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Reliability of the new environmental paradigm for analysing the environmental attitudes of Senegalese pupils in the context of conservation education projects

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ABSTRACT

The New Environmental Paradigm scale for children was developed and validated in Western nations but has seldom been applied in non-western countries. The aim of the current study is to examine the scale's validity for schoolchildren in Senegal. The study was conducted in three regions of Senegal in November and December 2015, and a total 782 schoolchildren with an average age of 13 years participated. We used Cronbach's alpha and confirmatory factor analysis to assess the consistency of the scale. The principal component analysis was used to reveal the different potential dimensions of our data-set. Given the low internal consistency of the scale and the unexpected responses to certain items, the scale seems to be rather unreliable for the investigated population. This difference could be caused by specific cultural features encompassing strong religious beliefs, different understandings of the place of humankind in nature, and weak awareness of humans' impact on the natural world.

Introduction

The primary condition for the successful conservation of species is ensuring the sustainable protection of the species' natural habitat. Nature has been under increasing pressure in Senegal as the country's population increased from 10 million inhabitants in 2000 to 15 million in 2015 (WB 2016). With this significant population increase, it is apparent that citizens' attitudes toward nature are becoming even more important than they were in the past. These attitudes determine the way people in Senegal approach the environment now and how they will approach it in the future. To influence future attitudes towards nature conservation, we first need to map current attitudes.

However, the selection of reliable instruments for measuring environmental values, attitudes, or beliefs in non-Western countries is subject to debate. One of the most widely used measures of environmental beliefs is the New Environmental Paradigm (NEP) scale (Dunlap et al. 2000). It was found to be valid across cultures and continents (Chatterjee 2008; Corral-Verdugo and Armendariz 2000; De Groot and Steg 2008; Dunlap 2008; Gangaas, Kaltenborn, and Andreassen 2015; Schultz and Zelezny 1999). Its modified version was developed for use with children in the United States (Manoli, Johnson,

and Dunlap 2007) and Belgium (Van Petegem and Blieck 2006), was examined in the Netherlands (Kopnina 2011; Van Petegem and Blieck 2006) and was validated in non-Western settings (Van Petegem and Blieck 2006; Wu 2012).

However, it seems that adult respondents in Western and non-Western countries do not interpret the underlying concepts of NEP the same way. For instance, Aoyagi-Usui, Vinken, and Kuribayashi (2003) and Ogubonde (2013) found that Western and non-Western respondents differed in the arguments they used to support the same answers. Other researchers (Bechtel, Verdugo, and Pinheiro 1999; Corral-Verdugo and Armendariz 2000; Van Petegem and Blieck 2006) found that the two of the NEP's main factors (pro-New Environmental Paradigm and pro-Dominant Social Paradigm) that are considered mutually exclusive in Western countries might be accepted as non-exclusive in non-Western countries. The authors of the scale themselves consider it very important to repeat and validate the scale in different cultural and geographical contexts (Dunlap 2008; Dunlap et al. 2000). Although the number of studies using the NEP scale for adults in non-Western countries is increasing, the use of the NEP scale for children remains largely unexplored in non-Western settings.

As the NEP Scale is intended to be used to evaluate youth environmental education programmes in Senegal, we found resolving this issue to be of high theoretical and practical importance.

The NEP as a whole can be treated as a single measure of environmental attitudes, or its different subscales can be considered separately (Dunlap et al. 2000; Hawcroft and Milfont 2010). The number of subscales varies from two to four across studies (Dunlap 2008; Dunlap and Van Liere 1978). Based on the considerable inconsistency in the number and structure of its dimensions, the authors of the NEP encourage researchers to factor analyze their entire item set to determine its dimensions (Dunlap et al. 2000). In terms of dimensionality, the NEP authors also appeal to future researchers to gather data from various demographic, cultural or social settings with the goal that one day, it will be possible to compare the coherence of NEP beliefs across nations (Dunlap et al. 2000).

The NEP scale was created and first used in the USA (Dunlap 2008); hence, it reflects a Western mentality. The question of whether the NEP scale is applicable outside developed Western nations is therefore natural (Chatterjee 2008). In Bulgaria, NEP was examined by (Bostrom et al. 2006) when inconsistency and low reliability ($a = .45$) was found. Similar results were obtained from the Turkish respondents by Erdoğan (2009) when the reliability values were $a = .57$.

Although the values of the scale might seem to be comparable between Western and non-Western nations, these values do not necessarily arise from the same psychological constructs. According to Aoyagi-Usui, Vinken, and Kuribayashi (2003), pro-environmental attitudes are based on altruistic values in the Western countries, while in Asia, they result from traditional anthropocentric concerns that pragmatically lead to caring for the environment without necessarily adopting eco-centric motivations. Next to economically motivated, pro-environment answers of Asians stand findings of Ogunbode (2013), who reported similar environmental attitudes in Nigeria and USA on responses to questions about such issues as degradation and overexploitation, while at least one anthropocentric answer from the Nigerians had its roots in religion and did not oppose eco-centric attitudes. Aoyagi-Usui, Vinken, and Kuribayashi (2003) and Ogubonde (2013) found that the same answers by respondents from Western and non-Western countries did not represent the same mental construct. In addition to calls for factor analysis, there are calls from various parts of the world (Corral-Verdugo and Armendariz 2000; Kopnina 2011, 2012; Ogunbode 2013) for qualitative analyses of the NEP scale for every sample. Such data can reveal the motivations behind respondents' answers and can eventually lead to the better phrasing of NEP items for different cultures. Within those research, the studies on NEP for children are scarce (Kopnina 2012).

The dualism of the Dominant Social Paradigm and NEP concepts seems to be another source of discussion, especially in non-Western countries (Bechtel, Verdugo, and Pinheiro 1999; Bechtel et al. 2006; Corral-Verdugo and Armendariz 2000; Ogunbode 2013; Van Petegem and Blieck 2006). For instance, Ogunbode (2013) found that whilst Nigerians and Westerners agree that 'Humanity is subject to the laws of nature', Nigerians, unlike Westerners, can respond positively to the statement that 'Humans will eventually learn enough about how nature works to be able to control it'. This seemingly inconsistent

answer might be based on the common belief that one can learn how to control the nature through spiritual empowerment, which is independent of technological advancement (Ogunbode 2013). Another example challenging the concept of dualism in Africa comes from the comparative study by Van Petegem and Blieck (2006), which showed that children from Zimbabwe simultaneously hold a pro-ecological worldview and feel dominant over nature, believing that they have the right to use nature for their needs. Corral-Verdugo and Armendariz (2000) found the same results in Mexico. In multicultural comparative studies, the dualistic view on NEP was much more reported by the group of students from the United States than by Mexican, Peruvian, and Japanese ones (Bechtel et al. 2006).

The aim of our study is, therefore, to examine the validity of the NEP scale for children in Senegalese settings by assessing the internal consistency of the scale and determining its dimensions. We also focus on the occurrence of dualistic answers and try to ascertain the mental concepts behind the respondents' answers. Specifically, the study seeks to answer following research questions:

- What is the validity, reliability, and structure of the NEP scale when applied on Senegalese children?
- How Senegalese children interpret the meaning of the NEP items and what mental concepts their interpretation reflects?

Methodology

Social and educational settings of Senegal

Senegal is the second fastest growing economy in West Africa, the poverty, however, affects 46.7% of the population. Geographic disparities are very pronounced with almost twice as much residents considered poor in rural areas, then in capital city Dakar (WB 2016). The education system is based on its French counterpart when primary education is obligatory and free of charge. Primary education is divided into three cycles of two years (WB 2017). In 2015, 82% children of official primary education age enrolled in primary school. This number includes a significant number of youth who only go to Koranic schools that are not aligned with the public curriculum. Only 58% of enrolled children eventually reached the last grade in 2014 (WB 2017).

Study area and target group

The study was conducted in November and December 2015 in three regions of Senegal: Dakar, Thies and Ziguinchor. Both urban and rural areas were sampled in each region. The questionnaires were collected in 7 rural schools and 12 urban ones. The convenient sample was used. The size disparities between urban and rural areas in our study are quite large given the fact that the smallest urban area in our study (Nguekokh) has more than 20 000 inhabitants and the biggest area considered as rural is assumed not to have more than 1000 inhabitants. In total, 765 questionnaires were collected, 448 in urban areas and 317 in rural areas. The distribution of gender was 229 girls and 219 boys from the urban areas and 145 girls and 172 boys from the rural areas. The criteria for schools to be involved in the study was a willingness to participate, accessibility and an appropriate sample of children (CM1 level). CM1 school grade equals the first level of 'middle school' in Senegal; thus, in theory, it involves children aged 12–13 years (ISCED2). The average age of the participating children was 13 years (SD ± 1.3 years, ranging from 10 to 16, with the exception of one 17-year-old and two 18-year-olds). The age deviation was caused by a delayed start of primary education, caused in Senegal by a lack of infrastructure or the repetition of classes among other factors (Montgomery and Hewett, 2005).

Questionnaire

In this study, we employed an adapted version of the NEP scale for children (Manoli, Johnson, and Dunlap 2007). The original scale for adults was reduced from 15 to 10 items, and wording changes were

made to make the scale suitable for children (Manoli, Johnson, and Dunlap 2007). Originally, the scale was designed for children aged 10–12 years, but based on experience from education programmes in 2008 (Grúňová et al. 2017), we found it more suitable for older children (between 12 and 14 years, which was the age range of the majority of our respondents) in Senegalese settings.

The items 1–10 were translated into French (Table 1). To eliminate misunderstanding of the wording, we interviewed children ($n = 10$) and discussed our preliminary version of the questionnaire with local teachers ($n = 3$). The teacher discussion led us to change in item 5 and 10; there was a considerable misunderstanding of the phrase 'to mess up nature', so we were advised to translate it literally as 'to make a mess in nature'. Item 10 was rephrased in French to promote understanding without changing meaning: 'Nous serons en danger si nous continuous à détruire la nature et nous risquons la catastrophe' was used instead of 'Si les choses ne changent pas, nous aurons une grande catastrophe dans l'environnement.' Basic respondent demographic data were collected in the header of the questionnaire.

Qualitative data were gathered by interviewing two mixed groups in two schools ($n = 10$, $n = 7$) using each scale item to reveal the mental concepts behind the children's answers. The responses of each group were recorded individually. The same criterion for participation was applied for the interview groups as for the 'questionnaire group'. The sample was selected on a voluntary basis and included children who did not participate in the educational programme. Ten male and seven female respondents ranging in age from 12 to 14 years participated in two mixed-gender interview groups.

Data analyses

The NEP scale measures whether respondents' environmental attitudes correspond more to an anthropocentric (low NEP scores) or an eco-centric worldview (high NEP scores), with a value of 3.00 used as the boundary (Bamberg and Möser 2007; Manoli, Johnson, and Dunlap 2007; Van Petegem and Blieck 2006). As the Likert scale for children was graded from strongly agree (value 1) to strongly disagree (value 5) in our case, it was reversed for further statistics to ensure comparability with similar studies.

The confirmatory factor analysis (CFA) was performed to evaluate the extent to which the obtained data correspond to hypothetical NEP structure (Byrne 2010; Dunlap et al. 2000; Manoli, Johnson, and Dunlap 2007; Schumacker and Lomax 2004). The consistency of the following three subscales (Dunlap et al. 2000; Manoli, Johnson, and Dunlap 2007) was examined: Rights of Nature (items 7, 1, 4), Eco-Crisis (items 10, 2, 8,5), Human Exceptionalism (items 3, 6, 9). Furthermore, the internal consistency of the scale as both a single and a multidimensional measure was analyzed by the Cronbach alpha test (Tavakol and Dennick 2011). The principal component analysis was used to reveal the different potential dimensions (subscales) specific to this data-set and for further comparison with other studies dealing with NEP scale for children (Manoli, Johnson, and Dunlap 2007; Van Petegem and Blieck 2006).

Quantitative data (obtained scores for individual items 1–10) were transformed by Box-Cox transformation ($\lambda = 1.119$) to improve the normality of distribution (tested by Kolmogorov-Smirnov test of normality). Two-way ANOVAs were used to test the effects of gender, socio-economic background and their interaction on obtained scores for each item separately. Significant differences were tested by *post hoc* Tukey tests. The effect of age on scores (Box-Cox transformed) was tested using simple linear regression. Analyses were performed using the Statistica 13.2 package (StatSoft, Tulsa).

Results

Low correspondence with valid hypothetical NEP scale structure was detected by CFA. We used a combination of relative fit indices, namely the Comparative Fit Index (CFI) and non-centrality-based index Root Mean Square Error of Approximation (RMSEA) according to (Hu and Bentler 1999) and the Standardized root mean square residual (SRMR) and the Bollen's incremental fit index (IFI) recommended by (Newsom 2012). The results for all respondents and for rural and urban groups separately are given in Table 2. The conformity with original NEP scale corresponded only to some fit indices, it was therefore necessary to refuse the conformity as such.

Table 1. Mean scores and frequency distribution of the responses to the 10-item NEP scale for children (English translation of the items followed by original French version).

Manoli et al. and current	PB	Items	Score (mean ± SE)	SD (%)	D (%)	I (%)	A (%)	SA (%)	Missing responses (%)
1	7	Plants and animals have as much right as people to live. NEP / *Les plantes et les animaux ont autant de droit que les gens à vivre*	3.7±.05	9	13	14	26	35	3
2	1	There are too many people on Earth. NEP / *Les personnes sont très nombreuses sur terre*	4.4±.03	2	2	7	31	57	1
3	4	People are clever enough to keep from ruining the Earth. DSP / *Les gens sont assez intelligents pour éviter la destruction de la terre*	2.3±.04	6	8	22	31	30	3
4	9	People must still obey the laws of nature. NEP / *Les gens doivent toujours obéir aux lois de la nature*	4.2±.04	2	6	10	28	52	2
5	3	When people mess with nature, it has bad results. NEP / *Quand les gens salissent la nature, il y a de mauvais résultats*	3.7±.05	10	11	13	25	39	2
6	8	Nature is strong enough to handle the bad effects of our modern lifestyle. DSP / *La nature est assez forte pour gérer les mauvais effets de notre mode de vie actuel*	2.8±.05	15	12	27	24	18	4
7	12	People are supposed to rule over the rest of nature. DSP / *Les gens sont destinés à régner sur le reste de la nature*	2.5±.05	9	13	22	28	23	5
8	5	People are treating nature badly. NEP / *Les personnes ont un mauvais comportement envers l'environnement*	3.6±.05	9	15	16	27	31	2
9	14	People will someday know enough about how nature works to be able to control it. DSP / *Les gens sauront un jour assez à propos de comment fonctionne la nature pour être en mesure de la contrôler*	2.2±.04	5	6	21	33	32	3
10	15	If things don't change, we will have a big disaster in the environment soon. NEP / *Nous serons en danger si nous continuons à détruire la nature et nous risquons la catastrophe*	4.2±.04	5	6	9	27	52	1

Notes: The scores of the DSP items (Q 3, 6, 7, 9) are reversed so that all values below 3 indicate the respondent's support for the DSP worldview, while whole values above 3 support the NSP worldview; Manoli and current: the number of 10-scale items adopted from Manoli, Johnson, and Dunlap(2007); PB: items corresponding to the 15-item scale for children proposed by Van Petegem and Blieck (2006); NEP and DSP indicate New Environmental Paradigm and Dominant Social Paradigm items. On the right side of the table, the frequencies of the responses are presented as percentages. SD = strongly disagree, D = disagree, I = indifferent, A = agree, SA = strongly agree.

Table 2. Fit indices for confirmatory factor analysis (CFA).

	All	Rural	Urban
CFI	.805	.759	.542
RMSEA	.041	.052	.055
SRMR	.047	.064	.077
IFI	.812	.776	.568

Notes: The fit for good model: Comparative Fit Index (CFI) > .95, Root Mean Square Error of Approximation (RMSEA) < .06, Standardized root mean square residual (SRMR) < .08, Bollen's incremental fit index (IFI) > .95.

Results of CFA showed that the factors were significantly differently loaded than in the original model (Table 3). Although all values (except item 1 in the Urban group) are statistically significant, the loading itself often ranges below .35. In the context of the original, only the items 5, 9 and 10 are adequately loading the factors.

The test of reliability revealed very weak reliability for the scale as a unidimensional measure ($n = 678$; Cronbach's alpha = .23) and for the subscales (Human Exceptionalism, Cronbach's alpha = .28; Eco-Crisis, Cronbach's alpha = .50; Rights of Nature, Cronbach's alpha = .20). The strongest consistency was found in items 2, 4, 5, 8, and 10; Cronbach's alpha was 0.54, which did not reach the recommended level of internal consistency for the individual scale.

Principal component analysis revealed three dimensions that explained 43% of the variance in the answers obtained (for the results see Table 4). The first factor (item 4, 2, 5, and 10) explained 18.7% of the variance; the second factor (item 3, 6, and 9) explained 13.1% of the variance; and the third factor (items 8 and 9) explained 11.3% of the variance. The option with fourth-factor (item 1) adjustment explained a total of 53.5% of the variance. Because of the low internal reliability of the instrument, each of the items was analyzed separately (for the results, see Table 1).

There was no significant difference between the male and female students' scores on all items ($p > .05$ in all analyses). The children from urban schools scored higher on item 2, 5, 8 and 9 (in all these analyses $p < .01$). Only the item 9 showed a significant difference in the effect of interaction between sex and socio-economic background ($F_{1,743} = 4.06$, $p = .04$), i.e. there was a significant difference between high scores of urban male students and lower scores of rural male (the lowest) and female students. Female students' scores were similar in urban and rural areas. No effect of age on scores was detected ($r^2 = -.0004$, $p = .10$).

The interview revealed that the respondents associated the NEP/DSP items with interpretations that differed from those that were expected in the NEP's design. As a result, respondents' support for some of the items indicating eco-centric attitudes actually expressed their anthropocentric perspective. The main differences were the strong faith in an omnipotent God as the divine source of natural harmony

Table 3. Confirmatory factor analysis of the valid NEP model (original) with the obtained data (all) and the relevant groups (rural, urban).

Factor	Item	Original (Manoli, Johnson, and Dunlap 2007)	All	Rural	Urban
Human Exemptionalism	3	.667	.336	.451	.297
	6	.614	.242	.371	.214
	9	.685	.542	.355	.702
Rights of nature	7	.695	−.298	−.335	−.405
	1	.691	.239	.363	.116
	4	.640	.363	.283	.613
Eco-Crisis	10	.707	.619	.568	.628
	2	.663	.253	.309	.187
	8	.733	.454	.461	.426
	5	.459	.728	.843	.655

Notes: The values represent loading of the original factors by the individual items in the interval < −1;1 > .

Table 4. Comparison of the subscales based on principal component analysis of the NEP scale for children.

	Region of study	Rights of nature/ limits to growth	Human exceptionalism/humans over nature	Eco-crisis/balance of nature
Manoli *et al.*	USA	1, 4, 7	3, 6, 9	2, 5, 8, 10
Van Petegem and Blieck *	Belgium, Zimbabwe	2, 4	3, 6, 7, 9	1, 5, 8, 10
Current investigation	Senegal	2, 4, 5, 10	3, 6, 9	8, 9

Notes: Rights of Nature, Human Exceptionalism, and Eco-Crisis are the subscales proposed by Manoli, Johnson, and Dunlap (2007); Limits to Growth, Humans over Nature, and Balance of Nature are the subscales proposed by Van Petegem and Blieck (2006).
*The items proposed by Van Petegem and Blieck (2006) were given appropriate item numbers in the current study. The four itemss that were employed by Van Petegem and Blieck (2006) that did not appear in Manoli, Johnson, and Dunlap's (2007) 10-item scale were not included in this table.

and stability. The other was a prevailing positive interpretation of the place of humankind in nature and our limited potential to damage nature.

Strong faith in God was expressed by most of the respondents and affected items 4, 7, 9, and 10. For example, on item 4, 'People must obey the laws of nature', a 12-year-old female respondent explained that '… they do it because nature is good and they want to … otherwise, they are stronger than nature, and if they are not, they can pray and make sacrifices, and a good God will do what they ask him to'.

The same arguments emerged in responses to other items. Commenting on item 7, the respondents stated that people are supposed to rule over nature by the will of God or that they are not supposed to rule over nature because there is a god who rules it. Similarly, for item 9, they argued that a god controls nature but can teach us to control it if he wants to, or, for item 10, that 'If there is a danger of disaster, we will pray and make sacrifices'.

In contrast, humans' potential to seriously damage the environment seemed to be underestimated, and the role of humankind in nature was perceived positively in item 1 and item 6. Item 1 was answered with 'animals and plants have as much right to live as humans because they are living things', and no discussion of the subject occurred in either of the two groups. The same was true for the responses to item 6, in which the children seemed not to be aware of problems connected with civilization's progress.

The children's explicit understanding of certain items was evident on items 3, 8 and 5. The respondents provided only two examples of mistreating nature, i.e. cutting trees and making charcoal. Similar issues arose for item 3, for which all the interviewed children agreed that 'People are clever enough to avoid ruining the Earth' and for which a 12-year-old male respondent in one group replied that we just have to 'cease cutting trees and making bushfires'. For item 5, the interviewed children agreed that if people mess with nature, it has bad results. A 12-year-old male respondent gave the example that 'when people throw a mess into nature, an animal will eat it and die'. When asked why it is bad if an animal dies, he answered 'people will have nothing to eat, and it is the same with plants that die in forest fires'.

For the respondents, item 2, 'There are too many people on the planet', where the respondents' agreement is supposed to indicate their eco-centric view, actually expresses their the anthropocentric position. While the children tended to agree with the statement, they were unable to provide a plausible explanation of why the presence of too many people on the planet would have negative consequences for the environment. Overpopulation is not regarded as having a negative association with disadvantages for nature and subsequent negative effects on humankind. Consequently, item 2 cannot be considered valid when the NEP subscale is applied to this population.

Discussion

Consistency of the NEP scale for children in Senegal

Although the total NEP scores for our sample are comparable with those of samples from similar socio-cultural settings (Van Petegem and Blieck 2006), the CFA analysis revealed that the scale behaves

in non-standard or even non-functional way in our conditions. There are several possible explanations for this finding. Despite the piloting of the translated instrument, the wording may have been an issue. The difference in understanding of the word 'salir' ('mess up' in French) between children in the preliminary study and the ex-post interviews suggests a possible difference in the level of education among Senegal's schools of the same types and level. Low internal consistency of translated versions of the NEP Scale (Dunlap et al. 2000) was also found by Schultz et al. (2005) in Brazil and India, while in other countries with a different socio-cultural environment (e.g. Czech Republic, Germany, Russia or New Zealand), the reliability was acceptable. Consequently, we assume that it is culture rather than language that is a primary source of the instruments' reliability. For example, the fact that the Senegalese students did not view overpopulation as having a negative association characterized by disadvantages for nature and subsequent negative effects on humankind indicates that item 2 on the NEP scale has an opposite meaning in Senegalese versus Western settings and cannot be considered valid for this population. Interestingly, at least some parts of the NEP Scale (Human Exceptionalism/Humans over Nature) seem to be consistent across cultures. However, it should be mentioned that all the subscale items are worded in an anti-NEP direction. On the NEP for adults, those items often form a distinct dimension, and Dunlap et al. (2000) suggested that they might represent a 'methodological artifact'.

In terms of Western dualistic logic, the high level of agreement with contrary sentences such as item 1, 'Plants and animals have as much right to live as people', and item 7, 'People are supposed to rule over the rest of nature', may be considered irrational. However, further evidence of such findings seems to support a hypothesis of different mental constructs of environmental values in different cultures (Bechtel, Verdugo, and Pinheiro 1999; Bechtel et al. 2006; Corral-Verdugo and Armendariz 2000; Ogunbode 2013; Van Petegem and Blieck 2006). In the case of Senegal in particular, the first apparent explanation would be the combination of perception through monotheistic religions and persisting animism within the population. While the 'religions of the book' (Christianity, Islam, Judaism) see nature as something given to man for his use (95% of the Senegalese population is Muslim, and 3–5% are Christians (CIA 2011)), widespread belief in supernatural forces and the role of ancestors enables people to view themselves as an equal part of the nature (Dieye and Roy 2012). Further research on the structure of environmental attitudes should be performed to confirm this primary assumption.

The quantitative findings might seem to suggest that most of the Senegalese children share an eco-centric view on some questions (e.g. item 2, 'There are too many people on the planet'). However, the qualitative analysis suggests that for the Senegalese population, this item has a different meaning from its original position on the NEP subscale. Among the sample for this study, overpopulation was considered neither an environmental threat nor a potential threat to humankind. The fact that most of the respondents agreed with this claim showed their more anthropocentric view on this issue.

At the same time, Senegalese children believe that nature (item 6) or people (item 3) can handle the bad effects of modern life. The anthropocentric position in those items was also identified in Zimbabwean children (Van Petegem and Blieck 2006) and Nigerian students (Ogunbode 2013). While Van Petegem and Blieck (2006) stated that children displayed faith in the problem-solving abilities of science and technology, we suggest that this might also cause them to underestimate humans' negative effects on the environment and to believe in supernatural forces. Ogunbode (2013) found that both Nigerian students and Senegalese ones agree with item 9, 'Humans will eventually learn enough about how nature works to be able to control it'. He argues that Nigerians may conceive the gain of control over nature through spiritual empowerment, independent of modern techniques.

There was no significant difference between the male and female respondents' scores on al the items. This result is in the line of Zelezny, Chua, and Aldrich, 2000 who found gender difference in NEP scores in two countries out of 14 only. However the females tended to score generally higher in cultures where the value of 'caring for others' is more supported (Schultz et al. 2005). It was also previously suggested that NEP scale is positively correlated with the level of education and liberalism (Dunlap and Van Liere 1978). In light of this, it is encouraging that there was no significant difference between male and female scores in Senegal, as it is the region where women's empowerment has not yet been fully realized (WB

2016). This further corresponds with the findings of Ogunbode and Arnold (2012) and Ogunbode (2013), who found no gender differences in the environmental attitudes of Nigerian respondents.

No significant effect of age on mean scores was found in the current study probably because all tested children attended the CM1 level and the age variation is therefore limited in tested sample. Whereas some available studies found that the NEP score negatively correlates with age (Gangaas, Kaltenborn, and Andreassen 2015; Parizanganeh et al. 2011) and other studies have not found any such correlation (Hawcroft and Milfont (2010), none of those studies correspond to our sample age category and deal with wider age range.

The children who attended urban schools scored higher than the rural schoolchildren on almost all the items. This finding could be explained by Ogunbode and Arnold (2012), who found that individuals tend to be more concerned about environmental issues that may immediately and directly affect their daily life, such as air pollution or waste management issues, which Senegalese children living in polluted cities are familiar with. Given that urban children receive a better education or/and have better access to the media, Mayer and Frantz's (2004) argument that the NEP scale measures cognitive beliefs rather than affective experience should be taken into an account.

Conclusion

We can conclude that the use of the NEP Scale to evaluate the environmental attitudes of schoolchildren seems to be rather unreliable in Senegalese settings despite its well-established use in Western countries. The difference between the Senegalese and Western results could be related to specific cultural features such as strong religious beliefs, different understandings of the place of humankind in nature, and weak awareness of humans' impact on the natural world. We suggest that for further application of the NEP scale for children, it is necessary to reformulate its items to better reflect the specific socio-cultural features of this region.

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