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Associations Between Companion Animal Caregiving Characteristics and Perceived Stress Among Chinese Older Adults: A Multicenter Cross-Sectional Study

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Simple Summary

Stress is a major public health concern for older adults, and perceived stress is associated with a range of physical and mental health problems in later life. Pet ownership has become increasingly common among older adults and may affect human well-being in different ways. However, it remains unclear how different pet-keeping characteristics relate to perceived stress in this age group. This study analyzed data from 1428 adults aged 60 years and older across five provinces of China. Companion-animal owners, especially those keeping dogs only, reported lower perceived stress than non-owners. Longer ownership duration and regular hands-on pet care were associated with lower stress. In contrast, frequent pet illness and weekly dog walking were associated with higher perceived stress, which may partly offset the observed inverse associations. These findings provide local evidence for supporting older pet caregivers and for promoting responsible ownership and animal welfare in aging societies.

Abstract

Objectives: Pet ownership may affect older adults' health in multiple ways, yet its specific association with perceived stress remains unclear. From a One Welfare perspective, this study examined associations between companion-animal ownership, diverse companion animal caregiving characteristics, and perceived stress among Chinese older adults. **Methods**: A multicenter cross-sectional study was conducted among older adults recruited from five provinces in China between August 2024 and January 2025. Perceived stress was measured using the 14-item Perceived Stress Scale (PSS-14) among 1428 eligible participants aged 60 years or older. Multiple linear regression models were used to examine these associations, adjusting for sociodemographic, socioeconomic, and health-related confounders. **Results**: In fully adjusted models, companion-animal ownership was associated with significantly lower perceived stress compared with non-ownership. Stratified analyses showed that this association was significant only among exclusive dog owners. Longer ownership duration (>3 years) and frequent hands-on pet care were also associated with lower perceived stress. In contrast, frequent pet illness and weekly dog walking were linked to higher perceived stress. **Conclusions**: Pet ownership, particularly exclusive dog ownership and long-term companionship, was significantly associated with lower perceived stress in Chinese older adults. However, caregiving burdens, such as managing pet illness and weekly dog walking, may partly explain the weaker observed associations. These findings offered localized empirical evidence and highlighted the need for targeted support systems that consider both older adults' mental health and companion-animal welfare within a One Welfare framework.

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Keywords: older adults; companion-animal ownership; caregiver burden; perceived stress; One Welfare

1. Introduction

Stress constitutes a major public-health threat to physical and psychological well-being across demographic groups, with older adults particularly vulnerable to its adverse impacts [1]. Chronic stress not only disrupts health-related behaviors but also impairs the function of the cardiovascular, autonomic nervous, endocrine and immune systems [2,3], increasing the risk and progression of multiple chronic conditions. Perceived stress reflects individuals' subjective appraisal of stressors and is a reliable indicator of psychological stress responses [4–6]. In later life, stress stems from age-specific adversities including physical deterioration, difficulties adjusting to changing social roles, multimorbidity-related physical discomfort, financial hardship, and caregiving obligations. Since stressful experiences in later life are often accompanied by strong feelings of helplessness, perceived stress better captures real-world psychological strain among older adults. Cumulative evidence indicates that higher perceived stress among older adults correlates strongly with depression, anxiety, cognitive decline, sleep disturbance and cardiovascular disease [7,8], all of which undermine both physical and mental health and quality of life. Accordingly, identifying effective approaches to reduce perceived stress is critical to advancing healthy aging.

Despite a range of psychosocial interventions developed to alleviate stress in older adults, human–companion-animal interactions remain an underexamined factor in older adults' mental health. Pet ownership has grown in popularity among older adults globally. Socio-economic changes have transformed the roles of animals in human households. Animals historically kept primarily for labor have become companion animals that offer emotional support to household members, including older adults, alongside new caregiving responsibilities for owners. Under the One Welfare framework, animal welfare, human well-being and the shared domestic environment are recognized as interconnected through bidirectional human–animal interactions [9]. One Welfare explicitly links the welfare of companion animals to human social and emotional health, including the burdens and rewards of caregiving [9,10]. Whereas One Health-informed research has traditionally prioritised zoonotic disease risks [11], this study focuses on the psychological and caregiving dimensions of human–companion-animal bonds. Human–companion-animal relationships cannot be adequately characterized through a simple binary comparison between pet owners and non-owners. Instead, key dimensions including pet health status, length of pet ownership, and pet-related caregiving demands together shape the quality of human–animal interactions, and animal welfare is central to responsible pet care.

Against this conceptual backdrop, a substantial body of literature has examined the mental-health correlates of pet ownership, encompassing outcomes such as anxiety, depression, loneliness, social support and life satisfaction, yet consensus has not been achieved. One systematic review synthesising 54 studies reported mixed associations between pet ownership and mental health, including beneficial, detrimental and null findings [12]. A subsequent meta-analysis by Martins et al. further demonstrated that pet ownership was not associated with measurable improvements in mental health but was linked to higher physical activity levels [13]. When focusing specifically on perceived stress, available evidence remains sparse and contradictory, especially for older cohorts. Some investigations have reported lower perceived stress among dog owners relative to non-owners [14,15], with several studies additionally noting an inverse association between pet attachment and perceived stress; however, such favourable patterns were not consistently observed among cat-owning older adults [16]. Other studies, by contrast, detected no inter-group differences

in perceived stress levels between pet owners and non-owners [17]. These inconsistencies may partly reflect differences in study samples, cultural contexts, and the common practice of treating pet ownership as a simple binary variable. Few studies consider the broader pet-keeping characteristics highlighted by a One Welfare perspective, which may partly account for such divergent findings.

Existing relevant work draws predominantly on Western adult samples, and robust empirical data specific to Chinese older adults remain scarce. Against this backdrop, this multicenter cross-sectional study had two main objectives: first, to evaluate associations between a suite of pet-keeping characteristics and perceived stress among community-dwelling Chinese older adults; second, to interpret these associations within the One Welfare framework that accounts for both human mental health and companion-animal welfare. It is expected that these findings can provide empirical evidence to support culturally appropriate, companion-animal-based approaches for stress reduction and mental-health promotion among older Chinese adults.

2. Materials and Methods

2.1. Study Design and Participants

A nationwide, multicenter cross-sectional study was conducted from August 2024 to January 2025 to evaluate the association between pet ownership and perceived stress among Chinese older adults. To obtain a representative sample, a mixed sampling strategy combining quota and alternating sampling was adopted across five provinces. These regions—Zhejiang and Jiangsu (eastern), Henan (central), and Shaanxi and Xinjiang (western)—were strategically selected to capture the country's diverse economic, geographic, and sociocultural landscapes. Within each targeted province, 3 to 4 community health service centers were randomly selected as primary recruitment hubs. To achieve balanced exposure groups, we employed a 1:1 quota-based enrollment protocol at each site, aiming to recruit one non-pet owner for every pet owner, with a target sample size of 80 to 100 participants per facility.

Eligibility was restricted to individuals aged 60 and above who had sufficient cognitive capacity to provide informed consent and independently complete the assessments. To minimize acute stress biases related to our primary outcome (perceived stress), we strictly excluded participants who had experienced major life traumas (e.g., recent bereavement) within the preceding three months. Individuals with clinically diagnosed severe psychiatric disorders, advanced dementia, or terminal physical illnesses were also excluded. Of the 1507 distributed surveys, strict quality control procedures yielded a final analytical sample of 1428 valid responses. The study protocol was approved by the Medical Ethics Committee of the School of Public Health, Zhejiang University (Approval No.: ZGL202406-8). Written informed consent was obtained from all participants, with verbal confirmation also recorded, and all study procedures complied with the ethical principles of the Declaration of Helsinki.

2.2. Measures

2.2.1. Perceived Stress (Primary Outcome)

The dependent variable, perceived stress, was measured using the validated Chinese version of the 14-item Perceived Stress Scale (PSS-14) [18]. This instrument assesses the extent to which individuals perceive their lives as unpredictable, uncontrollable, and overwhelming. Unlike scales targeting discrete stressful events or situations, the PSS captures general stress-related cognitions and emotions and has demonstrated good reliability and validity in prior studies [19,20]. The PSS-14 comprises seven negatively phrased items (items 1, 2, 3, 8, 11, 12, 14) and seven positively phrased items (items 4, 5, 6, 7, 9, 10, 13). Responses are rated on a 5-point Likert scale ranging from 1 (never) to 5 (very often). After

reverse-coding positively worded items, the total score ranges from 14 to 70; higher scores indicate greater perceived stress.

2.2.2. Pet-Keeping Characteristics and Caregiving Context (Exposure Variables)

Pet ownership status was determined through structured interviews. Participants reporting current companion animal ownership were defined as pet owners in this analysis. To capture multifaceted human–animal interactions, pet owners were further interviewed regarding key pet-keeping attributes: type of companion animal owned (dog only, cat only, both, or other species), and duration of ownership (<1 year, 1–3 years, >3 years). Caregiving intensity was evaluated using self-reported indicators, including frequency of direct pet care (rarely, occasionally, frequently), routine pet-walking frequency (rarely, weekly, daily), and occurrence of pet illness (rarely, occasionally, frequently).

Operational definitions were specified for each exposure item. Direct pet care referred to hands-on caregiving activities performed by the participant, including feeding, grooming and bathing, cleaning waste or litter, administering medication, and direct affectionate contact such as petting or holding. Its frequency was reported on a three-level ordinal scale (rarely, occasionally, frequently) according to the participant's usual involvement.

Routine pet-walking frequency captured how often the participant walked a companion animal, categorized as rarely, weekly, or daily. Pet illness frequency referred to owner-reported illness episodes, including conditions requiring extra care or veterinary attention, categorized as rarely, occasionally, or frequently; no fixed recall window or veterinary diagnostic criteria were applied, so this item reflected the owner's subjective perception rather than clinically verified disease.

All participants reporting current companion animal ownership were classified as pet owners; the interview did not distinguish the primary guardian from household members co-residing with animals kept by other family members, and the questionnaire did not record the number of animals kept per household.

2.2.3. Covariates

A set of sociodemographic and health-related covariates was included to adjust for potential confounding factors. Covariates encompassed age, gender, body mass index (BMI), geographic region, urban/rural residence, educational attainment, marital and living arrangement, employment status, and monthly household income. Lifestyle and medical covariates additionally included current smoking and alcohol drinking status, and the presence of one or multiple chronic conditions.

2.3. Statistical Analysis

Data management and statistical analyses were performed in Python (version 3.12) using pandas, SciPy, and statsmodels. Categorical variables were summarized as counts (percentages) and continuous variables as means (standard deviations). Group differences were tested using chi-square tests for categorical variables and independent-samples t-tests or one-way ANOVA for continuous variables, as appropriate. Multiple linear regression examined associations with perceived stress, with coefficients reported as unstandardized β and 95% confidence intervals (CIs). To account for clustering, standard errors were computed with province as the clustering unit. Three models were fitted: Model 1 (unadjusted), Model 2 (adjusted for age and sex), and Model 3 (additionally adjusted for BMI, household type, educational level, marital status, living arrangement, employment status, household monthly income, chronic disease, smoking, and drinking). Variance inflation factors (VIF) were assessed to check multicollinearity. All tests were two-tailed with $\alpha = 0.05$.

Among the 1428 participants, the only covariate with missing data was BMI (33 cases, 2.31%), which was handled by multiple imputation using chained equations (MICE; five imputed datasets, 10 iterations), pooling estimates across datasets by Rubin's rules. All other covariates, the PSS-14 items, and the total PSS score had no missing values. Pet-related variables were missing only for non-pet owners (missing by design); analyses restricted to pet owners therefore used complete data within that subsample.

3. Results

3.1. Baseline Characteristics of Participants

Of the 1428 participants included in the study, 713 (49.9%) were pet owners. Pet owners and non-pet owners differed significantly in BMI, residential region, employment status, household monthly income, chronic disease status, smoking status, and drinking status (all $p < 0.05$). Notably, pet owners exhibited significantly lower perceived stress scores than non-pet owners (33.96 ± 8.14 vs. 35.27 ± 7.79, $p < 0.01$). Baseline characteristics stratified by pet ownership status are summarized in Table 1.

Table 1. Characteristics of participants stratified by pet ownership status (%).

Demographic Characteristics	Total (N = 1428)	Non-Pet Owners (N = 715)	Pet Owners (N = 713)	*p* Value
Age, Mean ± SD	70.93 ± 6.98	71.11 ± 6.87	70.75 ± 7.10	0.34
BMI, Mean ± SD	24.16 ± 3.55	23.86 ± 3.47	24.46 ± 3.60	<0.01
Region, N (%)				<0.05
Western China	528 (36.97)	240 (33.57)	288 (40.39)	
Central China	208 (14.57)	106 (14.83)	102 (14.31)	
Eastern China	692 (48.46)	369 (51.61)	323 (45.30)	
Gender, N (%)				0.34
Male	673 (47.13)	328 (45.87)	345 (48.39)	
Female	755 (52.87)	387 (54.13)	368 (51.61)	
Household type, N (%)				0.56
Urban	758 (53.08)	374 (52.31)	384 (53.86)	
Rural	670 (46.92)	341 (47.69)	329 (46.14)	
Education level, N (%)				0.99
Uneducated	238 (16.67)	119 (16.64)	119 (16.69)	
Primary school	458 (32.07)	232 (32.45)	226 (31.70)	
Middle and high school	613 (42.93)	306 (42.80)	307 (43.06)	
College or above	119 (8.33)	58 (8.11)	61 (8.56)	
Marital status, N (%)				0.10
Married	1159 (81.16)	596 (83.36)	563 (78.96)	
Widowed	215 (15.06)	94 (13.15)	121 (16.97)	
Others	54 (3.78)	25 (3.50)	29 (4.07)	
Living arrangement, N (%)				0.58
Living With Partner	1029 (72.06)	524 (73.29)	505 (70.83)	
Living alone	221 (15.48)	106 (14.83)	115 (16.13)	
Others	178 (12.46)	85 (11.89)	93 (13.04)	
Employment status, N (%)				<0.01
Employed	203 (14.22)	79 (11.05)	124 (17.39)	
Non-employed	1225 (85.78)	636 (88.95)	589 (82.61)	
Household monthly income, N (%)				<0.01
<¥3000	525 (36.76)	290 (40.56)	235 (32.96)	
¥3000–10,000	793 (55.53)	376 (52.59)	417 (58.49)	
>¥10,000	110 (7.70)	49 (6.85)	61 (8.56)	

Table 1. *Cont.*

Demographic Characteristics	Total (N = 1428)	Non-Pet Owners (N = 715)	Pet Owners (N = 713)	*p* Value
Chronic disease status, N (%)				<0.01
No	446 (31.23)	246 (34.41)	200 (28.05)	
Single disease	477 (33.40)	240 (33.57)	237 (33.24)	
Multimorbidity	505 (35.36)	229 (32.03)	276 (38.71)	
Smoking status, N (%)				<0.01
Non-smoker	969 (67.86)	511 (71.47)	458 (64.24)	
Smoker	459 (32.14)	204 (28.53)	255 (35.76)	
Drinking status, N (%)				<0.01
Non-drinker	958 (67.09)	515 (72.03)	443 (62.13)	
Drinker	470 (32.91)	200 (27.97)	270 (37.87)	
PSS-14 total score, Mean ± SD	34.62 ± 7.99	35.27 ± 7.79	33.96 ± 8.14	<0.01
Pet ownership type, N (%)				
Dog only			339 (47.55)	
Cat only			124 (17.39)	
Both dog and cat			145 (20.34)	
Others			105 (14.73)	
Pet ownership duration, N (%)				
<1 year			211 (29.60)	
1–3 years			181 (25.39)	
>3 years			321 (45.02)	
Frequency of direct pet care, N (%)				
Rarely			210(29.45)	
Occasionally			235(32.96)	
Frequently			268(37.59)	
Pet walking frequency, N (%)				
Rarely			380 (53.30)	
Weekly			134 (18.79)	
Daily			199 (27.91)	
Pet illness frequency, N (%)				
Rarely			293 (41.09)	
Occasionally			305 (42.78)	
Frequently			115 (16.13)	

3.2. Association Between Pet Ownership and Perceived Stress

Table 2 shows the association between pet ownership and perceived stress. After adjustment for age and gender, pet ownership was associated with significantly lower perceived stress ($\beta = -1.25$; 95% CI: −2.05 to −0.45; $p < 0.01$). This inverse association remained statistically significant following full adjustment for BMI, residential region, household monthly income, and other potential confounders ($\beta = -1.07$; 95% CI: −1.90 to −0.23; $p < 0.01$).

Table 2. Associations between pet ownership and perceived stress.

Demographic Characteristics	Model1		Model2		Model3	
	β (95%CI)	***p* Value**	**β (95%CI)**	***p* Value**	**β (95%CI)**	***p* Value**
Pet Ownership status						
Non-pet owner	0.00 (Reference)		0.00 (Reference)		0.00 (Reference)	
Pet owner	−1.30 (−2.13, −0.48)	<0.01	−1.25 (−2.05, −0.45)	<0.01	−1.07 (−1.90, −0.23)	<0.01

3.3. Association Between Pet Ownership Type and Perceived Stress

Table 3 shows associations between pet ownership type and perceived stress. In the fully adjusted model, exclusive dog ownership had a strong inverse association with

perceived stress relative to non-ownership (β = −2.28; 95% CI: −3.31 to −1.24; $p < 0.01$). Exclusive cat ownership was linked to lower perceived stress in the unadjusted model, yet this association lost statistical significance after adjustment for covariates ($p > 0.05$). No significant association was found for concurrent dog and cat ownership ($p > 0.05$).

Table 3. Associations between pet ownership type and perceived stress.

Demographic Characteristics	Model1		Model2		Model3	
	β (95%CI)	***p* Value**	**β (95%CI)**	***p* Value**	**β (95%CI)**	***p* Value**
Pet ownership type						
No pet	0.00 (Reference)		0.00 (Reference)		0.00 (Reference)	
Dog only	−2.75 (−4.24, −1.27)	<0.01	−2.64 (−3.91, −1.36)	<0.01	−2.28 (−3.31, −1.24)	<0.01
Cat only	−2.08 (−4.62, 0.46)	0.11	−2.02 (−4.44, 0.39)	0.10	−1.48 (−3.95, 0.99)	0.24
Both dog and Cat	−0.29 (−1.55, 0.97)	0.65	−0.29 (−1.75, 1.17)	0.70	−0.68 (−1.76, 0.40)	0.22
Others	2.90 (0.56, 5.25)	<0.05	2.79 (0.43, 5.14)	<0.05	2.79 (0.69, 4.89)	<0.01

3.4. Association Between Pet-Related Characteristics and Perceived Stress

Table 4 presents associations between pet-related factors and perceived stress. In the fully adjusted multivariate analysis, ownership lasting more than 3 years was robustly associated with lower perceived stress (β = −4.41; 95% CI: −6.93 to −1.89; $p < 0.01$), whereas ownership durations of 1–3 years showed no significant association (β = −1.73; 95% CI: −4.51 to 1.06; $p = 0.23$). Frequent direct pet care was also robustly associated with lower perceived stress (β = −4.65; 95% CI: −6.95 to −2.35; $p < 0.01$). To confirm that the pet-related predictors were not collinear, we computed variance inflation factors (VIF) within the fully adjusted model among pet owners; all VIF values were below 3 (maximum 2.57), well below the conventional threshold of 10, indicating no problematic multicollinearity—including between direct care and walking frequency.

Table 4. Associations between pet-related characteristics and perceived stress.

Demographic Characteristics	Univariate Analysis		Multivariate Analysis	
	β (95%CI)	***p* Value**	**β (95%CI)**	***p* Value**
Pet ownership duration				
<1 year	0.00 (Reference)		0.00 (Reference)	
1–3 years	−2.17 (−5.79, 1.44)	0.24	−1.73 (−4.51, 1.06)	0.23
>3 years	−4.74 (−7.82, −1.66)	<0.01	−4.41 (−6.93, −1.89)	<0.01
Pet illness frequency				
Rarely	0.00 (Reference)		0.00 (Reference)	
Occasionally	3.07 (1.57, 4.57)	<0.01	2.99 (1.57, 4.40)	<0.01
Frequently	7.12 (4.62, 9.63)	<0.01	7.22 (4.54, 9.90)	<0.01
Frequency of direct pet care				
Rarely	0.00 (Reference)		0.00 (Reference)	
Occasionally	−2.64 (−7.05, 1.77)	0.24	−2.42 (−5.93, 1.09)	0.18
Frequently	−4.56 (−7.80, −1.31)	<0.01	−4.65 (−6.95, −2.35)	<0.01
Pet walking frequency				
Rarely	0.00 (Reference)		0.00 (Reference)	
Weekly	2.17 (−1.13, 5.47)	0.20	2.63 (−0.37, 5.63)	0.09
Daily	−1.48 (−4.07, 1.10)	0.26	−0.61 (−2.68, 1.47)	0.57

Note: The multivariate models were adjusted for the full covariate set specified in Model 3 (age, gender, BMI, household type, educational level, marital status, living arrangement, employment status, household monthly income, chronic disease status, smoking status, and drinking status).

Care-related factors were associated with perceived stress in the opposite direction. Compared with the group whose pets rarely became ill, occasional pet illness (β = 2.99; 95% CI: 1.57 to 4.40; $p < 0.01$) and frequent pet illness (β = 7.22; 95% CI: 4.54 to 9.90; $p < 0.01$) were significantly associated with higher perceived stress. Regarding pet walking frequency, neither weekly nor daily walking showed a significant association with perceived stress in the full sample (weekly: β = 2.63, 95% CI: −0.37 to 5.63, $p = 0.09$; daily: β = −0.61, 95% CI: −2.68 to 1.47, $p = 0.57$). In the subgroup analysis restricted to dog owners, weekly dog walking was associated with higher perceived stress after adjustment (β = 3.83; 95% CI: 2.09 to 5.57; $p < 0.01$), while daily dog walking showed no significant association (β = −0.82; 95% CI: −2.39 to 0.76; $p = 0.31$) (Table A1).

4. Discussion

To our knowledge, this is the first multicenter study adopting a One Welfare perspective to examine associations between companion-animal ownership, diverse pet-related characteristics, and perceived stress among Chinese older adults. Our results showed that pet ownership was associated with lower perceived stress, particularly among exclusive dog owners. Longer ownership duration and frequent direct pet care were also associated with lower perceived stress. In contrast, frequent pet illness and weekly dog walking were associated with higher perceived stress. These findings suggest that the mental health effects of pet ownership depend on relationship quality and caregiving context, rather than ownership status alone.

Most studies of pet ownership and older adults' health have focused on physical activity, anxiety, depression, and social support [21,22], with limited evidence specific to perceived stress. Our finding of lower perceived stress among dog-owning Chinese older adults is consistent with earlier cross-cultural work [14,15]. McConnell et al. [23] reported stronger well-being benefits when companion animals met owners' social needs, including reduced loneliness, depression, and perceived stress. Physiological studies also indicated that human–dog interaction can lower blood pressure and reduce sympathetic nervous system activation [24,25], consistent with the biophilia hypothesis that human–animal interaction may buffer stress. Pet companionship may help explain lower perceived stress through emotional support [26,27] and promoting social engagement [28,29], which together may support psychological resilience in later life [30].

Pet-owner attachment is a key mechanism shaping mental health outcomes [31,32]. Attachment theory suggests that secure human–animal bonds can help owners cope with stress. Dogs often form stronger attachment bonds with caregivers than other companion species, which may partly explain the stronger observed associations among dog owners [31,32]. Dog walking is often considered protective because it increases physical activity and social contact, with additional benefits for sleep and cognition [33–37]. Nevertheless, no significant independent association was observed for exclusive cat ownership, consistent with US-based findings among community-dwelling older cat owners [16]. Similarly, owning both dogs and cats was not associated with lower perceived stress, despite previous reports of sleep benefits in mixed-species pet households [38]. Greater time, financial, and care-related burdens associated with multi-pet keeping among older adults may offset emotional benefits from dual-species companionship.

Several mechanisms may explain the null findings for exclusive cat ownership. First, the decision to acquire a cat often follows pre-existing emotional strain, loneliness, or empty-nest distress; cats may therefore serve as an active coping or self-comforting strategy for more vulnerable individuals [39]. Because cross-sectional data lack pre-adoption measurements, this confounding by indication can leave the post-adoption stress scores of cat owners

comparable to those of well-adjusted non-owners who never experienced comparable distress, even when the cat provides genuine comfort.

Second, feline guardianship frequently involves more than one animal, yet the number of cats per household was not recorded; the emotional benefits of single-cat companionship could therefore not be separated from the compounding housekeeping, financial, and veterinary demands of multi-cat households [39,40].

Third, in urban Chinese households cats are typically kept strictly indoors. Daily litter-box cleaning, odor control, floor sanitation, and management of shedding constitute recurrent indoor chores that, unlike dog walking, provide no outdoor exercise or neighborhood social facilitation.

Fourth, cats and dogs differ in their communicative ecology. Dogs require structured, outward daily routines, including leashed walks and overt greeting rituals, that enforce behavioral activation, whereas cats show greater behavioral autonomy and more subtle communicative cues, which may not produce the same structured psychological activation in older adults. These interpretations remain speculative and warrant dedicated investigation.

Contrary to many Western reports, walking frequency was not linked to lower perceived stress in our sample. The bonded-green-exercise framework may help explain this discrepancy: the mental health benefits of dog walking depend on the combination of physical activity, nature exposure, and voluntary human–dog interaction, and these benefits emerge when walking is mutually enjoyable for both owner and dog [41]. In Western contexts, dog walking commonly represents recreational leisure [42]. Because our survey measured only walking frequency and did not assess motivation, enjoyment, or perceived obligation, we cannot determine whether participants experienced walking as leisure or as a strain; the observed positive associations may instead reflect underlying burden-related factors, such as pet illness, multi-pet management, owners' physical limitations, or financial strain [41,43]. In urban China, dogs are often acquired by adult children who later move away for work or marriage, leaving day-to-day care, including walking, to aging parents—a form of involuntary caregiving that carries its own strain. Walking only weekly may also be a marker rather than a cause: it can reflect mobility limitation, or a dog that pulls, reacts to traffic, or is difficult around other animals, turning each outing into an ordeal. In addition, the generic walking variable pooled dogs and cats, although walking is species-inappropriate for most cats and may cause distress for both animal and owner, introducing further measurement error. Simple frequency-based measures alone therefore cannot fully capture the mental health implications of dog walking. Future studies should also consider motivation, enjoyment, context, and duration when assessing dog walking [44]. The accessibility, safety, and suitability of public walking spaces, together with local regulations and restrictions on dog access, may further shape whether walking is experienced as leisure or as an obligation, and these environmental factors should be examined in future work.

Longer ownership duration and frequent direct care were associated with lower stress, consistent with evidence that sustained care strengthens attachment [15] and with the bidirectional, evolving nature of human–animal bonds [45]. From a One Welfare standpoint, however, frequent pet illness compromises animal welfare and imposes time, energy, and financial pressures that can raise stress and reduce quality of life, particularly among owners with poor health or limited resources [40,46], and may partly explain the weaker associations. Accessible pet insurance, welfare education, and community-based pet support networks could help older owners retain the benefits of companionship. As pet keeping grows among older Chinese adults [47], these findings indicate that its mental health effects vary with caregiving characteristics rather than ownership status alone. Future research should move beyond binary owner–non-owner comparisons to examine relationship quality, caregiving

motivation, and the experiences of both owner and animal, and interventions should target relationship quality and caregiving context rather than pet ownership per se.

This study has several limitations. First, the cross-sectional design precludes causal inference and cannot track change before and after acquiring an animal. Confounding by indication (distressed older adults acquiring pets as a coping strategy) and healthy-adopter bias (healthier seniors being more able to keep animals) may partly explain the observed differences; only prospective longitudinal studies can establish whether companion animals improve or worsen psychological trajectories.

Second, key exposures were subject to measurement error. The unrecorded number of animals per household pooled single- and multi-animal homes and likely produced exposure misclassification, because pet count multiplies caregiving chores, costs, and illness risk. The single, self-reported items lacked objective time anchors, fixed recall windows, and clinical verification, and the interview did not distinguish primary guardians, leaving the analyses vulnerable to recall and social desirability bias.

Third, generalizability and model specification are limited. Recruitment through health centers may introduce selection bias, and unmeasured functional independence (ADL/IADL) and cognitive status may leave residual confounding. Because identifiers for the individual community health service centers were not recorded, clustering was implemented at the province level; with only five provinces, the number of clusters was small, which also precluded center-level multilevel models. This study was designed and conducted from a human primary-care medical perspective, without direct veterinary clinical examination, disease staging, or formal ethological assessment, and the team included no veterinary or animal-behavior collaborators.

Future research should adopt prospective, longitudinal designs with pre- and post-adoption assessments to establish temporal and causal relationships, while recording objective pet headcount and caregiving time. Interdisciplinary collaboration between general practitioners, veterinary clinicians, and animal welfare scientists would substantially strengthen future work at the human–animal interface.

5. Conclusions

This multicenter study examined associations between companion-animal ownership, diverse companion animal caregiving characteristics, and perceived stress among Chinese community-dwelling older adults from a One Welfare perspective. Exclusive dog ownership, longer ownership tenure, and frequent direct pet care were linked to lower perceived stress. Such associations were not observed for cat-only or dual dog-and-cat ownership. By contrast, care-related burdens stemming from frequent pet illness and weekly dog walking were associated with higher perceived stress. Our results indicated that mental-health outcomes of companion-animal ownership depend largely on dyadic relationship quality and caregiving context rather than ownership status alone. From a One Welfare perspective, these findings suggested that interventions should consider both older adults' psychological well-being and companion-animal welfare.

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Abbreviations

The following abbreviations are used in this manuscript:

BMI	Body Mass Index
CI	Confidence interval
PSS-14	14-item Perceived Stress Scale
SD	Standard Deviation

Appendix A

Items and Instructions for Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate how often you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate.

For each question choose from the following alternatives:

1. Never;
2. Almost never;
3. Sometimes;
4. Fairly often;
5. Very often.

1. In the last month, how often have you been upset because of something that happened unexpectedly?

2. In the last month, how often have you felt that you were unable to control the important things in your life?

3. In the last month, how often have you felt nervous and "stressed"?

4.[a] In the last month, how often have you dealt successfully with irritating life hassles?

5.[a] In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life?

6.[a] In the last month, how often have you felt confident about your ability to handle your personal problems?

7.[a] In the last month, how often have you felt that things were going your way?

8. In the last month, how often have you found that you could not cope with all the things that you had to do?

9.[a] In the last month, how often have you been able to control irritations in your life?

10.[a] In the last month, how often have you felt that you were on top of things?

11. In the last month, how often have you been angered because of things that happened that were outside of your control?

12. In the last month, how often have you found yourself thinking about things that you have to accomplish?

13. [a] In the last month, how often have you been able to control the way you spend your time?

14. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

[a] Scored in the reverse direction.

Appendix B

Table A1. Associations between pet-related characteristics and perceived stress among exclusive dog owners (N = 339).

Demographic Characteristics	Univariate Analysis		Multivariate Analysis	
	β (95%CI)	***p* Value**	**β (95%CI)**	***p* Value**
Pet ownership duration				
<1 year	0.00 (Reference)		0.00 (Reference)	
1–3 years	−1.50 (−4.08, 1.08)	0.25	−1.26 (−3.36, 0.84)	0.24
>3 years	−3.41 (−5.92, −0.90)	<0.01	−3.20 (−5.08, −1.32)	<0.01
Pet illness frequency				
Rarely	0.00 (Reference)		0.00 (Reference)	
Occasionally	3.78 (1.35, 6.22)	<0.01	3.49 (1.15, 5.84)	<0.01
Frequently	8.16 (5.52, 10.80)	<0.01	8.31 (5.72, 10.90)	<0.01
Frequency of direct pet care				
Rarely	0.00 (Reference)		0.00 (Reference)	
Occasionally	−1.48 (−4.95, 2.00)	0.41	−1.77 (−4.74, 1.20)	0.24
Frequently	−3.96 (−6.02, −1.91)	<0.01	−4.11 (−6.66, −1.57)	<0.01
Dog walking frequency				
Rarely	0.00 (Reference)		0.00 (Reference)	
Weekly	2.69 (0.80, 4.59)	<0.01	3.83 (2.09, 5.57)	<0.01
Daily	−2.50 (−5.59, 0.59)	0.11	−0.82 (−2.39, 0.76)	0.31

Note: The multivariate models were adjusted for the full covariate set specified in Model 3 (age, gender, BMI, household type, educational level, marital status, living arrangement, employment status, household monthly income, chronic disease status, smoking status, and drinking status).

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