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Review

A relational developmental theory of human-animal interaction: A *meta*-synthesis and grounded theory

Erin Flynn [a], Miriam G. Valdovinos [b], Megan K. Mueller [c], Kevin N. Morris [a,*]

[a] *University of Denver, Graduate School of Social Work, Institute for Human-Animal Connection, 2148 South High Street, Denver, CO 80208, USA*
[b] *University of Denver, Graduate School of Social Work, 2148 South High Street, Denver, CO 80208, USA*
[c] *Cummings School of Veterinary Medicine and Jonathan M. Tisch College of Civic Life at Tufts University, Department of Clinical Sciences, Tufts Initiative for Human-Animal Interaction, 200 Westboro Road, North Grafton, MA 01536, USA*

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ABSTRACT

Limited research has explored youths' relationships with animals as a possible ecological asset. We conducted a qualitative *meta*-synthesis of studies published before 2022 that examined how youth-animal interactions are described as shaping youth social-emotional health in education and therapeutic settings. We compared and combined the patterns of findings to determine which mechanisms within youth-animal coaction might be theorized to shape social, emotional, and behavioral development for youth in education and therapy contexts. We used a grounded theory approach to further analyze the primary data and compare it with extant relational developmental systems literature to suggest a new theoretical model for understanding the role of youth relationships with animals in youth development. We expand established human-centric theoretical models of youth development to describe how youth relationships with animals may operate as influential assets on youth developmental trajectories. We discuss implications for practice, limitations, and future research directions.

Adolescence is a highly consequential life stage with impacts on individual health and wellbeing reaching across the lifespan (World Health Organization, 2024). The relational developmental systems models (RDSM; e.g., Overton, 2011) that are the basis of most contemporary developmental theories emphasize the importance of contextual resources that comprise the ecology of human development and are organized within immediate, overlapping social systems and more distal influences, such as cultural and physical ecology (Lerner et al., 2012). In this paradigm, the individual is a creator of their own development (Lerner, 1982). Relational exchanges unfold within these contexts that may mediate key processes, such as youths' abilities to self-regulate and shape trajectories of development. Most youth development research focuses on resources that exist within socially defined systems and neglects to account for relations that are self-selected by individuals (Bowers et al., 2012). One largely overlooked, yet formative ecological asset is youths' relationships with animals. Human-animal coaction can be a significant part of the ecology of human development through pet ownership and therapeutic and educational programs involving animals (Gee et al., 2017; Purewal et al., 2017).

Abbreviations: AAI, Animal-assisted interventions; HAI, Human-animal interaction; QIMS, Qualitative interpretive *meta*-synthesis; RDSM, Relational developmental systems model.

* Corresponding author at: Graduate School of Social Work, University of Denver, 2148 South High Street, Denver, CO 80208, USA.
E-mail addresses: erin.fleming@du.edu (E. Flynn), Miriam.valdovinos@du.edu (M.G. Valdovinos), megan.mueller@tufts.edu (M.K. Mueller), kevin.morris@du.edu (K.N. Morris).
@@ErinJFlynn (E. Flynn), @@megankmueller (M.K. Mueller)

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Companion animals are highly prevalent in the U.S., with approximately 70 % of households having at least one pet (American Pet Products Association [APPA], 2022). This rate is higher in families with children (Westgarth et al., 2007) and it is likely that more children in the U.S. live with pets than with siblings (Jacobson & Chang, 2018). A significant number of children and adults view pets as family members (Melson, 2001; Cohen, 2002; American Pet Products Association [APPA], 2022). In one study, children ranked pets higher in importance as resources for social support than extended family (e.g., grandparents, aunts; Collis & McNicholas, 1998). There is growing empirical evidence that youth engage companion animals for emotional support when feeling a range of emotions (Purewal et al., 2017). Pets may indirectly support youth outcomes by mitigating stress among adults who facilitate youth programs (Hughes et al., 2024), leading them to feel more "enthusiastic" and "dedicated" to their work (Junça Silva, 2022) and helping them recover from negative situations or job demands (Junça-Silva, 2023). The ubiquity of animals in health and education interventions further illustrates cultural and professional recognition that companion animals represent an important contextual resource in the lives of youth (Gee et al., 2017; Gee et al., 2015; Hoagwood et al., 2016; Nimer & Lundahl, 2007; Lentini & Knox, 2009; O'Haire, 2013; Chur-Hansen et al., 2014).

Animal-assisted interventions and youth development

Animal-assisted interventions (AAI) for youth use human-animal interaction (HAI) across a range of contexts to promote outcomes such as academic skills (Brelsford et al., 2017; Bassette & Taber-Doughty, 2016; Uttley, 2013) and psychosocial health (Balluerka et al., 2015; Hoagwood et al., 2017; Nimer & Lundahl, 2007; Stefanini et al., 2016). When AAI are delivered in school and therapy settings, they support major developmental processes during adolescence (Balluerka et al., 2014; Lloyd et al., 2008). This includes reduced disruptive behaviors, anxiety, attention challenges, and depression (Balluerka et al., 2015; Friedmann et al., 2010; Stefanini et al., 2016, Schuck et al., 2013). AAI is associated with strengthened social-emotional competencies (Stefanini, et al., 2016), emotional well-being (Nimer & Lundahl, 2007), promotion of self-regulatory behaviors (Flynn et al., 2020b, 2020c, 2023), and significant benefits in educational contexts (Brelsford et al., 2017; Hall et al., 2016). AAI has grown in popularity partly because of its versatility across various settings (Brelsford et al., 2017; Jones et al., 2019; Villafaina-Domínguez et al., 2020) and cost-effectiveness (Bert et al., 2016), though findings from existing research have been mixed and not replicated across all studies (Bert et al., 2016).

Animals within a relational developmental systems model

Relational-developmental systems models (RDSM) view individuals as being embedded in a physical and psychosocial context with the person-context coaction as the basic unit of analysis (Lerner et al., 2012). This conceptualization is particularly useful to AAI, where youth-animal coactions are theorized to be highly varied in quality and process of change (Gee et al., 2017; Beetz 2017). AAI aligns with RDSM by offering opportunities for youth to engage in reciprocal human-animal relationships that may elicit positive psychosocial behaviors (Mariti et al., 2011; Mueller, 2014a; Silva et al., 2011). One study assessing the relationship between HAI and the Five Cs model of positive youth development (PYD) found that positive emotions and cognitions about animals correlated with higher levels of PYD (Mueller, 2014a). Engaging in social behavior with animals may help youth to form a range of developmental competencies (Purewal et al., 2017), including moral development (Mueller, 2014a), perspective-taking (Kahn et al., 2008), and a sense of responsibility (Mariti et al., 2011).

One notable paper examined the utility of RDSM as a paradigm to understand the role of human-animal relationships in positive youth development (Mueller, 2014b). This early work emphasized that the type and quality of human-animal relationships may vary based on the developmental period of the human and animal involved in the interaction and the duration and intensity of that relationship (Mueller, 2014b). Further, the author asserted that animal-related experiences may give youth the opportunity to form positive interactions between individuals and contexts, which would allow for "the fluid, changing nature" of the person and animal (Mueller, 2014b, p. 8). Lastly, an RDSM approach does not view animals as static actors; rather, youth-animal coactions must account for how the relationship impacts the animal and the person (Mueller, 2014b).

Use of theory in human-animal interaction research

The human-animal interaction (HAI) discipline lacks a widely accepted theoretical framework to guide research in the field (Gee et al., 2017). Kazdin (2017) encouraged the use of "small theories" to explain how and why HAI might yield a positive influence on human health and well-being. Extant HAI research employs a range of theories, including biophilia (Wilson, 1984), anthropomorphism (Urquiza-Haas & Kotrschal, 2015), cognitive-experiential self-theory of personality (Epstein, 1994), and motivation theory (McClelland, 1985). Julius et al. (2013) link attachment, biophilia, and neurobiological processes in an integrative theory to assert that HAI activates the oxytocin system and reduces stress.

Researchers studying youth programs that use HAI have employed a social development model (Catalano & Hawkins, 1996), motivation, and learning theories (e.g., Olbrich, 2009; Wohlfarth et al., 2013). Others formed a social-emotional development theory for HAI that they developed based on a review of research on HAI for children's social and emotional health, engagement, and learning (Gee et al., 2017). However, to date, no theories for HAI are based on first-hand qualitative accounts of the processes and outcomes that youth and youth program providers believe to be associated with HAI. Further, theories for HAI have not considered such qualitative data through an RDSM paradigm. Doing so in the current study allows us to form a theory capable of explaining the relationship between youth-animal coactions, processes of change, and youth development. This fills a gap in extant theory by expanding established human-centric theoretical models of youth development to understand how youth relationships with animals may operate as

influential assets on youth developmental trajectories, to identify processes of change that may underlie these relationships, and recognize possible variations in pathways of growth for individuals at different developmental stages in their own lives and between individuals with different individual and context-level assets. Such theoretical models are needed to inform our understanding of how youth-animal coactions function in therapeutic and educational settings where there are acute opportunities to shape developmental pathways. Such a theory will aid in the design and study of theoretically-based interventions that employ a dynamic approach to understanding the role of HAI in youth development.

Current study

The goals of the current work were to (1) synthesize existing qualitative literature that examines the influence of youth relationships with animals in education and therapy contexts on youth development to identify potential processes of change, and (2) to complete a grounded theory analysis to compare findings from studies included in the *meta*-synthesis done in real-world contexts with the work of Mueller (2014b) that details how an RDSM paradigm would help to understand HAI as a context for youth development. We focus on the period of early to late adolescence, which we define as youth between the ages of 10 and 18, and which we hereafter refer to simply as "youth." We narrow our focus to these ages because this developmental period is characterized by a growing emphasis on peer relationships (Scholte & Van Aken, 2020), expanding social networks (Giordano, 2003), and a need to acquire new social skills to function more independently in complex social situations (de Armas & Kelly, 1989). Such dimensions of the developmental tasks involved in this period suggest that HAI and its relationality have the potential to be particularly impactful in this developmental stage.

By systematically reviewing and synthesizing the qualitative literature, we aim to compare and combine the patterns of findings from HAI studies to determine which processes within youth-animal coaction might be theorized to shape social, emotional, and behavioral development for youth in education and mental health treatment contexts. By using a grounded theory approach to further analyze the primary data and compare it with extant RDSM literature, our purpose is to suggest a new theoretical framework for understanding the role of youth relationships with animals in youth development. Qualitative research lends itself to theory generation because it uses detail-rich descriptions of phenomena, and the data draws from real-world contexts, thereby increasing the validity (Creswell & Poth, 2016).

Methods

To address the research question, we used a qualitative interpretive *meta*-synthesis (QIMS) method combined with a grounded theory approach. This allowed us to synthesize the results of existing qualitative studies to generate new interpretive dimensions of the extant qualitative research (Aguirre & Bolton, 2014) and create a new theoretical framework (Glaser & Strauss, 2017) to understand the role of HAI in youth development.

Systematic literature search and retrieval of studies

Search strategy

We completed a systematic search in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement (Moher et al., 2009). We conducted systematic searches across eight psychology, social science, health, social work, and education databases. The databases were: PubMed, PsycINFO, Google Scholar, Academic Search Complete (multidisciplinary), ProQuest Central, ERIC, Social Services Abstracts, and Human Animal Bond Research Institute Central electronic database. The search was conducted in English and Spanish using subject headings and/or keywords in the title and abstract to ensure consistency of search terms was maintained across each database. Table 1 provides a full list of search terms used in conducting the search. Terms were aggregated into search strings with "OR" between synonymous terms and "AND" between areas. We used purposive sampling to capture all studies relevant to the phenomenon under study (Aguirre & Bolton, 2014; Dixon-Woods et al., 2006; Sliva 2015). The reference lists of sources selected for inclusion from full text review were hand-searched for additional relevant articles until conceptual saturation was reached. The search was completed between April and August 2022.

Eligibility criteria

In accordance with the study's purpose, to be eligible for inclusion in the *meta*-synthesis, retrieved studies were required to:

Table 1
Literature review search terms.

Area	English search terms	Spanish search terms
Youth	'youth*', 'teen*', 'adolescen*', 'child*'	'jóven*', 'juventud', 'juvenil', 'adolescente'
Program	'special education*', 'school*', 'therap*', 'interaction*', 'treatment*'	'educación especial', 'escuela*', 'interacción', 'tratamiento', 'terapia*'
Animal	'animal-assisted', 'animal*', 'guinea pig*', 'equine*', 'horse*', 'dog*', 'canine*', 'cat*'	'asistido por animales', 'animal*', 'cobayo*', 'equin*', 'caballo*', 'perro*', 'canin*', 'gato*'
Development	'youth development', 'health', 'wellbeing', 'emotion regulation', 'self-regulation', 'psych*', 'social-emotional', 'socialemotional'	'desarrollo juvenil', 'socioemocional', 'salud', 'bienestar', 'psicológica', 'autorregulación', 'regulación emocional'

(a) report on a sample of youth (ages 10–18);
(b) report findings focused on the lived experiences or psychological, behavioral, social, mental health, and/or academic outcomes of AAI in education or mental health settings;
(c) focus on an intervention that involved live animals (e.g., not robotic animals);
(d) use qualitative or mixed methods and had quotations or excerpts from original interviews with participants;
(e) be peer-reviewed articles, theses, or dissertations;
(f) focus on youth experiences of AAI;
(g) be in English or Spanish, and
(h) meet these minimum criteria for animal welfare: no indication of aversive methods of animal handling, restriction of movement of the animal, a failure to meet the five freedoms of the animal (Ng et al., 2019), or of forcing an animal to interact with participants after they communicated they do not want to engage. Articles were included even if they did not specify their animal handling practices.

We excluded studies focused on substance use because we expected the treatment goals and processes to involve more complex change pathways that diverge from our focus on how HAI might shape social-emotional health and psychological wellbeing. We excluded studies focused on developmental disabilities because the experiences, concerns, and needs of this subpopulation were distinct from our primary focus. Exceptionally, we included autism spectrum disorders because related interventions typically target social-emotional wellbeing. Books and conference presentations were excluded. No restrictions were placed on the date range or country of origin of the retrieved studies.

Literature screening

The first author conducted a systematic search and appraisal of retrieved abstracts and then screened each retrieved abstract at the title and abstract level to determine if they might meet inclusion criteria. Studies that appeared to meet inclusion criteria or could not be determined with just information available in the abstract were screened at the full-text level. Only the first author completed the article screening. Results from our search process are included in Fig. 1. The search resulted in 14 studies. See Table 2 for details of

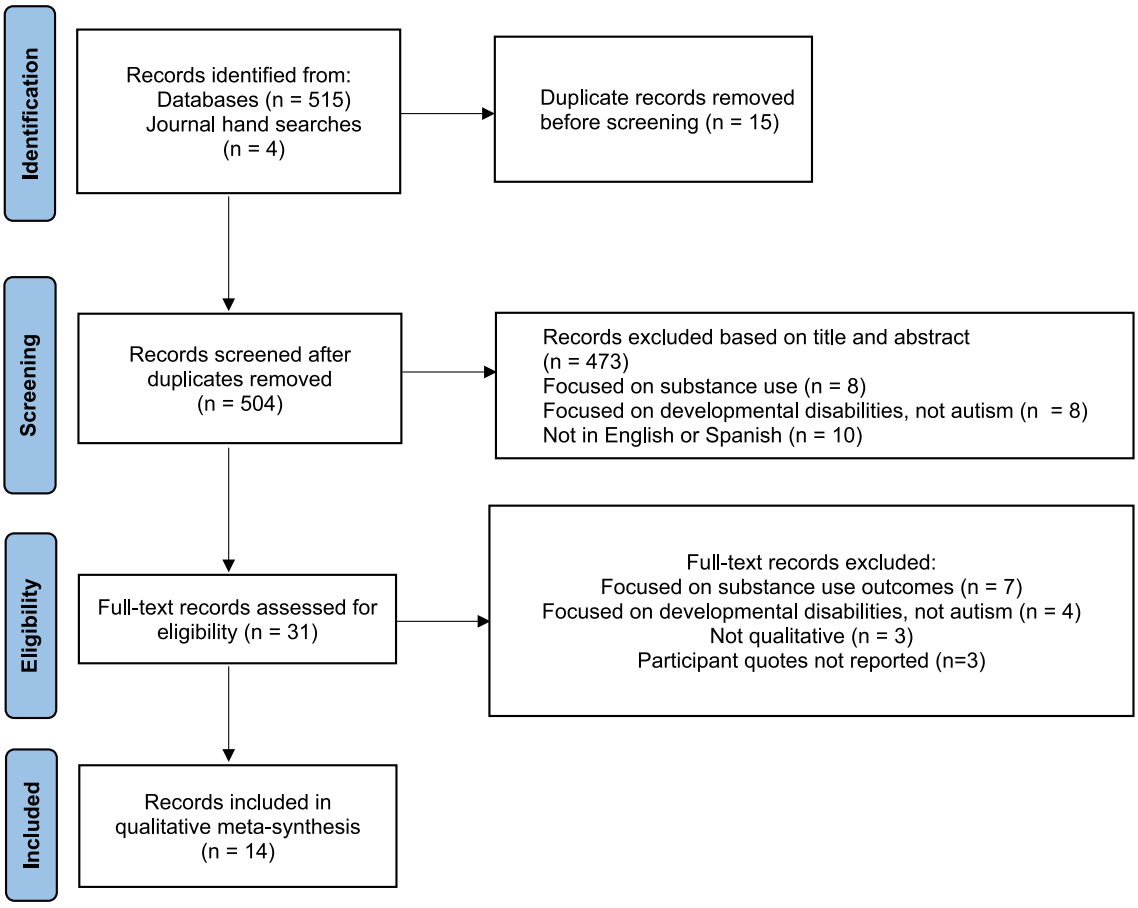

Fig. 1. PRISMA diagram of search and screening process.

Table 2
Details about included studies.

Authors (year)	Source type	Data Collection	N	Dates of data collection	Setting Characteristics	Sample characteristics	Type of AAI
1. Anderson & Olson (2006)	Peer reviewed journal article	Mixed methods; case study	6	Not available	Elementary school ~ 400 students, predominantly low socioeconomic community	Latinx = 1, Asian American = 1, Black = 1, Native American = 1, White = 2; 1st graders = 2, 2nd grader = 1, 3rd graders = 2, 5th grader = 1; Oppositional Defiant Disorder and Attention Deficit with Hyperactivity Disorder = 1, Reactive Attachment Disorder, intermittent Explosive Disorder, and Oppositional Defiant Disorder = 1, Reactive Attachment Disorder = 1, Attention Deficit Disorder and Central Auditory Processing Disorder = 1, Oppositional Defiant Disorder, Mood Disorder, and Attention Deficit Disorder with Hyperactivity = 1, Asperger's Syndrome and Bipolar Disorder = 1	Dog
2. Bradley (2013)	Dissertation	Case study; interviews	5	Nov-Dec 2012	Middle school; Northeast USA; ~200 students	Teachers (n = 3); school counselor (n = 1); principal (n = 1)	Dog
3. Canelo (2020)	Peer reviewed journal article	Qualitative descriptive longitudinal; interviews	12	October 2016 – June 2017	Public elementary school; lower-middle class community; Portugal	Parent-student dyad (n = 10), teachers (n = 2); students were 7-year-old 2nd graders; 2 male, 3 female; parents were 4 female, 1 male; teachers were 2 female, 0 male	Dog
4. Ewing et al. (2007)	Peer reviewed journal article	Case study	26	~2004–2007	Alternative day school; Middle and high school; Midwestern USA	Students (n = 4); 2 male, 2 female; 1 posttraumatic stress disorder, 2 multiple behavioral disorders, 1 attention deficit disorder, ages 10–13	Horse
5. Flynn et al. (2019)	Peer reviewed journal article	Phenomenology; interviews	18	March 2018	Private school for special education; Elementary, middle, and high school; Northeastern USA	Teachers (n = 7), teaching assistants (n = 11); mean age of students = 10 (min = 6, max = 19); Male = 7, Female = 11; White = 14, Black = 3, Black/ Caribbean = 1; years of experience on-site = 1–39	Farm animals, wildlife, Horses, Dogs
6. Flynn et al. (2020a)	Peer reviewed journal article	Phenomenology; interviews	24	March 2018	Private school for special education; Elementary, middle, and high school; Northeastern USA	Nature-based and animal-assisted intervention specialists:Canine (n = 4); equine (n = 5); wildlife (n = 3); farm animal (n = 7) nature-based (n = 5); male = 8, female = 16; Asian/Pacific Islander = 2, Latinx = 2, White = 19, No response = 1; mean years of experience on-site = 4; mean age of youth clients = 10 (SD = 5)	Farm animals, wildlife, Horses, Dogs
7. Flynn et al. (2020b)	Peer reviewed journal article	Phenomenology; interviews	23	July 2018	Mental health therapy program embedded within a private school for special education; Elementary, middle, and high school; Northeastern USA	School psychiatrist (n = 4), school psychologist (n = 6); school social workers (n = 13)	Farm animals, wildlife, Horses, Dogs
8. Flynn et al. (2023)	Peer reviewed journal article	Phenomenology; interviews	30	March-June 2021	Private school for special education; Elementary, middle, and high school; Northeastern USA	Mean student age = 12.6 years (10–14); male = 27, female = 2, gender fluid = 1; White = 18, Black = 6, multiracial = 4, Hispanic/Latinx = 2; Day treatment program = 14, Residential program = 14, both programs at different times = 2; average length of enrollment = 25 months	Farm animals, wildlife, Horses, Dogs
9. Kalkoske (2018)	Dissertation	Phenomenology; interviews	12	Not available	K-12 special education programs; Northeastern and Western USA	Teachers in private school (n = 6), public school (n = 6); School in Northeast (n = 3), school in West (n = 1)	Dogs
10. Lange et al. (2007)	Peer reviewed journal article	Observations and focus group	3	Not available	Group therapy program offered by a University's Department of Counselor Education and School Psychology; Midwestern, USA	Adolescents; male = 3, female = 2; ages 13–16	Dog

(*continued on next page*)

Table 2 (*continued*)

Authors (year)	Source type	Data Collection	N	Dates of data collection	Setting Characteristics	Sample characteristics	Type of AAI
11. Posas (2013)	Dissertation	Mixed methods; grounded theory; open-ended survey questions	5	Not available	Rural public school, Midwestern USA	Psychologists (n = 2), teachers (n = 2), counselor (n = 1); Male (n = 0), Female (n = 5); Age: 31–60 years	Horses
12. Mallon (1994)	Peer reviewed journal article	Mixed methods, qualitative, in-depth, semi-structured interviews	85	April – June 1993	Private school for special education; Elementary, middle, and high school; Northeastern USA	Students (N = 80; male = 73, female = 7; enrolled in residential treatment; ages 7–16 years (mean = 11 years); Black = 41, Latinx = 28, White = 10, Caribbean = 1); from urban area = 60, from non-urban area = 20).Farm treatment staff (N = 5; no demographics available)	Farm animals, wildlife, Horses, Dogs
13. Scholtz (2010)	Peer reviewed journal article	Intrinsic case study; drawings, interviews, field notes, reflections, photographs, observations	1	Not available	Community-based mental health therapy organization;South Africa	Therapy client, Male, age = 14	Dogs
14. Tate (2014)	Dissertation	Mixed Methods, Case study; interviews, open-ended survey questions, observations	1	December 2013	3 public schools (1 elementary, 1 middle, 1 high); Mean number of students = 283; student race (Asian = 0.2 %, Black = 0.7 %, Hispanic = 2.5 %, Indian = 0.5 %, White = 95 %); Midwestern USA	Sample was identified as 1 school district; Survey responses: not availableInterviews: school counselor (n = 1), school administrator (n = 1); Average years worked in district = 9.6	Dogs

Table 3
Original themes extracted from included studies.

Authors (year)	Themes
1. Anderson & Olson (2006)	1. Contributed to students' overall emotional stability, evidenced by prevention and de-escalation of episodes of emotional crisis 2. Improved students' attitudes toward school 3. Facilitated students learning lessons in responsibility, respect, and empathy
2. Bradley (2013)	1. The facility dog improves student learning 2. The facility dog enhances the learning environment 3. The facility dog helps to address students' academic, social, emotional, and behavioral needs 4. The facility dog improves the working environment for staff 5. The facility dog is an alternative teaching tool
3. Canelo (2020)	Pre-canine-assisted reading 1. Negative self-concept regarding reading 2. Avoidance of reading aloud Post-canine-assisted reading 3. Appreciated reading aloud without fearing exposure 4. High expectations of AAR were met 5. Benefits besides reading improvement.
4. Ewing et al. (2007)	1. Discussed worries about personal safety, trust, fears and anxieties 2. Positive mood 3. Improved personal hygiene 4. Confidence 5. Social skills and behaviors
5. Flynn et al. (2019)	1. Barriers and challenges to implementing human-animal-environment interventions (HAEI) 2. Impacts of HAEIs on behavior 3. Impacts of HAEIs on competence 4. Impacts of HAEIs on confidence 5. Impacts of HAEIs on connection 6. Impacts of HAEIs on curiosity, interest, and excitement 7. Impact of HAEIs on mood regulation 8. Impact of HAEIs on Motivation 9. Worldview expanded through novel experiences
6. Flynn et al. (2020a)	1. Barriers and challenges a. Fear or discomfort b. Dysregulated behavior 2. Opportunities a. Overcoming fears 3. Positive mood 4. Relationships and interactions a. Contribution b. Empathy c. Boundaries d. Communication e. Relationship facilitation f. Nurturing 5. Self-regulation a. Behavior b. Self-awareness c. De-escalation 1. Internal self-conception a. Confidence b. Self-esteem c. Responsibility
7. Flynn et al. (2020b)	1. Opportunities for contribution a. Nurturing and caring actions b. Self-efficacy and competence c. Equity d. Self-worth 2. Sense of safety a. A safe environment b. A less stressful therapy environment 3. Self-regulation a. Calming b. Self-awareness 4. Engagement a. Cooperation 5. Facilitating relationships a. Interpersonal skills b. Improved boundaries c. Better communication skills
8. Flynn et al. (2023)	1. Social-emotional development

(*continued on next page*)

Table 3 (*continued*)

Authors (year)	Themes
	a. Self-esteem and confidence b. Self-regulation c. Communication 2. Social Connection a. Attuned affection b. Support c. Companionship 3. Enjoyment 4. Positive sensory experiences 5. Barriers
8. Kalkoske (2018)	1. Incentive to complete work 2. Improved focus and attention 3. Distraction (negative) 4. Ability to manage academic frustration 5. Reading to dog 6. Calming or settling heightened emotional states 7. Increased expression of empathy 8. Improving students' self and situational awareness 9. Drawing out the student 10. Providing comfort 11. Sharing positive emotion when around dog 12. Improved social skills 13. Incentive for good behavior
9. Lange et al. (2007)	1. Calming effect on adolescents 2. Humor relief during therapy sessions 3. Increased feelings of safety in the group 4. Experiencing empathy 5. Motivation to attend sessions
10. Mallon (1994)	1. Spoke to the animals, without fear that what they said would be repeated 2. Visited the animals to feel better when they felt sad or angry 3. Learned about nurturing and caring for other living things
11. Posas (2013)	1. Knowledge and understanding 2. Attitudes and opinions
12. Scholtz (2010)	1. Improve Brandon's self-confidence and self-worth 2. Improve his self-acceptance 3. Improve his trust in others 4. Support him in experiencing success 5. Improve school attendance and participation 6. Improve social skills 7. Improve his relationship with his mother
13. Tate (2014)	1. The pet therapy dog at District X was being utilized 2. The positive effects of pet therapy in the district 3. The perceived negative effects of pet therapy in the district

included studies.

Data extraction, meta-theme analysis, and theory formation

Stage 1: Generate QIMS *meta*-themes. We extracted qualitative data from eligible studies using detailed instructions. These were to extract the original themes identified in each study using the authors' own words to preserve the initial findings and interpretations of each study. Then, to collate direct participant quotes and summaries of participant data. Finally, to extract summarizing information for each study (e.g., date of publication, sample characteristics; Table 2).

The first author recorded the extracted data in a spreadsheet. The second author checked all extractions for accuracy. In cases of missing information, the corresponding author was emailed to attempt to obtain the data. In accordance with the QIMS method, the first author synthesized the themes from the qualitative studies by comparing metaphors and concepts and their interactions across studies and grouping themes into overarching themes (Table 3; Aguirre & Bolton, 2014). Quotes from the original text were selected to develop the relationship between themes from the original articles and the newly developed themes (Aguirre & Bolton, 2014). A codebook was created to describe the newly synthesized themes (Table 4); The second author checked the codebook for consistency, and disagreements were discussed and resolved by consensus. Themes were shared with the third author, who gave input to develop further conceptual clarity.

Stage 2: Create an *a priori* RDSM-based codebook. We reviewed a seminal article that discussed the use of RDSM to study the dynamics that may be involved in human-animal interactions (Mueller 2014b). From this review, the first author created an *a priori* codebook that used the RDSM terminology that was presented as being central to understanding human-animal interactions in youth development (Table 5). The second and third authors reviewed this analysis and gave input to improve conceptual clarity.

Stage 3: Integrate the codebooks. The first author used a grounded theory approach with the constant comparative method (Corbin & Strauss, 1990) to create a third codebook that integrated the RDSM-based and QIMS codebooks (Table 6). The first author

Table 4
Stage 1 analysis — QIMS *meta*-themes. Summary of the codes developed from the included articles and changes to codes and code definitions when the codes were applied to the original QIMS data. *Note.* *New code.

Code Name	Definition	Examples (reported in QIMS articles)	Changes during application of codes to QIMS data	Final Codes
Enhanced environment	Animals enhance the therapy, learning, and working environments (an alternative teaching tool); in some cases, this is experienced as transformative of the environment for participants and/or facilitators.	Animals promotes equity; increased feelings of safety in the environment; less stressful therapy; improved trust in others; provides outlets for appropriate physical comfort); offers positive sensory experiences; youth feel accepted and that animals have unconditional positive regard toward them; fosters a sense of family and community; support of the wellbeing of adults and staff who are more relaxed & happier with animals present.	The dimension of this code "supports the wellbeing of staff members who are more relaxed & happier" was moved to a new subcode "emotional wellbeing"	Enhanced environment
––	––	––	––	Emotional wellbeing*
Facilitates engagement	Animals facilitate engagement and cooperation in school or therapy	Improved attendance, participation, motivation, and attitudes toward school	––	Facilitates engagement
Improves learning processes and academic outcomes	Improves student learning, supports students' academic needs and improves academic outcomes	Improved reading skills	––	Improves learning processes and academic outcomes
Supports development	Supports social, emotional, and behavioral development	Promotes nurturing and caring actions; promotes self-regulation (emotional stability, calming, self-awareness, mood regulation, behavior regulation, prevention of emotional crises, de-escalation, improved focus and attention, ability to manage frustration, elicits positive emotions); facilitates relationships and social connection (interpersonal skills, affection, support, companionship); improved social skills (boundaries, communication, empathy, responsibility, respect)	This code was divided into three child codes to adequately capture three sub-patterns that occurred. These were: nurturing and caring, self-regulation, and social connection. The new code "nurturing and caring" included people feeling nurtured and cared for by their interactions with animals.	––
––	––	––	––	Nurturing and caring*
––	––	––	––	Self-regulation*
––	––	––	––	Social connection*
Contribution	Provides opportunities to contribute – to others' wellbeing, the community, the group	––	––	Contribution
Self-concept	Strengthened internal self-concept	Improved self-esteem (self-worth, self-confidence); confidence (self-efficacy, competence, increased knowledge and understanding; experiencing success); improved self-acceptance	––	Self-concept
Elicits curiosity and joy	Encourages enjoyment and excitement	––	––	Elicits curiosity and joy
Barriers	Negative outcomes, barriers, or effects	Distraction, fear, discomfort (sensory discomfort, allergies), dysregulated behaviors (sometimes making the presence of the animal unsafe)	––	Barriers

identified convergence and divergence between code definitions in the two codebooks (Fig. 2) and identified relationships between themes that constituted the expanded relational developmental model of human-animal interaction (Fig. 3). The second and third authors reviewed summaries of this analysis and gave input on the organization and code definitions in the integrated codebook.

Stage 4: A new relational developmental model of youth-animal interactions. The first author applied the integrated codebook to the quotes, excerpts, and author summaries of the original content of the studies included in the QIMS to check for goodness of fit. The first author revised the integrated codebook based on new insights from the review of the original data. Where data supported greater differentiation of components within a theme, we divided QIMS and RDSM themes into subthemes. Where there was clear overlap in theme definition and excerpt meaning, we merged themes or subthemes. Through this process, we developed a set of final themes that were comprised of either the original definitions, or a combination of QIMS and RDSM definitions to be most reflective of

Table 5
Stage 2 analysis — RDSM-based themes. Summary of changes that were made after comparing the codes from the stage 1 QIMS analysis with those developed from a review of Mueller 2014b that uses RDSM as a framework to understand the dynamics of HAI in youth development. Codes and code definitions RDSM-based codes were revised to best represent the QIMS data. The final code list includes only the RDS codes that were present in the QIMS data.

Code Name	Definition	Examples	Link between QIMS & HAI-RDS code definitions	Changes	Final Codes
Bi-directional, mutually influential	Instances of animals and people influencing one another through their proximity or behaviors.	Fluid changes in behavior that arise from influences of being in a relationship to the other.	This code was well-represented in the data as defined.	––	Bi-directional, mutually influential
Purpose	The intention to accomplish something that is meaningful to the self and consequential for the world beyond the self; setting goals that transcend self interest.	Nurturing, care, and interaction with animals as a key purpose in the youths' lives; one's search for deeper meaning; contribution to others.	The concepts of "nurturing" and "caring" that exist in the QIMS codes also appear in the RDS models' "purpose" and "moral development" code definitions; The concept of contribution is also described in the QIMS and HAI-RDS systems.	We narrowed the code definition to only include cases of caring or nurturing when it was related to giving a person a sense of purpose.	Purpose
Intentional self-regulation (ISR)	The selection of goals, the optimization of resources needed to make such goals a reality, the ability to compensate effectively when goals are blocked, and the ability to reorganize one's goal system due to the loss of the capacity to achieve the goal.	Seeking out and maximizing resources in the environment.	The RDS conception of ISR is focused on regulating yourself and your environment to achieve your goals. The QIMS data had ample evidence of optimization of HAI resources to achieve acute cognitive, emotional, and behavioral self-regulation, which is a specific facet of the definition of ISR. Where goals were discussed more broadly in the QIMS data, it was in the form of adults deciding treatment or education goals, rather than youth identifying and pursuing their own goals.	We merged ISR with the "self-regulation" code definition and removed ISR as a standalone code due to the lack of evidence of goal selection and optimization more broadly in the QIMS data.	––
Social skills	Human-animal interactions encourage the practice of important human social skills.	Appropriate facial features and eye contact; the presence of animals serving as social facilitators to conversations or interactions.	This code overlaps with the QIMS codes "nurturing and caring" and "social connection" which also overlap with "moral development".	Differentiation between the definitions of this code and other codes is needed. No changes have been made yet.	Social skills
Moral Development	The presence of animals creates moral challenges in how we think about the role of animals and our responsibility to treat them with respect. This encourages the practice of navigating moral dilemmas.	Developing complex cognitive strategies and moral cognitions. Being able to express simultaneously fear and caring emotions. Socializing with animals helps practice reciprocity and caring behaviors, promoting perspective-taking skills and the formation of moral reciprocity and its compliment: nurturing behavior.	This code's definition overlaps with the QIMS data via the "promotes nurturing and caring actions" code and the inclusion of "empathy" in the definition of the QIMS code "social connection".	Differentiation between the code definitions is needed. No changes have been made yet.	Moral development
Health and fitness	Positive impact on health outcomes	Reduction of stress and obesity, providing an engaging and motivating context for physical	The QIMS data clearly linked HAI to physical activity (e.g., dog walking, animal	The "stress reduction" component of the code definition was merged with the "self-regulation"	––

(*continued on next page*)

Table 5 (*continued*)

Code Name	Definition	Examples	Link between QIMS & HAI-RDS code definitions	Changes	Final Codes
		activity for youth who may not participate in sports.	grooming, cleaning) and reduced stress but only indirectly associated this activity with improved health. (1) This code's mention of "reduction of stress" links to the QIMS theme "supports development" child code "promotes self-regulation," which includes calming. Some of the QIMS data illustrates calming to be a shift from a non-adaptive, undesired emotional state to one that is adaptive, which exemplifies calming in the sense of self-regulation. (2) Increased motivation: this aspect of the "health and fitness" code definition is well-represented in the QIMS data but these are instances of participating in a wide range of activities, and motivation to participate in physical activity is never explicitly mentioned. The QIMS data represents a broader definition of motivation than how it is defined in the RDS framework.	code definition. The "motivation" component of the code definition was merged with the "facilitates engagement" code. This was removed as a standalone code.	

the meaning interpreted from the QIMS data (Table 7, Fig. 2).

We identified excerpts that best represented each code. We then organized codes into overarching axial codes and mapped the evolution of the codebook (Fig. 2). This approach allowed us to test existing RDS theory against data from real-world practice settings and ground our new theory in empirical data that spanned time and contexts. We mapped the relationships between themes to create a new theoretical model for understanding youth-animal interactions (Fig. 3). Codes were reviewed by the second author and disagreements were discussed and resolved by consensus. The final codebook was re-applied to the original data from the selected studies to identify excerpts that best represented each code.

Results

Results from the *meta*-synthesis and grounded theory analyses provide important insights into possible processes underlying how youth-animal coaction might shape social, emotional, and behavioral development for youth in education and mental health treatment contexts. Four studies met the selection criteria through purposive sampling. Ten additional studies were found and screened for inclusion using the systematic review protocol (Fig. 1). All included studies were in English. The search using Spanish terms yielded seven studies; none focused on HAI. Of the 14 articles, eleven were in educational settings and three were in therapy settings (Table 2). In the following sections, where we present direct quotes to illustrate the themes, the descriptors of the speaker are reflective of the context of the HAI (e.g., "school therapist, teacher, or educator" indicates a school setting; "therapist" indicates a residential psychiatric treatment or community mental health program). Extracted data included article information (Table 2) and original theme extraction from sampled studies (Table 3).

Within original studies, youth and youth program providers detailed four overarching domains: (1) context-specific factors that shaped youth-animal coactions; (2) advantageous processes that may underlie youth-animal coactions and primary outcomes (i.e., some processes were also primary outcomes); (3) beneficial secondary outcomes that may stem from youth-animal coactions; and (4) strengthened self-concept from improvements in primary or secondary outcomes. After the *meta*-synthesis and grounded theory

Table 6
Stage 3 analysis — integrating the QIMS and HAI-RDS codes. *Note.* *New code.

Code Name	Code Source	Definition	Examples
Bi-directional, mutually influential human-animal bond	RDS	Instances of animals and people influencing one another through their presence, proximity, or behaviors.	Fluid changes in behavior that arise from influences of being in a relationship to the other.
Purpose	Purpose (RDS); Contribution (QIMS)	The intention to accomplish something that is meaningful to the self and consequential for the world beyond the self; setting goals that transcend self-interest; contribution to others.	Nurturing, care, and interaction with animals as a key purpose in the youths' lives; one's search for deeper meaning.
Social skills	Moral development, social skills (RDS); nurturing and caring (QIMS)	Skills needed to have productive social relationships.	Setting healthy boundaries, effective communication, expressing empathy, taking responsibility, showing respect for others; people feeling nurtured and cared for through their interactions with animals.
Social facilitation	Social skills – Animals as social catalyst (RDS); social connection (QIMS)	The presence of animals facilitates human relationships and social connection; use of interpersonal skills; giving or receiving affection, support, companionship.	Youth enjoying the companionship of a trusted animal.
Facilitates engagement	Health and fitness – motivation (RDS); enhanced environment (QIMS)	The presence of animals facilitates engagement and cooperation in youth programs.	Improved attendance, participation, motivation, and attitudes toward school or therapy.
Enhanced environment	QIMS	The presence of animals enhances the therapy, learning, and working environments for participants and/or facilitators.	Involvement of animals in youth programs offers an alternative teaching tool; promotes equity through youth becoming animal experts; increased feelings of safety in the environment; less stressful therapy; provides comfort (e.g., appropriate physical comfort); offers positive sensory experiences; feeling accepted, positive regard; fosters a sense of family and community.
Emotional wellbeing	Subcode of QIMS code "enhanced environment"	A general sense of safety and support; curiosity, and interest. Includes the additional subtheme: "curiosity, interest, enjoyment"	Youth and adults experience a greater sense of wellbeing; they are more relaxed & happier when an animal is present.
Improves learning processes and academic outcomes	QIMS	Improves student learning, supports students' academic needs.	Improved reading skills; improved test scores; greater attention to learning tasks.
Self-regulation	Health and fitness – stress reduction (RDS); Subcomponent of ISR.	Optimization of HAI resources to achieve acute cognitive, behavioral, and emotional regulation. Emotional stability, calming, self-awareness, mood regulation, behavior regulation, prevention of emotional crises, de-escalation, improved focus and attention, ability to manage frustration, elicits positive emotions.	Student seeks an animal when they are in crisis because they know interacting with the animal will help them feel safe and be soothed. Gaining permission to pet a horse during a period of heightened emotional dysregulation in order to be soothed by the tactile experience of the HAI. Visiting a trusted animal to reduce impulses to leave the residential program.
Self-concept	QIMS	Strengthened internal self-concept	Improved self-esteem (self-worth, self-confidence); confidence (self-efficacy, competence, increased knowledge and understanding; experiencing success); improved self-acceptance.
Elicits curiosity and joy	QIMS	Encourages curiosity, interest, enjoyment and excitement (expanded worldview)	
Barriers	QIMS	Negative outcomes, barriers, or effects	Distraction, fear, discomfort (sensory discomfort, allergies), dysregulated behaviors (sometimes making the presence of the animal unsafe).
Animal wellbeing*	RDS – subset of the theme bi-directional, mutually influential human-animal bond	Indications of the animal's wellbeing. Descriptions of the impacts (positive or negative) of human-animal interactions on the wellbeing of the animals involved.	A dog showing affiliative behavior while playing a communication game with a student.

analysis, eleven themes were developed that constituted these four original domains (Fig. 2). The domain "context-specific factors that shaped youth-animal coactions" was comprised of the themes: barriers, quality of the animal's experience, bi-directional, mutually influential human-animal coaction, and responsiveness to youth needs (Fig. 3). The domain "advantageous processes that may underlie youth-animal coactions and primary outcomes" was comprised of the themes: social facilitation, increased engagement, and improved self-regulation (Fig. 3). The domain "beneficial secondary outcomes that may stem from youth-animal coactions" was comprised of the themes: purpose through contribution, social skills, and improved academic outcomes. The final domain "strengthened self-concept from improvements in primary or secondary outcomes" was a theme in itself.

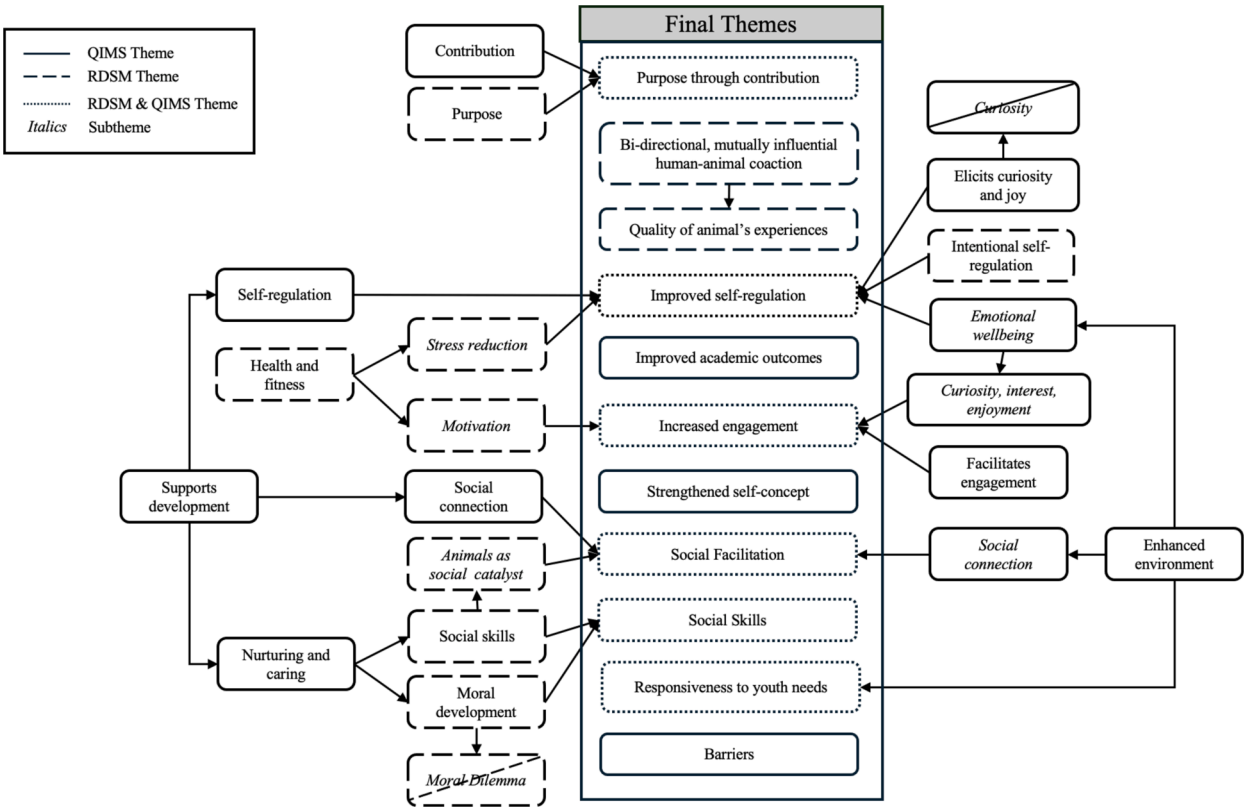

Fig. 2. Map of the theme development process.

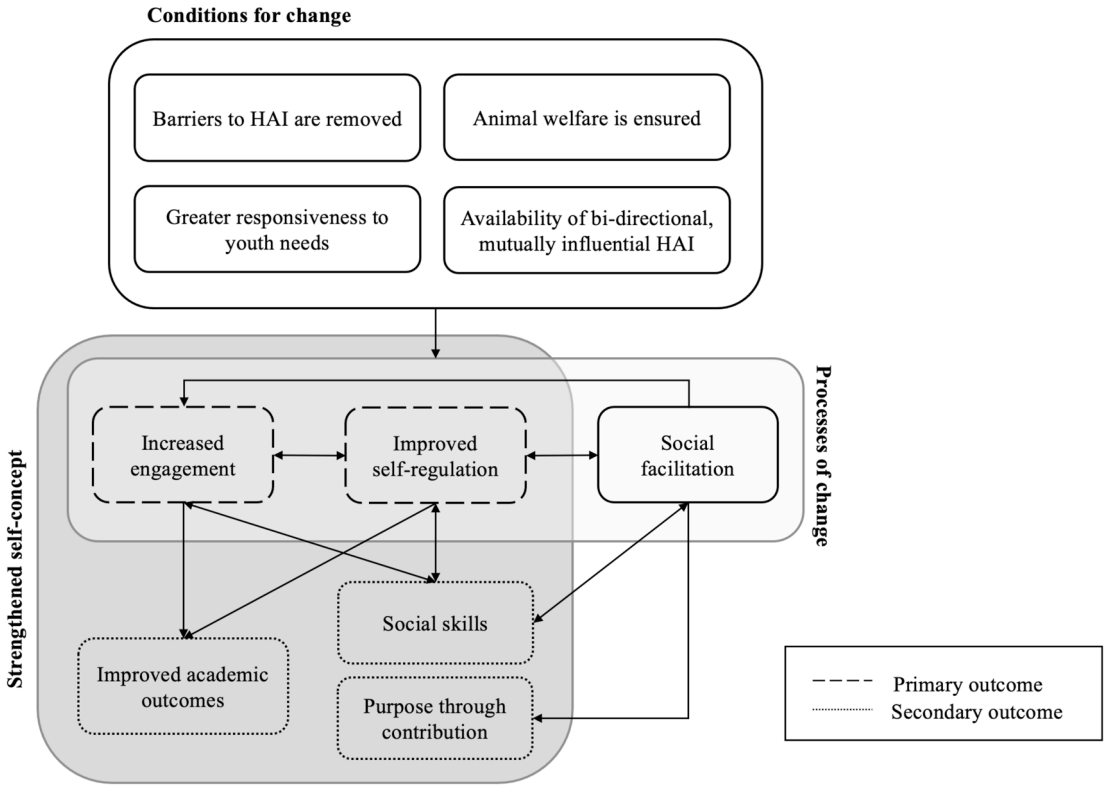

Fig. 3. Proposed relational developmental theory of human-animal interaction. Double arrows represent simultaneous interactive processes.

Table 7
Stage 4 analysis — Revision of the integrated model.

Final phase 3 code name	Changes	Final code	Definition
Bi-directional, mutually influential human-animal bond	Revised the name for clarity.	Bi-directional, mutually influential human-animal bond	The experience of a person and animal being in a dynamic, reciprocal relationship through which they have mutual influence over one another's experience as coactions unfold.
Purpose	Revised the name for clarity	Purpose through contribution	The human-animal bond offers an avenue for people to find meaning in their context and what they are experiencing or navigating. It transcends self-interest and involves a contribution to the world beyond the self. It may involve caring and nurturing behaviors but the focus of these rests on the motivation to engage in the behaviors *to create a benefit beyond the immediate self* and one's own needs and desires.
Social skills	None	Social Skills	HAI promotes nurturing behavior, reciprocity skills, caring behavior, navigating interpersonal boundaries, communication, empathy, respect for others, awareness of facial expressions and body language, and mutual eye contact.
Social facilitation	None	Social Facilitation	The presence of an animal(s) facilitates social relationships between a person and animal(s) or between people; experiences of affection, acceptance, support, companionship, and connection with an animal or other people. Supports a person's ability to participate in social contexts including classroom & learning settings and therapeutic relationships
Facilitates engagement	Updated the definition to include "curiosity, interest, enjoyment" that was a subtheme of the "emotional wellbeing" QIMS subtheme. For clarity, revised the code name to "increased engagement".	Increased engagement	Increased curiosity, interest, enjoyment, motivation, and positive attitudes toward class or therapy activities. Increased attendance or participation.
Enhanced environment	Renamed code to be "greater responsiveness to youth needs". A subset of excerpts aligned better with the codes "social facilitation, emotional wellbeing, and self-regulation" and were regrouped accordingly.	Greater responsiveness to youth needs	Enhances the therapy, learning, and working environments for participants and/or facilitators. Animals foster a sense of family and community; create new opportunities for staff members to meet students' needs for different kinds of sensory input and preferences for information processing. Animals provide appropriate avenues for youth to receive physical comfort from another living being. Animals promote equity by giving youth opportunities to be in the role of expert.
Emotional wellbeing	Removed "curiosity, interest, & enjoyment" from the definition and moved associated excerpts to the "increased engagement" code. Merged the remaining excerpts of "emotional wellbeing" with the code "self-regulation" due to overlap in definitions. Removed this code.	––	––
Improves academic outcomes	Removed "learning processes" from the codename and definition as this was too broad and overlapped with other codes.	Improved academic outcomes	Improved academic outcomes including reading skills, test scores, and focus on learning tasks.
Self-regulation	Merged the QIMS subcode "emotional wellbeing" due to an overlap in excerpt meanings and inability to reliability code them separately. Merged the QIMS theme "elicits joy" after removing "curiosity" from the code's definition.	Improved self-regulation	Optimization of HAI resources to achieve acute cognitive, behavioral, and emotional regulation. The presence of an animal(s) facilitates acute cognitive, behavioral, and emotional regulation. This includes support of individuals' abilities to process emotions and adaptively shift from one mood or emotional state to another to feel better emotionally, stay calm, reduce their anxiety, increase their focus, or overcome fear. A sense of emotional wellbeing, self-awareness, mood regulation, prevention of emotional crises, and improved focus and attention.
Self-concept	Revised name for clarity.	Strengthened self-concept	Strengthened internal self-concept. Improved self-esteem (self-worth, self-confidence); confidence (self-efficacy, competence, increased knowledge and understanding; experiencing success); improved self-acceptance.

(*continued on next page*)

Table 7 (*continued*)

Final phase 3 code name	Changes	Final code	Definition
Elicits curiosity and joy	Removed "curiosity" from definition to distinguish this code from "increased engagement" where "curiosity" is part of the code's definition. Merged code with "self-regulation" based on overlap between the definitions.	––	––
Barriers	None	Barriers	Negative outcomes, barriers, or effects such as distraction, fear, discomfort (sensory, allergies). Dysregulated behaviors may make the presence of the animal unsafe.
Quality of the animal's experience	Revised code definition to capture broad examples of the animals' experiences during interactions, rather than focusing strictly on wellbeing.	Quality of the animal's experience	Indications of the animal's experiences during interactions. Descriptions of the impacts (positive or negative) of human-animal interactions on the animals' wellbeing.

Context-specific factors that shape the youth-animal coaction

Four types of contextual factors seemed to shape youth-animal coactions. These were barriers to youth-animal coactions at the individual and structural levels, the quality of the animal's experience during coactions, bi-directional, mutually influential coactions, and greater responsiveness to youth needs.

Barriers to youth-animal coactions

This theme represents negative outcomes or effects of youth-animal coaction (Table 7). Data illustrated how youth's dysregulated behaviors may make the presence of the animal unsafe for the animal, people, or all participants. Contextual factors in the environment shape how youth-animal coaction unfolds dynamically for different individuals at different times. Participants attributed challenges at the individual level as related to allergies, uncomfortable sensory experiences, or disinterest in animals. One teacher said, "[if the students] had allergies, it affected their willingness to go to the farm" (Flynn et al., 2023, p. 9). Another study described: "Cleaning up farm animal excrement was especially noted [as a barrier] by students due to the smell and concern of encountering waste" (Flynn et al., 2023, p. 9). A teacher elaborated: "Smells in the classroom from the animals pooping … it kinda gets to some of the students" and "The dirt, the smell, the noise, the weather … can be so overwhelming" (Flynn et al., 2020a, p. 3). One therapist shared "they did not like …Tucker's breath and his fur shedding" (Lange et al., 2007, p. 27).

Another barrier was youth aversions to or disinterest in the animal. One student commented that "learning about the animals was 'just a little boring'" and another described "not enjoying interactions with the llamas…due to their tendency to spit, which might make a student 'mad' or 'frightened'" (Flynn et al., 2023, p. 9). A student explained, "The green duck is the most annoying because he always tries to nip" (Flynn et al., 2023, p. 9). Other individual-level challenges were fear of the animal or difficulty self-regulating. One teacher said, "Horses are big and … sitting on their back and having control of an animal, it's intimidating" while another explained, "Younger children seem to be especially susceptible to fears of animals they're not familiar with" (Flynn et al., 2020a, p. 3). Though short-lived, one educator explained, "Some students will want to make their focus…on the therapy dog, and they get a little bit distracted" (Kalkoske, 2018, p. 143). A student recalled of their peers: "With the animals, they were pretty hyped up" (Flynn et al., 2023, p. 7).

Barriers at the structural level involved the need for enough staff to safely facilitate youth interactions with animals. One teacher explained: "There should be enough adult staff…present in case a child's behavior becomes unsafe without warning" (Posas, 2013, p. 81). Though barriers existed, they occurred infrequently and were usually predictable and manageable. Another teacher observed, "many students eventually overcame barriers related to fears and sensory issues that had previously stopped them from participating" (Flynn et al., 2019, p. 152). Distractions related to the animal were "either short-lived or…accommodated by staff and, therefore, did not have a particularly problematic impact" (Kalkoske, 2018, p. 155).

Quality of the animal's experience

The quality of the animal's experience shapes the relational dynamic that unfolds during coactions (Table 7). This is central to an RDSM-based approach to understanding mutually influential human-animal interactions. There was wide variation in the included studies in how much youth-animal relationships were perceived as relational exchanges that were mutually shaped by the experiences of both the people and the animal. Most of the included studies described youth-animal relationships as unidirectional and focused on human experiences during interactions with animals.

Animals were described using utilitarian and objectifying language, and many study participants did not view the relationship as one that was co-created by youth and animals. One educator said, "[the facility dog program had] reinforced what I already believed about how animals are… around to help people" (Bradley, 2013, p. 52). Another educator described the facility dog as "a good prop," and a teacher in the same study viewed the dog as "the remedy for various student issues" (Bradley, 2013, p. 47). Another educator said, "The student's teacher often finds the student sleeping with Braxton as his pillow" (Tate 2014, p. 78). A therapist described limiting an animal's movement to benefit a child: "As her behaviors began to de-escalate, [the dog] was placed in her arms to hold and pet" (Anderson & Olson, 2006, p. 44). A teacher similarly restricted a classroom dog's natural behaviors: "She doesn't talk unless I tell

her to…I can get her to speak and… she will not bark unless I tell her to" (Tate, 2014, p. 85). It may be that more of these behaviors were present in studies that did not meet the criteria for inclusion.

In contrast, participants in some studies described their view of the animal's behaviors or the quality of their experience shaping the coaction. Participants recounted giving animals choices in their movement to convey information about boundaries to students: "The dog responded warmly to activities that pleased him and walked away or barked when he was displeased" (Anderson & Olson, 2006, p. 45). One youth recounted, "[the therapy dog] taught me how to do what he wants to do, not what I want to do" (Anderson & Olson, 2006, p. 45). A therapist postulated, "If they do something that bothers the animal, they're not as reactive as they might be with a peer, and defensive, cause the animal might just walk away. And then they … want that interaction, so they might adjust themselves without … prompting" (Flynn et al., 2020b, 638). A teacher said: "They know that when he comes in, they have to be quiet. He won't approach them if they're acting out" (Bradley, 2013, pp. 62-63). Other teachers used the dog's free movement to create opportunities for youth to feel the animal was attuned to their emotional experience. A teacher said, "When Matt did not feel physically well from tonsillitis … J.D. would curl up next to him and sleep as well" (Anderson & Olson, 2006, p. 45). A teacher said, "Braxton can just feel when kids have anxiety … and she'll just go over and … lie down in front of them or … sit there by them" (Tate, 2014, p. 79).

Some described the potential for increased risks that animals might be mistreated or negatively impacted by interactions with youth. One researcher noted of the data, "There is always a greater risk that animals could be negatively impacted by students who sought them out for soothing when dysregulated. For example, youth's erratic or loud behaviors could startle the animals" (Flynn et al., 2020b, p. 636). An HAI program staff member described, "aggressive interactions with animals, in some cases, developed as a consequence of misinterpretations of animal behaviors: I've noticed a kid getting angry because a horse stepped on their foot" (Mallon, 1994, p.468). Another HAI program staff member explained, "The children we work with need to learn how to be gentle with an animal; it's hard for some of them because they have never had someone be gentle with them. In many cases, they have been exposed to people who were aggressive with them, and then it carries over to the animals" (Mallon, 1994, p. 468).

Bi-directional, mutually influential human-animal coaction

This theme represents the experience of a dynamic and reciprocal relationship through which people and animals have mutual influence over each other's experience as coactions unfold (Table 7). Bi-directional youth-animal coactions seemed to elicit youth's social skills (i.e., empathy, caring, and sharing). A teacher described: "By them having that empathy toward the pet and the pet showing that empathy back towards them, it does kind of help them relate this to the empathy they have with their peers" (Kalkoske, 2018, p.161). A therapist described animals eliciting caring responses: "The animals' dependence on the students … help[ed] the students develop healthy caregiving skills [and], in turn, 'helps them to be more affectionate towards each other and towards themselves'" (Flynn et al., 2020b, p. 635). A young person reflected: "Horses can feel what we feel… [and] we want them to be calm and happy … [so] we have to keep our cool, even if we get nervous" (Flynn et al., 2023, p. 8).

Youth-animal coactions helped youth shift toward adaptive self-regulation. One teacher recalled, "Smooch will approach the student on his own and rest his head on the student's lap. The student will gently stroke his head, and a smile will return to the student's face" (Bradley, 2013, p. 58). The teacher remembered another instance when "A student broke his leg and was in a wheelchair… Smooch sensed that the student was upset, so he approached the student and gently placed his head on the student's lap. The student had a big smile on his face and proceeded to pet Smooch" (Bradley, 2013, p. 56). A therapist said: "[students would] sit on the floor and ask Tucker to sit in their lap. Tucker seemed to like this and often would fall asleep. This appeared to occur when an adolescent needed to "tune out" and take a break from the group experience" (Lange et al., 2007, p. 24).

In other instances, positive coactions soothed youth and prevented or resolved periods of dysregulation. A teacher said, "While J.D. [the dog] was a member of the class, Ben went into emotional crisis once, and the episode was significantly less intense than on previous occasions … J.D. would go to Ben, who would then begin to pet the toy poodle…[who would] lie on his back while Ben rubbed his belly… until Ben was ready to talk about his problems" (Anderson & Olson, 2006, p. 43). A therapist reported that they would ask their students to "notic[e] the animals' emotional state[…] and then encourag[e] the child to help bring the animal down energy wise, and so the child then learns how to bring their own energy level down" (Flynn et al., 2020b, p. 637). A therapist summarized, "[The animal] can have an interaction that's maybe not the best and then drop it and move on if the child changes behavior, so it's definitely a situation that promotes the child also continuing to be more regulated'" (Flynn et al., 2020b, p. 636). Students reflected similarly: "If I'm like arguing with someone, I don't just stand there and keep arguing. Walk away and take a break," while another student shared that they learned "to stay calm around animals and other people" (Flynn et al., 2023, p. 7).

Greater responsiveness to youth needs

The inclusion of animals in youth programs seemed to create opportunities for the youth and staff members to be more responsive to their needs (Table 7). Participants described the involvement of animals in enhancing therapy, learning, and work environments. One teacher shared incorporating a dog into class activities to meet students' different sensory needs. They shared, "If a student needed to relax in class, the student could pet or read a book quietly to Smooch… if a student needed to move around, the[y] could throw a ball softly in the classroom and Smooch would fetch it… A student had to take frequent breaks in class… [and] could pet Smooch every so often. [Eventually, they] developed the ability to take fewer breaks as a result of Smooch's presence" (Bradley, 2013, p. 51). Another teacher explained, "Some students need more sensory techniques than others …the facility dog program … serves as an additional sensory intervention for certain students" (Bradley, 2013, p., 62). One educator illustrated, "The dog served as a learning tool for students who were visual learners, which allowed for lessons to … better meet students' diverse learning needs" (Bradley, 2013, p. 47). A therapist described meeting different information processing needs by "using a horse in therapy… [to] create powerful metaphors [that] can in turn be related back to the client's life goals, recovery, and self-awareness" (Posas, 2013, p. 80).

Animals were described as uniquely situated to meet youth needs for physical comfort, particularly while participating in residential programs. One residential therapist explained, "We can't touch them… like a parent would. If they have a bad dream, we won't get in bed with them… and I think that the animals can offer… physical comfort that we just can't … particularly the younger kids who [most] seek it out" (Flynn et al., 2020b, p. 636).

Because HAI is highly adaptable, program staff could help youth overcome fears. One HAI program staff described, "[We] were careful to adapt the interaction to match the student's comfort level … one [child] who had never worked with horses when we're grooming, he was like, 'Nope. Not touching. I'll stand here though, but I am terrified,' [so I said] 'Okay, we'll have you watch.' In another example, a student was fearful of the horses, so the teacher 'took him to the smaller [equines], the donkeys and the mini horses and … he was … more relaxed" (Flynn et al., 2020a, p. 3).

Advantageous processes and primary outcomes

Participants described three advantageous processes they thought were involved in youth-animal coactions: increased engagement in youth programs, improved self-regulation, and social facilitation. The themes of increased engagement and improved self-regulation were processes and primary outcomes.

Increased engagement

This theme describes the perception that animals helped youth increase their attendance or participation in youth programs, which was characterized by increased curiosity, enjoyment, motivation, and positive attitudes toward activities when animals were involved (Table 7). A teacher described, "For some, it's a reason for them to come to school. They really love Smooch" (Bradley, 2013, p. 108). Another teacher remembered that "Parents felt their children had been more motivated during the school year" (Canelo, 2020, p. 102). A teacher noted, "There's more participation—more eagerness to learn or do the lesson when [Smooch] is here" (Bradley, 2013, p. 50) while another teacher expressed: "Smooch is an incentive to …follow directions and work" (Bradley, 2013, p. 50). "The dog, Smooch, initiates student learning …a student is tired or disengaged from the lesson. In this case, she would instruct the student to drop his pencil and give Smooch the command to pick it up. Students responded positively … and generally refocused their attention on the teacher" (Bradley, 2013, p. 48). Two educators shared, "Smooch motivated students to be more physically active" (Bradley, 2013, p. 51). In some cases, the anticipation of encountering animals reduced youth's school anxiety enough that they could join their class. A teacher explained, "[Braxton, the dog] helps out a lot with new students who are apprehensive about coming to a new school …putting students at ease with their surroundings…befriending the new student when the student feels alone" (Tate, 2014, p. 80).

Across studies, participants thought that youth's enjoyment of the animals contributed to increased program engagement. One educator described, "they begin to see that …you can enjoy work…they come in thinking that the future is going to be nothing but more trouble, like the trouble they've already had… But I think the farm programs are a part of changing their attitude" (Flynn et al., 2020b, 637). A young person described their experience during therapy, "I be coming in here and being mad and I just like said, 'Oh there is a dog…this is so sweet!'" (Lange et al., 2007, p. 27). A therapist noted: "They begin to feel 'Something good could happen to me.' You know? 'Something good has happened to me'" (Flynn et al., 2020b, p. 637).

Youth's interest in animals motivated them to pursue social interactions. A therapist explained, "If you want the sheep to come near you, you're gonna be motivated, right? Whereas a lot of the time with the peers, they're like 'forget it. It's too hard'" (Flynn et al., 2020b, p. 638). Another therapist said, "Students were often motivated to practice good boundaries with animals out of a desire to get positive engagement from them" (Flynn et al., 2020b, p. 638). Animals were described as helping youth let their guard down to increase their participation in social interactions. This tended to occur first during youth's direct interactions with animals and then broadened to include interactions with people. An educator described, "Children were more willing to be themselves around the dogs and let down their guard…they come in very rough and tough and when they are with the therapy dog…you just finally get to see the child" (Kalkoske, 2018, p. 162). One therapist illustrated, "I experienced a change in Brandon's attitude towards me. He gradually started to make more eye contact with me, smiled, and frequently spoke to me, answering my questions" (Scholtz, 2010, p. 57).

Improved self-regulation

The presence of animals was perceived as facilitating acute cognitive, behavioral, and emotional regulation. This includes supporting individuals' abilities to process emotions and adaptively shift from one mood or emotional state to another to feel better emotionally, stay calm, reduce their anxiety, increase their focus, or overcome fear. Animals were perceived to provide a sense of emotional wellbeing, self-awareness, and prevention of emotional dysregulation (Table 7). Participants described how youth explicitly coordinated their environment to solicit support through HAI to achieve emotional and cognitive self-regulation. This process falls within the RDS concept of intentional self-regulation (ISR), which relates to goal selection and resource optimization more broadly (Mueller, 2014b).

Youth sought the support of animals to help themselves process emotions and adaptively self-regulate. One therapist linked this to youth trust in the animals, explaining, "Because students felt a sense of safety around animals at the farm, they were able to better self-regulate there" (Flynn et al., 2020b, p. 639). A therapist recounted students seeking animals when they were in crisis, saying, "I think [its] really telling, that somehow that's a place that they know is safe or where they can be soothed" (Flynn et al., 2020b, p. 636). One HAI program staff member said, "[a] student was [dysregulated] … but then he … started petting the horse … that broke him out of an episode to … be tactile with a horse, and … he was de-escalating. It was wild … to see him come back instantly, just because of that tactile connection" (Flynn et al., 2020a, p. 5). One youth similarly described relying on their relationship with an animal to control their impulse to leave their residential program: "When I go AWOL, I go to see the animals, and I pet them, then I feel better… I go

there, and then I feel better" (Mallon, 1994, p. 462). One student said the dog "helped her slow down and keep her engine running just right… [that] dogs were good for kids because they helped kids get out of trouble. Even when J.D. was not around, thinking about him helped her make better choices" (Anderson & Olson, 2006). A study summarized, "During intense therapeutic sessions they…used animals 'as a distracting point' that could help 'bring them back down so they can go back to [processing]'" (Flynn et al., 2020b, p. 636).

Program staff noted increased youth abilities to be more self-aware and use self-control in the animal's presence. HAI program staff noted that in the presence of animals, youth seemed to have an "increased capacity to control their actions, emotional triggers, and outbursts" (Flynn et al., 2020a, p. 5), and animals "encouraged mindfulness for kids" (Flynn et al., 2020b, p. 637). Other HAI program staff described that "they're more aware of themselves, and just more centered and grounded" and "[Youth are] more aware of their emotions and how they're feeling" (Flynn et al., 2020a, p. 5). A therapist described incorporating animals to help youth "[get] grounded, get them connected to reality… to reduce worry chatter" (Flynn et al., 2020b, p. 637). A school therapist described one student's decreased emotional intensity through his awareness of the dog: "You could get him from a 12 back to a 3, just by showing [the therapy dog's] face, because he didn't want the dog to be scared, he didn't want to upset the dog, he wanted to make sure the dog was safe" (Kalkoske, 2018, p. 160).

Staff and youth noted positive shifts in youth moods through their relationships with animals. A student explained, "When I'm having a sad day, I go there [to the farm], I pet the animals, and I feel better. I go to look at the animals when I'm mad, and then I feel better" (Mallon, 1994, p. 461). An HAI program staff similarly illustrated: "I pick[ed] up a student and … it had been a really, really, really rough day [for him]. He came to the program, and he was outgoing … happy … you never would have known that before he was kicking and screaming" (Flynn et al., 2020a, p. 5). One teacher described a similar contrast, saying, "If the kids are having a bad day and they see [the dog], it's automatically – it's almost like they forget. They see her, and they're just like 'Braxton!'" (Tate, 2014, p. 82). One student shared that "when she was having a problem at home, she would close her eyes and think about playing with J.D. to feel better. If she was having a bad day at school, she also helped herself pull out of it by petting the dog" (Anderson & Olson, 2006, p. 45). Another youth said of therapy, "I just wanna bust out and cry sometimes or get mad and just, I just feel bad, and [Tucker, the dog] helps me feel better" (Lange et al., 2007, p. 26).

Staff perceived their own moods and ability to provide emotional support to youth as positively influenced by their relationships with animals. One HAI program staff said, "You could be having a really rough day. You missed your lunch, you're tired, and you walk down the hallway, and there's a dog wagging its tail at you. You go over there, you pet it, you talk to it for a few minutes, and it just makes everything seem more ok…. and I'm sure I'm not the only one" (Bradley, 2013, p. 59). One school therapist elaborated: "[I] remember a first-year teacher who was newly hired. The teacher was really struggling the first few weeks of school. She came into [my] office every day after school, and Braxton would walk up and lay her head in the teacher's lap, and the teacher would just cry and cry" (Tate, 2014, p. 83). The emotional support teachers felt from an animal seemed to impact their students, as one therapist said: "Having access to the animals has a therapeutic impact on the people that work here, too. People are more regulated. And happier. They're more able to actually interact more peacefully with students who really have some difficulties" (Flynn et al., 2020b, p. 636). Similarly, a teacher said, "Teachers may be going through personal issues and might have to hide their emotions when teaching to maintain a happy and positive learning environment. Having a facility dog that is always happy would help any teacher overcome those challenges" (Bradley, 2013, p. 53).

Participants talked about youth being more capable of managing their anger and frustration through their relationships with animals. Youth explained that they intentionally turned to animals to calm themselves when they were angry. One youth said, "When I'm having a bad day, I go up [to the farm] with my [social] worker to cool down…it makes me happy … When I'm angry, I go look at the animals, and I feel better and calmer" (Mallon, 1994, p. 462). Another student described, "When I am mad or upset; I try to take a time out… I go up and play with the sheep…I go to see the animals" (Mallon, 1994, p. 462). One teacher said of a student, "He was able to avoid bad behavior toward his peers and his teachers because of the dog. Jake's foster mother said that [the dog] J.D. seemed to be a good sidetrack for Jake's anger" (Anderson & Olson, 2006, p. 43). A therapist described youth turning to a dog during group therapy: "[They] used Tucker as a buffer against their own anger. If two of the adolescents started to argue, it was not uncommon to see one of them call Tucker over to join him or her. The adolescent would speak softly to Tucker and pet him" (Lange et al., 2007, p. 28). In a similar observation, an educator recalled, "The children very definitely come to the farm when they are upset or angry; they see the farm as a soothing, healing place" (Mallon, 1994, p. 462). One teacher described: "There were a couple of kids, they just wouldn't talk. They'd get so mad; they'd get balled up they just wouldn't talk to me… So, I'd just kind of sit here, and Braxton [the dog] …can just feel when kids have anxiety. And she'll just lie down in front of them, or sometimes she'll just sit there by them. And they will start petting her…" (Tate, 2014, p. 79).

Participants described youth relationships with animals as helping youth cope with anxiety. One teacher said: "It does help them all stay more calm" (Kalkoske, 2018, p. 159). When asked why animals were calming, a student explained, "They don't make a lot of movement," and another student shared, "They don't ask questions," while a third student said, "[They]… help me … get my energy out… and [get] my mind off of what I'm upset of'" (Flynn et al., 2023, p. 7). Another student explained, "When I'm not around animals … I tend to be … impatient… [the animals] kind of feel like emotional support fluffs … because they're always there when you need them" (Flynn et al., 2023, p. 7). One teacher illustrated: "Hyperactive kids will … sit there for 45 min just so they can play with the dog. It's like, I try this all day for hours, and nothing, but you put them around the animals, they're completely different people" (Flynn et al., 2019, p. 152).

Staff described youth-animal coactions as helping youth focus. One teacher described visits with the classroom dog as providing a break that aided focus: "Sometimes paying attention for an entire 45-minute period was difficult for students, so Smooch's quick breaks helped students maintain their concentration throughout the whole class" (Bradley, 2013, p. 49). Some teachers thought it was the

dog's calming presence that improved student focus: "Smooch [the dog] would go over to the chatty student and gently place his head on the student's feet…the pressure of his head is just calming … and allow students to refocus through positive redirection" (Bradley, 2013, p. 56). Another explained: "When you remove that anxiety, the focus is there, the attention is there. And they're able to absorb what is being taught in the classroom" (Kalkoske, 2018, p. 134). One therapist highlighted that animals might improve youth's focus by giving them an outlet for physical activity, particularly students "who are a little hyper or just need to run around or need to touch things" (Flynn et al., 2020b, p. 637).

Instances of dysregulation and crises seemed to be reduced in intensity and duration when youth could interact with animals. One study reported that, for all 12 educators who participated, "dogs impacted emotional crises, helping to reduce the frequency, duration, or intensity of students' meltdowns. Because they cared about the dog, some children were able to release frustration and anger" (Kalkoske, 2018, p. 160). One educator said, "[Youth] would forget why they were upset and spend some time with [the animal], and then they would go back to what they were supposed to be doing" (Kalkoske, 2018, p. 160). Another educator observed, "I haven't seen too many outbursts since the dogs have been here with my kids" (Kalkoske, 2018, p. 161). They continued, "I had a child who when he shuts down, he will shut down for like an hour. He will just sit, stare. Won't do any schoolwork. And bringing [the therapy dog] and [the other therapy dog] in the room, he can kind of pet her, calm down, and he comes out of that shutdown faster than an hour and completes his work" (Kalkoske, 2018, p. 163).

Social facilitation

This theme describes how an animal's presence can facilitate social relationships between a person and animal(s) or between people. This includes youth experiences of affection, acceptance, support, companionship, and connection with an animal or other people. Youth relationships with animals were described as supporting their ability to participate in social contexts including classrooms, other learning settings, and therapeutic relationships (Table 7).

Staff members referenced animals' predictability and trustworthiness as one avenue through which social facilitation seemed to occur. A teacher explained, "These kids want to give, but it's hard when you don't trust humans anymore. You don't know what's around the corner in the classroom, but you know that that animal is steadfast and that it's always going to be [a] cow. It's always going to like a treat" (Flynn et al., 2019, p. 155). Another teacher commented, "They have relationships with these animals and… then they can suddenly look at their peers and their staff and say 'okay, you're not going to hurt me' and 'you're not going to betray me. Maybe I can have a relationship with you too'" (Flynn et al., 2019, p. 156).

Animals were perceived as strengthening relationships between peers as one teacher explained, "They're not laughing at each other; they're not making fun of each other. They stick up for each other. They're like, 'If he's scared, then he's scared. Just don't put it [the animal] around him'" (Flynn et al., 2019, p. 153). A teacher described, "Smooch provides another mode of socialization …it gives them something else to talk about…Smooch is a conversation starter" (Bradley, 2013, p. 55). This social connection between peers occurred even after interpersonal conflict: "You have kids that perhaps that day were just in a quarrel with one another … and then you see them both with the dog, just lying there, being able to connect with one another because of this beautiful creature helping bridge that bond" (Kalkoske, 2018, p. 161). Another educator shared similarly: "Students that would never normally get along, they have a shared affection for the dog. And it starts the conversation of 'well my pitbull' so they start sharing personal experiences" (Kalkoske, 2018, p. 165). A school therapist recounted a dog helping her student form new relationships: "J.D. [the dog] had taught her how to get along better with friends by sharing him. The dog 'taught' her to interact more appropriately with her friends by modeling acceptance, affection, and trust" (Anderson & Olson, 2006, p. 44).

A teacher described another dimension of social facilitation as increased cooperation among peers: "[students] share, they communicate, they speak to each other. They are like, 'oh, you want to feed it too? Okay, I can share with you.' But you hate to share. Where is this coming from? You've never done this" (Flynn et al., 2019, p. 157). An HAI program staff member recounted the new camaraderie they observed: "A student wasn't interested in trotting [their horse] because… it can be faster, and he's like, 'No, no, no.' And then you heard … one of his classmates [say], 'Come on …! You got it!' … He was … there to encourage his peer that way. And he ended up trotting" (Flynn et al., 2020a, p. 5).

Participants described animals facilitating relationships between youth and adults as one teacher recalled a student who "In the dog's presence, he put down his guard … and spoke with teachers about problems in his home life" (Anderson & Olson, 2006, p. 43). An HAI program staff member described, "[youth] were able to initiate much more intimate conversations" (Flynn et al., 2020a, p. 4). Another staff highlighted, "The reason they come to the barn shifts from the interest in animals to [an] interest in the relationship with the person who takes care of the animals" (Flynn et al., 2020a, p. 4). Animals were described as supportive of the therapeutic alliance and the overall therapeutic process. One therapist said, "Having a dog like Tucker in sessions might help counselors build rapport more easily" (Lange et al., 2007, p. 26), and another therapist echoed this, saying, "I started using Morkie to interact with Brandon… He [the client] sensed that Morkie trusted me, thus allowing himself to trust me as well" (Scholtz, 2010, p. 3). Still another therapist described: "The sense of safety elicited by the animals made the farm a less stressful therapy environment. Its relatively relaxed atmosphere, as compared to that of a clinician's office, required less eye contact, less focus on the conversation, and greater emphasis on other forms of processing … it's not as stressful as sitting in a chair staring at your social worker saying, 'My life sucked.' It's less demanding. Less intense" (Flynn et al., 2020b, p. 636). Therapists were able to keep students engaged in "deeper topics" for longer periods of time, which one therapist noted "[could] make the entire difference on the therapy session and how much progress you're making" (Flynn et al., 2020b, p. 637). A therapist observed, "Gains from time spent together with animals often carried over to future therapy sessions" (Flynn et al., 2020b, p. 637).

Challenging social interactions were perceived as being made easier by the sense of connection, acceptance, support, and companionship that youth had with an animal. One teacher described youth as "perceive[ing] the help [of the animal] as that of a

sympathetic listener (A5) encouraging them to read (A2), promoting their focus (A2)… [one student explained,] 'It helped me by caring' (A4)" (Canelo, 2020, p. 101). A young person described their therapy, "You just get this connection with the dog… it feels good … I just feel like he is understanding you and just letting you open yourself up to other people" (Lange et al., 2007, p. 27). A therapist explained his client "expressed himself through interaction with [the dog]… he felt safe and accepted in the intervention" (Scholtz, 2010, p. 85).

In a classroom context, one teacher explained, "Smooch … giv[es] unconditional love and attention to everyone" (Bradley, 2013, p. 57). A teacher echoed: "Braxton doesn't care if you're rich or poor or what kind of house you come from or what kind of clothes you wear. Braxton loves you equally" (Tate, 2014, p. 80). Students described: "When I was sad, she would come around and see if I'm okay…when I cry, she licks me in my eyes and then I hug her" and said, "Well, without the animals, when there's no one to help me, I feel like the work is hard … very few times I feel completely helpless because no one is there to encourage me to do stuff and I just feel alone. But, when an animal is near me, I feel like someone is right by my side helping me" (Flynn et al., 2023, p. 8).

Beneficial secondary outcomes

Participants described three beneficial secondary outcomes: improved academic outcomes, social skills, and purpose through contribution.

Improved** academic **outcomes

This theme describes perceptions that youth-animal coactions support academic outcomes, including reading skills and test scores (Table 7). One educator said, "The teachers… have seen weaker readers boldly and strongly read to Braxton [the dog]" (Tate, 2014, pp. 76-77). A parent recalled, "He didn't want to read to anybody else because he was embarrassed, but he would read to [the therapy dog] … he went up three reading levels by the end of the year because he would read [to the dog] every day" (Kalkoske, 2018, p. 160). Another teacher linked improved learning to student experiences of the dog bolstering their mood: "[Smooch, the dog] has made everybody feel happy and comfortable, and that certainly helps everyone with learning" (Bradley, 2013, p. 58). Lastly, educators linked better test performance with animals support of positive learning experiences: "The correlation [is there] between getting the work done and then doing better on a test. If they did their work and they understood and they learned something, then they're going to do better on their test … because some children learned to read better due to the dog's presence that this would carry over to test performance" (Kalkoske, 2018, pp. 157-158).

Social skills

Participants described important ways that youth-animal coaction seemed to strengthen youth social skills. This theme describes HAI as promoting nurturing and caring behaviors, social reciprocity skills, navigation of interpersonal boundaries, communication, empathy, respect for others, awareness of facial expressions and body language, and mutual eye contact. Relationships with animals gave youth opportunities to expand their communication skills (Table 7). A parent in one study observed her child "had become better able to express herself and to be understood by others" (Canelo, 2020, p. 102). Around animals, youth seemed to use a broader repertoire of verbal and body language. One HAI program staff member said, "I've worked with kids that started here and would not look at you, but through… what we do… over time … they'll be able to give tours looking at adults in the face" (Flynn et al., 2020a, p. 4). A therapist said of their client, "Brandon communicated more spontaneously during our session. Through using Morkie [the dog] as a medium … I felt that [the dog] served as a protective barrier through which he could start communicating" (Scholtz, 2010, p. 58). The therapist elaborated, "Brandon had to give certain commands to Morkie … This required Brandon to speak louder than he usually did, also using a bit more authority in commanding her" (Scholtz, 2010, p. 60). Another therapist noted how: "[horses] are so big; with the horse, you need to communicate; it's more of a give-and-take relationship" (Mallon, 1994, p. 464).

Participants talked about animals eliciting more nurturing and caregiving behaviors from youth. Students recognized the animals had needs they could support. One student explained, "If [the animal is] just not having a good day, I can tell, and I just try to cheer 'em up, like try to do activities with them" (Flynn, et al., 2023, p. 8). Therapists reflected that animals' dependence on the students often evoked caring responses, which could help the students develop healthy caregiving skills. One therapist said about youth caring for animals, "[it] helps them to be more affectionate towards each other and toward themselves" (Flynn et al., 2020b, p. 635). A therapist noted this was especially true for students who spent much of their lives receiving intensive treatment: "It's not about them, and sometimes that's really helpful" (Flynn et al., 2020b, p. 635). A teacher shared, "I can see that [they practice] the same interaction [from when] the dogs come into the classroom. You know, this one kid in particular, if he sees a kid is having a hard time, will go up and give the kid a hug and say, 'It's okay'" (Flynn et al., 2019, p. 154).

Participants perceived youth relationships with animals as sparking greater empathy and forgiveness among youth. One therapist said, "they have a hard time understanding how actions may impact others, or picking up on how others feel […] some of them feel much safer with animals to practice that" (Flynn et al., 2020b, p. 638). One teacher said similarly, 'I think they're more apt to accept mistakes as a mistake and kind of move on with an animal" (Flynn et al., 2019, p. 153). An HAI program staff member described a student who "instead of showing frustration with a nervous dog who did not want to enter a new area, they were able to recall moments when they themselves felt afraid and then sympathize with the dog" (Flynn et al., 2020a, p. 4). One teacher explained, "It's teaching him that the [animals] have feelings; they need to be taken care of" (Kalkoske, 2018, p. 162). Sometimes, youth awareness of the animal's dependence on them and empathy toward the animal helped them to strengthen their social skills. A therapist shared: "It's starting to translate, I think, through the dogs, thankfully. If he's hurting somebody's feelings … he's like, 'Why do I care if I'm hurting somebody's feelings?' But … he sees external cues from the dog that he might not get from a human. And he seems to care more and

empathize with them because there's a sense of dependence on him in that moment" (Flynn et al., 2020b, p. 638).

Participants noted that youth-animal coaction seemed to help youth improve their social boundaries. One teacher described how student interactions with the dog helped them follow the rules: "Being calm, being patient, being nice, being gentle, watching their tone of voice, watching how loud they are, watching their physical mannerisms, their proximity to the animals. 'How close am I?', 'Is this going to make the dog uncomfortable?'" (Flynn et al., 2019, p. 153). Another educator highlighted: "[Students] learn[ed] to establish appropriate boundaries with horses" and this translated into "better boundaries with peers" (Flynn et al., 2020a, p. 4). These gains seemed to be facilitated by students learning to read behavioral cues and relating these to their own experiences. Staff recalled students learning, "[while] reading [with] the dog, if the dog's turning away from you, give them their space. If a kid … is in a bad mood and walks away from you, don't egg them on. Give them their space" (Flynn et al., 2020a, p. 4).

A teacher talked about the role of self-awareness in navigating social boundaries, saying: "Youth developed a greater awareness of their emotions and how those emotions impacted others. For example, "a student did not want to ride [horses] … he was just not in the right headspace, and he told me that from the get-go" (Flynn et al., 2020a, p. 4). One therapist described asking youth to notice their "thoughts and body sensations in relation to the animal and building on this immediate awareness to develop better spatial awareness and boundaries" (Flynn et al., 2020b, p. 637). In some cases, participants linked the improved boundaries to an increase in youth's sense of safety. In one study, therapists described: "The animals were seen to provide a safer space to practice boundaries than with other humans who might be more confrontational or judgmental … over time their skills led to them having a greater ability to navigate boundaries with people … if they do something that bothers the animal they're not as reactive as they might be with a peer, and defensive, cause the animal might just walk away. And then they kind of want that interaction, so they might adjust themselves without even prompting" (Flynn et al., 2020b, p. 637). One school therapist illustrated how feedback from a therapy dog instilled in their student a new understanding of boundaries: "The dog responded warmly to activities that pleased him and walked away or barked when he was displeased" (Anderson & Olson, 2006, 45).

Purpose through contribution

Purpose through contribution

This theme describes how the human-animal bond can offer an avenue for people to find meaning in their context and what they are experiencing or navigating. It transcends self-interest and involves a contribution to the world beyond the self. It may involve caring and nurturing behaviors, but the focus of these rests on the motivation to engage in the behaviors *to create a benefit beyond the immediate self* and one's own needs and desires (Table 7). One study described, "Youth …expand[ed] their world view and better understood how they fit into the world" (Flynn et al., 2019, p. 158). An educator talked about the school dog's ability "to unite the school in a common interest – [the dog's] own wellbeing….students… feel responsible for him" (Bradley, 2013, p. 54). Teachers described students feeling their actions were purposeful with the animals: "[they] realize[d] that this is something they do that makes a difference… and made them feel like [they were] giving back" (Flynn et al., 2019, p. 155). Several therapists described students knowing their care for the animals was "Something important and[…] what they're doing has meaning" (Flynn et al., 2020b, p. 634). An HAI program staff member said, "Youth acquired autonomy and a seriousness towards tasks of taking care of another being… learning that if you put an animal in their hands, they're responsible for this animal's safety. It's physical. It's tactile. They can see it. They understand it" (Flynn et al., 2020a, p. 5). In one youth program, staff described how youth's initial interest in helping animals expanded to include helping other people: "If they're carrying a bale of hay and it's too heavy, a[nother] student will … [say], 'here, I [can] carry this side, you carry that side.'" Another HAI staff member similarly observed, "they thrive when they feel like they're helping somebody else and they're not [the ones] being helped" (Flynn et al., 2020a, p. 4).

Strengthened self-concept from improvements in primary or secondary outcomes

This domain describes strengthened internal self-concept, including improved self-esteem, confidence (e.g., self-efficacy, competence, knowledge, and understanding), and improved self-acceptance (Table 7). One study summarized, "[HAI program] staff heard youth and adolescents voice greater understanding of their capacity for success, and their negative self-talk decreased. 'They all really own their position on the farm'" (Flynn et al., 2020a, p. 5). One teacher attributed youth relationships with animals with creating self-acceptance, saying, "I think a lot of the kids can find an animal here who displays the same traits [as they have] and then they can kind of … say, 'Hey, this is acceptable. People love this animal regardless of [their] being shy. Some of the llamas are shy. Hey, it's all right. Everybody loves this llama, so everybody could love me too even though I'm shy'" (Flynn et al., 2019, p. 156).

Another study described youth obtaining greater self-efficacy through feeling expert in their care of animals and being perceived as knowledgeable by others. A therapist recounted, "I think for some kids, it's having a specialty that … gives them something … that they can kind of shine in" (Flynn et al., 2020b, p. 635). One therapist linked youth's greater self-efficacy to their relationship with an animal giving them a greater sense of control, describing: "A lot of the time they […] don't have control over their emotions, they don't have control over their behavior… they don't learn as well as they'd like to, they don't speak to others as well as they'd like to, but being at the farm gives them an opportunity to have that sense of self: 'I know what I'm doing'" (Flynn et al., 2020b, p. 635). Another therapist said: "They are able to just walk in [to the farm]… and know what they need to do and know where the supplies are, so there's a lot of, 'I've got this.' And I think there's very few opportunities for our kids to walk around like, 'Oh, I got this,' because a lot of the time they don't got this" (Flynn et al., 2020b, p. 635). One therapist reflected how, as youth's sense of competence increased through their work with animals, it "started to bleed into their other interactions, because they can say 'I can do this, so maybe I can do that'" (Flynn et al.,

2020b, p. 635).

Some participants linked increases in self-concept to youth being able to "enter as beginners in a more safe way and then start to learn things and feel efficacious" (Flynn et al., 2020b, p. 635). A therapist contrasted this with youth school experiences, explaining: "Nobody gets [to the farm] and are like, 'Why don't you know how to take care of sheep?' Whereas they're in math and they don't know how to add; they already know that they're behind, right?" (Flynn et al., 2020b, p. 635). Other participants thought youth's strengthened self-concept may arise from having an opportunity to overcome fears. One HAI program staff shared, "For youth for whom [animals] incited fear, working to overcome it gave them the chance to experience themselves as brave" (Flynn et al., 2020a, p. 4). A teacher explained, "[We've] seen clients transform as a result of working through their fears with a horse. They gain inner strength, a sense of safety; and life feels more worthwhile" (Posas, 2013, p. 81).

Several studies described students feeling increased pride and confidence through their relationship with animals. One student noted this confidence would extend to new settings: "I feel a lot more confident around other people's animals and when I'm older, and I get a farm, if I ever did … I could do it myself" (Flynn et al., 2023, p. 6). Another student described their relationship with animals eliciting the feeling: "I can do anything I put my mind to" (Flynn et al., 2023, p. 6). One youth shared, "I'm really good at taking care of animals" (Flynn et al., 2020a, p. 5,) and a staff member recalled their student "walking with more swagger [and] confidence … that he was getting from [his relationship with] the horse" (Flynn et al., 2020a, p. 5). A therapist described their client walking the dog, sharing it "made him feel proud of being able to walk her, also providing some self-confidence as Morkie listened to him and responded to his commands" (Scholtz, 2020, p. 64).

A relational developmental theory of human-animal interaction

We present an RDSM-based theoretical model for how human-animal interactions shape adolescent development (Fig. 3) based on our integration of concepts (Fig. 2, Table 6) that were supported by the *meta*-synthesis (Table 4) and themes from extant literature (Mueller 2014b) that used RDSM as a paradigm to understand human-animal relations (Table 5). We argue that when conditions are made conducive to change, that is, barriers to HAI are removed, animal welfare is ensured, people seize opportunities to use HAI to be more responsive to youth needs, and bi-directional, mutually influential human-animal interactions are available, these context-specific factors enable youth development to occur through three processes of change. These are (1) increasing engagement, (2) improving self-regulation, and (3) social facilitation. In addition to being processes of change, self-regulation and engagement are primary outcomes. We propose that these processes of change directly or indirectly contribute to three secondary outcomes that are consequential to youth's trajectories of development: (1) improved academic outcomes, (2) social skills, and (3) purpose through contribution. Improvements in primary or secondary outcomes lead to a strengthened self-concept (Fig. 3). We detail each component of the proposed theory further below.

In alignment with RDSM, our theory asserts that development consists of youth's increasing ability to explicitly coordinate their environment to engage HAI to manifest the three processes of change. Doing so can yield greater alignment between youth's needs and the mobilization of available HAI resources to support their needs. Youth explained, for example, that they sought out animals to calm themselves when they were anxious or angry. Similarly, youth attained social support from dogs to aid them in overcoming anxieties while learning a skill (e.g., reading). Variations in development will occur due to differences in the available environmental assets. This supports youths' capacities to adaptively respond to their environment and move toward positive pathways of development. While the components of the model are presented in order, we do not claim that they necessarily occur in that order. The process of youth-animal coaction is thought to be iterative and dynamic with different components influencing one another and some change processes also being primary outcomes. Below, we outline in general terms the processes involved in each component. By necessity, we have kept the focus broad and emphasized general descriptions of these elements but acknowledge that each of the processes and outcomes that we identify could be divided into further sub-components based on insights gained through future inquiry and that there will be variation between individuals and within an individuals' experiences at different points in time.

Description of the four conditions for change of the framework

Youth-animal coactions are dynamic and unfold in different ways based on how contextual factors in the environment influence the experiences of youth and animals.

Barriers to HAI are removed. Conditions exist that may hinder youth-animal coaction. At the individual level, sources of discomfort such as allergies, sensory experiences, level of self-regulation, energy (i.e., being well-rested), fear (on the part of the person or animal), and interest in the HAI need to be addressed to create the possibility for generative youth-animal coactions. At the structural level, there needs to be enough staff to safely facilitate youth-animal coactions and respond to unplanned events (e.g., youth's extreme dysregulation, the animal needing a break). Processes of change can occur once environmental factors that could interfere with the safety of human and animal participants and their ability or willingness to engage in coactions have been addressed.

Animal welfare is ensured. The quality of the animal's experience shapes the relational dynamic that unfolds during coactions. Conditions need to be made conducive to the animal's expression of species-specific behaviors and promoting the animal's wellbeing. This enriches the youth-animal coaction and maximizes the chances that the relationship will yield positive growth for youth. For example, providing animals with ample choice in their movement supports their safety and ability to maintain their sense of security *and* allows them to express information about boundaries to youth who, by learning to detect and appropriately respond, can use this input to strengthen their social skills. In contrast, allowing conditions that jeopardize the animal's wellbeing can foster harmful relational dynamics and impede future beneficial relations. For example, an animal that is malnourished or handled abrasively will have a reduced capacity to navigate highly demanding interspecies exchanges. This could lead the animal to be less or non-responsive

to cues related to the youth and, in extreme cases, could result in them using physical strategies to escape the interaction (e.g., kicking or biting). Similarly, an animal forced to endure interactions with youth will be more prone to distrust people and avoid future interactions. Animals are more motivated to engage in affiliative behaviors, detect and respond to subtle cues from youth, and seek relationships with people when they are given what they need to feel physically well, safe, and free to fully express their species-specific behaviors.

Greater responsiveness to youth needs. The integration of HAI in therapeutic contexts to be responsive to youth needs is likely to be initiated by a realization that a misalignment exists between a youth's capacity and their environment. For example, there may be a gap between the demand for youth to engage socially and their readiness to engage in social interactions or a discrepancy between the magnitude of stressors occurring in the environment and the youth's capacity for real-time self-regulation. Leveraging HAI to achieve greater responsiveness to youth needs may be initiated by adults (e.g., youth program staff), peers, or youth themselves. Animals may respond to cues from people (e.g., nonverbal behaviors or tone of voice) or the environment to provide needed forms of support. Improved alignment of youth's needs and their environment using HAI promotes youth's engagement in programs (e.g., class, therapy, recreation), improves youth capacities for self-regulation, and elicits social participation.

Availability of bi-directional, mutually influential HAI. Youth and animals mutually influence each other's experiences as the dynamic coaction unfolds. This bi-directional relationship elicits youth social skills, helps them shift toward adaptive self-regulation, prevents or reduces the intensity of episodes of dysregulation, and encourages engagement in youth programs. The course of the youth-animal coaction is heavily shaped by the quality of the youth and animals' experience during the relationship and their overall wellbeing.

Description of the three processes of change of the framework

Increased engagement. We propose that two components comprise the process of increasing youth engagement through HAI: youth's enjoyment of programs where animals are incorporated and clearer avenues for youth to share positive social interactions with others. For youth, it is often clearer how to engage in social interactions with an animal compared to interactions with other people which can be more complex. Increased engagement is itself a primary outcome that advances youth development.

Youth's enjoyment of programs with animals. Animals elicit youth curiosity, and this sparks passive attention and active engagement in youth programs. Youth form positive associations with animals through their experiences with them. Through this affiliation, youth become more eager to engage in programs, and the quality of their participation increases (e.g., enthusiasm for the activity, increased focus, following directions, and task completion).

Clearer avenues to share positive social interactions. Youth's desire to interact with animals motivates them to practice social skills so that animals will interact with them (e.g., boundaries, cooperation, empathy, verbal and nonverbal communication). As they strengthen social skills during co-action with animals, youth broaden their practice of social skills to include other people. Increased use of social skills facilitates participation in activities broadly. Greater engagement leads to improved academic outcomes, which we return to below.

Improved self-regulation. While engagement focuses on motivation and active participation, self-regulation focuses on the process of increasing one's ability to regulate adaptively, increasing one's window of tolerance, and reducing the resources needed to return to a regulated state after dysregulation occurs. The process of trusting an animal and the presence of trusted animals helps youth self-regulate by providing a sense of safety. This occurs through youths' perceptions that an animal is predictable and non-judgmental and opportunities for tactile soothing during interactions with animals (e.g., petting the animal). The animal's presence may provide a helpful distraction from stressors, a reassuring and calming companion, or an outlet for a youth's energy through play.

Youth are more motivated to self-regulate in the presence of animals because they are concerned for the animal's well-being and are aware that dysregulation could negatively affect the animal. An animal's presence, or imagining a trusted animal, supports youth and staff mood regulation. Youth are additionally indirectly supported by having staff who are better emotionally resourced to be responsive to youth needs after interacting with animals. When accessible, these pathways toward greater self-regulation reduce the frequency and intensity of periods of dysregulation by helping youth expand their window of tolerance to stressors. In addition to being a change process that supports related developmental outcomes, improved self-regulation is itself a primary outcome that advances youth development.

Social Facilitation. We propose that the process of social facilitation is divided into three components: 1) trust-based relationships with animals leading to new levels of social engagement; 2) elicitation of conditions needed for positive social exchanges; and 3) attenuation of challenges through supportive relationships with animals.

Trust-based relationships with animals lead to new levels of social engagement. Youth perceive animals as safe partners in social relationships, which is particularly valuable to youth when other social relationships are experienced as being inaccessible (e.g., due to social anxiety, prior negative experiences, or a gap in the needed social skills). Youth experience animals as trustworthy through their perceptions that animals are predictable, don't have ulterior motives, and have more comprehensible social behaviors and forms of communication than other people. Youth's trust in animals keeps them engaged in activities that involve other people. Youth generalize their trust in animals to other people and become open to new levels of social engagement. They let their guard down, tolerate more vulnerable and intimate social exchanges, and take social risks such as advocating for peers or engaging in new levels of cooperative behavior. Through these changes, they discover that people around them sincerely care for them. Through shared experiences with an animal, youth form trusting relationships with other people, and youth increasingly value and depend on these person-to-person relationships.

Elicitation of conditions needed for positive social exchanges. Animals elicit conditions that are conducive to positive social

exchanges between people. Animals promote self-regulation among adults and youth. Animals evoke people's motivation to seek positive responses from them, prompting people to engage in prosocial behaviors that generate positive interactions with other people (e.g., cooperation, vulnerability, loyalty). Animals create opportunities for people to demonstrate their trustworthiness through their interaction with the animal.

Attenuation of challenges through supportive relationships with animals. Youth's experiences of connection, acceptance, support, and companionship with animals attenuate challenges. Social Facilitation is characterized by experiences of affection, acceptance, support, companionship, and connection with an animal or other people. Social facilitation supports a youth's ability to process adverse experiences (e.g., past trauma) and participate in social contexts, including classroom settings and therapeutic relationships.

Description of the three secondary outcomes of the framework

Social skills and purpose through contribution. As youth's relationships with animals deepen their relationships with humans, their social skills are strengthened and this reinforces the process of social facilitation. As social skills improve, it increases youth's capacity to self-regulate. As social facilitation grows, it strengthens youth's sense of purpose and enhances their self-regulation.

Improved academic outcomes. Strengthened levels of engagement, self-regulation, and social connection, increase youth's capacity in academic settings, and bolster their ability to focus on academic tasks that support learning. The presence of animals decreases youth performance anxiety and increases their tolerance of lacking certain skills; this greater vulnerability frees them to focus on skill formation (e.g., reading comprehension).

Strengthened self-concept. Skills obtained through youth-animal coactions are consolidated into a strengthened self-concept. This manifests through youth-animal coactions sparking new levels of youth purpose, moral development, academic learning, social development, self-regulation, self-acceptance, confidence, and self-efficacy.

Discussion

This *meta*-synthesis and grounded theory analysis provided important insights into the influence of youth-animal coactions in education and mental health treatment contexts on youth development. Our findings identify potential processes of change and theoretically predicated outcomes that can be tested in future research. We discuss key findings, implications for practice, limitations, and future research directions.

Key findings

Several key findings were uncovered within this *meta*-synthesis. First, this study contributes new theory that is grounded in data that is reflective of real-world experiences. It is apparent that animals influence youth development through varied and multifaceted pathways of change. This finding supports the assertion that existing RDSM-based theories of youth development can be strengthened by expanding their scope to include human-animal coaction as one form of ecological asset that may be highly influential.

Next, this study contributes empirically-predicated theorized processes of change, namely that HAI, and in particular, youth programs that incorporate animals, *indirectly* enhance youth academic outcomes, social skills, sense of purpose, and self-concept by promoting youth engagement, self-regulation, and social interaction, often first with animals and then with humans. Youth-animal coactions can also *directly* affect youth engagement in programs, self-regulation, and social interactions. Different pathways may be activated for youth with different strengths and opportunities to align these strengths with environmental assets. For some, youth-animal coactions best support development via pathways that promote self-regulation. For others, the greatest impact may be found through coactions that bolster social facilitation and social skills. Practically, the theoretical model this study contributes can be used to design interventions and youth programs that are responsive to varied youth strengths and needs. It can also be used to guide assessments of youth programs that use HAI.

These findings parallel some aspects of extant theory for HAI. One researcher expanded the conservation of resources theory and recovery step model to assert that HAI may improve employee efficacy by restoring the internal resources needed to engage in cognitive work (Junça-Silva, 2022). This corresponds with our findings that youth program staff can benefit from HAI through its support of their self-regulation, and youth can indirectly benefit from adults around them having increased capacities for emotional labor. Our findings similiary converge with Yam and colleagues' (2023) work that builds on existing models of compassion and mind perception theories to create a theoretical model of compassion for HAI. They find that HAI evokes compassion and is associated with prosocial behavior among employees. Kandel and colleagues (2023) assert an expansion of organizational role theory to explain how frameworks for HAI must go beyond anthropocentric and anthropomorphic perspectives of the phenomenon. This corresponds with our findings that the quality of the youth-animal coaction likely influences the outcomes and efficacy of HAI to shape youth development.

Other researchers formed a social-emotional development theory for HAI based on a review of studies focused on HAI for children's social and emotional health, engagement, and learning (Gee et al., 2017). This theory corresponded with our findings that HAI shapes children's social development, as they drew from studies that found HAI could encourage interactions with animals and, subsequently, humans (Melson, 2003); that animals may act as social buffers (O'Haire, McKenzie, Beck, & Slaughter, 2013), enhance social skills training (Schuck & Fine, 2017), and improve children's social competence (Pendry & Roeter, 2013; Pendry et al., 2014) and empathy (Tissen et al., 2007; Hergovich et al., 2002; Kotrschal & Ortbauer, 2003).

Gee and colleagues' work shared similarities with our findings by theorizing that HAI shapes youth self-regulation. They drew from

other studies' findings that HAI may moderate children's stress responses (Friedmann & Son, 2009) and indirectly shape self-regulation through adaptive social behaviors, calmness, and the reduction of fear and anxiety (Rajan et al., 2017; Beetz et al., 2012; Hergovich et al., 2002); that HAI can reduce stress during learning (Schuck & Fine, 2017); and increase cognitive arousal among children with ADHD (Schuck & Fine, 2017), which mimics the expected benefits of pharmacological treatments for ADHD (Somervill et al., 2009). Lastly, this extant theory corresponded with our findings that HAI shapes youth engagement and academic outcomes. Gee and colleagues' theory used research findings that HAI strengthened children's attitudes toward school and learning (Beetz, 2013), promoted children's motivation, engagement, and learning (Wohlfarth et al., 2013), and indirectly supported learning by enhancing their executive function (i.e., self-regulation and attention; Gee et al., 2015; Gee et al., 2009; Hediger & Turner, 2014).

While some aspects of this extant theory closely parallel the current study, our theory offers practitioners and researchers an avenue to conceptualize interventions, research, and assessments using an RDSM paradigm. Our study contributes a detailed description of how an RDSM paradigm is supported by the real-world lived experiences of youth and the adults around them. Of the eleven final themes, six were developed by combining themes from the QIMS and RDSM data, which represent phenomena occurring in real-world practice settings *and* extant RDSM theory. As such, our study contributes a theory that is anchored in RDSM concepts such as the individual being the cocreator of their development (Lerner, 1982), relational exchanges being the drivers of developmental processes (e.g., increasing social skills and self-regulation), and the need for alignment between individuals' unique strengths and the varying assets available in their environment (Lerner et al., 2012). These principles make a relational developmental systems paradigm particularly powerful in understanding the role of youth-animal coactions in youth development. The theory's use of the concept of mutual influence precisely parallels the relational dynamic that our *meta*-synthesis revealed to be central to youth-animal coactions. We found this reciprocating cycle of influence to underlie the processes of change that we theorize to occur. Similarly well-fitted is RDSM's recognition of the importance of the broader context in which youth and their relationships unfold and are shaped. Results from our *meta*-synthesis consistently illustrated how environmental factors (e.g., addressing barriers to HAI, animal welfare, teacher self-regulation, the sensory environment, and social dynamics) heavily influence youth experiences, their capacity for growth, and the course of how youth-animal coactions unfold.

A final theoretical contribution our study makes is to highlight dimensions of real-world youth-animal coactions we found in the *meta*-synthesis that *existing theory does not yet describe* and account for these phenomena in our theory. We explain for the first time using an RDSM paradigm how youth-animal coaction supports improved academic outcomes and strengthened self-concept along with the need to resolve barriers associated with HAI. By situating these outcomes and, in the case of barriers, an important contextual factor, within a social-ecological system view for understanding HAI, we describe how these outcomes can be promoted alongside related and equally important facets of development (e.g., social skills, self-regulation, and purpose). In the case of barriers, we underscore the importance of attending to the environment surrounding HAI to attain the theorized outcomes and reach efficiencies.

Practically speaking, identification of these elements of HAI within our theory enables the creation or improvement of interventions that capitalize on as much of the theorized processes of change and related outcomes as possible. As one of our findings suggests, HAI itself is conducive to multifaceted processes of change and, as such, offers an opportunity for youth programs to be designed in a manner that aims to cultivate parallel goals for youth development, health, and learning. Lastly, identification of these three dimensions of HAI equips researchers with a more accurate model for understanding how youth-animal coactions operate and supports the generation of more precise research hypotheses and inquiries. This is particularly salient given the expected interactions between different elements of the model (e.g., conditions must be conducive for change; improved self-regulation can simultaneously promote engagement, academic outcomes, and social development, etc.).

Implications

The *quality* of relational coaction is central to our proposed theory. A logical product of this is the possibility that *how* people view animals (e.g., sentient beings deserving of wellbeing versus objects with utility or somewhere in between) may well influence the wellbeing of human and animal participants during coactions and the efficacy of youth programs involving HAI. If a youth-animal coaction attempts to advance a person's wellbeing at the expense of an animal's, this relational exchange may have a fundamentally different quality of coaction and, therefore, impact compared to one that is experienced as mutually neutral or positive. In other words, exploitative attitudes towards animals may change the nature of the relationship between youth and animals and the impact of these relational dynamics on both parties. Given this finding, training is needed for youth program staff who wish to use HAI to ensure they are prepared to adequately address barriers to the use of HAI and safeguard the welfare of the animal. This need is underscored by the predominance of participants in this study who used utilitarian language to describe animals or shared examples of HAI that may have jeopardized the animal's wellbeing for the sake of youth outcomes.

This study provides a theory that can explain how HAI shapes developmental pathways as youth grow older and how such pathways might vary depending on the needs of youth, degree and quality of alignment between youth strengths and HAI assets in their environment, and the nature of the relational exchanges between youth and animals. Participants emphasized, and the theory would support, for example, that younger individuals (i.e., early adolescents) especially benefitted from engaging in HAI to obtain tactile input that was soothing to manage anxiety and periods of dysregulation. Participants referenced that older adolescents more commonly sought to use HAI to increase their capacity to understand and navigate more complex social interactions.

Some attributes of HAI, in contrast, might be impactful across stages of development. For example, we would expect a person whose social relationships have instilled a pervasive distrust of other people to respond to the experience of steadfast, unconditional positive regard that is possible through a relationship with an animal to be transformative at any age. We would expect HAI, by fostering trust toward another being to cultivate in the person a greater openness toward new social relationships and, through this greater access to

the environmental resource of a supportive social network, cultivate new social skills and abilities to cope with stress. Further evaluation could test these and other predictions that would be supported by the theory we present here.

Limitations and future research directions

Although this *meta*-synthesis provides important insights into the influence of youth-animal coactions in education and mental health treatment contexts on youth development, several limitations should be noted as well as areas for future research. First, only one author screened all the articles increasing the risk that sources that would have qualified for inclusion were erroneously excluded. We mitigated this risk somewhat by using a comprehensive search strategy that included all databases known to be relevant and searching in Spanish as well as English, but the elevated risk of error remains. Next, we only explored data from studies done in education and mental health treatment contexts, not a wider variety of types of youth programs or youth-animal coactions occurring in unstructured settings (e.g., at home with family pets). It is critical that we also understand how development may be shaped by youth relationships with animals occurring across diverse settings. This should include additional research and/or *meta*-syntheses to understand the experiences of youth-animal coaction using various methods. Further, we restricted this review to studies involving youth ages 10–18 (i.e., early to late adolescence) because we expect the processes underlying HAI to vary for people in different developmental stages. Future research could examine if the theory we present here is valid for younger children or adults.

Additionally, the studies included in our *meta*-synthesis report data that was cross-sectional or asked people to reflect over relatively short timeframes (i.e., a class, semester, or school year), which meant that several aspects of the RDSM that are focused on phenomena occurring over longer periods could not be assessed. This is an area for future research. A third of the studies were dissertations that did not undergo full peer review. Five studies were completed at the same organization, making the overall sample less representative than if each study was done in a different organization. Next, most of the studies selected for inclusion in the *meta*-synthesis explored adult observations of youth experiences, and, in this manner, descriptions of impacts on youth relied on secondary accounts. There is a need to understand the voices of youth themselves to inform the theoretical model and research based on this model. Although the study sample included some racial and ethnic diversity, most studies reflect the perspectives of participants who were predominantly White. We recommend future research use purposive sampling strategies to involve individuals, especially youth, who hold more diverse identities and increase the transferability of findings.

Further, none of the studies included in the *meta*-synthesis asked questions about the animals' experience or how intervention designs may or may not have accounted for the animal's experience of the relationship. Future research is needed that uses various methods to understand the animals' experience and how their wellbeing may be shaped by qualitatively different types of coactions. This understanding would be particularly important to inform the components and design of human health interventions that involve animals.

Finally, studies included in the *meta*-synthesis did not directly ask participants about their perceptions of how mutual influence unfolds within youth-animal coactions and its impacts on participants' health. Expansion beyond exploring youth-animal relationships as being one-directional is needed in future research, including an explicit definition of variables to measure animals' experiences (e.g., affiliative behaviors, stress) during coactions with youth.

Conclusion

This study uncovered a new, relational developmental theory of human-animal interaction. Given the central role that animals play in the lives of many youth, there is a need for continued research to test the proposed theory for diverse youth across varied contexts and stages of development. The innovation of determining that a relational developmental paradigm is supported by real-world experiences of youth-animal coaction underscores the importance of elucidating how qualitatively different animal experiences of the exchange shape the course of the coaction and its impacts on youth and animal wellbeing.

Compliance with Ethical Standards

The authors report there are no competing interests to declare. Ethical incorporation of animals into therapy settings requires consideration of, and advocacy for, the individual animal's needs and welfare. Included studies were screened for ethical treatment of animals using an *a priori* rubric to assess animal welfare and wellbeing.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

Data will be made available on request.

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