scores' (BCS). Opnieuw gebruiken we vragenlijsten. Deze keer bestaat onze steekproef uit 2.303 deelnemers. De deelnemers zijn allen hondeneigenaren en kunnen daarnaast wel of niet ouder zijn van één of meer kinderen. De BCS worden onderverdeeld in ondergewicht (scores één tot drie), gezond gewicht (scores vier en vijf) en overgewicht/obesitas (scores zes tot negen). Vervolgens toetsen we met Chi-kwadraattests verschillen in verwachtte en gevonden aantallen en vinden we dat honden met overgewicht/obesitas oververtegenwoordigd zijn in het hoogste kwartiel van de permissieve hondgerichte opvoedstijl. Deze bevinding komt overeen met uitkomsten van ouder-kindgerichte studies, waarbij een permissieve opvoedstijl eveneens relateert aan overgewicht. Waarschijnlijk kunnen dus niet alleen gewichtsmanagementprogramma's gericht op het kind maar ook die gericht op de hond, baat hebben bij het adresseren van een permissieve opvoedstijl.

Fysieke factoren, zoals (de gevolgen van) overgewicht, beïnvloeden het welzijn van de hond. Het welzijn van honden wordt echter ook in hoge mate bepaald door de kwaliteit van de eigenaar-hond relatie. Daarom relateren we in **Hoofdstuk 8** opnieuw de tevredenheid met hondenbezit en MDORS-scores, deze keer echter aan de hondgerichte opvoedingsstijlen, in de onderzoekspopulatie van 2.303 hondeneigenaren. De AUC-opvoedstijl is de enige opvoedstijl die resulteert in een hogere voorspelde gemiddelde kans om in mindere mate zeer tevreden te zijn met hondenbezit, zoals bepaald middels logistische regressie. Ook relateert deze AUC-opvoedstijl aan minder gunstige MDORS-scores betreffende de ervaren kosten van zorg voor de hond, zoals bepaald middels ANOVA's. Eigenaren die in hoge mate worden gekenmerkt door de AUC-opvoedstijl lijken dus een risico te lopen op een mindere ervaren kwaliteit van de eigenaar-hond relatie. In contrast daarmee, relateert de AUI-opvoedstijl aan gunstiger MDORS-scores betreffende emotionele nabijheid en gedeelde activiteiten en relateert de AUT-opvoedstijl aan gunstiger scores betreffende de ervaren kosten van zorg voor de hond. De AUT-opvoedstijl richt zich op het aanleren van gewenst gedrag aan de hond en mogelijk beschermt dit een hondeneigenaar tegen ervaren kosten van zorg voor de hond. Dit maakt het van waarde te onderzoeken of hondeneigenaren onder invloed van educatieve interventies zich een andere opvoedstijl kunnen aanmeten.

Tot slot bestuderen we dan ook de effectiviteit van twee online educatieve interventies op hondgerichte opvoedstijlen in **Hoofdstuk 9**. Beide interventies bestaan uit een online-presentatie en drie informatieve video's. Eén interventie bevat opvoedingsinformatie, één interventie bevat trainingsinformatie. De 88 deelnemende hondeneigenaren worden willekeurig toegewezen aan deze opvoed- of trainingsinformatie en de effecten van de interventie worden getest met REML's waarin we de vaste effecten van fase (pre/post-interventie), informatie (opvoeding/training) en de interactie daartussen opnemen. De hondeneigenaren in ons onderzoek kenmerken zich in hoge mate door een AUT-opvoedstijl. In deze specifieke groep, wordt de AUC-opvoedstijl verlaagd door zowel de opvoedings- als de trainingsinformatie en wordt de AUT-opvoedstijl alleen verhoogd door de trainingsinformatie. Hieruit maken we op dat online educatieve interventies hondgerichte opvoedstijlen kunnen beïnvloeden, maar dat de optimale educatieve inhoud nog bepaald moet worden. Een interessant punt voor toekomstige studies is het bereiken van die eigenaren die het meeste baat zullen hebben bij dergelijke educatieve interventies. Tot nu toe lijken educatieve interventies en gerelateerde effectiviteitsstudies uitgedaagd in het bereiken en betrekken van een brede deelnemersbasis, inclusief lagere opleidingsniveaus en evenveel mannen als vrouwen. Alle onderzoeken binnen dit PhD-project weten namelijk voornamelijk hoogopgeleide vrouwen te enthousiasmeren tot deelname en dit is niet uniek voor ons onderzoek, zoals beschreven in de algemene discussie in **Hoofdstuk 10**.

Ondanks deze uitdaging en het nog niet identificeren van een duidelijke permissieve en/of niet-betrokken hondgerichte opvoedstijl, welke wellicht hondenwelzijn en kwaliteit van de eigenaar-hond relatie sterk kunnen beïnvloeden, bieden de gevonden drie opvoedstijlen nieuwe aanknopingspunten voor het optimaliseren van de evolutionaire band tussen eigenaar en hond. In dit PhD-project tonen we aan dat hondgerichte opvoedstijlen een rol spelen in de eigenaar-hond relatie, duiden we verschillen tussen hondgerichte en kindgerichte opvoedstijlen op basis van dieroriëntaties en vinden we logische relaties tussen de opvoedstijlen en het gedrag van eigenaren en honden, overgewicht bij de hond en relationele aspecten van tevredenheid met hondenbezit, kosten van zorg voor de hond, emotionele nabijheid en gedeelde eigenaar-hond activiteiten. Tot slot tonen we aan dat hondgerichte opvoedstijlen gevoelig zijn voor de effecten van (online) educatieve interventies, zelfs in populaties die in hoge mate gekenmerkt worden door gezaghebbende opvoedstijlen. Dit biedt nieuwe wegen om de kwaliteit van de eigenaar-hond relatie en hondenwelzijn te bevorderen, juist ook voor die eigenaren die nog niet in hoge mate betrokken zijn bij de begeleiding van hun hond. Hoe dergelijke eigenaren te bereiken en te betrekken, is een interessante uitdaging voor vervolgonderzoek, in het streven naar optimalisatie van de eigenaar-hond relatie.

Curriculum Vitae

Ineke Rombout van Herwijnen was born on April 17th 1977 in Rhoon, the Netherlands, and ventured into 'the world of the dog' for the first-time during travels to Australia, after finishing her studies on human nutrition and public/preventive education in Groningen (BSc Nutrition and Dietetics specialisation public/preventive education) and Wageningen (MSc Human nutrition specialisation public health). In Queensland she worked with assistance dogs of several types, and upon her return to the Netherlands in 2000 she continued to develop her dog skills and knowledge, successfully concluding courses on dog training, therapy and testing, while working as an international communication manager for a large multinational. On a voluntary basis she worked with dog owners at a dog school belonging to a large animal charity in the Netherlands. Later she became co-owner of a dog school, while being a board member of the association for dog trainers in the Netherlands. In January of 2009 she started as director at the Royal Association for the Protection of Dogs in the Netherlands. This Association contributes to dog welfare and responsible dog ownership. Through the years the experience of seeing so many owner-dog relationships going wrong, instilled the desire to contribute with research to the prevention of less-than-optimal owner-dog relationships. Consequently, in September 2016 Ineke started a PhD-project on dog-directed parenting styles with Wageningen University and Research.

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Upon reaching the top of a mountain we look back and realise it was not reaching the summit, but the journey towards the summit that made us who we are.

WIAS Training and Education statement

Completed in fulfilment of the requirements for the Education Certificate of the *Wageningen Institute of Animal Sciences*

The Basic Package	2 ECTS
WIAS Introduction Course	2017
Ethics for Social Sciences Research	2018
Scientific Integrity & Ethics and Animal Science	2019
Disciplinary Competences	3 ECTS
WIAS/PE&RC Design of Experiments	2016
Writing research/grant proposal–Dobberke & UFAW	2016
PE&RC Basic Statistics	2017
Professional Competences	15 ECTS
How to address the media, external: Hogeschool Utrecht	2011
WIAS-proposal Dog-directed parenting styles, effect on dog quality of life	2016
Techniques for scientific writing–How to write a scientific paper coursera	2017
Techniques for scientific writing–WUR Scientific Writing	2017/2018
WUR Posters and pitching	2018
WUR How to supervise MSc-thesis students	2018
Societal Relevance	2 ECTS
WIAS Societal impact of your research	2018
Presentation Skills	4 ECTS
ISAE 2017–oral presentation	2017
WIAS-science day 2018 oral presentation	2018
Canine Science forum 2018 poster presentation	2018
WIAS-science day 2019 oral presentation	2019
Teaching competences	6 ECTS
Lecturing–February 2017–Companion Animals (human-animal relationship)	2017
Lecturing–February 2018–Companion Animals (human-animal relationship)	2018

Case study groups–February 2018–Companion Animals (human-animal relationship)	2018
Case study groups–February 2019–Companion Animals (human-animal relationship)	2019
Supervising MSc-students	2017-2019

EDUCATION AND TRAINING TOTAL **32 ECTS**

One ECTS credit equals a study load of approximately 28 hours