Psychosocial and psychological effects of human-animal interactions

A literature study

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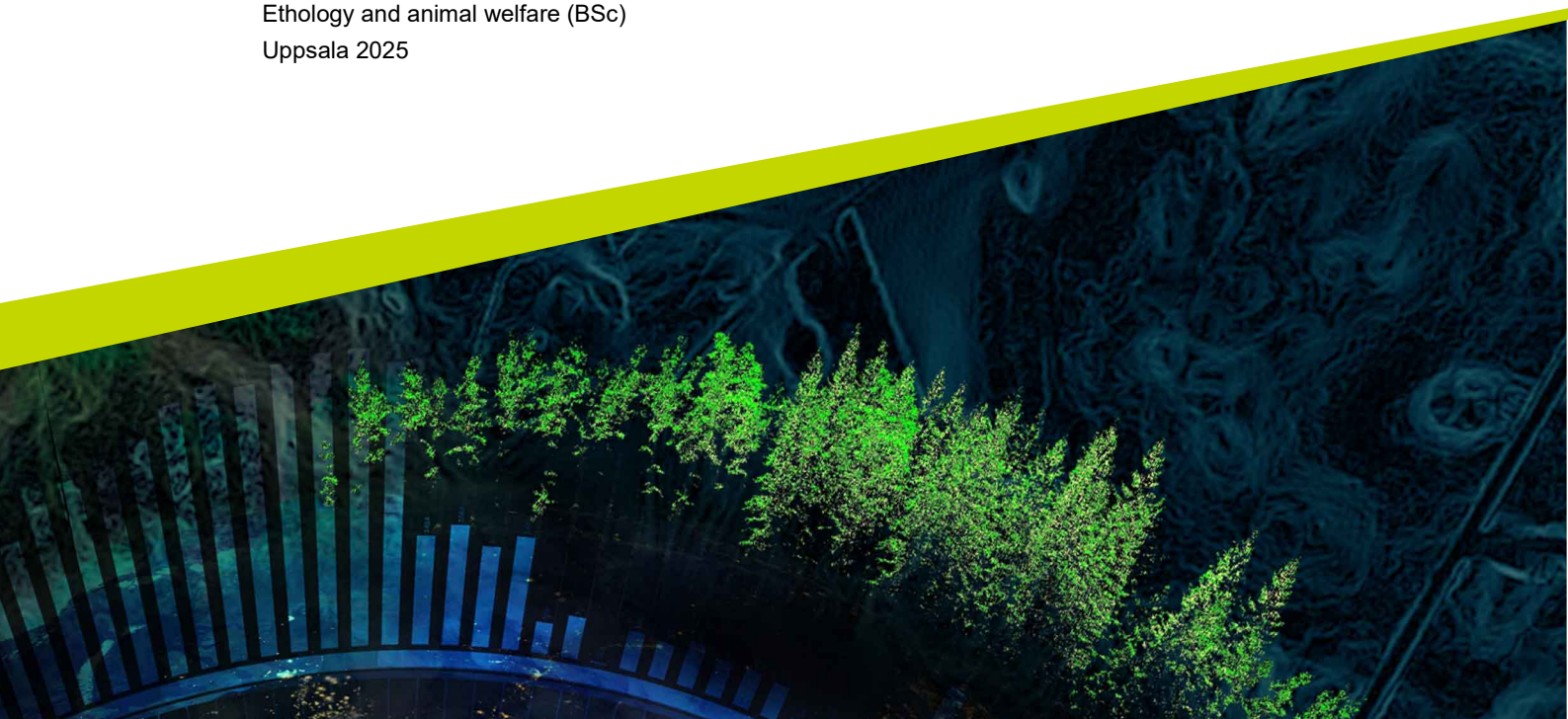

Psychosocial and psychological effects of human-animal interactions – a literature study

Psykosociala och psykologiska effekter av människa-djur interaktioner – en litteraturstudie

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Abstract

Forskning om sociala interaktioner mellan människor och djur är ett växande område såväl nationellt som internationellt och interaktionerna kan resultera i en mängd olika effekter hos både människor och djur. Denna litteraturstudie baseras på den vetenskapliga artikeln av Beetz *et al.* (2012) som diskuterar effekterna av människa-djur interaktioner, dess fördelar för människan samt rollen av oxytocinsystemet. I studien granskades 78 artiklar med syfte att uppdatera infomationen om människa-djur interaktioner och djurunderstödda insatser som publicerats sen 2012, samt med fokus att se över djurens välfärd.

Granskningen visade att det finns en mängd olika fördelar med djurunderstödda insatser i olika miljöer såsom inom sjukvårdssammanhang och i terapeutiskt syfte. Det tas upp flera aspekter kring hur oxytocinsystemet kan ha en viktig roll i de fysiologiska och psykologiska förändringar som sker i människokroppen som följd av interaktioner med djur. Även tidigare erfarenheter av djur och starka band med djur kan spela en viktig roll i hur mottagliga patienter är för människa-djur interaktioners effekter.

Djurens välfärd diskuteras dessutom då dem kan påverkas negativt av interaktioner med människor. På grund av detta kan etiska dilemman uppstå och vidare forskning om djurs välbefinnande i dessa situationer krävs för att säkerställa en god välfärd hos de samtidigt som vi kan gynna människan.

Genom att skapa en bredare förståelse kring dessa aspekter kan vi arbeta mot ett mer hållbart användande av djurunderstödda insatser.

Keywords: human-animal interaction, animal-assisted intervention, oxytocin, well-being, welfare

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Abbreviations

Abbreviation	Description
AAA	Animal-assisted activity
AAC	Animal-assisted coaching
AAE	Animal-assisted education
AAI	Animal-assisted intervention
AAP	Animal-assisted psychotherapy
AAT	Animal-assisted therapy
AAS	Animal-assisted services
HAI	Human-animal interaction
HAR	Human-animal relationship
OT	Oxytocin

1. Introduction

Research on social interactions between humans and animals is a field that is growing fast internationally (Beetz *et al.,* 2012; Rodriguez *et al*., 2018). According to previous research, such interactions have a variety of effects on humans, such as reduced stress and can increase empathy, and in the majority of cases, there is a direct connection to the oxytocin system (Beetz *et al.,* 2012).

1.1 Human-animal interactions

Human-animal interaction (HAI) is often described as the distance and interactions between humans and animals, which influence physical and psychosocial aspects of human health (Vitztum, 2012). Such interactions can appear in different settings, such as direct contact with companion animals, animals which humans can encounter in the wild, during work with livestock, in laboratories and zoos (Chang & Hard, 2002; Learnmonth, 2020; Yerbury & Lukey, 2021).

1.1.1 Animal-assisted interventions

Some human-animal interactions can appear during structured interventions or services with animals in order to achieve goals that are meant to help humans by for example, improving their emotional and social functioning, physical and mental health, but also to increase motivation (Beetz *et al*., 2012; Bert e*t al.,* 2016; Lobato-Rincón *et al*., 2021).

There are different kinds of services, such as animal-assisted intervention (AAI), which is a structured intervention that includes animals in, for example, health, education, or social work (IAHAIO, 2025). AAI incorporates human services such as animal-assisted therapy (AAT), animal-assisted education (AAE) and animal-assisted activity (AAA) (IAHAIO, 2025). Animal-assisted coaching (AAC) and animal-assisted psychotherapy (AAP) are also structured interventions used to enhance personal growth in humans, such as social functioning (Parish-Plass, 2013; Lobato-Rincón *et al*., Lobato 2021; IAHAIO, 2025).

1.2 Effects of human-animal interactions

1.2.1 Psychological and psychophysiological effects

Previous studies show that human-animal interactions can have effects on humans and their psychosocial health. It has been indicated that while interacting with animals, humans improve their social attention and behaviour, but also that they experience a reduction of cortisol and blood pressure (Beetz *et al*., 2012).

1.2.2 Human-animal relationship

Research has shown that humans are more positively emotionally affected by interactions with animals if they have previous experience with animals and also if they have a connection with the animal, compared to interactions with unfamiliar animals (Beetz *et al.*, 2012).

Earlier studies show that if there is a positive interaction between an animal and a familiar human, the oxytocin concentration generally rises, but the correlation still has to be further studied (Rault *et al*., 2020). Oxytocin (OT) is produced and released from hypothalamus in the brain but also from the body and it has an important role as it influences social-, reproductive and maternal behaviour (Barraza & Zak, 2009; Beetz *et al.*, 2012; Churchland & Winkielman, 2012: Carter *et al.*, 2020). According to Beetz *et al.* (2012), oxytocin may help explain some of the observed effects of human-animal interactions, for example the reduction of anxiety. Therefore this is an important aspect to include in this.

1.3 Welfare

The term "welfare" can be defined as the state of an individual as they interact with the environment, a state which can also be assessed (Broom, 1991). A positive human-animal relationship has been shown to induce positive emotions and welfare outcomes for both humans and animals (Rault *et al*., 2020).

As the interest in social interactions between humans and animals increases, the information on research results regarding this type of interaction needs to be updated. Therefore, this literature study was carried out as part of the framework presented by Beetz *et al.* (2012) in the scientific article "Psychosocial and psychophysiological effects of human-animal interactions: the possible role of oxytocin".

2. Aim and questions

2.1 Research aim

The aim is to update the state of knowledge from 2012 regarding how human-animal interactions affect humans physiologically, psychosocially and neurologically, and to investigate whether there are any welfare risks for humans and animals.

2.2 Question statements

The questions that this study intends to answer are the following:

- How do different types of physical contact with animals affect oxytocin levels in humans?
- How do human-animal interactions affect social, psychological and psychophysiological parameters and are they dependent on previous experiences with animals?
- How is the welfare of humans and animals affected by human-animal interactions?

3. Materials and methods

This bachelor's thesis was carried out as a literature study based on the scientific report by Beetz *et al.* (2012), and the material was collected from the databases Google Scholar and Web of Science. Only articles that were published in a scientific journal between 2012-2025 were used for this literature study. The search words that were included in the study were the following:

"Animal assisted intervention", "Animal assisted education", "Animal assisted coaching", "Animal assisted activity", "Animal assisted therapy", "Animal assisted services", "Animal assisted psychotherapy", "Animal assisted learning", "Animal facilitated learning", "Human-animal interaction", "Therapeutic riding", "Equine facilitated therapy", "Farm based interventions", "Farm animal assisted interventions", "Human-animal", "Oxytocin", "Pet-facilitated therapy", "Dog assisted education", "Dog assisted therapy", "Dog assisted activities", "Hippotherapy", "Horse therapy", "Riding therapy", "Djurunderstödd insats", "Djurunderstödd aktivitet", "Djurunderstödd pedagogik", "Djurunderstödd utbildning".

While searching via Google Scholar the search terms gave the following hits between the years 2012-2025:

- Animal-assisted intervention:18 700 (with exact phrase: 5 450)
- Animal-assisted activity: 17 800 (with exact phrase: 3 130)
- Animal-assisted coaching: 17 700 (with exact phrase: 123)
- Animal-assisted education: 74 400 (with exact phrase: 1 640)
- Animal-assisted therapy: 18 700 (with exact phrase: 16 400)
- Animal-assisted services: 17 800 (with exact phrase: 158)
- Animal-assisted psychotherapy: 17 600 (with exact phrase: 993)
- Animal-assisted learning: 18 200 (with exact phrase: 104)
- Animal facilitated learning: 60 200 (with exact phrase: 1)
- Human-animal interaction: 17 800 (with exact phrase: 14 000)
- Therapeutic riding: 18 900 (with exact phrase: 3 700)
- Equine facilitated therapy: 18 100 (with exact phrase: 717)
- Farm-based intervention: 18 600 (with exact phrase: 30)
- Farm animal assisted interventions: 17 900 (with exact phrase: 128)
- Human-animal: 368 000 (with exact phrase: 301 000)
- Oxytocin: 133 000
- Pet-facilitated therapy: 1 370 (with exact phrase: 967)
- Dog assisted education: 56 200 (with exact phrase: 120)
- Dog assisted therapy: 27 800 (with exact phrase: 1 820)
- Dog assisted activities: 56 100 (with exact phrase: 133)
- Hippotherapy: 8 380
- Horse therapy: 45 900 (with exact phrase: 1 060)
- Riding therapy: 24 400 (with exact phrase: 1 480)
- Djurunderstödd insats: 102 (with exact phrase: 8)

- Djurunderstödd aktivitet: 105 (with exact phrase: 17)
- Djurunderstödd pedagogik: 58 (with exact phrase: 16)
- Djurunderstödd utbildning: 99 (with exact phrase: 6)

The selection of articles was mainly based on the content of the abstracts and also on whether the exact search word was included in the title or somewhere in the article. Another criterion was that the original research had to include a sample size of at least 10 subjects (i.e humans) per group. In addition, articles cited from the original scientific report by Beetz *et al.* (2012) were used if relevant search words were included in the articles.

Relevant original research articles, reviews and meta-analyses in English and Swedish were included in this literature review, but a large proportion of material was excluded, such as book chapters, opinion articles, bachelor's theses and PhD theses. Duplicates were also removed using the reference management software, Zotero. The AI writing assistance, Grammarly, was also used to check the grammar.

4. Results

4.1 Article selection

In the end the searches yielded a total of 95 original studies and reviews published between 2012-2025. Duplicates and articles that did not meet the sample size criterion were removed, which resulted in a total of 78 articles. Out of these 39 were reviews (Table 1) and 29 original studies (Table 2). The original scientific paper by Beetz *et al.* (2012) which this study is based on, has been cited about 638 times and out of these 10 reviews and original studies were included in this review (Table 3).

Table 1: Characteristics of reviews included in the study

Search term	Author and publication year
Animal assisted intervention	Bert *et al*., 2016
	Glenk, 2017
	O'Haire, 2013
	O'Haire *et al*., 2015
Animal assisted education	Meixner & Kotrschal, 2022
Animal assisted therapy	Charry-Sánchez *et al*., 2018
	Marcus, 2013
	Kamioka *et al.,* 2014
Animal assisted service	Flynn *et al.,* 2021
	Wijnen & Martens, 2022
Animal assisted psychotherapy	Jones *et al.,* 2019
Human-animal interaction	Gee *et al.,* 2017
	Glenk & Foltin, 2021
	Rodriguez *et al.,* 2018
	Rodriguez *et al.,* 2021
Equine facilitated therapy	Naste *et al.,* 2018
Farm based interventions	Artz & Davis, 2017
	Iancu *et al.,* 2015
Farm animal assisted intervention	Jau & Hodgson, 2017
Human-animal	Hosey & Melfi, 2014
	McCune *et al.,* 2014
	Zulkifli, 2013
Oxytocin	Carter *et al.,* 2020
	Froemke & Young, 2021
	Jones *et al.,* 2017
	Uvnäs-Moberg et al., 2015
	Uvnäs-Moberg, 2022
	Uvnäs-Moberg *et al.,* 2024
	Quintana & Guastella, 2020

Pet-facilitated therapy	Pandey *et al.,* 2024
Dog assisted therapy	Hüsgen *et al.,* 2022
	Zafra-Tanaka *et al.,* 2019
Hippotherapy	Koca & Ataseven, 2015
Horse therapy	Hilliere *et al.,* 2018
	Srinivasan *et al.,* 2018
	White-Lewis, 2019
Riding therapy	Whalen & Case-Smith, 2012
Djurunderstödd insats	Mårtensson *et al.,* 2021
Djurunderstödd aktivitet	Berget *et al.,* 2021

Table 2: Characteristics of original studies included in the study

Search term	Author and publication year	Number of participants, N
Animal assisted intervention	Berry *et al.,* 2012	N = 19
	Boyle *et al.,* 2019	N = 40
Animal assisted education	Dicé *et al.,* 2017	N = 17
	Novotná *et al.,* 2024	N = 149
	Scandurra *et al.,* 2021	N = 104
	Verhoeven *et al.,* 2023	N = 37
Animal assisted activity	Germone *et al.,* 2019	N = 142
	Menna *et al.,* 2019	N = 10
	Nepps *et al.,* 2014	N = 218
	Ng *et al.,* 2014	N = 15
	Olsen *et al.,* 2016	N = 80
Animal assisted psychotherapy	Muela *et al.,* 2017	N = 87
Oxytocin	Nilsson *et al.,* 2024	N = 28
	Petersson *et al.,* 2017	N = 10
Animal assisted learning	Giuliani & Jacquemettaz, 2017	N = 53
	Pendry *et al.,* 2020	N = 349
Therapeutic riding	Lanning *et al.,* 2017	N = 51
Equine facilitated therapy	Kemp *et al.,* 2014	N = 30
	Zhu e*t al.,* 2021	N = 19
Pet facilitated therapy	Mulvaney-Roth *et al*., 2022	N = 30
Dog assisted education	Kiesewetter *et al.,* 2023	N = 55
	Lobato-Rincón *et al.,* 2021	N = 14
Dog assisted therapy	Chubak *et al.,* 2017	N = 19
	Cruz-Fierro *et al.,* 2019	N = 12
	Kleftaras & Diamantakos, 2024	N = 44
	Tunçay-Elmaı & Cevizci, 2015	N = 10

	Wood *et al.,* 2018	N = 131
Riding therapy	Bunketorp-Käll *et al.,* 2019	N = 41
	Kemeny *et al.,* 2022	N = 27

Table 3: Characteristics of original studies and reviews which has cited the article by Beetz et al. (2012) and are included in the study

Theme	Author and publication year	Number of participants, N	Type of paper
Animal assisted education	Ngai *et al.,* 2021	N = 110	Original study
Human-animal interaction	Chan *et al.,* 2025	-	Review
	Nagasawa *et al.,* 2020	N = 29	Original study
	Yerbury & Lukey, 2021	N = 359	Original study
Human-animal	Junça-Silva, 2025	N = 209	Original study
	Prato-Previde *et al.,* 2022	-	Review
Dog assisted therapy	Lass-Hennemann *et al.,* 2018	N = 60	Original study
Dog assisted intervention	Peña-Jorquera *et al.,* 2025	-	Review
	Rothkop & Schworm, 2021	N = 27	Original study
	Wołyńczyk-Gmaj *et al*., 2021	N = 51	Original study

The number of participants included in the original research articles ranged from 10 to 359, and participants' mean ages differed between the papers. The articles were also based on individuals of different genders, their current status in life and settings of interventions.

4.2 Study findings

A majority of the studies brought up the positive aspects of human-animal interactions, such as the impact which animal assisted intervention might have on humans (McCune *et al*., 2014; Rodriguez *et al.*, 2021) while others focused more on the welfare of animals (Marcus, 2013; Zulkifli, 2013; Hosey & Melfi, 2014; Ng *et al*., 2014; Wijnen & Martens, 2022).

4.2.1 Species involved in interventions

The majority of studies referred to dogs as the most frequently used species in different interventions (Berry *et al*., 2012; Marcus, 2013; Ng *et al.*, 2014; O'Haire *et al*., 2015; Bert *et al.*, 2016; Chubak *et al*., 2017; Guiliani & Jacquemettaz, 2017; Menna *et al*., 2019; Gee *et al.*, 2020; Pendry *et al*., 2020; Flynn *et al*., 2021; Rodriguez *et al*., 2021; Hüsgen *et al*.,2022; Meixner & Kortschal, 2022). Farm animals such as chickens, cows and goats were also mentioned as species involved in the interventions (Iancu *et a*l., 2015; Artz & Davis, 2017; Jau & Hodgson, 2017), as well as horses (Kemp *et al*., 2014; O'Haire *et al*., 2015; Lanning *et al*., 2017; Naste *et al*., 2018; Flynn *et al.*, 2021).

Dogs are mentioned to be the most frequently involved species in interventions, primarily because of their availability, they are convenient to work with, have a high trainability and they are predictable individuals (Glenk, 2017; Glenk & Foltin, 2021).

4.2.2 Psychophysiological effects on humans

Oxytocin is a hormone that plays an important role in regulating social behaviour and cognition. It functions as a stress-coping molecule and is also suited to facilitate survival (Jones *et al.,* 2017; Carter *et al.,* 2020; Quintana & Gastella, 2020; Froemke & Young, 2021). When interacting with animals, several senses are involved, including eye contact, talking, stroking and/or petting and oxytocin is released mainly as a response to these sensory nerves (Uvnäs-Moberg *et al*., 2015; Nilsson *et al.*, 2020; Nilsson *et al*., 2024).

Cortisol is also a hormone, known to be released as part of the physiological reaction to stressors and can be measured as chronic and acute stress (Rodriguez *et al*., 2018; Peña-Jorquera *et al.,* 2025). Prolonged exposure to stressors increases the release of cortisol in the body, which can affect the immune function (McCune *et al*., 2014).

Research has shown that interactions with animals, such as dogs in therapeutic settings, can result in increased levels of oxytocin which can inhibit the cortisol synthesis over time (McCune *et al.,* 2014; Uvnäs-Moberg *et al*., 2015; Giuliani & Jacquemettaz, 2017; Meixner & Kotrschal, 2022; Peña-Jorquera *et al.,* 2025). This means that there is a reduction in the stress hormone cortisol when oxytocin is high (Marcus, 2013; Giuliani & Jacquemettaz, 2017; Rothkopf & Schworm, 2021; Nilsson *et al*., 2024). Animal-assisted activities with dogs have been documented to stimulate the release of both serotonin and oxytocin, which over time resulted in behavioural changes, for instance, enhanced sociability among patient groups undergoing dialysis (Menna *et al*., 2019). The release of oxytocin is also mentioned to stimulate well-being and social interactions, decrease stress, pain and also fear in humans (Uvnäs-Moberg & Petersson, 2022; Uvnäs-Moberg *et al.*, 2024). In addition to reducing the stress hormone cortisol, oxytocin has been shown to lower blood pressure and may also promote faster wound healing (Uvnäs-Moberg *et al.*, 2015).

4.2.3 Psychological effects on humans

Animal-assisted interventions have been documented to be an effective complementary treatment in helping people with various psychiatric conditions, including schizophrenia, alzheimer disease and personality or mood disorders, as it improves physical, social and cognitive function (Kamioka *et al*., 2014; Bert *et al.*, 2016; Artz & Davis, 2017; Pandey *et al.*, 2024). Reduction of aggression in patients with schizophrenia has been documented as a result of animal-assisted therapies, as well as reduction of anxiety (Bert *et al.*, 2016). An improvement in social-, emotional- and physical functioning has also been documented in especially children with autism spectrum disorder and cerebral palsy as a result of interactions with animals such as dogs and horses (Whalen & Case-Smith, 2012; O'Haire *et al.*, 2013; Tunçay-Elmaı & Cevizci, 2015; Arts & Davis, 2017; Srinivasan *et al*., 2018; Germone *et al.*, 2019; Hüsgen *et al*., 2022; Lobato-Rincón *et al.*, 2021; Pandey *et al*., 2023; Chan *et al.,* 2025; Peña-Jorquera et al., 2025).

Patients who are hospitalized for different reasons can get physiological and psychological effects by animal-assisted interventions, such as pain reduction and decreased worry and loneliness, increased relaxation, socialization and self-esteem, decrease in depression, anxiety, pain and pulse pre-post interventions (Nepps *et al.*, 2014; Bert *et al.*, 2016; Chubak *et al*., 2017; Rodriguez *et al*., 2021; Wołyńczyk-Gmaj *et al.*, 2021; Mulvaney-Roth *et al.,* 2022; Kiesewetter *et al*., 2023). Similar effects have been registered in patients in psychotherapy and therapy for trauma, posttraumatic stress disorder (PTSD) and behavioural difficulties and is therefore considered a useful intervention (Kemp *et al.,* 2013; O'Haire *et al*., 2015; Lanning *et al*., 2017; Muela *et al*., 2017; Naste *et al.,* 2017; Charry-Sánchez *et al*., 2018; Lass-Hennemann *et al.,* 2018; Jones *et al*., 2019; Flynn et al., 2021; Kemeny *et al.,* 2021; Zhu *et al*., 2021).

Animal-assisted therapy has been indicated to increase motivation, but also reduce stress in university students, based on blood pressure after interventions (Wood *et al.,* 2018; Pendry *et al*., 2020; Rothkopf & Schworm, 2021). Blood pressure has also been used as a method to measure the stress in people with dental anxiety, which showed that there was a decrease in discomfort in humans during dental appointments after they had been in contact with therapy dogs (Cruz-Fierro *et al*., 2019).

Positive effects have also been documented in elementary school students who interact with dogs, where there has been a positive change in their emotional mood, social behaviour, evidence of increased memory retention and a decrease in depression (Verhoeven *et al*., 2023; Kleftaras & Diamantakos, 2024) as well as increased cognitive competence and empathy in primary school students (Dicé *et al*., 2017; Ngai *et al*., 2021; Scandurra *et al.*, 2021; Novotná *et al.*, 2024). In the review by Mårtensson *et al.* (2021) it is mentioned that continuous interactions with animals may be considered for increased learning and development in children. Participants in Green care, that is, nature-based interventions with

animals and plants, have also indicated that they find peace and physical support while interacting with animals (Berget *et al.,* 2021).

Dog-assisted therapy has also been studied for adults with dementia, but unfortunately, there is no significant evidence in improvement of daily life, agitation or disorientation (Zafra-Tanaka *et a*l., 2019). In the article by Olsen *et al*. (2016) they did not find any evidence of improvement in daily life either, but there was a positive effect on the balance directly after the dog-assisted intervention, which they connected to that there was a change in the patients' physiological state.

Hippotherapy or horse/riding therapy has also been documented to have positive effects on humans, it provides a rhythmic and repetitive movement during horseback riding which has been found to encourage proper balance (Koca & Ataseven, 2015). It has been an effective treatment in patients with physical or mental disabilities as it can improve physical function, such as balance and mobility, but it can also improve well-being and self-esteem (Koca & Ataseven, 2015; Hilliere *et al*., 2018; Bunketorp-Käll *et al.*, 2019; White-Lewis, 2019).

There are also positive findings of farm-based interventions, using different farm animals, were an improvement in mood and self-esteem, reduction of anxiety and depression has been documented as well as feelings of social inclusion (Iancu *et al.,* 2014; Jau & Hodgson, 2017).

Interactions with wild animals can affect humans as well. According to the study by Yerbury & Lukey (2021), human well-being is enhanced by nature and wild-animal interactions, as well as meaningful relationships between humans can be enhanced as a result of such interactions. These types of wild-animal interactions can occur when observing or encountering wildlife in nature or observing animals in zoos as well (Yerbury & Lukey, 2021).

4.2.4 Effects on animals

The relationship between humans and animals seems to be complex and the interactions between them have different effects on both, psychological and psychophysiological (Marcus, 2013; Prato-Previde *et al*., 2022).

According to Ng *et al.* (2014) and Wijnen & Martens (2022), there is a growing concern for the welfare of animals that are a part of animal-assisted interventions and their welfare since this is a field that is not fully studied. Though, according to other studies, it has been documented that dogs who participate in interventions can get similar positive responses as humans get, such as an increase in endorphin, oxytocin and dopamine (Marcus, 2013). Such effects can appear when there are positive interactions such as direct physical contact, grooming and gentle handling (Hosey & Melfi, 2014). This is documented to have positive effects on animals' productivity, can decrease stress levels and lead to better health, and therefore also better welfare, especially when it is done by a familiar person (Zulkifli, 2013; Hosey & Melfi, 2014). However, an increase in oxytocin levels

does not always indicate in good welfare, as it has been associated with heightened anxiety and distress in some cases (Glenk & Foltin, 2021). Though, according to Glenk & Foltin (2021), this area needs to be further studied.

As expected, rough handling can lower the welfare of animals remarkably, as it for example increases the fear of humans and can lead to stress (Zulkifli, 2013; Hosey & Melfi, 2014). Such interactions can be unpredictable and appear during interventions with for example children (Ng *et al*., 2014; Meixner and Kotrschal, 2022).

Though Marcus (2013) and Petersson *et al*. (2017) mention that there is an increase in cortisol levels in dogs when interacting with dog owners and also an increase in therapy dogs during therapeutic settings, which means that the interactions with humans may not be stress relieving for them. Though both increases and decreases of salivary cortisol have been documented in therapy dogs, and thus changes do not automatically mean that the dogs are affected negatively, but rather that they feel excitement during interventions (Glenk *et al.,* 2017). Further, Glenk e*t al.* (2017) discuss that salivary cortisol should be used carefully when evaluating the welfare of animals due to the results presented above. However, prolonged periods with higher cortisol have been documented to increase the negative effects on both health and immune functions (Glenk *et al*., 2017). Despite this, some ethicists claim that the benefits humans obtain from the interventions justify the use of dogs for animal-assisted interventions, such as for therapy (Marcus, 2013).

4.2.5 Earlier experience with animals

Humans engage with animals in various ways and the nature of these interactions can differ significantly. According to Prato-Previde *et al.* (2022), humans consider companion- and farm animals and how they should be cared for based on factors such as their personality, attitude, empathy, gender, education and earlier experience with animals.

Human-animal bonds have received recognition since the interactions between people, animals and the environment can provide emotional stability, affection, closeness and nonjudgmental presence for specifically humans (Berry *et al.,* 2012; Prato-Previde *et al.*, 2022). Previous experience with animals may also influence humans psychophysiologically as research has shown that pet ownership seems to be associated with certain health benefits, such as lower blood pressure and reduced heart rate in humans (Gee *et al.*, 2017; Nagasawa *et al.,* 2020).

Additionally, there are findings which indicate that the bond between adults and their pets has a reducing effect on depression (Gee *et al.,* 2017). However, the loss of a pet may in some cases, lead to an increase in depressive symptoms among pet owners (Gee *et al.,* 2017).

4.2.6 Possible risks of different interventions

Animal-assisted interventions can be implemented in different settings, including hospitals and schools (Bert *et al*., 2016). When such interventions are used in specifically healthcare settings, there are potential risks associated with infections, for example zoonoses, which are diseases that can be transmitted directly between humans and animals (Bert *et al.,* 2016; Boyle *et al*., 2019). Boyle *et al*. (2019) highlight that healthy animals may still carry zoonotic pathogens and therefore, it is a considerable risk when bringing animals into healthcare settings. Additional concerns include allergies and animal-related accidents, such as injuries. However, Bert *et al.* (2016) noted that these risks can be significantly reduced through careful selection of animals and patients and established protocols.

5. Discussion

This literature study aimed to summarize and update information regarding the effects of human-animal interactions since 2012, with particular focus on the role of oxytocin, psychophysiological and psychological effects and the welfare of both humans and animals. By increasing the knowledge about the effects, it is possible to find out about possible challenges associated with human-animal interactions. In the discussion, ethical, societal and sustainability aspects are presented, as well as advantages and disadvantages of the material and method and in addition suggestions for future research.

5.1 The effect of human-animal interactions on humans

5.1.1 The role of oxytocin

Oxytocin plays a key role in the regulation of social behaviour and cognitive processes in humans and is released mainly as a response to sensory nerves (Uvnäs-Moberg *et al*., 2015; Nilsson *et al.*, 2020; Nilsson *et al*., 2023). According to the results, human-animal interactions can lead to oxytocin release or at least increased levels of oxytocin in humans as part of, for example, therapy sessions with dogs (Uvnäs-Moberg *et al*., 2015; Meixner & Kotrschal, 2022; Peña-Jorquera *et al.,* 2025). Beetz *et al*. (2012) have also suggested that a closer relationship between humans and animals has a greater effect on the oxytocin release.

The increased levels have been documented to enhance human well-being as they stimulate social interactions as well as decrease stress and pain (Uvnäs-Moberg & Petersson, 2022; Uvnäs-Moberg *et al.*, 2024). This also aligns with the article by IsHak *et al.* (2011), who mention that oxytocin contributes to enhancing well-being, calmness and reduced anxiety. The anxiety reduction has also specifically been associated with the increase of oxytocin, since the increase of this hormone lowers the cortisol levels, e.g, the stress hormone (Giuliani & Jacquemettaz, 2017). Since oxytocin decreases anxious feelings, it is mentioned to be valuable for people with, for example, anxiety disorders such as PTSD (Missig *et al.*, 2010).

5.1.2 Psychological and psychophysiological effects

The presented results suggest many beneficial points regarding the effect of human-animal interactions. The studies focused on different groups of humans such as people with psychiatric conditions and behavioural difficulties (Kamioka *et al*., 2014; O´Haire *et al*., 2015; Bert *et al.*, 2016; Olsen *et al.,* 2016; Artz & Davis, 2017; Lanning *et al*., 2017; Muela *et al*., 2017; Charry-Sánchez *et al*., 2018; Lass-Hennemann *et al.,* 2018; Jones *et al*., 2019; Zafra-Tanaka *et a*l., 2019;

Pandey *et al.*, 2024), children and adults with autism spectrum disorder and cerebral palsy (Arts & Davis, 2017; Germone *et al.*, 2019; Hüsgen *et al*., 2022; Lobato-Rincón *et al.*, 2021; O'Haire *et al.*, 2013; Pandey *et al*., 2023; Peña-Jorquera et al., 2025; Srinivasan *et al*., 2018; Tunçay-Elmaı & Cevizci, 2015; Whalen & Case-Smith, 2012), hospitalized patiens (Nepps *et al.*, 2014; Bert *et al.*, 2016; Chubak *et al*., 2017; Rodriguez *et al*., 2021; Wołyńczyk-Gmaj *et al.*, 2021; Mulvaney-Roth *et al.,* 2022; Kiesewetter *et al*., 2023), in students in university as well as elementary- and primary school (Dicé *et al*., 2017; Wood *et al.,* 2018; Ngai *et al*., 2021; Rothkopf & Schworm, 2021; Scandurra *et al.*, 2021; Verhoeven *et al*., 2023; Kleftaras & Diamantakos, 2024; Novotná *et al.*, 2024), as well as patients with physical or mental disabilities (Koca & Ataseven, 2015; Hilliere *et al*., 2018; Bunketorp-Käll *et al.*, 2019; White-Lewis; 2019).

There was a wide range of outcomes from AAI presented in the results, such as an improvement in physical, social and cognitive function. The reduction of anxiety and pain as a consequence of AAI was a common outcome in multiple studies and can be connected to oxytocin as it contributes to these changes (IsHak *et al*., 2011; Uvnäs-Moberg & Petersson, 2022; Uvnäs-Moberg *et al.*, 2024). Another frequently documented effect was the decrease in depression (Nepps *et al.*, 2014; Bert *et al.*, 2016; Chubak *et al*., 2017; Rodriguez *et al*., 2021; Wołyńczyk-Gmaj *et al.*, 2021; Mulvaney-Roth *et al.,* 2022; Kiesewetter *et al*., 2023; Verhoeven *et al*., 2023; Kleftaras & Diamantakos, 2024). The effects on blood pressure were also assessed during AAI and the results showed a decrease (Gee *et al.*, 2017; Wood *et al*., 2018; Nagasawa *et al.,* 2020; Rothkopf & Schworm, 2021). The decrease in blood pressure after interventions can be explained by oxytocin, which is supported by Uvnäs-Mobert *et al*. (2015)

In one of the articles, there were no significant effects of AAI in patients with dementia (Olsen *et al.,* 2016; Zafra-Tanaka *et al*., 2019). Because of this, it was discussed that AAI might not be a useful treatment for dementia patients. However, other studies discussed that the presence of a therapy dog can affect patients with dementia positively, as it increases their well-being and decreases levels of aggression (Bernabei *et al.,* 2012; Wesenberg *et al*., 2019). It seems that there are varying findings in this area, and due to this it is considered that further research is required.

AAI can be used as a complementary treatment in different settings since it is documented to help, for example patients with PTSD and children with autism who usually experience social impairments (O´Haire *et al.,* 2015; Chan *et al*., 2025).

The human-animal relationship and how people engage and consider animals are mainly influenced by the humans' earlier experience and familiarity with an animal, attitudes, and knowledge (Rault *et al*., 2020; Prato-Previde *et al*., 2022). Previous experience with animals may also be a factor in how people perceive the effects of human-animal interactions and therefore, the effects may differ between individuals. For example, if you have had a bad experience with dogs before, you

may not get the same calming effect as another person might get during services including animals.

5.1.3 Risk of human-animal interactions

The review also investigated the potential risk of HAI and brought up that there can be potential risks with animal-assisted interventions used in healthcare settings, for example, that zoonoses can be transmitted between humans and animals (Bert *et al.,* 2016; Boyle *et al*., 2019). Boyle *et al.* (2019) and Dalton *et al.* (2020) highlight that healthy animals may still carry zoonotic pathogens and therefore, it must be a considerable risk when bringing animals into healthcare settings. Additional concerns that were brought up included allergies and animal-related accidents, such as injuries. According to Bert *et al.* (2016) these risks can be significantly reduced if the animals are carefully selected and also by establishing clear protocols.

The International Association of Human-Animal Interaction Organisation (IAHAIO) has implemented guidelines concerning, for instance, the selection of animals and how they should be examined to ensure that they are well-suited for AAI (Jegatheesan *et al.,* 2018). Further on Jegatheesan *et al.* (2018) discuss the risk of infections and briefly discuss how they should be prevented. Though clearer protocols should be developed to specify the responsibilities of each party and how they should proceed to minimize the potential risks of AAI.

5.1.4 Welfare of animals

Beetz *et al*. (2012) mention that there has been an increase in animal-assisted interventions during the last decade, and because of this, the welfare of animals has to be considered as well.

During human-animal interactions and interventions, there may be negative interactions, meaning interactions that can have an unpleasant and direct negative impact on the animal (Mellor *et al.,* 2020; Rault *et al.,* 2025). Such interactions include if there is no- or very little contact between human- and animal and if there are unpleasant or threatening actions from humans and in addition these interactions may increase the fear of humans and lead to stress in animals (Zulkifli, 2013; Hosey & Melfi, 2014; Mellor *et al*., 2020). Based on the evidence presented in the results, Ng *et al.* (2014) and Meixner & Kotrschal (2022) documented that these kinds of negative interactions may occur during interventions with, for example, children.

According to earlier studies, dogs get an increase in cortisol levels when interacting with both handlers and when involved in different interventions (Marcus, 2013). The increase can be explained by the dogs associating the visits as a work experience with strangers, and this may not be stress relieving (Marcus, 2013).

Animals involved in HAIs may also get an increase in oxytocin, though they may not get the same positive effects as humans, due to that the increase in basal oxytocin has been indicated to be associated with anxiety and distress Glenk & Foltin, 2021). The increases and decreases of oxytocin levels seem to be inexplicit according to Glenk *et al*. (2017) and further research regarding the effects of release and changes in levels of such hormones should be taken into consideration.

Overrall, there are specific recommendations and guidelines published by the International Association of Human-Animal Interaction Organisation (IAHAIO, 2025) that should be implemented to ensure the well-being of animals involved in animal-assisted interventions, but they can be difficult to enforce (Ng *et al.,* 2019). Ng *et al.* (2019) mention that the welfare of animals involved in different interventions, such as in therapy, are sometimes jeopardized because it is neglected that animals are sentient beings that deserve equal ethical consideration.

5.2 Advantages and disadvantages of the material and method

The aim with this literature review is to update the state of knowledge from 2012 regarding how human-animal interactions affect humans' physiologically, psychosocially and psychophysiologically, and to investigate whether there are any welfare risks for humans and/or the animals.

There were a lot of search words included to receive the best possible result in collecting information regarding the subject, though the disadvantage of this was that it gave a large amount of hits through Google Scholar and the timeframe was not enough to go through it all. Google Scholar is also a search engine that allows you to make some advanced settings for the searches, though it does not provide the option to filter exclusively for peer-reviewed articles which means that other materials such as books, bachelor thesis and so on appears, which were materials that was part of the exclusion criterion for this review. Though the searches yielded a lot of scientifically reviewed articles in the end which were relevant for this study.

5.3 Advantages and disadvantages of literature

The literature included in this literature review has undergone scientific peer review and consists of studies published between 2012 and 2025, ensuring that the articles are relatively recent and thereby enhancing their credibility. Several authors have also contributed to multiple studies which was used for this review, such as Glenk (2017; 2021), Nilsson *et al..,* (2020; 2024), O'Haire (2013; 2015), Rodriguez (2018; 2021), Uvnäs-Moberg (2015; 2022; 2024). The repeated inclusion of publications by the same authors may indicate in a strong familiarity with the subject areas, which further supports the trustworthiness of the material that has been used. The different articles covered diverse aspects of human-animal interactions, as well as interventions and their effects on both humans and animals. By combining several articles in the same area, it can provide a broad

understanding of how different interactions may affect different parties. Unfortunately, some articles were not available via Google Scholar or Web of Science, which makes it a disadvantage. Several uncertainties were identified in the literature included for this review and a majority of authors emphasized that further research is required in the discussed area. As a result of this, clear conclusions regarding the effects of HAI and AAI in different settings are difficult to establish.

5.4 Ethical aspects

Animal-assisted interventions are used to enhance human well-being in people who are generally in a vulnerable position in human society and there are multiple benefits as a result of the interactions (Rawlings, 2021). According to Rawlings (2021), humans have already decided that it is ethically acceptable to use animals in different interventions due to the benefits we receive. Though the animals' welfare has been brought up as a concern and it is therefore important to question if the benefits that humans gain from the interactions justify the use of animals (Ng, 2021). Animals are sentient beings, as well as humans, and have their own individual needs that must be taken into account (Nussbaum, 2012). The welfare of animals involved in interventions has been documented to be compromised and to ensure their welfare, proper assessments with appropriate knowledge of the individual animal have to be done, and this should be applied to all species involved (Ng, 2021).

According to the review by Sumner (1986), who brings up the case of animal rights ethics, individuals with welfare, such as animals, have an inherent value. This means that the individuals are valuable in and of themselves and not because of their usefulness to others (Abbate, 2020). These perspectives should be considered when we involve animals in interventions that intend to benefit humans.

5.5 The study´s usefulness and future research

Human-animal interactions have received growing attention and the use and research of animal-assisted interventions and services have expanded. Several authors have noted that the research in this area remains incomplete (O'Haire, 2013; Kamioka *et al.,* 2014; Zafra-Tanaka *et a*l., 2019; Flynn *et al.,* 2021; Glenk & Foltin, 2021; Scandurra *et al.,* 2021).

The selection of animals is mentioned to be a crucial aspect as they have to be well-suited to ensure the best possible outcome of the interventions for both human and animal, as well as ensure their well-being (Fine *et al.,* 2019). The relationship between an animal and its handler plays a significant role in the animal's health as well, therefore the handler must receive appropriate education and skills to assess the animal's behaviour and to identify potential risks that can affect both animals and patients in interventions (Fine *et al*., 2019). Because of this, it is an important aspect to view and update the current guidelines from

IAHAIO and to clarify these as it has also been mentioned that the guidelines appear to be challenging to implement in practice (Ng *et al.,* 2019).

According to the results, the welfare of animals involved in different interventions may be jeopardized, which makes it an important aspect to consider for future research. AAI can involve a variety of other species, such as rabbits, fish, reptiles and guinea pigs, and their well-being should be studied as well (Suba-Bokodi *et al.,* 2024). Oxytocin may also affect humans and animals in different ways and should be further studied. The use of AI and robotics instead of animals should also be further investigated to assess if it can have the same positive effects on human well-being.

Examples of questions for future research may be:

- How are animals affected by changes in oxytocin levels?
- What ethical guidelines should be followed to ensure animal welfare in animal-assisted interventions?
- To what extent can AI or robotics replicate the emotional effects that animals have on humans?

5.6 The study in relation to sustainability and societal aspects

Animals have played a significant role in human lives for thousands of years. Their use in animal-assisted interventions is equally important, as it promotes human well-being and social stability, which contributes to sustainable development. A broader knowledge about the use of AAI has highlighted dilemmas related to animal welfare. However, by addressing the challenges, continuing the research and improving welfare practices in the area, the use of AAI can align with and support the progress towards a more sustainable development.

6. Conclusions

The aim of this literature review was to update the knowledge regarding human-animal interactions, the effects of animal-assisted interventions, the physiological and psychological effects it can have on both humans and animals, but also to investigate the role of oxytocin during such interactions.

In conclusion, I would like to emphasize that there are several health-promoting effects of animal-assisted interventions, especially for humans, where they can, among other things, improve the socio-emotional development of children. Early experience with animals can be beneficial, for example, in therapeutic settings and a strong human-animal bond may further enhance the impact of such interactions. Oxytocin can also, to some extent, explain some of the physiological and psychological changes that occur in the body as a result of human-animal interactions, for instance, the decrease of anxiety. Animal-assisted interventions and the interactions between them can, however, raise some ethical concerns. However, I believe that these concerns can form the basis for future research in the area and help create regulations that are well adapted to protect the welfare of animals while at the same time benefiting human well-being. By gaining a broader understanding of these aspects, we can work towards a more sustainable implementation of animal-assisted interventions.

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Popular science summary

Human-animal interactions (HAI) are interactions between humans and animals, such as when you pet a companion animal or encounter animals in wildlife, which can have effects on both parties. Animal-assisted interventions are a kind of human-animal interaction that can be used, for example, to help hospitalized and therapy patients improve their physical and mental health.

The research around these interactions is a field that is growing fast, and in addition to this, it is important to view what effects it can have on humans' and animals' well-being and also if it affects the welfare of animals. Welfare can be described as the state of an individual as they interact with the environment, that is, for example, the state of an animal as it interacts with a human and the environment.

In this study, 78 scientific papers were reviewed to update the knowledge regarding the effects of different human-animal interactions. Some effects that have been documented in humans as a result of animal-assisted interventions are a reduction of stress and anxiety, but also an increase in empathy and motivation. Oxytocin, a hormone that plays an important role in regulating processes in the body, may play a role in the effects of human-animal interactions, and if there is a strong connection between the human and animal, for example, if there is an owner and their dog, this may cause stronger effects as well.

Even if these types of interactions may affect humans positively, there is a risk that the animals are affected negatively, which has to be considered as well.

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