

Animal-assisted therapy — magic or medicine?

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Abstract

A sound theoretical basis supported by scientifically measured physiological parameters is needed to gain medical support for animal-assisted therapy. Six neurochemicals associated with a decrease in blood pressure were measured in humans ($n = 18$) and dogs ($n=18$) before and after positive

interaction. Results ($P < .05$) indicated that in both species the neurochemicals involved with attention-seeking or attentionis egens behavior have increased. This information can be used as a rationale for animal-assisted therapy. © 2000 Elsevier Science Inc. All rights reserved.

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The field of study known as human–animal interaction only became known in the eighties when scientific societies were established and international conferences were organized. The field of study covers a broad scope that includes all interactions between man and animal on a continuum. Despite this inclusive approach to human–animal interaction, it was mainly the emotional and positive aspects that caught the imagination of the public and researchers alike. It was specifically highlighted in the use of animals in therapeutic situations that involved disabled persons. In this regard, the pioneer in the field of animal-assisted psychotherapy was Boris Levinson [1], a psychiatrist who had his practice in New York. Rowan and Beck [2] argued that there is already solid evidence of animal contact having significant health benefits, and that it positively influences transient physiological states, morale, and feelings of self-worth, but that more research funds are needed to identify the scope of the influence of animal contact. Rowan [3] indicated, however, his concern about the fact that health professions (veterinary medicine excluded) had shown limited interest in human–animal interaction studies since the initial attention these received. He said that those who wish to promote the wider

acceptance of animal-assisted therapy must address this particular problem. Medical interest will only be obtained when a sound theoretical basis is supported by scientifically measured physiological parameters.

Theoretical framework

One of the fundamental characteristics of life is inherent mobility. Such motion, even if it is only growth, implies an effect on the environment of an organism. Without inherent mobility plus its contingent effects, an organism is dead. The further living organisms are developed; the greater meaning is attached to this mobility-and-effect in terms of behavioral patterns. In various organisms, action–effect behavior has developed into action–reaction behavior that is used mainly for survival. Remember that all organisms, including plants, are part of this argument that is based on evolutionary principles. Survival has to do with the collection of food for energy (for continuing action or mobility) as well as reproduction. Survival activities are thus not only on the individual level but also on the species level of continuous existence. This leads to competition in the environment with accompanying self-defense or expansion with regard to territory that includes resources, shelter, and security. The effect of competition could be intraspecies, interspecies, or may include interaction with the non-biolo-

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gical environment. All behaviors up to this point are described as selfish and agonistic, and include food chains and parasitism.

Biology, however, seems to be more than that because it tends to organize in complicated self-organizing systems where the simple cause-and-effect of competition is not the only law of nature. In other words, the so-called “law of the jungle,” where only the strongest survives, appears not to be the whole truth. Organisms can also organize into cooperative systems such as various types of symbioses and dynamic equilibriums between organisms and their environment in terms of the use of resources and energy and the maintenance of the environment. Organisms can thus be instrumental in mutual ecological order while tolerance becomes another characteristic of biology. From an evolutionary point of view, action (mobility) is followed by reaction (effects of mobility), but it can also develop into beneficial and affiliation interaction (complementary mobility).

Although the need for positive interaction already exists in the basic behavioral patterns of many living organisms, attention-need behavior only becomes clearly identified in advanced and well-developed social systems as a universal emotional need. Attention-seeking behavior is not a new idea, and it is used especially when problem behavior in humans and social animals is described. In order to distinguish between problem behavior and a normal need, a Latin description is chosen to standardize its use in all languages. The term *attentionis egens* describes the need for attention on a normal, basic emotional level as the prerequisite for successful social interaction, and deviations from the norm could be found from withdrawal from attention on the one side to a myriad of behavioral patterns aimed at getting excessive attention on the other side. The latter develops because of either a lack of attention or an addiction to attention. Positive or affiliative interaction is seen as behavior that is mutually beneficial, and negative interaction as behavior that is harmful or a bad experience to one or both parties.

Intraspecies social systems are not necessarily closed systems. Such systems can be expanded to be interspecies in nature. One of the outstanding examples of such an interspecies relationship is that between humans and companion animals. The success of human–companion animal interaction is probably mainly based on a two-way fulfilling of *attentionis egens*. Animals suitable for companion animals are most often highly social animals, and if less social animals are kept, they can still fulfill the need for attention of their human owners. The greater the need for attention or the more social behavior an animal exhibits, the more successful the bonding between human and animal can be. When such a beneficial interaction between two social species is set in equilibrium, it can be described as a social symbiotic relationship (mutualism on a social level). In this regard, the dog is a prime example of such relationships because of the long period and the wide distribution (uni-

versalism) of human–dog interaction. The dog can truly be seen as a prototype of companion animals.

The fact that attention needs are fulfilled interspecies rather than intraspecies could possibly be explained on the basis that the two species in such a relationship do not compete for the same physiological needs such as food. On the contrary, the human provides food, shelter, and care, while at the same time, the animal can also be used for utility purposes and security. This provides an atmosphere in which the two species can interact positively on the emotional level because interaction on the physiological level is non-threatening. In this way, a positive feedback cycle of need and fulfillment of attention is established.

According to historical evidence and prehistoric speculations, it is believed that the social symbiotic relationship between man and dogs and cats developed without any coercion from the human’s side. This means that domestication was a natural process and not a unilateral decision by humans to tame them. It is thus possible to explain the unforced, natural way of establishing a social symbiotic relationship between humans and companion animals by well-developed needs for attention when viewed from a historic point of view. Whether the first step was taken by humans or animals is of less importance. What is known is that the interaction between *Homo sapiens* (wise man) and *Canis familiaris* (family dog) developed into a beneficial (utility) and meaningful (emotional) interaction that has lasted for at least 10,000 years. It seems that the way new relationships develop today does not differ much from the earliest information on human–companion animal relationships. If the first encounters were accidental, reinforced by rewards, encounters today can still be described in the same way except that selection for more social animals also took place. The purpose is not to analyze the historic cause and effect of the interaction but rather to understand the success in terms of the mechanism (*attentionis egens*) of the interaction, which has not altered since the history of man–companion animal, was first recorded. However, although the mechanism is still the same, human–dog relationships have become more varied and intensified in modern times.

Attention needs and therapy

The therapeutic role of companion animals is mainly established among the “weaker” people in society such as physically and mentally handicapped people, socially maladapted persons, chronically ill patients, the lonely as in long-term social deprivation, emotionally disturbed persons, prisoners, substance-dependent addicts, the aged, and children. There is not necessarily something wrong with the latter two categories, but they are included because these persons are often not part of the mainstream community activities as experienced by the economically active adult population. It means that all the above-men-

tioned persons may have an additional need for attention owing to their particular positions (peripheral to the mainstream) in the broader society. In other words, they cannot compete on an equal basis for attention among healthy, adult people because of their place in society in relation to the nucleus of activities. Obviously, this picture is not black and white or a matter of “them against us,” but it rather emphasizes the point that where there is a possible lack of attention, companion animals, which can provide attention in a reciprocal way, can be used to assist in therapy. Exceptions can occur: on the one hand, so-called healthy, active people may also use animals for fulfilling attentions egens, and on the other hand, the so-called marginalized people may not need animals to fulfill their needs for attention. Companion animals are not for everybody, and reasons are that the need for attention could be fulfilled by other means that people prefer, previous negative experiences with animals, or there could be practical limitations in keeping animals. What is then proposed is that the current claims for success where animals are used to assist in therapy are mainly based on

the fulfillment of attentionis egens, and that the success is reinforced because of a positive feedback system.

Attentions egens of social species are usually fulfilled by members of the same species, and this is also true for human–human interaction. Typical positive attention between human and human can, however, be replaced just as well by human–animal interaction. It is in this human–human interaction context that companion animals can truly be viewed as therapeutic agents. The arguments can thus be summarized in the following diagram that includes evolutionary, historical, cross-cultural, longitudinal (development), and interspecies interaction explanations as well as reasons for a lack of human–animal interaction (Fig. 1).

What is still lacking is more physiological support for the existing theoretical foundation.

Physiology of affiliation behavior

In 1929, it was apparently found that when a person strokes a dog, the dog’s blood pressure will drop, but the

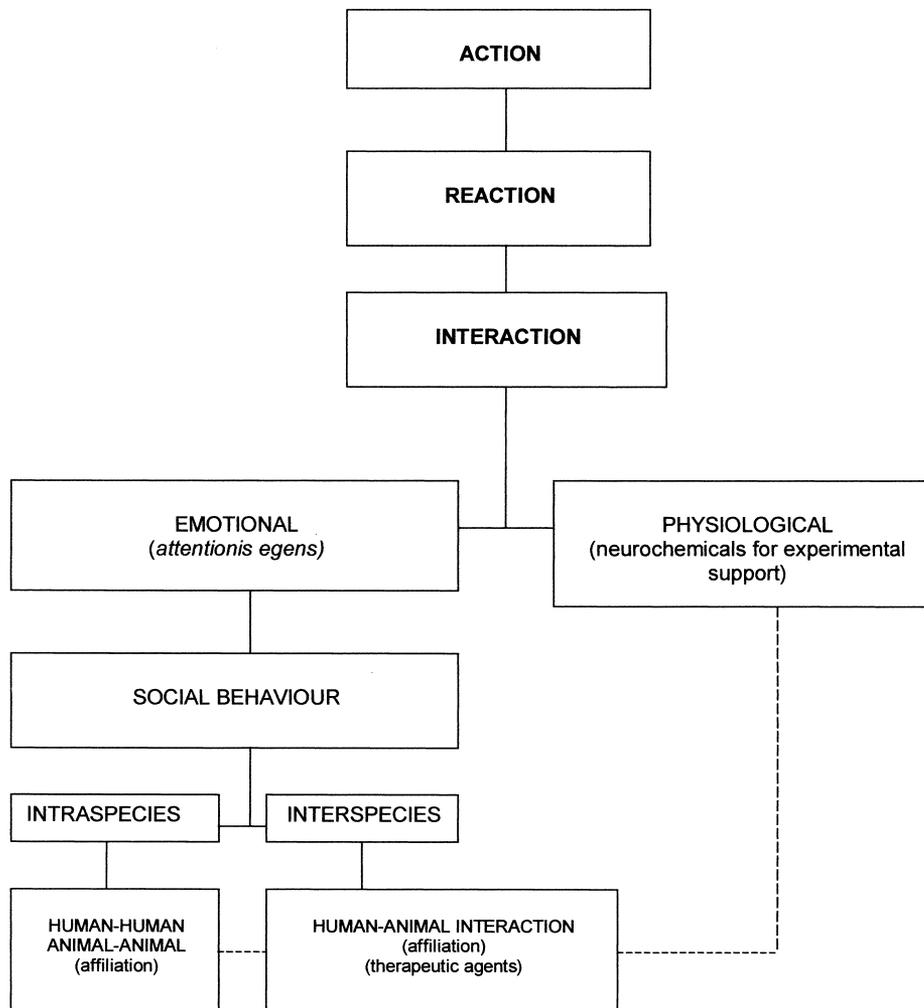


Fig. 1. Human–animal interactions in human–human contact.

original reference was not cited [4]. It was only more than 50 years later that it was determined that the person's blood pressure also drops with such positive interaction. Friedmann [5] and co-workers were pioneers in the field of determining the physiology of positive interaction between humans and animals. Physiological parameters recorded were changes of diastolic and systolic blood pressure, plasma cholesterol, plasma triglyceride, and skin conductance responses. Other symptomatic indications of physiological effects were anxiety and stress relief, or in physiological terms, the effects of the autonomic nervous system [6].

The physiological effects were summarized as follows:

Thus, it has been hypothesized that pets can decrease anxiety and sympathetic nervous system arousal by **providing a pleasant external focus for attention** (my accentuation) promoting feelings of safety and providing a source of contact comfort. They can decrease loneliness and depression by providing companionship, promoting an interesting and varied lifestyle, and providing an impetus for nurturing. Pets, therefore, have the potential to moderate the development of stress-related diseases such as coronary heart disease and hypertension. The range of benefits that owners might derive from their pets may not pertain only to pet owners; one could speculate that anyone, not just pet owners, could benefit from the presence of friendly animals [6].

On an intraspecies basis, physiological parameters were found to be indicators of affiliation behavior associated with the fulfillment of attentionis egens needs in humans, rats, monkeys, rabbits, sheep, prairie voles, and chickens [7–9]. Positive, affiliation feelings are not totally specific or just non-specific arousal that may then label as one feeling or another. Rather, they involve highly individualized feelings of attachment, which are biologically, psychologically, and culturally shaped, plus our secondary intellectual fine-tuning. While this may sound complex, it tends to happen instantaneously and involuntarily — at least the first reaction [7]. Hatfield and Rapson [8] were of the opinion that most emotions have more similarities than differences with regard to neurotransmitters or other chemicals that increase or decrease the sensitivity of the brain receptors. Walsh [10] stated that:

Our needs for nurturance, affiliation, and attachment have never, as far as I am aware, been considered anything but rooted in the biology of the species [10].

This may, however, include interspecies interaction. A difference is made between romantic love as passion (eros) and the various other forms of love as compassion (a combination of agape — a concern for the well being of others, and philia — friendship and companionship). The general love principle that is rooted in our biology moves people to exert physical and psychic energies to unity and growth [10].

Physiology of positive human–animal interaction

An experiment [11] was designed based on the above-mentioned existing knowledge to determine a physiological basis for affiliation behavior between humans and dogs. The aim was to implement a methodology that has used the same physiological parameters for positive human–animal interaction as for positive intraspecies interaction. The parameters chosen were β -endorphin, oxytocin, prolactin, β -phenylethylamine, dopamine, and cortisol. The indication when to collect blood for analyses was a decrease in the mean arterial blood pressure (MAP). Controls were baseline vs. after interaction values, dog owners vs. people interacting with unfamiliar dogs, and dog interaction vs. quiet book reading.

The hypothesis was that specific neurochemical plasma levels would indicate physiological responses associated with positive human–dog interaction. This statement was based on the fulfillment of attentionis egens or affiliation needs.

The independent variables were healthy humans ($n = 18$) and dogs ($n = 18$) interacting positively, and the dependent variables were blood pressure and the above-mentioned chemicals' plasma levels.

Validity was achieved by the control of variables during interaction session as far as practically possible, and reliability (repeatability) by using the largest number of subjects available as well as in describing the method, variables, and statistics in detail. The researcher was not present during the interaction to ensure neutrality. Statistics were also done independently, and the laboratory technicians had no idea what the “desired” results were. This approach ensured that the researchers had no effect on the outcome of the results.

Results

In humans and dogs, β -endorphin, oxytocin, prolactin, phenylacetic acid (metabolite of β -phenylethylamine), and dopamine increased significantly ($P < .05$). Cortisol decreased significantly in humans, but in dogs, the decrease was non-significant ($P = .30$). Dogs with their owners found the novel situation initially very exciting. The other results are summarized as follows:

The only statistical significant result in the difference before and after interaction between the experimental and control dog groups was oxytocin ($P < .01$). The increase in oxytocin was higher in the experimental group where people interacted with their own dogs. Oxytocin is an indicator of the neurochemicals measured for social attachment on an intraspecies basis.

There were no significant differences between the changes of the neurochemicals of quiet book reading and positive dog interaction except for oxytocin ($P < .01$), prolactin ($P < .01$), and β -endorphin ($P < .10$) where the increases of these neurochemicals were higher during dog interaction than book

reading. This is in accordance with social bonding neurochemical changes. The fact that quiet book reading followed very much the same pattern as positive dog interaction indicates the true effect of dog interaction because the latter is much more complex being an interaction between two biological entities. Quiet book reading as a control thus indicates that positive dog interaction can be as relaxing and stress relieving as book reading and in some aspects even achieve additional positive effects such as those caused by oxytocin, prolactin, and β -endorphin.

The results of this experiment support the theory of attentionis egens in human–dog affiliation. Once the physiology is known, i.e. the role that neurochemicals and hormones might play during positive interaction, it is possible to use this information as a rationale for using animals in animal-assisted therapy.

From the results, the following aspects should be considered:

- a significant decrease in blood pressure and thus all the other physiological effects can be achieved between 5 and 24 min of positive dog interaction. This information is important in therapy. After allowing a short period to get familiar with the contact situation, ± 10 min, the actual contact need not be long. In practical terms, it means that a contact session could be rather repeated more often than for a very long period of time. For example, rather three 15–20-min sessions/day than one 60-min session;
- attentionis egens needs (affiliation behavior, positive interaction) are described on the neurochemical level and on an interspecies basis. The importance of the measurements in both species is that the dog experiences the same physiological effects as the patient. These physiological changes may be linked to a feeling of well being, and the facilitator is thus being “treated” as much as the patient. This is exactly what the attentionis egens theory proposes;
- the theory that a decrease in blood pressure could be an indicator of concurrent biochemical changes is supported by the results. If biochemistry is not available, a much simpler measurement such as blood pressure could be a valid indicator whether the interaction has the necessary physiological effects;
- alternatively, the six neurochemicals can be used as a profile for affiliative behavior; and
- physiological parameters used during the experiment are not seen as causes of any process. They are regarded as effects of a complex biological interaction, and in a sense, the physiological changes are results of the phenomenon of human–dog interaction.

Discussion

It is possible that animal-assisted therapy was not generally accepted by physicians as a valid medical approach

because it was seen as a placebo effect. In their significant contribution on this subject, Shapiro and Shapiro [12] discussed this effect in depth in their book *The Powerful Placebo*. They defined a placebo as any treatment that is used for its ameliorative effect on a system or disease, but that actually is ineffective or is not specifically effective for the condition being treated. Developments that have decreased the placebo effect include the use of scientific method, controls, and the double blind method. However, not all problems were eliminated using these approaches.

This experiment complied with the methodological safeguards suggested by Shapiro and Shapiro [12], except that it was not used in actual patients. The other main criticism of the use of animals in psychotherapy is that it could be non-specific. Shapiro and Shapiro suggested that measurement of plasma variables is the best method to ensure accurate and specific changes. Furthermore, there is consensus that psychotherapy is beneficial for many patients, but additional studies are needed before it can be said with certainty that such therapy is more than a placebo. This study provided such additional physiological information. The authors concluded their book by indicating that the underlying mechanisms of the body (physiology) that control and maintain health still elude us:

If the nonspecificity of the placebo effect can be rendered specific and its strength can be unleashed, the terms *placebo* and *placebo effect* can appropriately disappear into medical history [12].

Le Doux [13] described emotions as biological functions (physiology) of the nervous system. The measurement of neurochemicals can be helpful in understanding emotions, and this approach contrasts with the more typical approach to understand emotions as psychological states, independent of the underlying brain mechanisms. Although psychological research has been extremely valuable, brain function is far more powerful in understanding emotions. There are specific classes of emotions, and some of them are universal among vertebrate despite the fact that there are also species differences. Emotional responses are for the most part generated unconsciously, and feelings often follow on physiological changes. He then made this very important statement that reflects on the results of this study:

If, indeed, emotional feelings and emotional responses are effects caused by the activity of a common underlying system, we can then use the objectively measurable emotional responses to investigate the underlying mechanism, and, at the same time, illuminate the system that is primarily responsible for the generation of the conscious feeling. And since the brain system that generates emotional responses is similar in animals and people, studies of how the brain controls these responses in animals are a pivotal step towards understanding the mechanisms that generate emotional feelings in people [13].

People have little direct control over their emotions, and they often set up situations as external events (such as positive dog interaction) so that the stimuli that automatically trigger emotions will be present. While conscious control over emotions is weak, emotions can flood consciousness because the brain connections from the emotional systems to the cognitive systems are stronger than the connections from the cognitive systems to the emotional systems. Once emotions occur, they become powerful motivators of future behavior. Mental health is maintained by emotional hygiene. Mental problems to a large extent reflect a breakdown of emotional order, and emotions can have both useful and pathological consequences [13].

From this, it is clear that what was measured in this experiment is part of “universal physiology” in the sense that results should be (within normal ranges) repeatable and have external validity despite the relative small number of participating subjects. Variations in normal physiological responses are attributed to genetic potential. The transmitters that neurons produce or can respond to are genetically specified. In fact, most characteristics of individual neurons such as their size, shape, and amalgamation with other neurons to form specific brain parts are largely determined by genes. Certain patterns of neural circuitry are also specified by genes.

Keeping in mind that the profile for neurochemicals during positive human–dog interaction can be too generalized, it is possible that the “success” of other complementary therapies such as reflexology, music therapy, some types of physiotherapy, and play therapy could also be based on the same physiological changes because attentionis egens needs are fulfilled. It may also fit in with the “skin hungry” theory. However, the suggested physiological basis for animal-assisted therapy may alter the approach to such

therapy as from “magic” to “medicine.” Bloom and Lazerson state it as follows:

All the normal functions of the healthy brain and the disorders of the diseased brain, no matter how complex, are ultimately explainable in terms of basic structural components of the brain and their function [14].

References

- [1] Levinson BM. The dog as co-therapist. *Ment Hyg* 1962;179:46–59.
- [2] Rowan AN, Beck AM. The health benefits of human–animal interaction. *Anthrozoös* 1994;7(2):85–9.
- [3] Rowan AN. Medical disinterest in human–animal bond research? *Anthrozoös* 1995;7(2):85–89, 87.
- [4] Cusack O, Smith E. *Pets and the Elderly — the Therapeutic Bond* New York: The Haworth Press, 1984. pp. 13–6.
- [5] Friedmann E. The role of pets in enhancing human well-being: physiological effects. In: Robinson I, editor. *The Waltham Book of Human–Animal Interaction: Benefits and Responsibilities of Pet Ownership*. Oxford: Pergamon, 1995. pp. 33–53, 39.
- [6] Wilson CC. The pet as an anxiolytic intervention. *J Nerv Ment Dis* 1991;179:482–9.
- [7] Liebowitz MR. *The Chemistry of Love*. Boston: Little, Brown and Co., 1983. pp. 61–127.
- [8] Hatfield E, Rapson RL. *Love, Sex and Intimacy: Their Psychology, Biology and History*. New York: Harper Collins College Publ., 1993.
- [9] Carter CS, Lederhendler II, Kirkpatrick B, editors. *The Integrative Neurobiology of Affiliation*, vol. 807. New York: The New York Academy of Sciences Annals, 1999. pp. 146–505.
- [10] Walsh A. *The Science of Love: Understanding Love and its Effects on Mind and Body*. New York: Prometheus Books, 1991; pp. 16, 188.
- [11] Odendaal JSJ. *A physiological basis for animal-facilitated psychotherapy*. PhD thesis, University of Pretoria, 1999.
- [12] Shapiro AK, Shapiro E. *The Powerful Placebo*. London: Johns Hopkins Univ. Press, 1997.
- [13] Le Doux J. *The Emotional Brain — the Mysterious Underpinnings of Emotional Life*. New York: Touchstone Book, 1998.
- [14] Bloom FE, Lazerson A. *Brain, Mind and Behaviour*. 2nd edn. New York: WH Freeman and Company, 1988.