ORIGINAL ARTICLE

Impact of Pet Companionship on Student Development: A Meta-Analysis

Peixuan Li, Jijun Yao, Yifan Xu, Fangru Zhou

Nanjing Normal University, Nanjing 210024, China

Abstract: *Animal companionship has been found to have a positive influence on human well-being, and the presence of pets can have a subtle yet significant impact on the healthy development of students. Pet companionship takes various forms across different fields in China and other regions worldwide, and the impact of such companionship remains uncertain. Hence, it is imperative to investigate the impact of diverse forms of companionship and animals on multiple facets of student growth and development. This study employed meta-analysis methodologies to examine 47 effect sizes derived from 12 domestic and international studies on pet companionship. The aim was to investigate the overall trends of the influence of pet companionship on student development as well as the effects of diverse types of companionship and pets on different aspects of student development, including physical and mental health, social-emotional abilities, and academic performance. The objective was to enhance the exploration of approaches for maximizing the utilization of various forms of pet companionship. Furthermore, this research suggests a systematic and incremental approach to enhancing the function of pets within households, educational institutions, and medical facilities. Adequate content and organization are essential for scientific advancement and the development of students. In this particular context, it is possible to optimize the impact of pet companionship on the development of students.*

About the Authors: *Peixuan Li, School of Educational Science, Nanjing Normal University, Nanjing 210024, China. E-mail: pxli_edu@163.com*

Yifan Xu, School of Educational Science, Nanjing Normal University, Nanjing 210024, China. E-mail: nnu_xuyifan@163.com

Fangru Zhou, School of Psychology, Nanjing Normal University, Nanjing 210024, China. E-mail: frzhou_psy@163.com

Correspondence to: *Jijun Yao, School of Educational Science, Nanjing Normal University, Nanjing 210024, China. E-mail: yaojijun_njnu@163.com*

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Introduction

PETS serve as companions to children in various ways, including by providing constant companionship at home, participating in animal-assisted classes at school, and engaging in animal-assisted therapy. They are valuable friends for students.

However, there are certain opinions that challenge the efficacy of pet companionship. Parents express concerns that the act of raising pets may have adverse effects on the physical well-being and socio-emotional growth of students, ultimately impeding their overall healthy development. Furthermore, the adoption of pet companionship is confronted with various uncertainties and hazards, including but not limited to the potential harm that pets' self-defense mechanisms may pose to infants and young children, gender-based discrepancies in attitudes towards pets among male and female students (Bosacki & Tardif-Williams, 2019), and the adverse impact that inadequate pet raising and care by families may have on student growth and development. Given the ambiguity surrounding the effects of pet companionship on student development, parents and society require empirical data to address inquiries pertaining to the potential benefits of pet companionship on student development, as well as the optimal type of pet companionship that may promote students' holistic growth, in order to facilitate informed decision-making. This study employs a meta-analysis methodology to investigate the influence of pet companionship on student development, drawing on both domestic and international research on the subject. The study aims to examine the effects of various types of companionship and provide insights into the role of pet companionship in promoting healthy development among students in family, school, and medical contexts.

Literature Review

Definitions of Core Concepts

Pet Companionship

The teenage period is a crucial life stage that has the potential to positively impact an individual's lifelong physical health, learning behavior, and emotional well-being. Additionally, pets can play an important role in adolescents' learning, therapies, families, and overall quality of life.

Studies on the subject of pet companionship have been carried out in multiple countries, focusing mostly on three areas. The first is having pets in daily life. According to statistics, at least one pet is owned by 68% of US families (American Pet Products Association, 2016) and 46% of UK families (Pet Food Manufacturers Association, 2016). According to epidemiological studies, families with children are more likely than other types of households to own pets (Westgarth et al., 2010; Melson, 2003). Since most students spend their time at home, companion animals play a significant role in daily human interaction. The second is animal-assisted therapy, which dates back to the founding of the Quaker Rehabilitation Center in the UK in 1792, where patients might

feel joy and responsibility through the employment of animals in treatment plans (Boris & Gerald, 1997). Animals act as co-therapists in animal-assisted therapy, collaborating with medical professionals to establish a secure therapeutic environment that treats hospitalized children with serious illnesses by lowering their anxiety (Lang et al., 2010). The third is bringing dogs into the classroom. Human-animal interaction (HAI) social support theory contends that pets can be a source of comfort and safety for students, acting as transitional objects to ease pain and problematic behaviors (Peter et al., 2002; Triebenbacher, 1998). Students' stressful experiences at school can result in maladaptive behaviors in their homes and social lives. Students may benefit from the motivation and education that come from having animals in the classroom.

In contrast to other nations, pet companionship has recently gained popularity in China. People's spiritual and material worlds have increasingly become richer as China's economic development and urbanization intensify. Pets are deeply involved in different parts of students' lives in such a setting. According to Huang Qin, young students' attachment to dogs can help them cope with loneliness (Huang, 2009). Meanwhile, Wang Jiaojiao and her colleagues work on dog-assisted intervention in reading for special education children, employing methodologies like one-on-one reading and dialogue-based reading (Wang et al., 2020). However, there is still a scarcity of research in this sector in China, and some parents fear that having a pet interferes with their child's growth.

The present study delineates the notion of pet companionship as a tripartite construct encompassing the following components: cohabitation in daily routines, animal-assisted therapy, and academic accompaniment. The assessment of students' social adaptation, physical health, and learning ability constitutes the measurement of these three distinct dimensions.

Student Development

In Mingyuan Gu's (1998) *Education Dictionary*, "development" is defined as a persistent and irreversible change in cognition, personality, physical condition, and socialization that occurs over the course of an individual's entire existence. In the context of education, student development theory is an extension of human development theory. Education, whose primary purpose is to cultivate individuals, encompasses a variety of activities that contribute to the formation and development of knowledge, abilities, physical and mental health, and ideological and moral qualities.

The level of a student's physical and mental health is the basis of their development. Individuals who are physically and mentally healthy actively experience positive emotions such as happiness, have excellent social adaptability, and are able to realize their full potential. They are vital and capable of contributing to society (Liu, 2001).

Studies have indicated that in certain nations and regions, the development of comprehensive abilities has consistently placed emphasis on knowledge acquisition as a key priority and a fundamental criterion for talent quality. In light of societal progress and its consequent transformations, it is insufficient to depend solely on the cognitive capacities of individuals to fulfill their developmental requisites (Wang & Tan, 1998). Within this particular context, social-emotional competencies have garnered significant attention from the general public and have emerged as a central and focal point for de-

veloping talent in the 21st century. Social-emotional skills pertain to the intrinsic attributes of individuals that are indicative of their personality traits. In contrast to academic achievement, there is a lack of consensus on the definition of social-emotional competencies. The framework for social-emotional skills developed by the OECD is the most commonly employed among the diverse definitions available. The framework is founded upon the Big Five personality traits, encompassing five distinct dimensions, namely task performance, emotional regulation, collaboration, open-mindedness, and interactions with others. The aforementioned domains provide a systematic summary of the trajectory of non-cognitive skill development in students.

In China, there was a time when academic performance was the primary measure of student development, and the concept of holistic student development was not given much consideration. This lack of understanding at the practical level of education has led to intense competition, which is not conducive to the establishment of a positive educational environment. The demand for the incorporation of non-cognitive factors and the advancement of holistic student development has been on the rise. In light of this context, the Chinese government has released a series of official papers aimed at advancing the reform of enhancing the comprehensive competencies of students. In 2021, a set of guidelines was implemented to alleviate the onerous workload of compulsory education students, including the Double Reduction Policy, with the aim of mitigating the burden on students and fostering their holistic growth.

This study categorizes student development into the growth of cognitive and non-cognitive abilities based on physical and mental health, depending on the aforementioned analyses. Non-cognitive abilities are assessed using the OECD framework of social-emotional skills, which includes self-control, emotional control, sociability, self-efficacy, and other abilities in social-emotional domains. Cognitive abilities are assessed by students' learning capacity and academic performance.

The Impact of Pet Companionship on Student Development

The impact of pet companionship on student development has been extensively researched, yielding varying conclusions.

On the bright side, there are studies that show how having a pet can positively impact student development. Interacting with animals in settings like home, school, or hospital can have a positive impact on students' emotional regulation, empathy, and stress relief, according to research by Anderson et al. (2006), Chubak et al. (2017), and Paul & Serpell (1996). It's great to see that animal-assisted education has become increasingly popular in recent years. This approach has been shown to have many positive effects on students, including the development of empathy, stress reduction, positive emotional development, stronger classroom cohesion, increased pro-social behavior, and fostering better attitudes toward learning (Brelsford et al., 2017; Nancy et al., 2017). This is a promising trend that can benefit students in many ways. It's great to know that early pet ownership can potentially reduce the risk of allergies and asthma in students, according to studies. It's great to know that exposure to pets in the first year of life can lower the risk of allergic rhinitis at age 7-9 and asthma at age 12–13 (Hesselmar, 1999).

In hospital settings, the presence of animals can help alleviate pain during medical procedures and make hospitalization easier for pediatric patients (Hoffmann et al., 2009).

Conversely, alternative evidence suggests that the companionship of pets may not be advantageous or may even have adverse effects on the growth and progress of students. Salo et al. (2004) conducted research on Chinese adolescents and revealed a higher incidence of persistent coughing in households that owned cats and dogs, particularly among children under the age of six. A study conducted on Bulgarian students aged 2–8 years revealed a favorable association between the existence of cats or dogs in their households during birth and their present-day susceptibility to asthma, rhinitis, and eczema, as reported by Naydenov et al. (2008). Pets have the potential to elevate the concentration of airborne allergens, thereby amplifying the susceptibility to allergic respiratory ailments such as asthma.

Therefore, it can be argued that the effects of pet companionship on student development are ambiguous. This uncertainty is largely attributable to multiple factors. In other words, other factors moderate the effect of pet companionship on student development. Based on this, this study used CMA 3.0 to conduct a comprehensive meta-analysis of domestic and international studies on pet companionship and student development in order to identify the general patterns of the effect of pet companionship on students' physical and mental development.

Research Process

Literature Retrieval

Meta-analysis is a secondary analysis that re-analyses the findings by incorporating data from the extant literature (Zeng & Yao, 2020).

The following keywords are crucial to the literature search: "pet raising," "student development," "physical health," "mental health," "higher order thinking skills," "social emotion," "animal assisted therapy," "school," and "study" on various databases like the China National Knowledge Infrastructure (CNKI), the Web of Science, SpringerLink, and Google Scholar. After retrieving 7,127 pertinent studies, 12 were ultimately added to produce 47 effect sizes (**Figure 1**).

Literature Inclusion Criteria

Meta-analyses require consistent inclusion criteria to retrieve and screen studies related to a particular topic and then to construct a literature pool that satisfies the requirements of the research topic and meta-analysis in order to support subsequent research. In order to better select relevant literature for this study, it was necessary to first define pet companionship and the research topic. This study defines pet companionship as activities in which pets accompany humans, such as the raising of pets at home, the incorporation of pets in the classroom, and animal-assisted therapy. The focus of this study is the influence of pet companionship on student development, and the intervention is whether or not pet companionship will be utilized. The target audience consists of students younger than 18 years of age. On this basis, the following inclusion criteria were developed:
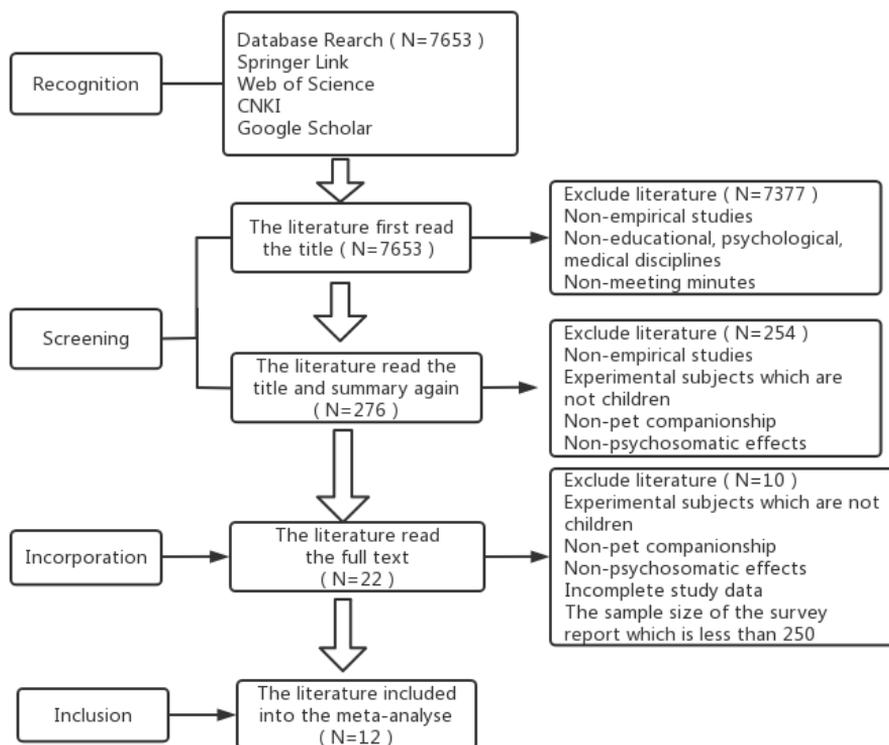
Figure 1. Literature Screening Process.

definition of pet companionship, research topic, research subjects, literature characteristics, and statistical requirements for the meta-analysis.

i.   The study's intervention measures are pet companionship or animal-assisted therapy, and the target population is students under the age of 18.

ii.   The research findings should pertain to student development, including aspects such as academic achievement, physical and mental health treatment, motor skills, and the enhancement of social and emotional skills.

iii.   For the purpose of this study's timeliness, the included studies must have been published between 2000 and 2021, regardless of form, in Chinese or English.

iv.   The design of the study should be experimental or quasi-experimental, with experimental and control groups. The sample size for large-scale survey reports should be greater than 250.

v.   The sample sizes of the experimental and control groups should be comparable to prevent biases resulting from a significant difference between the two categories of groups.

vi.   To calculate effect sizes, the study should provide information such as the mean, standard deviation, sample size, t-value, and p-value.

vii.   Pretest differences should not be excessively large, and the effect size d should not exceed 0.5.

Literature Coding

As previously stated, a meta-analysis is a statistical technique that involves synthesizing an extensive body of literature, albeit with inherent heterogeneity across various studies. Consequently, it is imperative to encode the pertinent research for subsequent examination, and the precise codes are explained as follows:

i. *Type of literature*: Journals are coded as Q, whereas other types are coded as X.

ii. *Type of pet companionship*: Home pet ownership is recorded as FAM, whereas animal-assisted therapy, animal-assisted education, multifaceted content, and unreported are coded as AAT, EDU, mix, and un, respectively.

iii. *Type of output*: academic ability is coded as study, social skills are coded as social skill, physical health is coded as physical health, mental health is coded as mental health, and other elements are coded as other.

iv. *Type of companion animal*: dogs are coded as dog, horses as horse, mixed animal species are coded as mix, and unreported animals are coded as un.

v. *Gender*: Males are coded as M, females as F, males and females together are coded as mix, and those who were not reported are coded as un.

vi. *Students at risk*: Students who have a low health level are coded as PD, those who have behavioral issues (such as truancy, violence, etc.) are coded as BD, those who have both of the aforementioned issues are coded as mix, and those who have not been reported are coded as un.

vii. *Length of research*: Research that is not less than 12 weeks in length is coded as > 12, less than 12 weeks in length is coded as < 12, and not reported is coded as unreported.

viii. *Intervention intensity*: low ($\leq$ 30 minutes per week), medium (30-75 minutes per week), or high (> 75 minutes per week). According to the literature, the precise information should be written down, and the unreported data is coded as unreported.

ix. *Age group*: pre-adolescent years (6-12) are coded as preadolescence, adolescence (13–18) is coded as adolescence, and a combination of various stages is coded as mix, in accordance with the age distribution in established studies and the typical developmental model proposed by Broderick and Blewitt (2003).

x. *Sample size*: Studies with sample sizes of less than 100, between 100 and 250, and greater than 250 are coded as < 100, 100-250, and > 250, respectively.

Research Results and Analysis

Heterogeneity Testing

Although there is heterogeneity among different studies, a meta-analysis provides an opportunity to integrate a large body of literature and gain valuable insights. There are several effective methods for conducting heterogeneity tests, such as the Q statistic, H statistic, and I^2 values. This study successfully utilized the Q statistic and I^2 values to analyze the heterogeneity between the studies (Zeng & Yao, 2020). The Q statistic showed that there is some heterogeneity among the samples (Q = 80.563, p < 0.001), but the I^2 values indicate that it is only moderate (I^2 = 42.902).

Table 1. Margaret Coding Table.

Litera-ture	Companion-ship Type	Doc Type	Output Type	Ani-mal	Gen-der	Age	Sample Size	Students in Crisis	Pro-gram Length	Interven-tion Intensity
Amy, 2017a	AAT	Q	Mental	Dog	Mix	Mix	<100	PD	<12	Low
Amy, 2017b	AAT	Q	Mental	Dog	Mix	Mix	<100	PD	<12	Low
Amy, 2017c	AAT	Q	Mental	Dog	Mix	Mix	<100	PD	<12	Low
Andrea, 2013b	EDU	Q	Mental	Dog	Mix	pre-adolescence	<100	un	>12	High
Andrea, 2013c	EDU	Q	Mental	Dog	Mix	pre-adolescence	<100	un	>12	High
Andrea, 2013d	EDU	Q	Behav-ior	Dog	Mix	pre-adolescence	<100	un	>12	High
Andrea, 2013e	EDU	Q	Behav-ior	Dog	Mix	pre-adolescence	<100	un	>12	High
Andrea, 2013f	EDU	Q	Behav-ior	Dog	Mix	pre-adolescence	<100	un	>12	High
Andrea, 2013g	EDU	Q	Mental	Dog	Mix	pre-adolescence	<100	un	>12	High
Anne, 2015	FAM	Q	Mental	Dog	Mix	pre-adolescence	>250	un	un	un
Carie, 2009a	AAT	Q	Physical	Dog	Mix	Mix	<100	PD	<12	Low
Carie, 2009b	AAT	Q	Physical	Dog	Mix	Mix	<100	PD	<12	Low
Carie, 2009c	AAT	Q	Physical	Dog	Mix	Mix	<100	PD	<12	Low
Carie, 2009d	AAT	Q	Physical	Dog	Mix	Mix	<100	PD	<12	Low
Carie, 2009e	AAT	Q	Physical	Dog	Mix	Mix	<100	PD	<12	Low
Cris-tiano, 2021	EDU	Q	Mental	Dog	Mix	pre-adolescence	<100	un	<12	High
Deborah, 2017	EDU	Q	Study	Dog	Mix	pre-adolescence	<100	un	<12	Medium
Davis, 2009a	AAT	Q	Mental	Horse	Mix	Mix	<100	PD	<12	Medium
Davis, 2009b	AAT	Q	Mental	Horse	Mix	Mix	<100	PD	<12	Medium
Davis, 2009c	AAT	Q	Mental	Horse	Mix	Mix	<100	PD	<12	Medium
Davis, 2009d	AAT	Q	Mental	Horse	Mix	Mix	<100	PD	<12	Medium
Davis, 2009e	AAT	Q	Mental	Horse	Mix	Mix	<100	PD	<12	Medium
Davis, 2009f	AAT	Q	Mental	Horse	Mix	Mix	<100	PD	<12	Medium
Davis, 2009g	AAT	Q	Mental	Horse	Mix	Mix	<100	PD	<12	Medium
Edward, 2017a	EDU	Q	Study	Dog	Mix	pre-adolescence	<100	un	<12	Medium
Edward, 2017b	EDU	Q	Study	Dog	Mix	pre-adolescence	<100	un	<12	Medium
Edward, 2017c	EDU	Q	Study	Dog	Mix	pre-adolescence	<100	un	<12	Medium
Edward, 2017d	EDU	Q	Study	Dog	Mix	pre-adolescence	<100	un	<12	Medium
Chris-tian, 2012a	FAM	Q	Physical	Dog	M	pre-adolescence	>250	un	un	un
Chris-tian, 2012b	FAM	Q	Physical	Dog	M	pre-adolescence	>250	un	un	un
Chris-tian, 2012c	FAM	Q	Physical	Dog	F	pre-adolescence	>250	un	un	un
Chris-tian, 2012d	FAM	Q	Physical	Dog	F	pre-adolescence	>250	un	un	un
Chris-tian, 2012e	FAM	Q	Behav-ior	Dog	M	pre-adolescence	>250	un	un	un
Chris-tian, 2012f	FAM	Q	Behav-ior	Dog	F	pre-adolescence	>250	un	un	un
Chris-tian, 2012g	FAM	Q	Behav-ior	Dog	M	pre-adolescence	>250	un	un	un
Chris-tian, 2012h	FAM	Q	Behav-ior	Dog	F	pre-adolescence	>250	un	un	un

Jessa, 2016a	FAM	Q	Mental	Dog	Mix	adolescence	>250	un	un	un
Jessa, 2016b	FAM	Q	Mental	Dog	Mix	adolescence	>250	un	un	un
Jessa, 2016c	FAM	Q	Mental	Dog	Mix	adolescence	>250	un	un	un
Julie, 2008a	EDU	Q	Behavior	Dog	Mix	pre-adolescence	>250	BD	<12	Middle
Maria, 2016a	AAT	Q	Mental	Dog	Mix	Mix	<100	mix	>12	Low
Maria, 2016c	AAT	Q	Social Skill	Dog	Mix	Mix	<100	mix	>12	Low
Marta, 2017a	FAM	Q	Mental	Dog	Mix	adolescence	>250	un	un	un
Megan, 2021	FAM	Q	Mental	Mix	Mix	Mix	100-250	un	un	un
Shu li, 2016a	FAM	Q	Physical	Mix	Male	Mix	>250	un	un	un
Shu li, 2016b	FAM	Q	Physical	Mix	F	Mix	>250	un	un	un

Table 2. Overall Effect Size and Heterogeneity Testing Results of the Impact of Pet Companionship on Students' Development.

	K	Q	I² (%)	ES	95%CI		p-value
Fixed-effect model	47	80.563 (p = 0.001)	42.902	0.222	0.189	0.256	0.000
Random-effect model	47			0.237	0.183	0.291	0.000

Analysis of the Effects of Pet Companionship on Student Development

The heterogeneity test results revealed that the samples in this study had a modest amount of heterogeneity. **Table 1** displays the results of the study using the fixed-effect model, with a combined effect size of 0.222 (p < 0.05), and **Table 2** displays the results using the random-effect model, with a combined effect size of 0.237 (p < 0.05). Cohen defines small, medium, and high impact sizes, respectively, as 0.2, 0.5, and 0.8. Therefore, having a pet as company has a minor but distinctly positive effect on students' growth.

Analysis of the Moderating Effects

As mentioned previously, the samples in this study were heterogeneous (Q = 80.563, p < 0.001), which may be closely related to the type of pet, the type of pet companionship, and the diverse backgrounds of the participants. In order to identify the origins of heterogeneity, it was necessary to assess the moderating effects in this study. Based on the results of the random-effect model analysis and the subgroup analysis, this study investigated the origins of heterogeneity in pet companionship at both the individual and research project levels.

As previously stated, student growth is primarily represented in physical health, mental health, academic output, social-emotional abilities, and behavior. **Table 3** shows the results of an in-depth analysis of the types and forms of student development outputs undertaken in this study to investigate the unique effects of pet companionship on student development. Pet companionship has a significant favorable impact on academic output (d = 0.098, p = 0.667), physical health (d = 0.199, p < 0.001), mental health (d = 0.259, p < 0.001), and behavioral performance (d = 0.244, p = 0.018), but the effect sizes are small. Pet companionship has a medium impact size and has a considerable beneficial influence on social-emotional skills (d = 0.595, p < 0.001). The findings indicate that pet companionship improves students' academic achievement while also encouraging physical and mental health as well as behavioral performance, and it plays an important role in strengthening students' social-emotional abilities. Previous research has focused on the effects of pet companionship on students' physical health rather than the development of social-emotional abilities, according to the current study. Some of the studies included in this investigation did not report potential influencing factors such as participants' families' economic situation and the gap between times of pet companionship, resulting in the loss of some sources of heterogeneity in this study.

As indicated in **Table 4**, characteristics including participant gender, age, and physical and mental health may contribute to heterogeneity at the individual level. The beneficial effect on male participants among teenagers (d = 0.189, p < 0.001) is marginally bigger than that on female participants (d = 0.152, p < 0.001). Participants who are preadolescent (d = 0.280, p < 0.001) and adolescent (d = 0.205, p < 0.001) in age do not experience any negative effects from pet companionship. In particular, it has a modest effect on preschool participants and a large favorable effect with relatively moderate effect sizes on preadolescent and adolescent participants. The strongest effect of pet companionship is on elementary school kids (d = 0.399), with a small effect size in the preadolescent period, whereas the poorest effect is on secondary school students (d = 0.099). Regarding the hazards that teenagers face, pet companionship has a statistically significant favorable effect on students who are at health risk (d = 0.215, p < 0.001) and behavioral risk (d = 0.717, p < 0.001). Pet companionship also has a good impact on children who are at risk for both physical and mental health, with an effect size of 0.207. The effects on students with behavioral risk and mental health crises are medium.

As demonstrated in **Table 5**, heterogeneity at the research project level may be related to elements like the kind of pet, the kind of pet partner, and the degree of the intervention. Horses, a common form of pet, have a beneficial impact on participants and have an effect size that is statistically significant (d = 0.344, p < 0.001), although dogs and other pets similarly significantly improve student development but with smaller effect sizes (d = 0.239, p < 0.001). Animal-assisted therapy, animal-assisted education, and pet companionship at home all had substantial benefits on various aspects of pet companionship; the corresponding effect sizes are 0.215, 0.385, and 0.202, with animal-assisted education surpassing the other two. Low-intensity interventions (d = 0.245, p = 0.005), medium-intensity interventions (d = 0.259, p < 0.001), and high-intensity interventions (d = 0.345, p < 0.001) all significantly affect student development, and the effect is stronger as the intensity rises.

This study also examined the moderating effects of literature type, sample size, and the period of publication in order to further understand how the characteristics of

Table 3. Analysis of Heterogeneity of Student Development Output Types.

		K	Q	ES	95% CI		p
Type of output	Physical	12		0.199	0.143	0.256	0.000
	Mental	21		0.259	0.186	0.332	0.000
	Social skill	5	3.245 (p = 0.518)	0.595	-0.038	1.228	0.000
	Behavior	8		0.244	0.042	0.446	0.018
	Study	5		0.098	-0.362	0.558	0.677

Table 4. Analysis of Heterogeneity at the Individual Level.

		K	Q	ES	95% CI		p
At-risk Students	PD	15		0.203	0.075	0.330	0.001
	HD	1	35.766 (p < 0.001)	0.717	0.555	0.880	0.000
	Mix	3		0.319	-0.043	0.680	0.084
	Un	28		0.207	0.159	0.246	0.000
Age	Pre-adolescence	22		0.262	0.153	0.371	0.000
	Adolescence	5	0.858 (p = 0.651)	0.205	0.145	0.266	0.000
	Mix	20		0.208	0.139	0.277	0.000
Gender	F	5		0.152	0.086	0.218	0.000
	M	7	Q=9.828 (p = 0.007)	0.189	0.121	0.258	0.000
	Mix	53		0.291	0.208	0.374	0.000

Table 5. Analysis of Heterogeneity at the Project Level.

		K	Q	ES	95% CI		p
Type of Pet Companionship	AAT	18		0.215	0.095	0.336	0.000
	EDU	13	3.021 (p = 0.221)	0.373	0.185	0.585	0.000
	FAM	16		0.195	0.153	0.251	0.000
Pet Breeds	Dog	37		0.243	0.175	0.312	0.000
	Horse	7	0.276 (p = 0.871)	0.200	0.023	0.376	0.026
	Mix	3		0.224	0.144	0.303	0.000
Intervention Intensity	Low	10		0.245	0.074	0.416	0.005
	Middle	14	1.844	0.259	0.066	0.453	0.000
	High	7	(p = 0.605)	0.345	0.119	0.571	0.000
	Un	16		0.202	0.153	0.251	0.000

Table 6. Heterogeneity Analysis of Literature Characteristics and Study Characteristics.

		K	Q	ES	95% CI		p
Sample size	<100	30	0.897 (p = 0.639)	0.243	0.142	0.344	0.000
	100-250	1		0.341	0.131	0.551	0.001
	>250	19		0.233	0.158	0.308	0.000
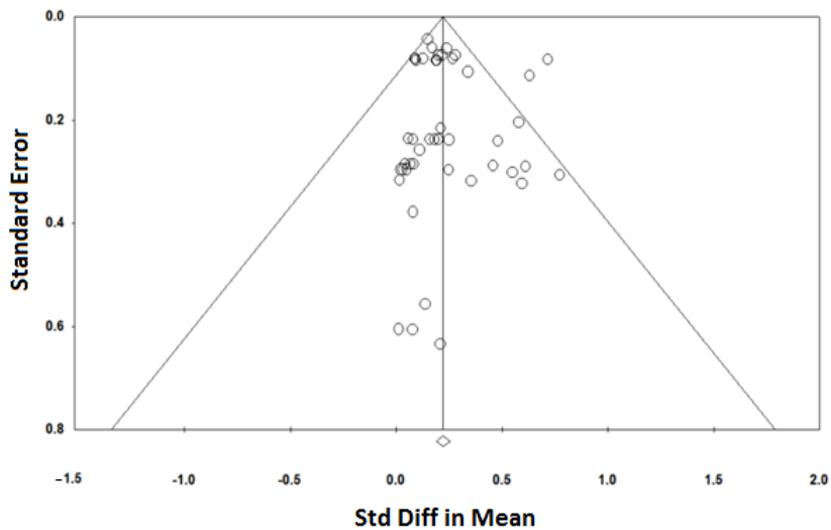
Figure 2. Funnel Plot of Standard Error by Std Diff in Means.

the literature and studies may also be significant factors affecting heterogeneity. The outcomes are displayed in **Table 6**. Since all of the included studies were journal articles, this study did not examine them. In terms of sample size, medium sample sizes (100-250 samples) have the largest effect sizes (d = 0.341), followed by small sample sizes (< 100 samples) (d = 0.243), and big sample sizes (> 250 samples) (d = 0.233). Both small and large sample sizes have non-significant effect sizes.

Robustness Testing

Publication Bias

Publication bias indicates that the studies included in the meta-analysis are the result of journal selection, and this selective bias typically results in positive meta-analysis results. Consequently, it is essential to evaluate the scientific validity of the results. This

study used funnel plots and Egger's Regression coefficient to assess the results of a meta-analysis, as these are common methods for evaluating meta-analysis results. The funnel plot for this study is depicted in **Figure 2**, which is approximately symmetrical, and the effect sizes of the study samples are primarily concentrated in the middle and upper effective areas of the funnel plot. The Egger's Regression coefficient indicates an insignificant Egger test result (t = 0.71642, p1 = 0.23872, p2 = 0.47744 > 0.01) and, consequently, a low probability of publication bias in this investigation.

Sensitivity Analysis

In this study, the fail-safe N was 1,463 (α = 0.05, p < 0.000), indicating that 2,622 additional studies would be required to render the results non-significant or to refute the conclusions. As a result, the findings of the study were relatively robust.

Discussion

Throughout the course of human history, animals have served as valuable aides, confidants, and associates, with such companionship being prevalent across various global societies. Currently, cats and dogs have emerged as the most popular domesticated animals. Several studies have indicated that the presence of pets can potentially augment the physical and psychological well-being of individuals, particularly adolescent students, and foster their social aptitude. However, a counterargument posits that pets may exacerbate the ailments of adolescent students. Hence, there is an exigent requirement for pertinent evidence to address the crucial inquiry of whether the companionship of pets fosters the physical and psychological growth of students. Furthermore, given the significance of pet companionship in facilitating school education and hospital treatment, it is imperative for educational institutions and healthcare facilities to comprehend the specific attributes of pet companionship that can enhance the physical and mental growth of students. This understanding is crucial for the optimization of animal-assisted therapy and animal-assisted education. This study employed meta-analysis techniques to examine the impact of pet companionship interventions on the development of adolescent students. Specifically, the study analyzed 12 studies to identify general patterns and test the effectiveness of various types of pet companionship. The findings may contribute to the optimization of animal-assisted therapy, animal-assisted education, and pet companionship in domestic settings.

The findings of this study suggest that the presence of pets has a noteworthy and favorable influence on the physical health (d = 0.199, p < 0.001), mental health (d = 0.259, p < 0.001), and social-emotional skills (d = 0.595, p < 0.001) of students. Furthermore, its positive impact on social-emotional skills surpasses that of physical and mental health. The study suggests that the effect on academic development is not statistically significant (d = 0.098, p = 0.677). Regarding the category of animal companions, research indicates that the association between students and horses and dogs as pets yields more substantial outcomes, with effect sizes of 0.200 and 0.243, respectively that are statistically significant. Regarding the category of animal companionship, animal-assisted therapy, animal-assisted education, and domestic pet companionship have notable impacts, exhibiting effect sizes of 0.215, 0.373, and 0.195, respectively. The find-

ings of this study exhibit conformity with certain assessments of the association between humans and pets conducted in other nations. Notwithstanding the uniformity of the impact's orientation, the magnitudes of the effects observed in this study deviate from those reported by certain researchers.

This study places a greater emphasis on China's present circumstances within the Chinese context in comparison to other meta-analyses on pet companionship conducted in other nations. Hence, the outcomes of this investigation hold greater significance for the advancement of pet companionship within the educational and medical domains in the current phase of China. Additionally, they are crucial for the enhancement of pet companionship in the entire country.

Conclusions and Suggestions

The present study employed meta-analytic procedures to scrutinize the phenomenon of pet companionship across a total of 12 studies, with the aim of examining the impact of such companionship on the physical health, mental health, and social-emotional competencies of students. This study conducted an analysis of the sources of heterogeneity present in the individual-level and research project-level studies that were included in the study. The findings indicate that (i) regarding the developmental stage, pet companionship has a better effect on preadolescent students than on adolescent students (d = 0.205); (ii) pet companionship has a significant positive effect on students with physical health risk (d = 0.203, p = 0.001) and behavioral risk (d = 0.717, p < 0.001), and the effect on those with behavioral risk is more significant and reaches a medium level; (iii) animals such as horses (d = 0.200) and dogs (d = 0.243) have significant positive effects on adolescent development; (iv) in terms of the type of pet companionship, animal-assisted therapy, animal-assisted education, and pet companionship at home all have significant effects, with effect sizes of 0.296, 0.373, and 0.195, respectively; (v) in terms of intervention intensity, low intensity (d = 0.245, p = 0.005), medium intensity (d = 0.259, p < 0.001), and high intensity (d = 0.345, p < 0.001) all significantly promote student development; (vi) the effect sizes of medium sample sizes (100-250 samples) are the greatest (d = 0.341), and the effect sizes of small sample sizes (d = 0.243) and large sample sizes (d = 0.233) are small.

The identification of overarching trends in the effects of pet companionship on the physical and mental development of students has the potential to enhance the efficacy of pet companionship in domestic settings, animal-assisted education in academic institutions, and pet-assisted therapy in clinical contexts. The analysis indicates that in China, when engaging in pet companionship, it is crucial to consider the physical and mental well-being, as well as the social-emotional growth, of individuals in order to enhance their holistic development. The significance of pets in facilitating the development of children should not be disregarded. Furthermore, it is imperative to enhance the function of companion animals strategically and systematically in various settings, such as households, educational institutions, and medical facilities, when they are in the company of students. The appropriate content and organization of pet companionship are essential for both scientific advancements and the development of students. Furthermore, the lack of proper planning in pet companionship can result in unanticipated outcomes.

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