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Animal-Assisted Interventions in Pediatric and Geriatric Care: A Review of Benefits, Mechanisms, and Limitations

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ABSTRACT

Background. The role of animals in modern medicine extends beyond experimental models to include the therapeutic potential of the human-animal relationship. Animal-Assisted Interventions (AAI), including Therapy (AAT), Education (AAE), and Activities (AAA), constitute an effective tool for improving patients' psychophysical well-being. These methods, utilizing appropriately trained animals (most commonly dogs) or their robotic counterparts, are applied in supporting cognitive and social functions as well as motivating activity.

Aim. The aim of this review was to present the benefits of AAI in both children and adolescents, as well as in elderly patients with age-related physical, mental, and neurological disorders.

Material and methods. This paper constitutes a review of recent literature, based on an analysis of data retrieved from PubMed, Google Scholar, and Web of Science databases. Only English-language publications were analyzed.

Results. Analysis of studies confirms the multidimensional impact of AAI on health. In the physical sphere, contact with an animal enforces movement and sensory stimulation, improving balance and cardiovascular parameters. Regarding the psychological aspect, AAI regulates hormonal balance (oxytocin/cortisol), reducing symptoms of depression and anxiety in seniors, as well as pain and hospitalization stress in children. Although robotics offer an allergen-free alternative, interaction with a living animal, yields more lasting social effects. However, the use of AAT carries epidemiological risks and challenges regarding animal welfare, requiring strict safety procedures.

Conclusions. AAI constitutes an effective, non-pharmacological support method in geriatrics and pediatrics, characterized by a unique, multidimensional nature. While the development of robotics (Pet-Robot Intervention, PRI) opens new perspectives, the success of interventions with living animals requires absolute adherence to strict safety and ethical standards.

Keywords: pet therapy, animal-assisted intervention, elderly, animal-assisted therapy, human-animal interaction

Introduction

The role of animals in modern medicine is multidimensional and is not limited solely to the sphere of laboratory research. Although traditionally associated mainly with experimental models, there is an equally significant area of their utilization, based primarily on relationship and interaction rather than biological aspects alone.

Observations from recent years indicate that Animal-Assisted Interventions (AAI) can be an effective tool for improving general human well-being. This term encompasses the intentional use of selected animal species in a manner that yields health or educational benefits. AAI includes a range of approaches, such as Animal-Assisted Therapy (AAT), Animal-Assisted Education (AAE), and Animal-Assisted Activities (AAA).

The wide range of therapeutic animals includes dogs, cats, horses, birds, and fish. Dogs are the most popular due to their natural ability to engage humans in play-based activities. For individuals experiencing fear of animals or having fur allergies, modern technological solutions in the form of advanced therapeutic robots constitute a valuable alternative [1].

AAI methods can be based on both short- and long-term contacts, and the interaction takes place in individual or group forms. Depending on the intervention goal, animals undergo specialized training, allowing their presence to be used to strengthen the patient's cognitive and social abilities, as well as to motivate them to perform routine activities [2].

Materials and methods

This article synthesizes the most recent literature (2015–2024) alongside selected historical references. The aim of the review was to discuss the benefits of AAI in both children and adolescents, as well as in elderly patients with age-related physical, psychological, and neurological disorders. In the process of collecting data, PubMed, Google Scholar, and Web of Science databases were searched using keywords such as pet therapy, animal-assisted intervention, elderly, animal-assisted therapy, human-animal interaction. Mostly English-language publications were analyzed.

Results

Impact of AAT on physical functioning and balance

Quality of Life (QoL) depends on many variables, among which balance plays a key role, being essential for performing most activities of daily living. It has been demonstrated that physical activity is a necessary condition in preventing falls and maintaining fitness during the aging process; however, its level unfortunately decreases with age [3, 4].

Horak's model lists key elements for maintaining good balance: cognitive abilities (attention and learning), biomechanical constraints (strength, stability), sensory and motor strategies, spatial orientation and dynamic control [5]. It appears that AAI methods affect selected mechanisms due to their complexity. These interventions improve cognitive processes naturally - by encouraging the patient to memorize the dog's name, commands, and task sequences [6].

Interactions with a dog require participants to be in constant motion, shifting body weight in multiple planes, bending down for a ball, or turning to check the animal's position, as well as leaning to pet it or reward it with a treat. Tactile stimuli and temperature differences stimulate the somatosensory system, which constitutes a key element of the sensory integration process, supporting the building of a correct body schema [7].

This increased mobility, stimulated by the animal's presence, extends its benefits beyond motor aspects, positively influencing general health, which is reflected in broad population studies.

Based on epidemiological studies, it was noted that pet owners derive benefits in the form of increased physical activity and improved blood pressure parameters. One study conducted in Australia in the 1990s showed that in a group of 5,741 subjects, pet owners had lower blood pressure values, lower cholesterol concentrations (by an average of 5 mg/dL), and lower triglycerides, where mean values hovered around 84 mg/dL [8].

Similar conclusions come from a study conducted in the USA on a group of 5,902 people. Pet owners walked an average of 150 minutes longer per week and more frequently engaged in any physical activity compared to non-pet owners [9].

The beneficial influence of owning a dog was also confirmed by the California Health Interview Survey, which covered over 55,000 people. It showed that pet owners more frequently spent their free time on walks [10]. However, critical analyses are present in the literature suggesting

that owners' increased physical activity largely results from the obligation to satisfy the animal's needs, rather than the caregivers' internal motivation to undertake effort [11].

Impact of AAI on neuroendocrine response in neurocognitive disorders

Neurocognitive disorders (NCD) constitute a significant clinical problem for the healthcare system, as well as for patients and their families. Early detection of these conditions enables better treatment planning and quality of life improvement; however, in clinical practice, they often remain undiagnosed in over half of patients. Regardless of the timing of diagnosis, the priority remains the implementation of interventions improving the patients' current well-being and alleviating progressive dysfunctions [12].

Animal-Assisted Therapy (AAT) can effectively alleviate symptoms and improve the quality of life of persons with neurocognitive disorders (NCD) [13]. In the case of patients whose verbal communication and comprehension abilities have weakened, AAT stimulates communicative functions through the necessity of continuous reception and interpretation of multisensory stimuli: visual, tactile, auditory, and olfactory. Moreover, the animal's presence may evoke positive memories, for example, regarding animals owned in the past, which favorably influences cognitive processes and memory [14].

In a study by Odendaal and Meintjes, a correlation was observed between interaction with animals and higher concentrations of endorphins, oxytocin, prolactin, phenylethylamine, and dopamine, with simultaneous lower cortisol levels [15]. Oxytocin influences a range of physiological, emotional, and social processes, reducing anxiety, stress, and aggressive behaviors. Furthermore, it regulates the activity of the parasympathetic system by inhibiting the secretion of cortisol, aldosterone, and adrenaline, leading to lowered blood pressure and alleviation of pain ailments [16].

Impact of AAI on the behavioral sphere and depressive symptoms

Along with the aging process, the behavioral sphere gradually narrows, manifesting as limited activity, social withdrawal, and passivity. These changes are associated with an increased risk of mood disorders, including depression, which in the geriatric population often takes a latent form or is masked by somatic ailments. The response to these challenges is AAI, acting as a stimulator aimed at alleviating symptoms, breaking behavioral stagnation, and activating patients in daily functioning.

Nordgren and Engstrom analyzed the behavioral sphere, noting significant improvement not only in the aspect of patient-animal interaction but also in relationships among the elderly themselves. Seniors more frequently initiated conversations where the main topic became the present animal [17].

Regarding the psychosocial area, an increase in the sense of independence, being respected, and self-esteem was observed in the elderly. Motivated and relaxed by the animal's presence, patients more willingly undertook caregiving tasks, such as brushing or walking the dog on a leash [18]. These activities resulted in a reduction of stress reactions and had a beneficial effect on the cardiovascular system [19].

Sun Ju Chang et al., in their analysis based, among others, on the meta-analysis by Lai et al. and studies by Nordgren and Engstrom, presented interaction with animals as conducive to the consolidation of new, pleasant memories and the recall of old ones, which is associated with the reduction of negative emotions and may constitute evidence for the effectiveness of Animal-Assisted Therapy (AAT) in treating depression [20].

This is particularly important in geriatrics, as depressive symptoms in seniors often accompany chronic pain or the loss of a loved one, consequently leading to a loss of interest in activities that once brought pleasure. Pets seem to counteract these mechanisms, creating a positive environment adapted to elderly people and helping in coping with pain by inducing joy and laughter in owners [21].

AAI using robotic animals

As presented above, animal-assisted therapy exerts a beneficial influence on physical functioning, balance, neurocognitive abilities, as well as the behavioral sphere and reduction of depressive symptoms. Unfortunately, AAI implementation encounters barriers including patient safety issues (allergies, fear), economic factors, and logistical challenges related to care (necessity of training, sanitary and spatial requirements) [22].

In response to these limitations, interventions using robotic animals (Pet-Robot Interventions; PRI) have been developed, aimed at replicating the therapeutic effects of contact with a living animal while simultaneously minimizing costs and health risks [23]. In the context of mental health, PRI promotes the creation of a friendly social environment, stimulates oxytocin secretion, and lowers blood pressure. These mechanisms control the body's reaction to stress, thereby reducing the risk of depressive and anxiety symptoms [24, 25].

However, reports by Thodberg, Sørensen et al. should be noted, indicating decreasing interest in interaction with robots over time, whereas engagement in contact with living dogs remained at a constant level. It seems that this unfavorable trend may change with technological progress and the refinement of robots to mimic living organisms more faithfully [26].

Multidimensional impact of AAT on the health and development of children and adolescents

The therapeutic potential of animals is not limited solely to geriatric care, demonstrating equally significant benefits in work with pediatric patients. AAT constitutes a versatile tool supporting both the rehabilitation process and the emotional stability of children struggling with hospitalization or developmental disorders.

A study analyzing the impact of AAT on neurological, cardiovascular, and endocrine responses in the immediate postoperative period showed that introducing a dog into the recovery room was associated with a faster return of beta activity in EEG recordings and lower pain perception compared to the control group. Therapeutic dogs facilitated the return of alertness after anesthesia, modifying pain perception and inducing a prefrontal emotional response and an adaptive cardiovascular reaction [27].

The dog, constituting a specific link between the harsh hospital environment and the animate world, also supported the development of children with various types of deficits. This likely results from the increased sense of security, stability, and constancy of the relationship offered by the animal [28]. Due to the achieved benefits, AAT is gaining recognition among both parents and medical staff. Considering the well-being of children and adolescents with cancer, it is postulated to include this method in hospital care standards [29].

Another study, conducted among patients with mental disorders aged 11–17, showed that the implementation of an AAT protocol statistically significantly improves general functioning and school attendance [30].

This method has also found application in the therapy of overweight children. Participants in the program involving dogs demonstrated higher motivation for physical exercises and a willingness to introduce permanent lifestyle changes [31].

In turn, children with cerebral palsy were found to be more independent in their daily activities and to initiate contact and emotional exchange with their loved ones more frequently [32].

Analysis of risk factors and limitations in Animal-Assisted Interventions (AAI)

Although the studies cited above unequivocally confirm the high therapeutic potential of AAI, the implementation of these methods in clinical practice is associated with specific challenges. The key limitations and potential threats accompanying animal-assisted therapy are summarized below [33].

Dietary and nutritional risks
● excessive rewarding with treats may lead to obesity and secondary cardiovascular sequelae; ● the practice of feeding raw meat poses a risk of pathogen transmission (e.g., Salmonella, E. coli) and parasites, constituting an epidemiological hazard for both animals and patients;
Environmental hazards
● in medical facilities or home settings, animals are exposed to mechanical injuries, entanglement in medical equipment, or accidental ingestion of medications; ● outdoor activities are associated with exposure to tick-borne diseases (e.g., Lyme borreliosis, tick-borne encephalitis);
Risks related to stress and animal welfare
● intense interactions, such as excessive hugging, kissing, or prolonged direct eye contact, may induce stress in the animal. Monitoring warning signals (e.g., gaze aversion, air snapping) is crucial; ● ignoring stress signals may provoke a defensive response from the animal, including biting; ● excessively long or intense therapeutic sessions may lead to elevated cortisol levels and chronic fatigue in the animal;
Epidemiological risks
● even clinically healthy animals may act as vectors for multidrug-resistant bacteria, which necessitates regular veterinary monitoring.

Table 1. Limitations and threats accompanying animal-assisted therapy.

Conclusions

Animal-Assisted Interventions (AAI) constitute a versatile complement to conventional medicine, bringing tangible benefits in the physical and mental spheres. Regular contact with animals promotes physical activity, influencing the improvement of patients' balance and cardiac parameters. These interactions also stimulate the neuroendocrine system, increasing oxytocin concentration and effectively reducing stress.

In the therapy of seniors, the presence of an animal supports cognitive functions, evokes positive memories, and motivates communication, playing a key role in counteracting depression and social withdrawal. Conversely, in the pediatric population, this therapy alleviates postoperative pain and supports emotional development and the rehabilitation process. An interesting alternative to live animals are therapeutic robots, which allow for the elimination of the risk of allergies or fear. However, it must be remembered that implementing methods involving living animals requires awareness of threats and care for their welfare to protect them from stress and fatigue.

Disclosure

Conceptualization: Michał Magiera, Piotr Czwałga

Methodology: Patrycja Koprowska, Miłosz Sikora

Software: not applicable.

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