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ON WOLVES AND BEES: FACTORS INFLUENCING THE NATURE RELATEDNESS OF THE PRE-SERVICE TEACHERS

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Abstract. *Biodiversity is the result of long-term evolution. It is one of the fundamental global problems of today as it is declining in space and time. The aim of this research was to determine the relationship of man and nature and to analyze the influence of variables such as gender, age, pet ownership, cultivation of plants, and perception of popular and unpopular animals. A total of 549 respondents took part in the research survey. In addition to the above-mentioned demographic variables, the research also contained 5 items related to the perceived vulnerability of respondents and 37 items focused on the perception of wolves and bees as example of unpopular or popular animals. All variables except gender had a significant influence on man's relationship to nature. Students who perceived their own vulnerability to a greater extent had a more negative attitude towards nature. Fear of both groups of observed animals had a negative influence on the relationship to nature. Other dimensions correlated positively, age as well as plant growing and pet breeding. In the end, the possibilities of improving the relationship to nature are suggested.*

Keywords: *nature relatedness, popular animals, quantitative approach, university students, unpopular animals*

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Introduction

Man's relationship to nature, its formation, structure, and the variables that affect it, are the fundamental research topics in science and environmental education. Love for nature and connection with it is perceived as one of the elementary predictors of interest in the issue of environmental protection and pro-environmental behavior (Krepelkova et al., 2020). In order for children to develop a positive attitude towards nature, it is necessary for their educators to have a similar personal quality. Finding out the relationship of prospective teachers to nature and the factors that influence it, is therefore, a completely legitimate and important goal of pedagogical research.

Quantitative approaches to measuring the relationship of man to nature most often use one of the proven scales measuring its specific dimension. As an example, the Connectedness to Nature Scale can be named. It is a fourteen-item scale introduced in 2004 by Stephan Mayer and Cynthie McPherson Frantz. It is designed to measure an individual's emotional connection with the natural world and is based on the idea that "the more people feel connected to nature, the less they damage it because they would perceive it as self-harm" (Mayer & Frantz, 2004). A very interesting tool is the Nature Relatedness Scale – NRS (Nisbet et al., 2009; Nisbet et al., 2011), based on the biophilia hypothesis (Kalayci, 2020; Wilson, 1984). For each item, the respondent expresses the degree of agreement on a standard 5-point Likert scale. The NRS is focused on a construct called nature relatedness by its author. "The concept of this construct involves appreciating and understanding our connection to other living beings on Earth. But it is not only a love of nature or the joy of superficial manifestation of nature such as sunsets or snowflakes. It is also understanding of the meaning of all its aspects, including those aesthetically unpleasant to people" (Nisbet et al., 2009). The same authors have proven in three follow-up studies that the nature relatedness construct is a predictor of an individual's personal well-being and mental health (Nisbet et al., 2011). They also achieved similar results in experiments examining the impact of staying in nature or watching nature documentaries on personal happiness

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and environmentally responsible behavior (Nisbet et al., 2011; Zelenski et al., 2015). The ability to predict personal happiness indicators distinguishes the NRS from scales that are primarily focused on attitudes to environmental issues and problems (Zelenski & Nisbet, 2014). Martyn and Brymer (2014) also proved a negaive correlation between anxiety and nature relatedness. Unlike the previous two tools which always consist of a number of statements which respondents comment on using the Likert scale, the Inclusion of Nature in Self (Schultz, 2002) is a one-item tool, the only item of which is a graphical representation of an individual's connection with nature. Respondents choose from a seven-point scale the image that best fits their connection with nature. Each degree of the scale is expressed by two different overlapping circles, one of which represents the respondent and the other nature. The advantage of such a research tool is its comprehensibility, simplicity, and speed of completion, which predestines it for use in various types of research. Of course, a one-item tool also has disadvantages related to, among other things, the problematic determination of psychometric features.

Bauer et al. (2018) distinguishes two human–nature relationship types: traditional nature users and progressive nature friends, which differ in their feelings towards nature (e.g., Orazem & Tomazic, 2018). Whitburn et al. (2019) stated pro-environmental behaviors (PEB) were connected with a relationship to nature. They realized a quasi-experiment with respondents who had or had not actively participated in a cultivation of trees and differ in their greenness level. They tested whether exposure to nature and/or past PEB was associated with respondents' PEB and if some psychological constructs would influence these relationships. Connection to nature was more associated with engagement in PEB than the use of nature for psychological restoration and environmental attitudes. Nyberg et al. (2019) implied that teachers and future teachers had an ecocentric attitude, which possibly indicates a positive attitude towards the environment. Mackay and Schmitt (2019) found a strong association between nature connection and PEB, suggesting that nature connection is a promising avenue for promoting PEB.

An important factor that is closely connected to nature relatedness and environmental attitudes in general are attitudes and relationship with animals. The positive effect of pet ownership on environmental attitudes (conservation of nature) was indicated in the studies of Shuttlewood et al. (2016); White et al. (2018). The effect of popular and unpopular animals was examined in some studies (Fancovicova & Prokop, 2017; Kubiatko, 2012; Martens et al., 2019; Orazem & Tomazic, 2018; Prokop & Fancovicova, 2013; Prokop & Kubiatko, 2008, 2014; Prokop et al., 2016; Schlegel et al., 2015; Tomazic et al., 2020; Zhbanova et al., 2020) with the result that if respondents' attitudes towards animals are positive, regardless of their popularity, their pro-environmental attitudes also increase along with a significant current effect of knowledge.

Above are mentioned research studies, which were focused on the similar problematic as is examined in this paper. The number of studies is low, and authors tried to mention all, which were found in databases like Web of Science or Scopus.

Research Problem

The literature review revealed that the research tool which assessed participants' perception of nature covered different age groups, from primary school students till adult population. However, the findings are discutable. The university students should have clear perception of nature, so this is the reason, why this sample was selected. The second reason is, that the comparison of popular and unpopular species of animal and their influence on perception of nature is rare, so the findings from this study could raise the knowledge about this topic. Also, it could lead to the understanding of interaction between man and nature, and what is crucial for the creation of positive perception of nature.

Research Focus

Nevertheless, relatively little is known about how an individual's relationship to nature affects one's perception of specific popular and unpopular animals. The aim of this research was, therefore, to determine the relationship to nature among prospective teachers and to determine in this context an influence of variables such as gender, age, pet ownership, cultivation of plants, and perception of popular (bee) and unpopular (wolf) animals.

In summary, this research was designed to answer the following questions:

1. What are the relationship of future teachers to nature?
2. How the variables such as gender, age, pet ownership, cultivation of plants, and perception of popular (bee) and unpopular (wolf) animals influence relationship to nature?

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Research Methodology

General Background

The research design was a quantitative survey, due to generalizing of the findings, and also to explain the examination of the findings. For the relationship toward nature of future teachers was used "Nature Relatedness Scale". The research was conducted during spring semester of the academic year 2019/2020 from the 5 universities.

Participants

The total number of respondents was 549. These were all students, which were willing to fill survey, from the asked respondents of the study program. The sample was selected using non-probabilistic convenience sampling. Data analysis focused on interpreting future primary education teachers' responses considering their perception of the studying phenomenon. The filling of survey was voluntary, it was not honored and after some time (approximately 2 weeks), when no more filled surveys were received, the reception of surveys was stopped. The distribution of the respondents according to selected demographic variables is presented in Table 1. The respondents were students from 5 universities in the Czech Republic. The average age of the respondents was 26.01 (*SD* = 8.06).

Table 1
The Distribution of Respondents according to Basic Demographic Variables

Variable	Groups	*N*	%
Gender	Men	61	11.11
	Women	488	88.89
Pet ownership	Yes	417	75.96
	No	132	24.04
Plant cultivation	Yes	391	71.22
	No	158	28.78

The ethic committee of the Jan Evangelista Purkyne University, Faculty of Education gave the permission to make a research and expressed that the research tool is suitable for university students. The permission is under reference number 4/2020/08.

Instrument and Procedures

In addition to the above-mentioned demographic variables, the research tool also included 5 items related to the perceived vulnerability of respondents, and 37 items focused on the perception of wolves and bees as examples of unpopular and popular animals. The items were divided into knowledge items, items related to fear, and protection of animals. Each item was evaluated by the respondents on a 5-point Likert scale (strongly disagree - … - strongly agree). The research tool was validated by its original creators who allowed its use in this research. The original version has not been published yet (Fancovicova & Dobrotkova, 2021). Based on the original, the items were divided into three dimensions (knowledge, protection, and fear). As authors quoted, the content validity was ensured by four experts on biology and environmental education. The effort of teachers was focused on the understanding of items due to cause ambiguity. Their comments were incorporated in the survey. However, before our distribution of surveys, the experts on methodology (n = 2) were asked to provide feedback toward whole survey. Their comments were regarding small stylistic revisions.

To determine the relation of future teachers of primary education to nature, the Nature Relatedness Scale was used (Kroufek & Chytry, 2015; Nisbet et al., 2009). There are 21 items evaluated by the respondents on a 5-point Likert scale (strongly disagree -…- strongly agree).

After recoding the scaled items, these were recoded into numerical form and subsequently the reliability

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of individual questionnaires and also their dimensions were determined. The NRS questionnaire achieved a high reliability (α = .85), scale concerning wolves α = .54, bees α = .57, and resistance scale α = .72. The reliability value for individual dimensions ranged α = .59 – .84.

Data Analysis

Correlations between several independent predictors and a dependent variable (NRS scale) were calculated with multiple regression analysis. Forward stepwise method was used to select the most parsimonious model. Data were first tested for normality with the Kolmogorov-Smirnov test. The NRS scale as a dependent variable did not show a normal distribution. Therefore, non-parametric statistical methods (Spearman's correlation coefficient and Mann-Whitney test) were used in further testing.

Research Results

Firstly, partial correlations were performed to examine relationships between variables. The most of these correlations are moderate and significant, and it is possible to show consistent patterns (table 2). Based on the coefficient values, it is possible to trace certain groups of relationships. The first is the relationship between knowledge and overall attitude to both groups of animals. There was a moderately positive correlation between the two variables. Another group consists of variables fear of bees and fear of wolves and the relationship of these variables to conservation behavior (protection of bees, wolves, nature). It is also possible to observe a significant negative relationship between knowledge and fear.

The relationship to nature is correlated moderately positively with conservation tendencies and, conversely, negatively with fear of both model organisms. Lower correlations were found in attitudes towards them.

Table 2
Correlation Coefficient Values between Variables

	Disgust	Attitude bees	Attitude wolves	Knowledge bees	Fear bees	Protection bees	Knowledge wolves	Fear wolves	Protection wolves
NRS sum	-.09	.10	.22	.30	-.40	.50	.36	-.37	.38
Disgust		.26	.15	.10	.24	.00	.10	.10	.05
Attitude bees			.38	.72	.39	.29	.32	-.02	.33
Attitude wolves				.45	-.11	.34	.78	.07	.59
Knowledge bees					-.23	.40	.50	-.24	.46
Fear bees						-.46	-.26	.37	-.24
Protection bees							.39	-.26	.43
Knowledge wolves								-.44	0.52
Fear wolves									-.43

Significant relationships are highlighted in bold ($p < .05$)

Multiple regression (forward stepwise method) with the NRS scale as a dependent variable and with independent predictors listed in Table 3 resulted in a significant model that explained 31 % of the variance of the results ($R^2 = .31$, $F(8, 54) = 29.69$, $p < .001$; *SEM*: 9.91). All the variables have a significant effect except gender. Age had a positive effect on the nature relatedness. Older respondents have a more positive relationship to nature.

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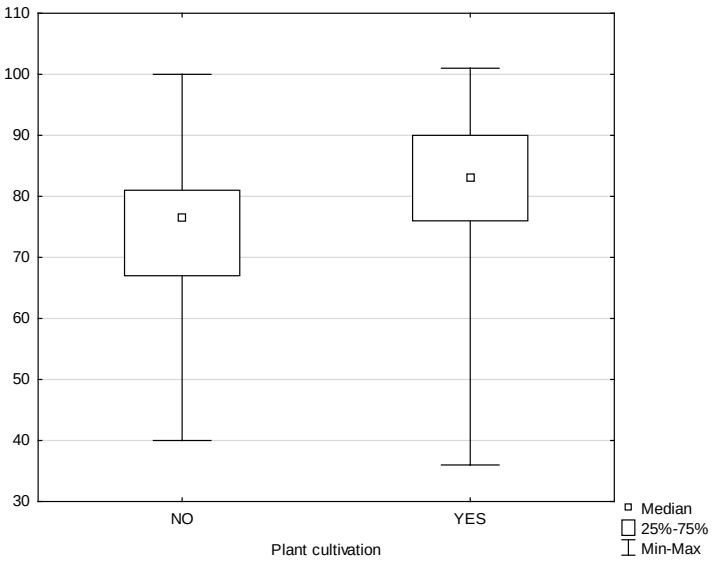
Table 3
Multiple Regression (Forward Stepwise Method) on Nature Relatedness

	B	***β ± SE***	*B*	***B ± SE***	*t(543)*	*p*
Intercept			1547.59	459.31	3.37	< .001
Disgust	-.09	.04	-.24	.11	-2.20	< .05
Attitude bees	.17	.05	.30	.08	3.62	< .001
Attitude wolves	.27	.05	.44	.07	6.01	< .001
Gender	-.06	.04	-2.35	1.39	-1.69	.09
Age	.15	.04	.22	.05	4.08	< .001
Pet ownership	-.09	.04	-2.63	1.01	-2.61	< .01
Plant cultivation	.23	.04	5.99	.97	6.17	< .001

The additional analysis (Mann-Whitney test) also showed a significant effect of plant cultivation and pet ownership ($Z = 6.87$; $p < .001$ and $Z = 3.41$; $p < .001$). If respondents cultivated plants (figure 1) or owned a pet, they had more positive attitudes to nature.

Figure 1
The Difference in the Nature Relatedness according to Plant Cultivation



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Multiple regression (forward stepwise method) was used to test which dimension (knowledge, protection and fear of wolves and bees) uniquely influences nature relatedness. The multiple regression model was significant and explained 42 % of the total variance of results ($R^2 = .42$, $F(6, 542) = 65.44$, $p < .001$; *SEM*: 9.03). Four of the six variables entering in the model were significant: knowledge about both animals had insignificant influence (Table 4).

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Table 4
Multiple Regression (Forward Stepwise Method) on Nature Relatedness with Dimension of Attitudes to Wolves and Bees as Independent Variables

	B	***β ± SE***	*B*	***B ± SE***	*t(543)*	*p*
Intercept			45.77	4.58	9.99	< .001
Bees knowledge	.04	.05	.10	.11	.88	.38
Bees fear	-.12	.04	-.33	.10	-3.12	< .001
Bees protection	.37	.05	1.76	.23	7.80	< .001
Wolves knowledge	.05	.04	.11	.10	1.15	.25
Wolves fear	-.14	.04	-.39	.11	-3.48	< .001
Wolves protection	.15	.05	.45	.15	2.95	< .001

Discussion

The presented study aimed to determine the influence of selected demographic variables such as gender, age, plant cultivation, and pet ownership on the nature relatedness of future teachers. In addition, the influence of perceived vulnerability (disgust) to attitudes towards nature was investigated. The last variable was the influence of popular and unpopular (controversial) animals on the above-mentioned variable. Studies where popular and unpopular animals are considered as variables are not very common (e.g., Kubiatko, 2012; Prokop & Kubiatko, 2008, 2014). The influence of perceived vulnerability on environmental attitudes was investigated, for example, by Brody et al. (2008); Keshavarz and Karami (2016); Prokop and Kubiatko (2014); Shafiei and Maleksaeidi (2020). In this research, the perceived vulnerability proves to be a significant predictor but in a negative sense, it means that respondents who have a higher level of perceived self-vulnerability have a lower measured value of the relationship to nature. This finding is in contradiction with other published results which show that the increased level of self-vulnerability leads to a better relationship to nature (Prokop & Kubiatko, 2014; Schaller, 2006). Although this relationship was weakly negative, it was significant, which means that among university students the effect of higher perceived vulnerability does not influence their attitudes to nature and its protection. Perhaps there is an indirect influence of the urban way of life. It is also possible to think about the effect of teaching which takes place to a greater extent indoors while outdoor teaching can also take place in other subjects such as in science. This has already been suggested, for instance, by Oztekin et al. (2017) or Woolley and Fishbach (2015). Demographic variables were in line with expected assumptions. Gender was not proven to be a significant factor which is in agreement with other authors (e.g., Hayes, 2001; Hurst et al., 2013) who reported an insignificant influence of gender on the relationship to nature. This finding, on the other hand, is in contrast with a similar research survey published by Prokop and Kubiatko (2014) as well as other authors (see current state). Their studies showed that women have a more positive attitude towards nature than men because women invest more in their own health to protect their offspring. An insignificant difference in this research can be linked to the fact that women in most cases were still single and childless so they may not have a more positive attitude towards nature at the level to identify a significant difference.

Other variables, such as plant cultivation or pet ownership influence the relationship to nature significantly. The growers and pet owners have more positive nature relatedness than respondents that are not interested in plant cultivation or pet ownership. This positive effect was also found in previous research by such authors as Shuttlewood et al. (2016) or White et al. (2018). Some authors also found an insignificant effect of these variables on broader environmental attitudes (Prokop & Kubiatko, 2014; Prokop & Tunnicliffe, 2010). In our case, it is possible to talk about an expected trend because the involvement of people probably leads to a more positive perception of nature.

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Age is identified as a significant predictor of the relationship to nature. The older respondents have more positive their perception of nature, which is in agreement with other research surveys, for example, by Casalo and Excario (2018). In our case, this phenomenon is also caused by the fact that not only full-time students but also distance students were included in the research sample. With age, changing values lead to a greater appreciation of nature as an indisputable and necessary quality of life among older people.

Significant influence is shown in attitudes towards popular and unpopular animals. Both types prove to be important predictors. Both attitudes towards wolves and bees positively influence the relationship to nature. This relationship was denied in several older research surveys (Prokop et al., 2008; Prokop et al., 2009) but in others (e.g., Prokop & Kubiatko, 2014), it was published with a similar finding as in this study. The results of this study are related to the general assumption that people with a positive attitude towards animals have a more positive attitude towards nature compared to those who state their attitude towards animals is neutral or negative. In a more detailed analysis, where the individual dimensions of attitudes towards animals such as knowledge, fear, and protection were analyzed, a negative relationship was found with the dimension related to the fear of wolves as well as of bees. Some people have a tendency to perceive any animals, both potential predators as well as animals that provide benefits to humans, as possibly dangerous and harmful to humans in certain areas. Such people are afraid of the behavior of these animals in the wild which they consider threatening. This leads to the feeling that animals are more harmful than useful to them and behavior with negative effects on the natural environment.

Conclusions and Implications

The above-mentioned results reflect the current problems with perception of the natural environment and its protection. It is possible to find a large number of environmental and eco-beneficial activities that should help environmental issues. However, as can be seen not only from the presented data but also from other research surveys, the concept of nature conservation is not one of the key emotional processes of human activity. Not even the selected predictors, such as, for example, perceived vulnerability, were detected as a positive predictor. The question is whether the current education system can influence the relationship of the population to nature. University students, not only of non-natural sciences, have contradictory reactions to nature conservation. Pet ownership and plant cultivation appear to be effective strategies for increasing nature relatedness. It would therefore be appropriate to include them in the training of pre-service teachers who would implement these strategies in their future profession.

Based on this, it is necessary to conduct further research with focus on a number of factors that may influence environmental attitudes and, based on their results, suggest possible solutions that will be directed to curriculum creators to revise the educational system. Other suggestion of further research could be focused on the respondents because this is one of the first types of this kind of study. So, there is a possibility to realize research among pupils of primary and lower secondary schools. And also, there is a possibility to make research among kindergarten children, but by the different research technique, probably the best ones are interview connected with child's painting. Other approach is to make longitudinal research due to change of relationship toward nature among respondents. Nature conservation as such is a key element in maintaining future biodiversity at a level that would be at least close to the current state.

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