Human–animal relationships within the context of Rogers' principle of integrality

A study was conducted to investigate the relationship of human rhythms, as expressed by heart rate and blood pressure, in response to environmental rhythms, including a companion dog and an unknown dog, within the context of Rogers' Principle of Integrality. A convenience sample of 30 was used in replicating a study by Baun et al. Results did not support the hypothesis but did support and clarify the relationship between human and environmental fields as postulated by Rogers.

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NURSING THEORIES, starting with the writings of Nightingale, have described a person's environment as an important factor in his or her health. Although Nightingale primarily emphasized physical elements of the environment (air temperature, lightness, and cleanliness), she wrote, "A small pet animal is often an excellent companion for the sick. . . ."[1(p103)] On a more abstract level, Rogers[2] conceptualizes the life process as a unitary phenomenon within which change occurs through the continuous and simultaneous interaction of the human and environmental fields. Both fields are identified by rhythmic patterns of energy. Defining animals, especially pets as important sources of environmental energy, may be one means of operationalizing Rogers' concepts for empirical research.

Although much has been written about the beneficial effects of pets on people's health, little research has been done documenting the results of human-animal interactions. The purpose of the study on which

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this article is based was to investigate the relationship of human rhythms, as expressed in vital signs, in response to environmental rhythms, including animals, within the context of Rogers' model.

The process of comparing the physiological rhythms while petting an unknown dog, while petting a companion dog, and while reading quietly is a modified replication of a study by Baun et al[3]. These nurse researchers found significant differences in changes over time in blood pressures when people petted a companion dog rather than an unknown one. The lowering of blood pressure while petting a companion dog equated with the relaxing effect of quiet reading. In replicating this study the major modification was the addition of Rogers' system as an organizing framework. Thus the human-animal interaction was conceptualized as the rhythmic exchange of energy, resulting in unique patterns.

LITERATURE REVIEW

Few studies of human-animal relationships were found, but the results were significant. For example, autistic children increased their interactions with their environment when exposed to dolphins and water play.[4] In addition, pets tended to decrease depression in the elderly[5,6] and increase the survival rate of persons discharged from coronary care units.[7]

Studies of human and animal physiological responses as shown by alterations in vital signs indicated reciprocal and consistent patterns. Gantt[8] and Lynch and associates[9] found that petting resulted in decreased heart and respiratory rates in dogs and horses. Katcher[10] described greater decreases in blood pressure of people while they were talking to and petting their own dogs than when they were quietly reading. The only nursing study[3] that was reviewed was the one chosen for replication and previously described. The literature review indicated that the role of pets in promoting health is important and in need of further study.

The research described in this article was conducted to verify previous nursing research related to positive benefits of pet companionship. In addition, this phenomenon was studied within a conceptual system of nursing. Thus results would contribute to nursing knowledge not only in the area of human-pet interaction but also in supporting or refuting Rogers' Principle of Integrality.

CONCEPTUAL FRAMEWORK

The theoretical rationale underlying this study is Rogers' Principle of Integrality,[11] in which she describes the continuous interactions of the human and environmental fields. The person and the environment are one. Encompassed within this principle are the concepts of rhythm, pattern, and negentropic evolutionary emergence.[12]

Rogers states that change in the pattern of the human field is propagated by waves. "The life process in man is a symphony of rhythmical vibrations oscillating at various frequencies. Between human and environmental fields there is a rhythmic flow of energy waves. An ordered arrangement of rhythms characterizes both the human field and the environmental field and undergoes continuous dynamic metamorphosis in the human-environment interaction process."[12(p107)]

This ordered arrangement of rhythms of the energy fields constitutes a pattern. Rogers[11] states that this pattern identifies energy fields. The nature of the pattern changes continuously and each human field pattern is unique and integral with a unique environmental field.

Rogers[11] considers human fields and environmental fields as open systems in constant interaction with one another. She also characterizes change in the human-environmental field as evolving toward increasing complexity and diversity.

This conceptual system gives insight into the relationship between humans and their pets, or other relationships between humans and unknown animals. One would expect a more harmonious interaction between humans and animals with whom they have a companion bond since their patterns might be more synchronous than the interaction between humans and unknown animals with whom patterning has not occurred. This interaction could be documented using human field parameters of heart rate and blood pressure as the human interacts with the animal environment. Rogers states, "Human field rhythms are manifestations of the whole."[11(p335)] Therefore, one would expect the parameters of the human field of heart rate and blood pressure patterns to express the manifestation of the whole human-environment interaction.

The relationship between humans and their pets illustrates Rogers' Principle of Integrality and the assumption of increasing complexity. When the new animal is brought into the home, there is a period of turmoil as patterning occurs. The master and pet, through continuous interaction, will first develop a basic relationship based on feeding patterns, play time, and housebreaking lessons. Patterns of interaction will be developed and then enhanced as the human and animal begin to recognize subtleties of movement, sounds that take on special meaning, and interactions of touch as the animal is petted or groomed. Eventually the relationship will take on a unique rhythm and pattern of interchange as it increases in richness and complexity. Each human-animal relationship will be unique. Even if there are multiple humans in the home, each human-animal bond will be characterized by a unique rhythm and pattern.

Rogers' system describes the person-environment (human-animal) interaction as appropriate for nursing research. The goal of that research, according to Rogers, is to promote symphonic interaction between human and environment. The human field parameters of heart rate and blood pressure have been studied in terms of their effect on cardiovascular health. Slower heart rates and reduced blood pressure seem to be beneficial in preventing cardiovascular disease. Persons who feel relaxed will exhibit lower parameters of heart rate and blood pressure patterns than they do when they feel stressed. This study postulated that patterns of energy exchange between humans and animals with whom they have a companion bond will be more synchronous and therefore more relaxing than energy exchange

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between human and animals with whom no bond is established.

HYPOTHESIS

A review of research and a synthesis of findings with Rogers' Principle of Integrality led to the following hypothesis: Persons petting a dog with whom they have a companion bond will experience a greater reduction in heart rate and blood pressure than when petting an unknown dog or reading quietly. Companion bond means subjects must have lived with their dog for at least six months and describe themselves as at least moderately attached to the dog. Heart rate refers to the intrinsic rhythm of the cardiac cells to contract and relax. Blood pressure is the pressure exerted by the blood against the blood vessels and reflects the rhythmic beating of the heart. The unknown dog was the researcher's dog, an 11-year-old mixed breed.

METHODOLOGY

A convenience sample of 30 subjects, 21 females and 9 males, with a mean age of 31.5 years, was obtained by soliciting volunteers in a hospital newsletter. Criteria included the absence of hypertension (systolic BP < 140; diastolic BP < 90); absence of medication that affects blood pressure, pulse, or respiration; absence of allergy to dogs; and possession of a pet dog longer than six months with at least a moderate attachment to the dog. A subject's dog also had to be capable of sitting still for 15 minutes while being petted and willing to allow a stranger to bring him or her into the test room.

Data collected during the study were limited to blood pressure and heart rate measured by an IVAC Vital-Check Model 4000 instrument while the subject read quietly, petted his or her own dog, or petted the researcher's dog. A digital readout was recorded by the researcher, which was not visible to the subject. Three 15-minute measurement sessions were conducted in random order. Each subject drew a slip of paper from a hat that listed the order of the measurement sessions.

The measurement sessions were as follows:

- Quiet Reading. The subject sat quietly reading a magazine (eg, *Sunset, Better Homes and Gardens*). The subject held the magazine in the dominant hand, but not above the level of the heart, and turned pages as desired.
- Petting Own Dog. The subject petted his or her dog using gentle rather than large arm movements. The dog was seated on the subject's dominant side with its head at the subject's chest level. Subjects did not speak to the dog.
- Petting Unknown Dog. The subject followed a procedure identical to petting his or her dog.

Once subjects had been accepted into the study, appointment times were made for them to come to the study room with their dogs. They were asked to sit well back in the chair with both feet on the floor. The blood pressure cuff was placed on the nondominant arm and three trial blood pressures were taken to familiarize the subject with the procedure. The study order was selected and the procedure explained. The subject was then allowed to sit quietly for ten minutes until heart rate and blood pressure reached a baseline.

Blood pressure and pulse were recorded; then the magazine was selected or the dogs were brought into the room and placed on the platform. Blood pressure and heart rate were measured every 2.5 minutes until the 15-minute interval was complete. Five-minute intervals between measurement sessions allowed the subject to talk and readjust position, but the subject could not stand or perform any strenuous exercise.

Data analysis

Repeated-measures analysis of variance (ANOVA) from the *Statistical Package for the Social Sciences* was used to test the hypothesis. Type of treatment (quiet readings, unknown pet, and companion pet) and time (seven measurements for each treatment) served within subjects factors in the design. Correlated *t* tests were used to determine which mean scores of pairs were statistically different. A significance level of $p < .05$ was accepted for this study.

Differences in methodology

The convenience sample in the replicated study was slightly larger (30 compared to 24), and the mean age was 15 years younger (35.5 compared to 46.7) than in the original study. Each session in the replicated study was monitored for 15 minutes rather than 9 minutes. Baun et al[3] had chosen nine minutes arbitrarily and had recommended lengthening the sessions in future studies to see if the variables would continue their downward trend. In addition, methods of monitoring blood pressure and heart rate varied between the two studies. In the original study blood pressures were measured at three-minute intervals by a Pentex Electronic Blood Pressure Instrument; heart rates were measured by three electrodes on the upper back; and respiratory rates were measured by a Thermister Respiration Transducer. The last difference was the unknown dog, which was a champion show dog in the original study. Both dogs were quiet and accustomed to strangers. Everything else in the methodology, including the data analysis, replicated the original study.

RESULTS

According to ANOVA there were statistically significant differences between the three protocols (quiet reading, petting unknown dog, and petting companion dog) in relation to heart rate ($F = 4.01, p = .030$) and diastolic blood pressure ($F = 3.69, p = .038$). Time's influence on systolic blood pressure approached significance ($F = 2.24, p = .076$). No other differences were noted with use of ANOVA.

Correlated *t* tests indicated that heart rate when quietly reading was significantly lower than heart rate when petting the unknown dog ($t = 3.02, p < .01$). This was the only pair that differed significantly although the *t* values of 2.29 for heart rate approached the significance level (critical *t* for $p = .05 = 2.45$) when comparing the quiet reading group to the combination of control dog and companion dog.

A study of the range and decrease in vital signs in the three protocols is shown in Table 1. The initial systolic blood pressure was highest in the petting companion dog group (114.1 mm Hg) and lowest in the quiet reading group (111.3 mm Hg). The greatest decrease over the 15-minute sessions occurred while petting the com-

Table 1. Means and SD for each variable

	Sampling time						
	1 Mean (SD)	2 Mean (SD)	3 Mean (SD)	4 Mean (SD)	5 Mean (SD)	6 Mean (SD)	7 Mean (SD)
Quiet reading							
Systolic BP	111.3	111.6	110.7	109.5	110.9	110.7	110.9
	(13.1)	(12.5)	(10.0)	(10.0)	(9.4)	(10.3)	(9.6)
Diastolic BP	71.0	69.4	70.7	70.1	70.2	70.8	70.6
	(8.7)	(10.1)	(8.9)	(9.3)	(8.8)	(8.4)	(7.2)
Heart rate	73.9	73.0	73.6	73.9	73.3	73.7	73.5
	(12.2)	(10.4)	(10.7)	(10.4)	(11.3)	(10.7)	(10.9)
Petting control dog							
Systolic BP	112.7	110.7	110.6	108.7	110.0	110.3	110.2
	(10.0)	(9.8)	(9.4)	(10.0)	(11.3)	(10.0)	(10.3)
Diastolic BP	71.0	71.0	71.1	70.1	70.7	70.1	70.1
	(9.4)	(10.7)	(8.2)	(7.6)	(7.5)	(8.9)	(7.3)
Heart rate	75.5	76.3	75.7	75.6	75.8	74.6	74.7
	(10.2)	(10.9)	(11.3)	(11.0)	(11.1)	(10.9)	(10.4)
Petting companion dog							
Systolic BP	114.1	114.0	112.4	113.0	112.0	111.5	110.1
	(12.4)	(12.3)	(12.6)	(10.6)	(11.4)	(10.7)	(9.8)
Diastolic BP	72.2	73.7	73.1	72.3	71.6	72.0	71.5
	(11.3)	(8.5)	(9.2)	(8.5)	(7.5)	(9.2)	(8.0)
Heart rate	75.9	76.4	75.5	75.1	74.8	74.8	75.2
	(10.8)	(10.8)	(10.9)	(11.3)	(11.5)	(11.7)	(11.3)

panion dog (−4.0 mm Hg) and the lowest decrease occurred while reading quietly (−0.4 mm Hg). As shown in Table 2 there is a decrease in blood pressure and heart rate in all three protocols but no apparent interrelationship among them.

The only increase in vital signs occurred in heart rate and diastolic blood pressure of those petting companion dogs at the second sampling time (2.5 minutes after starting). Several authors[3,8,9] have documented an initial increase in vital signs of humans and animals on initial meeting and have labeled this phenomenon the "greeting response."

Results of this study did not support the hypothesis that persons petting a companion dog would experience a greater reduction in blood pressure than when petting an unknown dog or reading quietly. Reading quietly, however, did significantly lower the heart rate.

Table 2. Decrease in vital signs over 15-minute study time

		Petting dog	
	Reading	Unknown	Companion
Systolic BP	−0.4	−2.5	−4.0
Diastolic BP	−0.4	−0.9	−0.7
Heart rate	−0.4	−0.8	−0.7

COMPARISON OF FINDINGS

In both studies ANOVA revealed statistically significant differences between the three protocols (quiet reading, petting an unknown dog, and petting a companion dog) in relation to heart rate and diastolic blood pressure. In the original study this significance included systolic blood pressure and respirations. Also the original study showed statistical significance over time in systolic and diastolic blood pressure and in the protocols and time interaction. This significance was not found in the replication. Besides the differences between the three protocols, the other two common findings in both studies were the initial increase in blood pressure when greeting the companion dog and the lowest vital signs throughout the protocol occurring during quiet reading.

DISCUSSION

The relaxing effect of quiet reading was consistent in the findings of both studies. This nonstressful focusing is similar to techniques that enhance the relaxation response researched by Benson.[13] A major difference seems to be what a person chooses to focus on. Both studies compared here used an external object, (ie, a magazine) instead of an internal phenomenon (ie, a sound or visualization as described by Benson[13]). The other consistent finding in both studies is the initial rise in blood pressure when greeting the companion dog. This phenomenon has been noted by others[3,8,9] and needs to be considered in future pet-human research.

The hypothesis of the study, persons petting a dog with whom they have a companion bond will experience a greater reduction in heart rate and blood pressure than when petting an unknown dog or reading quietly, was supported by the findings of the original study[3] and rejected by the findings of the replication. Attempts to find reasons for these differences were unsuccessful. However, examining the qualitative data from the replicated study within the context of Rogers' conceptual system indicates the inadequacy of the hypothesis and gives support to the Principle of Integrality.

The sensation of touch was a recurring theme noted by the researchers. Several participants remarked that they enjoyed petting the unknown dog because of her exceptionally soft fur. Others remarked that her fur felt strange when contrasted with their own animal. A distinct preference for one type of touch sensation might influence one's physiological parameters toward relaxation or stimulation.

Concerns were expressed by several participants about whether their animals would behave during the study session. Some of the pets urinated or defecated in the study room, and the owners were very embarrassed and upset as a result. Despite reassurance by the researcher that accidents were expected, as evidenced by a supply of carpet cleaner and paper towels, the rhythmic parameters of these owners were influenced.

An important finding of qualitative differences in human-pet relationships was observed that was beyond the scope of the quantitative screening instrument. Prior to acceptance as a subject, applicants rated their attachment to their dog on a 5-point scale with 1 representing no attachment and 5 representing extreme attachment.

All participants had rated themselves as 4 or 5 in attachment to their animals, but a wide variety of relationships were reported and observed. Some dogs were primarily house pets, while others spent their time outside. Some owners reported their pets were frequent companions on short trips, daily walks, or extended vacations. Other owners remarked that the day of the study was the first time the animal had been away from the house for a long period of time. Some owners and their pets seemed to have intimate trusting relationships, demonstrated in part by increased eye contact, a unique tone of voice used to address the pet, and obvious displays of affection by both parties. Other participants appeared to be less comfortable, with little eye contact, minimal conversation, and almost an uncomfortable response to the petting session. This wide diversity of relationships may have influenced subsequent outcomes. To reduce extraneous variables, future studies might be conducted in the homes of the subjects and might limit the sample to those with house dogs only.

Another qualitative difference involved patterns of communication within the seemingly bonded pairs. In some pairs, the bonding seemed based on loving affection, gentle petting, and apparent relaxation by both human and animal. In other relationships, the bonding seemed to be of much higher energy, based on play with vigorous petting and a more stimulating affect. While these high energy dogs cooperated by sitting during the study session, invariably an increased heart rate was noted for the owner.

Rogers[12] believes humans are becoming increasingly complex and rhythms are becoming faster. The uniqueness of the energy exchange she has described might be reflected in the animal one chooses as a pet and in the subsequent relationship that develops. An individual might be attracted to an animal who manifests rhythms similar to his or her own. Persons who are characterized by faster rhythms might choose a pet who has rapid rhythm patterns. This unique synchrony of rhythms might not necessarily be reflected by a decreased physiological parameter as the hypothesis proposed.

The uniqueness of energy exchange might be reflected in the animal one chooses as a pet and in the subsequent relationship that develops.

So while this investigation lends support to Rogers' Principle of Integrality by not supporting the hypothesis, a more appropriate investigation to describe her principle might explore the synchrony of physiological parameters in humans and their companion pets. The research hypothesis did not take into account the dynamic energy exchange of the human-environment interaction process.

IMPLICATIONS

While the purpose of this study was to replicate previous nursing research related to positive benefits of pet companionship, the important modification was adding the Principle of Integrality from Rogers' conceptual system as an organizing framework. Results did not support the hypothesis of the study but instead tended to support and clarify the relationship between human and environmental fields

as postulated by Rogers. Recently, Silva[14] concluded that most investigators used nursing models minimally or as organizing frameworks only, and failed to interpret the results as supporting or refuting designated assumptions or propositions of the model. In this study, analysis of data indicated that the hypothesis was not appropriate for testing Rogers' Principle of Integrality. Although the hypothesis was too narrow and simplistic to encompass the complex interrelationships of the model, the purpose of the study was accomplished.

The findings of this study have implications for nursing education, practice, and research. Research that tests nursing theories will give support or refute nursing assumptions and propositions on which practice is based. Findings will stimulate further study, expand nursing knowledge, increase understanding of theory, and give credence to nursing as a profession. This study, which operationalizes the concept of human-environment interaction, will increase nurses' sensitivity to its significance and will encourage them to promote greater synchrony between humans and their environments, resulting in higher levels of wellness.

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