

Association of the Environmental Attitudes “Preservation” and “Utilization” with Pro-Animal Attitudes

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The relevance of environmental attitudes is obvious and attitudes towards farm and companion animals and animal welfare in medical research are an important aspect of education. However, both have rarely been linked with each other, and animal attitudes are only sparsely represented within environmental education assessment instruments. Linking these two aspects was the main aim of the present study. The Animal Attitude Scale (AAS), the Intermediate Attitude Scale (IAS), and environmental attitudes based on the 2-MEV-model were used. The 2-MEV model is made of two distinct aspects: preservation and utilization of nature. This relationship between pro-animal attitudes and preservation and utilization has been assessed while controlling for pet ownership, meat consumption, gender and grade level. These covariates are necessary because they have been identified in previous research. Five hundred and forty-three pupils from two different schools in Leipzig, Germany participated in this study. There was a significant influence of gender and grade but not of pet ownership on environmental attitudes. Girls showed higher positive attitudes, and preservation decreased with an increasing grade. Animal attitudes (both AAS and IAS) correlated with > 0.4 with the two environmental attitudes preservation and utilization. It is therefore concluded that environmental attitudes and animal attitudes are closely related constructs.

Keywords: adolescents, attitudes towards animals, environmental attitudes, preservation, utilization

INTRODUCTION

The relevance of environmental attitudes for environmental education is obvious (Dunlap & Van Liere, 1978) and similarly, attitudes towards farm and companion animals are quite established as an important aspect of humane education (Herzog, Betchart and Pittman 1991). However, both aspects have rarely been linked with

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each other, and animal attitudes are only sparsely represented within environmental education assessment instruments. When they are covered, usually wild or natural animals are considered, and aspects of companion animals and animal welfare for food production or medical research are usually not addressed. Linking these two aspects, namely environmental attitudes and these other animal-related attitudes was the main aim of the present study.

Background

Measuring environmental attitudes

The relevance of measuring environmental attitudes seems obvious; however, the measurement instruments to assess quality of environmental education programs are less well-established (Hines, Hungerford & Tomera, 1987; Leeming, Dwyer, Porter & Cobern, 1993). The need for valid and reliable scales has been in the focus of research at least since the pioneering meta-analysis of Hines, Hungerford and Tomera (1987). One of the most established scales is based on the two-factor Model of Environmental Values (2-MEV-model) proposed by Bogner and Wiseman (2006). This model focuses on a preservation aspect and a utilization aspect, formalized as two independent (orthogonal) facets of the construct “environmental attitudes”. The more selfless domain is labeled as “preservation” and is defined by a preference to protect the environment. In contrast, the self-interested domain, labeled as utilization, contains preferences to dominate and exploit the environment and its natural resources (Bogner & Wiseman, 2006). Both concepts, preservation and utilization, have an underlying two-factor structure, labelled Two-Factor-Model of Environmental Values (2-MEV). This model has been validated in different countries and in different geographical areas. The structure of the model has been replicated in New Zealand by Milfont and Duckitt (2004), in the USA by Johnson and Manoli (2011), in Belgium with Flemish secondary school students (Boeve-de Pauw & van Petegem, 2011) and in France by Le Hebel, Montpied and Fontanieu (2014). The 2-MEV model was replicated in a West African children sample in Cote d’Ivoire by Borchers et al. (2014), with slightly reworded and adapted items. These studies suggest that the 2-MEV-model is suitable to assess environmental attitudes in adolescents.

Correlates of environmental attitudes

Some studies reported correlates of environmental attitudes and other demographic or psychological variables. In teachers, the psychometric structure of preservation and utilization was confirmed and discriminative correlations with age or grade level, gender and teaching subject were unveiled (Oerke & Bogner, 2010). However, further research is needed to deduce the implications for teaching (Oerke & Bogner, 2010). Grade level is an important demographic factor in determining attitudes towards animals in adolescents. Bogner and Wilhelm (1996) and Bogner and Wiseman (1997) pointed out that younger pupils in general were more sensitive toward nature and conservation compared to older pupils. In addition, older college students had more favorable implicit and explicit environmental attitudes than younger ones (Levine & Strube 2012). In University students, an increase in age and in educational levels had an effect on increasing environmental awareness and attitude (Aminrad, Sayed Zakaria, & Hadi, 2011). Thus, there seems to be a curvilinear relationship with a decrease in environmental attitude during schooling towards the end of adolescence and afterwards, an increase begins.

Concerning gender, girls on the primary school level were more concerned about environmental problems and tended to value nature more for its own sake than

boys (Onur, Sahin, & Tekkaya, 2012) and female pupils yield slightly but significantly higher values on preservation and lower values on utilization than males (Bogner & Wiseman, 2006). In sixth graders, there were no gender differences in ecologicistic attitude, but girls had higher moralistic attitude scores (Eagles & Demare, 1999). Generally, women display higher environmental concern than men even when controlling for covariates, such as income or educational background (e.g. Zelezny et al., 2000).

Many other correlates have been revealed, e.g. a similarity between parents and their children was found (Leppänen, Haahla, Lensu, & Kuitunen, 2012). In addition, media exposure had a significant effect on environmental attitudes (Lee, 2011). In a study of 6th-grade students, ecologicistic and moralistic attitudes toward the environment were correlated with talking about the environment at home, watching nature films, and reading about the environment (Eagles, & Demare, 1999).

Knowledge was also related to environmental attitude with higher knowledge scores being related to higher and more positive attitudes (Torkar et al. 2010). In adults, personality correlates have been found (Schultz & Zelezny, 1999): people's scores on the New Environmental Paradigm scale and the ecocentrism scale were predicted by universalism (positively), power (negatively), and tradition (negatively). In contrast, anthropocentric concerns were significantly related to benevolence (negatively), power (positively), tradition (positively), and security (positively). This suggest that environmental attitudes have their basis on common values (based on Schwartz's model of values; Schwartz, 1992; Schwartz & Boehnke, 2004). Similarly, Wiseman and Bogner (2003) found correlations between Eysenck's personality domains of psychoticism, extraversion and neuroticism with environmental attitudes. People scoring high on Psychoticism tended to favour an anthropocentric environmental approach, while people scoring high on neuroticism preferred a biocentric one. Extraversion was unrelated to environmental attitudes. Concerning the Big Five conceptualisation of personality, Milfont and Sibley (2012) reported that Agreeableness, Conscientiousness and Openness to Experience were the personality traits most strongly linked to environmental engagement.

Environmental education in Germany and curriculum

Seybold and Rieß (2006) reported three research fields in environmental education in Germany. First, there is survey research, which describes the practice of environmental education, focusing on instructional strategies and organisation of environmental education. Another aspect is the implementation of innovations, and lastly, the effects and effectiveness of environmental education is addressed. Bolscho and Hauneschild (2006) argued that there is a remarkable parallelism between public discussion of environmental issues and their consideration in school teaching, thus, teaching of environmental education is usually very recent in Germany and related to very recent topics. Scheunpflug and Asbrand (2006) reported that there was a shift from "Third World pedagogy" to "development education" and now to "global education". Thus, the German environmental education is already concerned with the topics of sustainability and concepts of global education. Concerning the curriculum in Saxonia, environmental issues are a basic aspect and principle of teaching biology. These topics are explicitly mentioned in grade 6 (topic "forest"), grade 9 ("ecosystems, ecology") and grade 11 ("ecological aspects, sustainable development"). However, there is no special part devoted to sustainability because it is integrated into many aspects of biology teaching.

Animal attitudes

Animal attitudes refer to attitudes and beliefs towards animals (Wagler & Wagler, 2011). To clarify, in this present study, the focus is on animal attitudes that are related to farm animals, animals used for medical research and for developing cosmetics, as well as using animals for food, for leisure and some other aspects that are related to animal welfare. This set of animal attitudes has been only rarely studied in relation to environmental attitudes (e.g., Wagler & Wagler, 2014). Our study differs from previous work (see below) on animal attitudes because it focuses on a different aspect (see above), and especially does not focus on a given taxonomic group.

There is a lot of research on animal attitudes, ranging from well-established scales to simple rating scales, mostly focusing on a specific taxonomic group. For example, Bjerke, Odegardstuen and Kaltenborn (1998) asked Norwegian children and adolescents about their attitudes toward animals. They reported gender differences on the moralistic and negativistic (girls highest), and the naturalistic, dominionistic, and utilitarian (boys highest) sub-scales. In another study, Bjerke, Kaltenborn and Odegardstuen (2001) found that children and adolescents without pets disliked farm and wild animals more than pet-owners. Prokop and Kubiak (2008) found that Slovakian children's attitudes were more positive towards a rabbit than towards a wolf and with increasing age, the positive attitudes towards both decreased. Prokop and Tunnicliffe (2008) found more negative attitudes towards spiders compared to bats in children, and this difference was especially distinct in girls. Binngießer, Wilhelm and Randler (2013) showed that grade level was also a predictor of animal attitudes. From grade 5 to 11, pro-animal attitudes declined significantly. Therefore, grade level should be treated as an important covariate in studies on animal attitudes as well as environmental education. In elementary pre-service teachers, arthropod carnivory and herbivory have been found to strongly affect attitude and belief. When the participants were made aware that an arthropod they thought was an herbivore was actually a carnivore, their attitude significantly declined (Wagler & Wagler, 2013). Another recent study showed that attitudes towards birds were higher in countries with a lower socioeconomic status (Hummel et al., 2015).

Some studies reported that keeping pets provides various social and educational benefits to children. Pet owners showed a primary concern for individual animals (Bjerke, Ødegårdstuen and Kaltenborn 1998a), oppose cruelty towards wild animals (Bjerke, Ødegårdstuen and Kaltenborn 1998a), show less fear of wild animals (Bjerke, Ødegårdstuen and Kaltenborn 1998a; Prokop, Özel, & Usak, 2009), have more positive attitudes to, and better knowledge of animals (Prokop and Tunnicliffe 2010; Prokop, Prokop, & Tunnicliffe, 2008). In contrast to this, Taylor and Signal (2005) and Signal and Taylor (2006) failed to find an effect of pet ownership in childhood on attitudes to the treatment of animals.

Animal-related activities have also been found to be associated with pro-animal behavior (Kellert & Westervelt 1983). Children participating in animal-related activities (e.g., watch birds, read about animals) showed higher naturalistic, humanistic, ecologicistic and moralistic scores (Bjerke, Ødegårdstuen and Kaltenborn 1998a). Tikka, Kuitunen and Tynys (2000) reported that environmental concern in students is related to participation in many nature-related activities, and Randler (2010) found, that there was a positive relationship between animal-related activities and knowledge. Also, animal related activities were found to be associated with lower fear of wolves (Prokop, Usak, & Erdogan, 2011).

Meat consumption is related to pro-animal attitudes. Animal welfare reasons are often the primary cause for a vegetarian diet (Cooper, Wise and Mann 1985; Santos and Booth 1996). Dixon Preylo and Arikawa (2008) reported that vegetarian men

showed higher empathy and more positive attitudes towards pets than non-vegetarians. Hagelin, Carlsson and Hau (2003) reported that vegetarianism was related to a lower acceptance of the use of animals in research. Meat consumption – which can also be viewed as an environmental behavior – might therefore be also related to preservation and utilization. Environmental perception also seems to be influenced by attitudes towards animals. Pifer, Shimizu and Pifer (1994) found a significant correlation between concern for the environment on the one hand and opposition to animal research and interest for animal rights on the other in eleven of 15 nations.

However, there seem to be no studies investigating this relationship by using a widely accepted, valid and reliable scale, such as the “2-Factor Model of Environmental Values (MEV)” to assess environmental perception (Bogner and Wiseman 2006) and other valid scales for animal welfare attitudes. Of course, animals are part of such scales for environmental perception and attitude, such as the 2-MEV or the New Environmental Paradigm (NEP; Dunlap, 2008; Hawcroft & Milfont, 2010), but these scales devote only one or a few items to animals, and further, the animal attitude scales are based on farm animals, or on the use of animals for medical research, education and cosmetics. Thus, the animal attitudes are a different construct in comparison to environmental attitudes.

Current study

Apart from age and gender, Bogner and Wiseman (2006) clearly suggested that future studies should include other values and attitudes, such as lifestyle, or distinct types of experience of nature (Lude, 2001). Therefore, the relationships between environmental attitude and some other constructs, such as animal attitude, meat consumption, and pet ownership were assessed. Animal attitudes and environmental attitudes seem distinct but related constructs because animal welfare is related to the individual animal while environmental attitudes are more global. Usually “wild” or free-living animals are used in items of measurements of environmental education, while aspects of companion animals and animal welfare in farm or food production, or the use of animals in medical research are mostly neglected. The present study aimed at revealing the relationship between pro-animal attitudes and the environmental attitudes based on the 2-MEV-model (preservation and utilization) while controlling for covariates, such as pet ownership, meat consumption, gender and grade level.

MATERIALS AND METHODS

Participants and data collection

Surveys took part from May 2011 until July 2011. Participation was unpaid, anonymous and voluntarily. All schools (Gymnasium) in Leipzig were contacted and invited to the study. The study was based on a convenience sample of two schools that agreed to participate, but the two schools where the data were collected are typical schools in Leipzig. The tests were distributed in the classroom after consent of the principal and the teachers. Written consent of the parents has been obtained. The study was approved by the Bildungsagentur Sachsen and the principals of the schools. The tests were applied in a normal classroom setting during a school day. After a short instruction, the pupils filled the test. Rejection rate was below 10%. Five hundred and forty-three pupils ($n = 261$ boys, $n = 282$ girls) from two different schools in Leipzig, Germany, participated in this study. Grade distribution was: 5th ($N=117$), 6th ($N=90$), 7th ($N=112$), 8th ($N=52$), 9th ($N=75$), 10th ($N=63$), 11th ($N=34$). Mean age was 13.37 ± 2.01 years and range was between 11–17 years.

Gender distributions was not different across grade groups ($\chi^2 = 1.62$, $df = 6$, $p = 0.951$) or age groups ($\chi^2 = 3.06$, $df = 8$, $p = 0.930$). The pupils were tested in their usual classroom setting. Socioeconomic (SES) status and ethnicity were not directly assessed, however, ethnicity in this part of Germany is rather homogenous, usually about >95% Caucasians. SES is broadly in the middle class.

Study area

The study area of Leipzig is situated in the eastern part of Germany and located in Central Europe, with a temperate continental climate. Germany was re-united in 1990. Leipzig is a large and flourishing city with about 500,000 inhabitants. Leipzig is about 150 kilometers south of Berlin at the confluence where three small rivers join. Despite its size Leipzig has many parks and other parts with natural area (e.g. "Leipziger Auwald"), and thus many possibilities to experience nature. School education is 4 years of primary school, followed by two different stratifications, with "Gymnasium" representing a higher educational stratification level, and "Mittelschule" as lower educational level.

Measurement instruments

The scales were based on previously published work. Nevertheless, before they were applied in the school context of this present study, they have been checked by different people to assess their suitability for research in adolescents. The items were checked if they cover the constructs that should be assessed in this questionnaire. These persons included a social scientist, a sociologist, two teacher educators at the University with two decades of experience in teaching adolescents as well as University students. This adds some face validity to the constructs.

Animal Attitude Scale (AAS) (Herzog, Betchart and Pittman 1991)

This scale was developed by Herzog, Betchart and Pittman (1991) and consists of 20 statements "assessing attitudes toward the use of animals" (Herzog, Betchart and Pittman 1991, p. 186), coded in a Likert type response format from 1-5. Eleven of the items were reverse coded. The items are scored so that a high score indicates pro-animal welfare attitudes. The mean of the items was calculated. Example items are "It is morally wrong to hunt wild animals just for sport", or "I do not think that there is anything wrong with using animals in medical research". The Cronbach's α of the present sample was 0.87 (and 0.88 in the original sample, see Herzog, Betchart and Pittman 1991). Scale mean was 3.66 ± 0.57 (mean $\pm$ SD). The AAS is considered as a uni-dimensional scale.

Intermediate Attitude Scale (IAS) (WIRE Western Institute for Research and Evaluation 1983)

This scale was developed by the Western Institute for Research and Evaluation (WIRE 1983) "to assess children's attitudes toward the humane treatment of animals" (WIRE 1983, p.1). The scale was developed for children from grade 3 to grade 6. The full scale containing 36 items about attitudes towards farm animals, pets and wild animals was used. Item examples are "people who abandon pets do not really care about pets", or "It's exciting when you see a galloping horse fall down on a TV show." The scale was coded in a Likert type response format from 1-5 (in the original a Likert type response format from 1-4 was used). 18 of the items were reverse coded. The most humane answers were represented by high scores. The

Cronbach's α of the scale was 0.69. Scale mean was 3.59 ± 0.31 . The scale is considered uni-dimensional.

2-MEV model (Bogner and Wiseman 2006)

The 2-MEV model (2 Factor Model of Environmental Values) was developed by Bogner and Wiseman (1999, 2002, 2006) "to measure the factors Utilization (U) and Preservation (P) in the field of adolescent environmental perception" (Bogner and Wiseman 2006, p. 247). The full scale consisting of the two subscales utilization (ten items) and preservation (ten items) was used based on a 5-point Likert scale. Example items are "Humankind will die out if we don't live in tune with nature." The Cronbach's α of the present sample was 0.78 for subscale preservation and 0.67 for subscale utilization. Scale mean was 3.65 ± 0.64 for subscale preservation and 2.25 ± 0.51 for subscale utilization.

Animal-related activities (Randler 2010)

Animal-related activities were measured according to Randler (2010). The scale was translated into German language and published by Randler (2010). It is based on previous work of animal related activities, for example from Bjerke et al. (2001). Eight items were assessed on a 4-point Likert scale ranging from "often" (= 4) to "never" (= 1). Animal-related activities included: walking in nature, reading books or journals about animals, watching TV shows about animals and nature, visiting the zoo, watching animals in nature, feedings ducks and swans, feedings birds at a feeder, using Internet resources for information about animals. The Cronbach's α of the present sample was 0.798. Scale mean was 2.50 ± 0.57 .

Additional variables

Meat consumption (including derived products such as sausages and "German wurst") was assessed by a six-point-Likert-scale from "daily/ almost daily" (scored 6) to "never" (scored 1). High scores present high meat consumption.

Statistical analyses

Concerning the psychometrics of the scales, only established scales were used in this present study. Thus, we give Cronbach's α as a measure of internal consistency, but we waive detailed factor analyses on these scales as is usual in such studies. We used correlation analyses to assess a bivariate relationship, but in addition, as grade level is linked with both constructs, we used a partial correlation to partial out age affects. T-tests were used to compare sample means between groups. A general linear multivariate model was applied to test all aspects and influential factors simultaneously, followed by univariate analyses for the two outcome variables utilization and preservation. In a first step, we calculated this model with all interaction terms. The interaction terms were all not significant and thus were removed from the model, which was then recalculated without these interaction terms. Concerning effect sizes, we consider only effects sizes above 1% explained variance as relevant.

RESULTS

The descriptive means of the scales according to grades are given in Table 1. The raw correlations between the dependent variables utilization and preservation are depicted in Table 2. Because animal related-activities and attitudes are related to

grade level (Binngießer et al., 2013), a partial correlation was used to control for the effect of grade level, and the correlations remained significant with somewhat smaller coefficients (Table 2). Grade level was negatively related to preservation, thus with an increasing age, preservation attitude becomes weaker (Figure 1). Utilization was not significantly related to grade level (Figure 2). Meat consumption was negatively related to preservation, but positively to utilization. Most important, both animal attitude scales (AAS, IAS) were positively related to preservation and negatively to utilization. Thus, pupils expressing high pro-animal attitudes also express a high preservation, combined with a low utilization. Similarly, animal-related activities are positively related to preservation and negatively to utilization. When comparing pet owners with non-owners, pet owners scored significantly higher in preservation (non-owners: $3.54 \pm .65$ versus owners: $3.70 \pm .64$, $T = -2.764$, $df = 541$ $p = .006$) and significantly lower in utilization (owners: $2.21 \pm .51$ versus non-owners: $2.34 \pm .51$, $T = 2.621$, $df = 541$, $p = .009$). To assess all covariates and factors simultaneously, we applied a multi-variate general linear model. This model included gender, pet ownership and grade as fixed factors. The covariates were: IAS, AAS, meat consumption and animal related activities. There was a significant influence of gender (Wilks $\lambda = .985$, $F = 3.913$, $p = .021$, $\eta^2 = .015$) and grade (Wilks $\lambda = .930$, $F = 3.198$, $p < .001$, $\eta^2 = .036$) but not of pet ownership (Wilks $\lambda = .995$, $F = 1.187$, $p = .306$, $\eta^2 = .005$) on environmental attitudes. Further, the co-variate animal attitudes (AAS: Wilks $\lambda = .905$, $F = 27.354$, $p < .001$, $\eta^2 = .095$, IAS: Wilks $\lambda = .874$, $F = 37.439$, $p < .001$, $\eta^2 = .126$), and animal related activities (Wilks $\lambda = .831$, $F = 52.916$, $p < .001$, $\eta^2 = .169$) contributed to scores of environmental attitudes. Meat consumption did not significantly add to the model (Wilks $\lambda = .992$, $F = 2.075$, $p < .127$, $\eta^2 = .008$). The uni-variate results are depicted in Table 3. Considering effect sizes only above 1% of explained variance, it was found that gender had only a negligible effect. Grade level has 3-4% of explained variance with higher grades scoring lower in pro-environmental attitude. The co-variate AAS provided between 2% and 6% of the variance explained and the IAS between 5% and 6%, suggesting the pro-animal and pro-environmental attitudes are somewhat related but might measure different constructs. Interestingly, animal-related activities explained 15% in preservation scores, while there was no effect on utilization. Meat consumption was not related to environmental attitudes.

Table 1. Descriptive statistics. Mean scores (and standard deviation) of the scales preservation, utilization, Animal Attitude and Intermediate Attitude Scale, and animal-related activities.

Grade		Preservation	Utilization	AAS	IAS	Animal-related activities
5	Mean	4.10	2.31	3.85	3.68	2.95
	SD	0.51	0.48	0.47	0.26	0.44
6	Mean	3.82	2.23	3.76	3.62	2.71
	SD	0.55	0.48	0.53	0.29	0.47
7	Mean	3.48	2.27	3.60	3.54	2.38
	SD	0.66	0.58	0.57	0.34	0.59
8	Mean	3.49	2.18	3.63	3.57	2.34
	SD	0.56	0.59	0.52	0.33	0.49
9	Mean	3.55	2.19	3.51	3.61	2.29
	SD	0.60	0.48	0.60	0.27	0.45
10	Mean	3.18	2.35	3.33	3.43	2.05
	SD	0.48	0.45	0.56	0.32	0.44
11	Mean	3.53	2.06	3.88	3.70	2.29
	SD	0.72	0.47	0.62	0.29	0.55

Table 2. Bi-variate correlations between the two dimensions of the 2-MEV-model and grade, meat consumption, the Animal Attitude Scale (AAS), the Intermediate Attitude Scale (IAS) and animal-related activities. Right columns adjusted for age (partial correlation).

		bi-variate		adjusted for grade	
		Preservation	Utilization	Preservation	Utilization
Grade	Pearson's r	-.372	-.060		
	Significance	<.001	.160		
Meat consumption	Pearson's r	-.245	.110	-.231	.116
	Significance	<.001	.010	<.001	.007
AAS	Pearson's r	.478	-.428	.448	-.448
	Significance	<.001	<.001	<.001	<.001
IAS	Pearson's r	.482	-.440	.477	-.451
	Significance	<.001	<.001	<.001	<.001
Animal-related activities	Pearson's r	.625	-.201	.550	-.261
	Significance	<.001	<.001	<.001	<.001

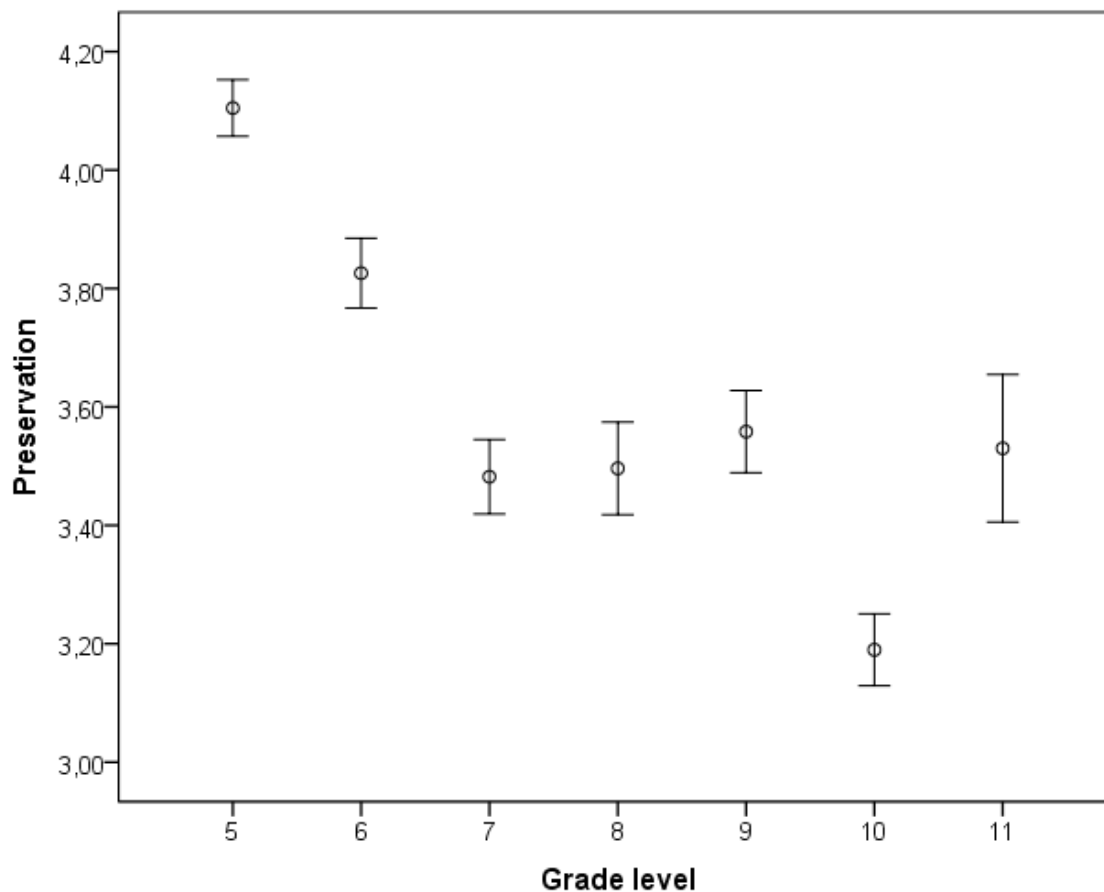


Figure 1. Relationship between grade level and preservation scores from the 2-MEV-model. Means $\pm$ 1 standard error are given.

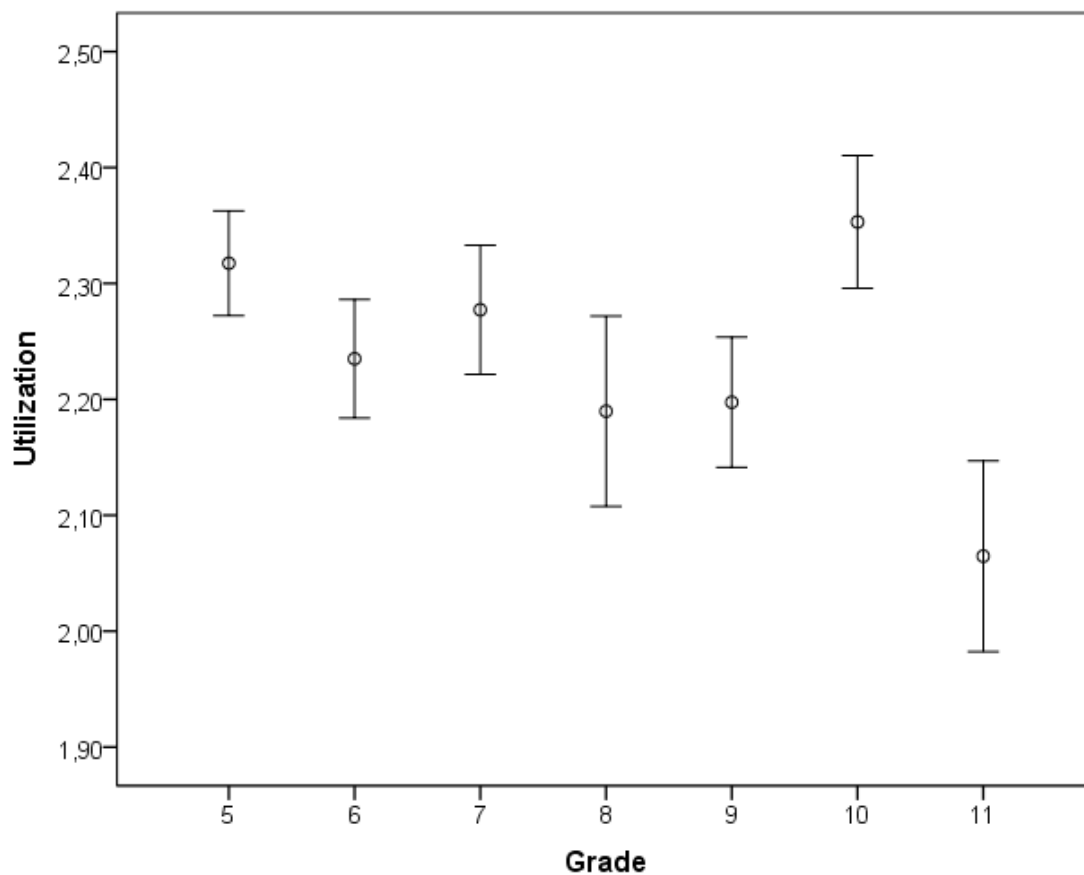


Figure 2. Grade level and utilization scores from the 2-MEV-model. Note: correlation not significant (see Table 1). Means $\pm$ 1 standard error are given.

Table 3. Results of the uni-variate models with preservation and utilization as dependent variables.

Source	Dependent Variable	df	Mean of squares	F	Sig.	Partial Eta-squared
Corrected model	Preservation	12	9.405	43.704	<.001	.502
	Utilization	12	3.232	16.217	<.001	.272
Constant	Preservation	1	.444	2.065	.151	.004
	Utilization	1	66.868	335.489	<.001	.392
Gender	Preservation	1	.547	2.540	.112	.005
	Utilization	1	.887	4.449	.035	.008
Grade	Preservation	6	.720	3.344	.003	.037
	Utilization	6	.740	3.712	.001	.041
Pet ownership	Preservation	1	.483	2.245	.135	.004
	Utilization	1	.008	.038	.845	.000
AAS	Preservation	1	3.009	13.982	<.001	.026
	Utilization	1	7.010	35.172	<.001	.063
IAS	Preservation	1	6.553	30.452	<.001	.055
	Utilization	1	7.213	36.188	<.001	.065
Animal-related activity	Preservation	1	20.963	97.406	<.001	.158
	Utilization	1	.655	3.286	.070	.006
Meat consumption	Preservation	1	.877	4.074	.044	.008
	Utilization	1	.001	.004	.952	.000
Error	Preservation	521	.215			
	Utilization	521	.199			

DISCUSSION

This is one of the first studies that assessed the relationship between pro-animal and pro-environmental attitudes based on valid and reliable scales. High pro-animal attitude scores were related to high preservation scores and to low utilization scores. Both, the IAS and the AAS showed medium correlations above 0.4 with preservation and utilization. Thus, animal attitudes and environmental attitudes are somewhat related but they do not measure the same construct. This could be because animals, at least to some extent, are parts of the nature, which should lead to a high correlation of both attitude dimensions, but on the opposite, the animal attitude scales measure also constructs that are related to medicine and health of human beings (animal welfare attitudes). In another direction, it could be interpreted as some convergent validity for environmental and animal attitudes. However, it seems that these constructs are related but not identical. Therefore, an individual may have a pro-environmental attitude, but may also agree to use animals for testing medical products. Both animal attitude scales showed the highest explained variance in the linear models, supporting the view that the scales are to some extent related with each other. Following Bogner and Wiseman (2003), preservation is associated with support for conservation, enjoyment of nature and care with resources; whilst utilization is associated with a view that mankind should dominate nature. Our results suggest that environmental attitudes and positive attitudes towards animals are based on a similar personality trait as has been already suggested by Pifer, Shimizu and Pifer (1994). However, further research should assess this relationship with regard to different personality measures.

Pet owners scored higher on preservation and lower on utilization, however, this difference merged to non-significance in the linear model, which may be a result of using diverse co-variables and factors. Nevertheless, the difference between both groups in the uni-variate T-test was small. Binngießner et al. (2013) reported that pet ownership lead to a higher valuing of animals and a lower value of hunting. The results on the 2-MEV-model are quite similar, and, in turn, are in agreement with studies of Bjerke, Ødegårdstuen and Kaltenborn (1998a), Bjerke, Kaltenborn and Odegardstuen (2001), Paul and Serpell (1993) and Prokop and Tunnicliffe (2010). Generally, the effect of pet ownership is difficult to disentangle in adolescents because there may be different kinds of pet ownership, such as family pets where all members are caring for, and pets for whom the adolescent is predominantly responsible. Further, those effects may arouse from two directions: pro-environmental people might choose a pet as companion more often, or having a pet as companion might lead to pro-environmental behavior. This should be addressed in further studies.

Grade effects showed a decrease in pro-environmental attitudes and an increase in utilization scores with increasing grade. This is in line with other studies using the 2-MEV model. Bogner and Wilhelm (1996) and Bogner and Wiseman (1997) reported that younger pupils were more sensitive towards nature and conservation compared to older ones. Prokop and Kubiato (2008) also reported that positive attitudes towards wolves and rabbits decreased with an increasing age. These authors have two explanations. One might be the general decrease in attitude with age, or a more ecological thinking in higher age. A decrease of attitudes, interest and other factors is reflected in many other variables. For example, general interest in biology or in the subjects zoology and botany have been investigated in some studies, and interest starts decreasing around the 4th grade (Randler, Osti, & Hummel, 2012).

The influence of gender was marginal and non-significant in the linear model. There may be many reasons why gender differences may occur: following Herzog, Betchart and Pittman (1991) and Knight et al. (2004), for example, socio-cultural

reasons with men being more utilitarian, or with men seeing animals as potential a food source, or with cognitive developmental reasons. Bjerke et al. (1998) also found that boys scored higher on a utilitarian view of animals. Usually, girls score higher on pro-animal attitudes (Binngießner et al., 2013; Taylor & Signal, 2005; Torkar, Mohar, Gregorc, Nekrep, & Adamic, 2010). However, Herzog (2007) found that many studies incorrectly overestimated gender differences. From a statistical viewpoint, gender effects may be negligible because the IAS and AAS were used to control for these as co-variables. Probably, the gender differences in attitudes are moderated by other factors, such as personality, as it has been found in explaining gender differences in student achievement (Steinmayr & Spinath, 2008). In these studies, gender differences were non-significant after controlling for covariates, such as motivation and personality. Therefore, we want to keep with Herzog (2007) and believe that future studies that go beyond the simple gender comparison by using complex statistical methods (see discussion below) might lead to smaller gender differences. However, if and when these gender differences still remain, an explanation might be in socialization theory (Risman, 2004) while evolutionary aspects should also not be neglected because the more utilitarian view of boys may be related to our history of hunter-gatherer-societies where males invested more energy and time into hunting. It is difficult to judge which of these influences is stronger because the time of hunter-gatherer-societies has long been gone.

Meat consumption was not related to environmental attitudes in the linear models, but in the bi-variate correlations. A higher meat consumption was negatively related to preservation scores and positively to utilization scores, but the coefficient was lower in the relationship between utilization and meat consumption. This is somewhat counterintuitive because one would expect a higher correlation coefficient between utilization and meat consumption because both are utilitarian aspects of attitude and behavior. However, meat consumption is partly dependent on parental influence at least at younger adolescence. Another explanation might be that the utilization scale of the 2-MEV model does not explicitly ask for aspects like hunting or fishing. This could explain the weaker relationship.

The relationship between animal-related activities and environmental attitudes showed that high animal-related activities are linked high with preservation scores but lower with utilization scores. This is in line with the study of Bjerke, Ødegårdstuen and Kaltenborn (1998a) who found that children who participated a lot in animal-related activities showed significantly higher naturalistic, humanistic, ecologicistic and moralistic scores than children spending less time in such activities.

One question is whether the various instruments are adapted to the local context. These scales have been used in different countries, and the German adaptations are valid and reliable measurement instruments. Questionnaire tests can always be criticized because of their missing objective assessment. However, this is difficult in attitude measure, which should be corroborated by behavioral observations, e.g., if pupils that score high on cruelty towards animals also show this cruelty in real life situations. In addition, it is difficult to assess consumer behavior in adolescents because their parents buy many aspects of the daily life. However, further research work could support the German adaptation of the scale by using questionnaires that could provide convergent validity. Nevertheless, we believe that our adaptations are useful to collect data on animal attitudes, and we also believe that scale development, e.g., by designing new scales rather than relying on established scales, is not always the best solution.

Another question is raised in methodological issues, especially when comparing with previous studies. Many studies assessed bi-variate relationships by correlations or compared groups (pet-owners versus non-owners, or boys with girls). In this present study, these comparisons and correlation are also shown to allow a comparison with previous work. However, it is advocated to use

multivariate statistics to assess the influence of the diverse variables simultaneously. Here, some significant variables turned to non-significance after applying complex statistics. In addition, structural equation modelling may help to assess relationships in a more complex way in future studies.

Limitations of the study

Some limitations should be mentioned. First, the study was based on two participating schools only. However, it is impossible to make research in schools without the consent of the principal. It is generally difficult to achieve a representative study. Online surveys might be a possible solution to this question. Further, other cities and areas of Germany should be covered. Also, the study could be replicated in other countries to support the findings. In addition, studies should try to assess convergent (and discriminant) validity of these questionnaires and measurement instruments in the future. For example, the animal attitudes questionnaires could be compared with real behavior, e.g., if adolescents reporting a high positive attitude towards farm animals indeed eat less meat or are vegetarians. This could be done by questionnaires, but also by assessing their real behavior, e.g. in choice experiments or by observations. In general, questionnaires focusing on adolescents should also be revised after a few decades of research because adolescent's language and expression change more quickly than in adults and some wordings in the questionnaires may sound strange after some years.

Educational implications

Whilst there is a debate at what grade level environmental or pro-animal attitude education should start, some voices call for a start around the age of 10-12 when interest and attitude are highest to halt the decline in positive attitude. However, others claim that environmental education should focus on grade levels where pro-environmental attitudes are low, and interventions should try to impact on and increase environmental attitudes. One aspect might be the complexity of environmental topics in education. As shown in previous work, complex ecological content in science and environmental education should be taught in higher grades, such as grade 8 or 9 (Randler & Bogner, 2009). As complexity is related to age, which in turn is related to cognitive development, one might suggest that pupils in lower grades should focus mainly on auto-ecological perspectives or on single species, while socio-ecological questions might be discussed in higher grades. As with many interests, attitudes decline with an increasing age, which could be linked with aspects of puberty, as well as with the fact that older pupils may have more interests that are diverse and have to focus on many different things simultaneously. One suggestion for teachers and schools might be to keep some animals in the school or biology classroom to allow and facilitate contact with living animals throughout the time they visit school. Common sense, however, is that children might develop positive attitudes towards the environment and towards animals through direct contact and experience (Bogner, 1996; Thompson and Gullone 2003; Tomažič 2011, Wagler & Wagler, 2011). How can the results from this study be used to promote positive change in science and environmental education? As we have shown that both – pro-environmental and pro-animal attitudes – are related, we suggest combining these two aspects in an educational program. Pre-service teachers could be assessed prior to their study at the colleges and Universities, and one idea would be to confront them with living animals, because Wagler and Wagler (2011) showed that this situation increases positive attitudes. Also, in school children, anxiety and fear decreased after an educational treatment with mice, woodlice and snails (Randler, Hummel, & Prokop, 2012).

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