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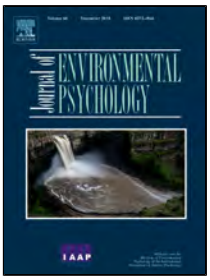

Children's environmental moral judgments: Variations according to type of victim and exposure to nature

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Title: Children's environmental moral judgments: Variations according to type of victim and exposure to nature

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1. Introduction

Human actions are largely responsible for environmental problems such as global warming (Cook et al., 2013; Evans, 2018). It is therefore increasingly important to understand how individuals develop a sense of environmental morality. Behaving in a pro-environmental way has long been considered a moral issue (Harland, Staats, & Wilke, 1999; Kaiser, Hübner, & Bogner, 2006; Matthies, Selge, & Klöckner, 2012; Thøgersen, 1996, 2006). Indeed, some empirical evidence shows that school-aged children reason about environmental issues in moral terms (e.g., Kahn, 1997; Kahn & Friedman, 1995), and children as young as three years of age show moral attitudes towards environmentally harmful actions (Hahn & Garrett, 2017). However, the factors and processes leading to children's moral judgments of actions that harm the environment are still quite unknown. Building upon research based on social domain theory, we expand on previous studies on children's environmental morality by examining two factors that may regulate children's moral judgments of environmentally harmful actions: 1. The target of the action and 2. Children's experiences in nature.

Social domain theory proposes that children's judgments about harmful actions depend on the identity of the victim (Smetana, 2006). The targets of environmentally harmful actions are diverse. Hence we decided it would be valuable to examine whether children's environmental moral judgments would vary depending on the victim of the actions. Given that young children tend to anthropomorphize animals, plants and trees (Ganea, Cantfield, Simon-Ghafari, & Chou, 2014; Gebhard, Nevers, & Billmann-Mahecha, 2003) and that this process often leads to feelings of empathy and perspective-taking (Kahn, 2006), we included three different targets of environmentally harmful actions: Animals, plants/trees, no specific victim. Would children reason similarly about hurting an animal compared to a flower; and how might these actions

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compare with a behavior where there is no clear victim, such as not recycling something? Moreover, according to this same theory, children's moral development emerges through social interactions, including children's own direct experiences of the consequences of their actions as well as the responses from others to those actions (Nucci, 1981; Smetana, 2006; Turiel, 2002). Children with more frequent interaction with the victim of the transgression develop a faster and/or stronger sense of morality than those with fewer opportunities for interaction (Smetana, 2006). Following this line of thought, children whose contact with nature is more frequent may have more opportunities to interact with the victims of environmental transgressions. Based on social domain theory this ought to lead to a stronger sense of morality about nature. In the next sections, we review the literature on moral environmental development and set up the basis for our hypotheses.

1.1. Children's moral evaluations of environmentally harmful actions

Social domain theorists have systematically analyzed children's judgments about hypothetical situations and found that, from a young age, children's moral reasoning can be categorized into three domains: 1. Moral transgressions (actions that harm people), 2. Social-conventional transgressions (actions that disrupt the social order), and 3. Non-harmful personal choices. Moral transgressions include harming others physically (e.g., hitting another child) and /or psychologically (e.g. teasing), as well as issues of justice and unfairness (for a review, see Smetana, Jambon, & Ball, 2014). Overall, children judged moral transgressions more severely than social-conventional transgressions (e.g. eating salad with your fingers), and tended to pass no judgment on personal choices (e.g. choosing a friend to play with) (Smetana, 2006).

Turning to children's evaluations of children's evaluations of actions that harm the environment, much of the work has been conducted by Kahn and colleagues (e.g.,

Kahn, 1997, 1999; Kahn & Friedman, 1995; Kahn & Lourenço, 2002). Based on Piaget's theory of a stage-like moral development (Piaget, 1965), these authors concluded that children believed animals have intrinsic values or rights, and extended these beliefs to non-sentient nature, such as their local environment. These results were replicated across different cultures (Kahn, 2006). It has only been recently that children's moral judgments of environmentally harmful actions have been examined within the social domain theory (Hahn & Garret, 2017; Hussar & Horvath, 2011). Hussar and Horvath (2011) examined 6 to 10 year olds' judgments of environmentally harmful actions with no specific victim (e.g. failing to recycle) using Turiel's (1983) social-domain scale. Participants were shown hypothetical situations depicted in a series of drawings and evaluated them as ok, bad or very bad. These evaluations were compared with how children judged actions included in the three social domains. Given that children expressed moral reasoning about environmental issues (Kahn, 2006), the researchers expected harmful actions towards the environment to be judged as harshly as moral transgressions. Contrary to their expectation, harm to others was evaluated more severely than harm to the environment. These results were replicated with 4 and 5 year old children, but not with three-year-olds, who equated environmental harm and harm to people (Hahn & Garrett, 2017). In turn, children from all ages judged social-conventional transgressions as less severe than moral and environmental transgressions, and children tended not to pass judgment on personal choices.

The reasons why from age four children perceive environmental transgressions less severely than moral transgressions remain unclear. One plausible explanation is that the comparisons made in previous studies included moral transgressions with a clearly defined victim (i.e. another child), whereas environmentally harmful actions lacked a well-defined victim (Hahn & Garrett, 2017; Hussar & Horvath, 2011). The absence of a

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well-defined victim in the environmentally harmful situations might have skewed the results, prompting children to evaluate actions towards other people more harshly than actions to the environment. This is especially relevant considering that abstract concepts such as “environment” and “ecosystem” are difficult for children to understand (Larson, Green, & Castleberry, 2011). Instead, children generally conceptualize the natural world as animals and plants (Adams & Savahl, 2016; Collado, Íñiguez-Rueda, & Corraliza, 2016). Moreover, it is common for children to anthropomorphize natural objects up until about age 12. This helps younger children to conceive animals, plants and trees as moral objects that are alive and can experience pain (Ganea et al., 2014; Gebhard et al., 2003). It also allows them to take their perspective, which is linked to feelings of empathy for them. However, concepts such as ecosystem and environment are not readily anthropomorphized (Gebhard et al., 2003). One possible reason for this is that children’s books and cartoons tend to attribute human characteristics, such as the ability to talk, to animals, plants and trees, but are less likely to do this with ecosystems as a “whole” (Ganea et al., 2014). Given that perspective-taking and shared feelings are two important elements for an individual’s moral development (Smetana, 2006), animals and plants/trees are more frequently seen as worthy of moral consideration than more abstract constructs such as the ecosystem or the environment (Gebhard et al., 2003; Kahn, 2006). Our first objective herein is to examine whether children’s moral judgments about environmentally harmful actions vary according to the victim.

A second objective of the current study is to explore whether experiences in nature are positively associated with children’s moral judgments about actions that harm the environment. By experiences in nature we refer to free time spent in settings where natural elements are an important part of the landscape, including wild natural areas, such as forests, but also nearby natural environments, like urban parks, gardens and

vacant lots (Chawla & Derr, 2012; Rupprecht, Byrne, & Lo, 2016). For instance, Cheng and Monroe (2012) found that the more natural elements near a child's home, the stronger the connection with nature s/he felt, and the higher his/her interest in environmentally friendly practices was. Children's connection with nature included feelings of empathy towards animals, such as shared feelings with a hurt animal and perspective-taking. Similarly, Collado, Staats and Corraliza (2013) concluded that spending time at a summer camp organized in a natural area increased children's emotional affinity towards nature. More recently, Evans, Otto and Kaiser (2018) conducted a prospective study in which children's experiences in nature, pro-environmental attitudes and behaviors were monitored over a period of 12 years. Positive experiences in nature at age 6 influenced the environmental attitudes and behaviors of the same children at age 18.

Empirical evidence supports the idea that children's interactions with nature are a relevant pathway to the development of empathy toward the natural world and moral reasoning about nature (Chawla & Derr, 2012; Kahn, 2006). There are several possibilities to explain why experiences in nature at an early age could be linked to children's environmental moral judgments. For example, children's direct contact with nature might provide them with opportunities to directly experience the consequences that their actions have on the environment and this might, in turn, lead to a stronger sense of morality towards the environment. Another possibility is that frequent experiences in nature might help develop a stronger emotional affinity towards nature (Collado et al., 2013) which might, in turn, lead to rating actions that harm the environment as wrong (Krettenauer, 2017). The possible link between experiences of nature and environmental moral judgments has, to the best of our knowledge, not been examined.

1.2. The current study

Building upon previous studies examining children's judgments of environmentally harmful actions from the perspective of social domain theory (Hahn & Garrett, 2017; Hussar & Horvath, 2011), we examined whether children's evaluations of harmful environmental actions varied depending on the identity of the victim. We had three types of environmentally harmful actions: 1) harmful actions with no specific victim, 2) harmful actions to animals and 3) harmful actions to plants/trees. Following Hussar and Horvath's (2011) approach, children's judgments of these three types of harmful actions were compared to judgments of moral transgressions, social-conventional transgressions, and personal choices.

As mentioned before, it has been concluded that children tend to anthropomorphize animals more frequently than any other natural object, and this process leads them to reason that animals deserve the same moral consideration as humans (Kahn, 2006). Hence, we expected children to judge harmful actions to animals as severely as moral transgressions (Hypothesis 1). Children also tend to anthropomorphize plants and trees, although to a lesser extent than animals. This process appears to be less common for more abstract natural objects, such as ecosystems (Gebhard et al., 2003). Given that anthropomorphizing a natural object is linked to assigning it a moral standing, we expected harmful actions to plants/trees to be judged less harshly than harmful actions to humans and animals, but more severely than environmentally harmful actions lacking a specific victim (Hypothesis 2). Moral and environmental transgressions were expected to be judged more harshly than social-conventional transgressions, independent of the victim (Hypothesis 3).

Given that moral development depends on children's interactions with their context (Smetana, 2006; Turiel, 2002), we expected children's experiences in nature to

be associated with their moral sense about nature (Howe, Kahn, & Friedman, 1996; Kahn & Lourenço, 2002). Specifically, children who experience nature more often were expected to judge the three types of environmentally harmful actions more severely than those whose contact with nature was less frequent (Hypothesis 4).

We included both pre-school and primary school children in our sample, widening the age range used in previous studies (ages 4 to 12) (Hahn & Garrett, 2017; Hussar & Horvath, 2011). This allowed us to explore differences in children's judgments of environmentally harmful actions according to age, without any specific hypothesis in mind.

2. Method

2.1. Participants

An invitation to collaborate in the study was sent to fifteen schools and 7 of them agreed to participate. A large number of children (N = 482) participated in the study. Eleven children were excluded from the study because they indicated that they were vegetarian, and this might influence how they interpret environmentally harmful actions, especially those in which the victim is an animal (Hussar & Harris, 2009)[1]. The final sample was formed by 116 four to six year-olds, 158 middle childhood children (aged 7 to 9) and 197 pre-adolescent children (aged 10 to 12). All of them were Spanish and fifty one percent of them were girls. Fifty percent of the children came from rural areas (fewer than 3,000 inhabitants) and the rest from a city of 700,000 inhabitants. Most participants were from well-educated families (68% had at least one parent who held a college degree). Parental level of education did not differ between rural and urban areas. Participants were recruited through their schools. Parents gave written consent for their children's participation in the study and children were also asked for

[1] Please note that the results presented in this paper do not change when these 11 children are included in the analyses.

175 their assent. Data collection was in accordance with the ethical standards of the first
176 author's institution.

177 *2.2. Instruments and stimuli*

178 *a) Stimuli:* Similar to Hahn and Garrett (2012), and Hussar and Horvath (2011),
179 children were presented with hypothetical situations in a pictorial way and asked
180 whether the situations presented were "ok" (coded as 1), "a little bad" (2) or "very bad"
181 (3). Color cards (14 cm x 11 cm) showed a child performing an action. The child's
182 gender was matched with the child in the drawing (Fig. 1). The drawing represented six
183 types of behaviors, with three actions per type of behavior (Appendix A): (1) Moral
184 transgressions (e.g. grabbing a euro from a classmate's desk) (2) transgressions of
185 social-conventions (e.g. eating a salad with your fingers); (3) environmentally harmful
186 actions with no specific victim (e.g. failing to recycle); (4) harmful actions to animals
187 (e.g. throwing pebbles at a squirrel) (5) harmful actions to plants/trees (e.g. taking
188 leaves from a tree) and (6) personal choices (e.g. reading during recess instead of
189 playing football).

190 FIGURE 1

191 *b) Nature exposure:* Similar to Larson, Szczytko, Bowers, Stephens, Stevenson,
192 and Floyd (*in press*), parents received a consent letter together with a question about
193 their child's frequency of contact with nature. This question was: "After school and/or
194 during the weekends, my child spends time in natural areas (e.g. parks, the country
195 side)". Answers were coded as 1 (never), 2 (almost never), 3 (sometimes), 4 (quite
196 often), 5 (always). According to their parents and in line with previous research (Gifford
197 & Nilsson, 2014; Hinds & Sparks, 2008), children from rural areas spent significantly
198 more time in nature (M = 3.55, SD = 0.79) compared to those from urban ones (M =

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199 2.52, *SD* = 0.80), *t* (469) = 13.87, *p* < .001.This represents a medium effect size (*d* =
200 0.13).

201 *2.3. Procedure*

202 Data were collected through individual interviews conducted in state schools
203 within school hours. The researcher showed each hypothetical situation to the
204 participant and read the description of the action depicted on the card aloud. Participants
205 were told that we wanted to know children's opinions about what actions they think are
206 ok to do and what actions they think are bad to do. Interviews lasted between 20 and 40
207 minutes, depending on the child's age (younger children tended to take more time).

208 **3. Results**

209 Participants did not differ significantly in their judgment of the three situations
210 that formed each behavior type. Following previous researchers' approaches (Hahn &
211 Garrett, 2017; Hussar & Horvath, 2011), the scores for each of the actions within each
212 behavior type were averaged so that participants received an overall score for each of
213 the six behavior types. We conducted a repeated measures ANOVA with each of the
214 behavior types as within-subjects variable and exposure to nature and age as between-
215 subject variables. Partial eta-square was computed to assess the effect size. Effect sizes
216 in the intervals [.01, .06), [.06, .14), and [.14, ∞) were considered small, medium, and
217 large, respectively (Cohen, 1988). The median of nature exposure was calculated (*Med*
218 = 3.00) and used to divide participants in two groups, the first one formed of 145
219 children whose scores in exposure to nature were above the median (high exposure to
220 nature group) and the second one represented by 326 children whose scores were equal
221 to or below the median (low exposure to nature group).

222 The three-way interaction *Behavior type* × *Nature exposure* × *Age* was not
223 statistically significant ($F(7.68, 1784.40) = 1.62$, $p = .12$). The two second-order

interactions *Behavior type* × *Nature exposure* ($F(3.84, 1784.40) = 14.31$, $p < .001$) and *Behavior type* × *Age* were both statistically significant ($F(7.68, 1784.40) = 2.33$, $p = .02$), and were further examined. The three main effects (i.e. behavior type, nature exposure, and age) were statistically significant, and they were interpreted in the context of the significant interactions.

3.1. Interaction between behavior type and nature exposure

Figure 2 depicts the *Behavior type* × *Nature exposure* interaction. Effect size was small (0.03) and the observed power was acceptable (1.00). As indicated before, we found a significant main effect of behavior type, indicating that children judged some behavior types more severely than others (effect size was large, 0.50). In addition, the significant interaction effect indicates that children's judgments of some behavior types differed according to their exposure to nature. To further explore this interaction, we calculated the simple effects conducting pairwise comparisons of means using the Bonferroni correction. Our results show that, overall, children judged harmful actions to other children more harshly than social-conventional transgressions, and tended to pass no judgment on personal choices. Considering the three types of environmentally harmful actions, harming plants/trees was seen as the least severe of the three types. Harmful actions to plants/trees were also perceived as less severe than harming other people, and also less severe than social-conventional transgressions.

Differences were found between children with high and low exposure to nature. Children with a high exposure to nature provided more severe judgments compared to children with a low exposure to nature in four out of the six behavior types (moral, environment without a specific victim, animals, and plants/trees). There were no significant differences in the social-conventional and personal choices behavior types. Children with high exposure to nature judged hurting another child and hurting animals

as equally bad, and their evaluations of hurting another child and environmentally harmful actions without a specific victim were also similar. For these children, social-conventional transgressions were evaluated as less severe than hurting another child, an animal or the environment, but more severe than hurting plants/trees and personal choices. For children with low exposure to nature, social-conventional transgressions were evaluated more harshly than any of the environmentally harmful actions. For these children, hurting an animal was judged more severely than environmentally harmful actions without a specific victim, and hurting a plant/tree was perceived as more severe than personal choices.

FIGURE 2

3.2. Interaction between behavior type and age

Figure 3 depicts the *Behavior type* × *Age* interaction. Effect size was small (0.01) and the observed power was acceptable (0.88). This statistically significant interaction effect indicates that there are differences in the severity with which children judge the different types of behaviors and that, for some behavior types, there are differences according to age. When analyzing the simple effects, we found that differences in the severity with which children judged the six behavior types were generally statistically significant. Children evaluated hurting another child more harshly than hurting an animal, with the exception of 7 to 9 year-olds, for whom these two behavior types were equally severe. For younger children as well as for pre-adolescent children, hurting an animal was seen as more severe than environmentally harmful actions without a specific victim and these, in turn, were more severe than social-conventional transgressions. All children perceived hurting plants/trees as the least severe harmful action, only seen more harshly than personal choices. Seven to nine year-olds evaluated hurting plants/trees more harshly than did children included in the other two groups.

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FIGURE 3

4. Discussion

Extending from previous studies examining children's moral environmental judgments from the perspective of social domain theory (Hahn & Garrett, 2017; Hussar & Horvath, 2011), we asked whether children assess environmentally harmful actions differently according to the target of the action, and compared these to judgments of actions that harm other children, social-conventional transgressions and personal choices. In addition, exposure to nature was considered as a factor associated with judgments of environmentally harmful actions, and we explored possible differences in children's judgments according to age.

Our results are in line with previous studies showing that children evaluate hurting another child more severely than social-conventional transgressions and these, in turn, were evaluated more harshly than personal choices (e.g., Smetana, 1985; Turiel, 2002). Several differences were found between children with high and low exposure to nature. For children with high exposure to nature, children judged harm to animals and harm to the environment (without a specific victim) as equally problematic as harm to other children. However, in line with Hussar and Horvath's (2011) findings, children with low exposure to nature evaluated actions that harm other children more severely than any of the other behavior types included in the study. They also perceived hurting an animal as more severe than environmentally harmful actions without a specific victim. All children perceived hurting plants/trees as the least severe action, and passed no judgment on personal choices. These findings partly support hypotheses 1 and 2 and are in line with previous researchers' suggestions that children's evaluations of environmentally harmful actions depend on the victim of such actions (Hussar & Horvath, 2011; Kahn & Lourenço, 2002; Kortenkamp & Moore, 2009). Moreover, for

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children with high exposure to nature, harming animals and the environment were both perceived as worse than disrupting the social order. However, children whose contact with nature is low perceive the disruption of the social order as worse than any of the three environmentally harmful actions. In other words, the severity with which children judge environmentally harmful actions with respect to the three classical social domains seems to be related to children's frequency of contact with nature.

Contrary to previous studies' findings (Hussar & Horvath, 2011), environmental transgressions do not fall between moral and social-conventional transgressions. Rather, their position seems to be linked to children's exposure to nature as well as to the natural element at hand. It is also worth noting that exposure to nature did not influence judgments about social-conventional transgressions or personal choices.

The above-mentioned findings support our fourth hypothesis. Children's social interaction may be responsible for these results. Moral development is shaped by children's interactions with their nearby environment, including direct interactions with the victim of transgressions as well as feedback received by others (Smetana, 2006). Our results might reflect that children with more exposure to nature have had more opportunities to experience the consequences of transgressions to animals and the environment (e.g. littering in the countryside) than children whose exposure to nature is low. In contrast, for children with fewer opportunities of direct contact with nature, anthropomorphization may play a stronger role in the development of empathy towards non-human others. The fact that animals are more likely to be anthropomorphized than more abstract environmental entities may explain why these children evaluated hurting animals as worse than hurting the environment without a specific victim. These findings are in line with Kahn and Lourenço's (2006) proposition that daily contact with nature is associated with a stronger sense of morality towards sentient and non-sentient nature.

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It should also be noticed that children with more exposure to nature judged moral transgressions slightly more severely than those with less exposure to nature. These results support the idea that interactions with nature may help children develop hallmarks of human morality, such as empathy, perspective-taking and reciprocity (Kahn, 2006). Future studies should register children's interactions with nature and natural elements in a more nuanced way by, for instance, considering children's frequency of contact with animals (e.g. house pets and farm animals) and whether this is associated with their environmental and moral judgments.

As indicated above, hurting plants/trees was perceived as the least severe transgression, followed only by personal choices. We can only speculate as to why this is the case. First, according to Mayers (1998), animals display a series of properties, such as *affectivity*, that help children accord them moral standing. These properties are not shared by plants/trees. Another reason may be that children are regularly exposed to a shared discourse about environmental issues and their consequences through, for instance, mass media, school, environmental education programs, and from their parents (Matthies et al., 2012). The environmental issues normally addressed in these contexts relate to harmful actions without a specific victim (e.g., energy waste). In light of social domain theory (Smetana, 2006), this shared discourse might prompt children to judge environmentally harmful actions without a specific victim, such as failing to recycle, more harshly than harmful actions to plants/trees. Similarly, children are frequently exposed to social norms (i.e., a person's beliefs about the common behavior within a group, Cialdini & Trost, 1998). Children's socially-based knowledge about harmful actions to plants/trees is likely to be more limited than socially-based knowledge about common pro-environmental practices (e.g. turning off the tap while brushing one's

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teeth) and social-conventional transgressions, and this might, in turn, affect the development of children's sense of morality about plants/trees.

Another contribution of the present study is our expanded age range compared to previous studies (Hahn & Garrett, 2017; Hussar & Hovath, 2011; Kortenkamp & Moore, 2009). We were able to examine possible differences in children's environmental judgments across different ages. In line with previous studies, 4 to 6 year-olds and pre-adolescents judged hurting another child more severely than hurting the environment (Hahn & Garrett, 2017; Hussar & Horvath, 2011) with the exception of hurting plants/trees, which was seen as less severe. Seven to nine year-olds showed a stronger sense of morality towards the environment than the other two groups of children. These children evaluated harm to animals as harshly as harm to humans, as did 3 year-olds (Hahn & Garrett, 2017), and condemned hurting plants/trees significantly more than children in the other two groups. Given that the acquisition of morality is socially determined (Smetana, 2006, Turiel, 2002), it seems reasonable that as children grow from early to middle childhood, they show a stronger sense of environmental morality as they have more opportunities for direct experience and social interaction with environmental problems. In fact, older children have a more developed cognitive ability to understand environmental issues (Kohlberg, 1984) and a higher capacity to empathize with other creatures (Hoffman, 2000). The developmental data also support previous findings regarding children's environmental moral development (Kahn & Lourenço, 2002; Kortenkamp & Moore, 2009). However, pre-adolescent children show a weaker moral sense about the environment compared to middle school children. This is in line with previous studies showing a drop in environmental concern in pre-adolescents and adolescents (Collado, Evans, Corraliza, & Sorrel, 2015; Krettenauer, 2017). The basis for these developmental differences are beyond the scope of the

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current study and remain for future research. Nevertheless, we can offer some tentative explanations. First, given the growing relevance that environmental issues have on the social agenda, pre-adolescents might be reacting to social norms. A second reason concerns the hypothetical actions used in the plants/trees behavior type and the harmful actions to animals. These might have been too childish for older children (e.g. “Taking flowers from the park to make a bouquet for mum”). Third, pre-adolescence matches the time in which children gradually stop anthropomorphizing natural objects (Gebhard et al., 2003). At the same time, by the age of 12, children have most likely been exposed to different social media and education about global environmental issues (e.g. climate change is studied at school). The actions included in this study related to hurting animals, plants/trees, and the environment without a specific victim, all of which may look less serious than bigger environmental problems.

Our findings have implications for environmental education (EE) programs. The present research shows that children perceive nature to have a moral standing. The fact that children grant different moral rights to different natural elements should be considered when designing EE programs. This is especially relevant for EE programs aimed at preserving plants/trees, as children’s sense of morality towards these is lower than the moral standing they attribute to other victims of environmentally harmful actions. Given that empathy and moral judgments have been linked to stronger environmental attitudes and behaviors (Berenguer, 2010; Krettenauer, 2017; Matthies et al., 2012), environmental educators could focus on instilling a sense of morality about the environment from a young age. Future research should study how children’s environmental morality may translate into environmentally friendly actions.

Our results show that young children and pre-adolescents do not perceive anti-environmental actions as severely as do middle school children, especially hurting

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plants/trees. In line with recommendations posed by previous researchers (e.g., Hahn & Garret, 2011; Krettenauer, 2017), we encourage educators to design EE programs that are appropriate for each age group. Longitudinal studies are needed in order to obtain a more accurate idea of how children's moral sense about the environment changes throughout their lives.

Some limitations should be considered when interpreting our findings. First, our results are correlational and, as such, causality cannot be established. Hence, we cannot rule out the possibility that other (currently unknown) factors explain the differences found between children with high and low exposure to nature. Experimental and longitudinal studies in which children's exposure to nature is more controlled will help us establish whether experiences in nature lead to a higher sense of morality about the environment.

Second, considering the large sample size, the statistical tests were probability over-powered. When possible, for analyses relying only on statistical significance, researchers should ensure that the statistical power is sufficient, but not excessive. In any case, the relevance of the significant effects can be judged using effect size measures. In the present study, a large effect size was found for the differences in how severely children perceive different types of behaviors. This main effect was interpreted in the context of the interactions of this variable with nature exposure and age. The effect sizes associated with these interactions were small. In other words, the magnitude of the differences found in how severely children judge different behaviors according to these two variables was small. Future studies might find larger effect sizes when using a more nuanced measure of children's opportunities to directly experience environmental transgressions, such as whether the child owns a pet (and therefore can more easily see how his/her actions affect animals) or collaborates in a home/school garden. Also, prior

research suggests that stronger differences might be found when including pre-school children (Hahn & Garret, 2017) and young adults (Krettenauer, 2017).

Third, we evaluated children's judgments of environmentally harmful actions, but we do not know the reasoning behind children's evaluations. The examination of whether children's moral *reasoning* about environmentally harmful actions varies according to the target of the action will certainly enrich our understanding of environmental moral development. For example, Hussar and Harris (2018) found that 7 to 12 year olds judge physical attacks against pets more severely than physical attacks against wild animals, and attacks against farm animals were seen as the least severe of the three. According to the authors' results, children justify their responses by focusing on several aspects of the victim, such as size and/or strength, as well as by considering their emotional closeness to the animal. What would be the reasoning behind judging hurting a plant/tree as less severe than hurting an animal? And would the reasoning behind children's judgments of harmful actions against some environmental victims be more biocentric/anthropocentric than others?

Fourth, some behaviors included in the domains referring to animals, plant/trees and no specific victim specify the child's underlying intention to conduct the action, whereas no justifications were offered for the other four types of behaviors. Considering that the reasons behind an action usually influence how the person judges such an action (Kortenkamp & Moore, 2009), children's moral judgments might have been influenced by the justifications provided. The reasons provided in our study imply that the child meant no harm to the environment. Future studies should evaluate whether our findings are replicated when no justification to the child's action is given or when the justification offered implies an intention to harm the environment.

4.1. Conclusion

There is a growing recognition of the relevance that different aspects of morality, such as moral identity (Jia, Soucie, Alisat, Curtin, & Pratt, 2017), moral emotions (Krettenauer, 2017) and moral foundations (Vainio & Mäkiniemi, 2016) have for the understanding of people's environmental actions. Given that children will be the ones to grapple with environmental issues in the future, the study of children's environmental moral development is becoming increasingly important. Children attribute moral standing to nature, and experiences of nature are linked to a higher sense of environmental morality among children. However, some natural elements are perceived as more worthy of moral concern than others. The study of the factors and processes leading children to acquire a sense of morality about the environment and the possible links between environmental morality and pro-environmental behaviors are certainly fruitful lines of research.

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Appendix A

Moral transgressions

1. Grabs a euro from a classmate's desk
2. Pushes a classmate out of the way so as to be first in line
3. Makes fun of another child because of his/her appearance

Social-conventional transgressions

1. Eats salad with his/her fingers
2. Speaks with his/her mouth full of food
3. Answers a teacher's question in class when it is not his/her turn

Non-harmful personal choices

1. Eats lunch with one group of friends rather than another
2. Reads during recess instead of playing football
3. Eats a ham and cheese sandwich instead of a tuna sandwich

Environmentally harmful actions without a specific victim

1. Fails to recycle
2. Throws a candy wrapper on the floor as s/he cannot find a bin
3. Does not turn the tap off while brushing his/her teeth.

Actions that harm animals

1. Catches a butterfly to check how beautiful it is.
2. Throws pebbles at a squirrel on a branch to make it come down
3. Pokes a birds'nest to check what is inside

Actions that harm plants/trees

1. Takes flowers from the park to make a bouquet for mum
2. Takes leaves from a tree to make a collage for school
3. Sees a half-broken tree branch and pulls it until it is broken

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Fig 1. Example of a story card depicting a harmful action towards animals. Left drawing used for males and right drawing for females. Caption: “Mario/María is in the park and sees a squirrel climbing the trunk of a tree. Mario/María throws pebbles at it so that it comes down”

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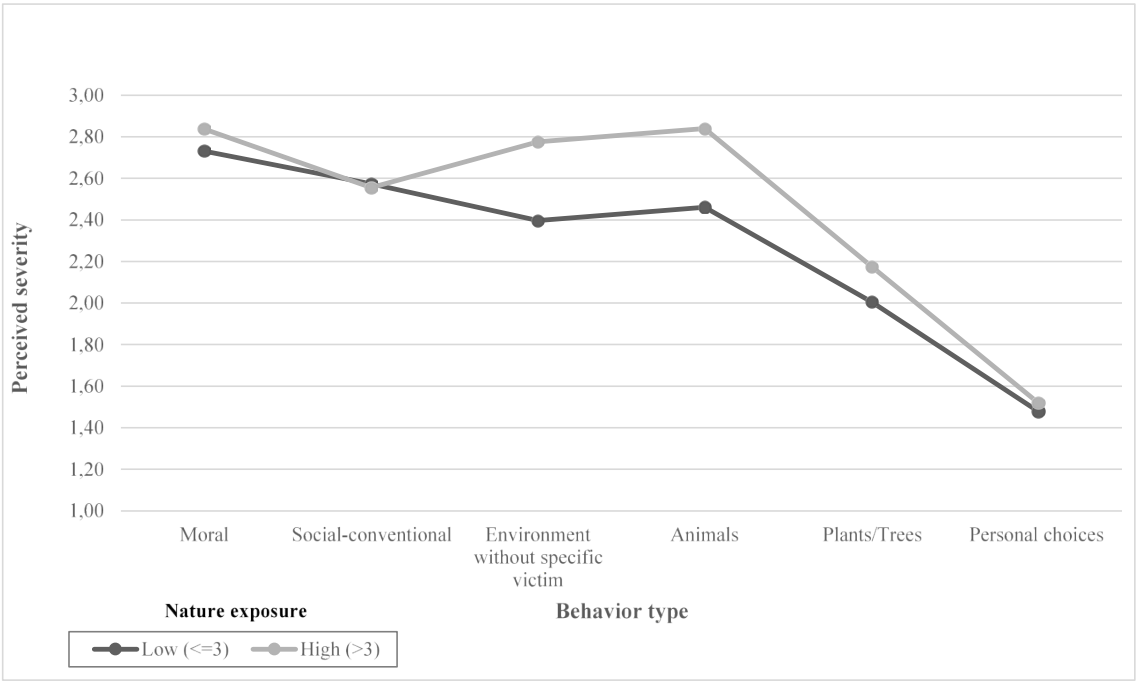

Fig 2. Behavior type × Nature exposure two-way interaction.

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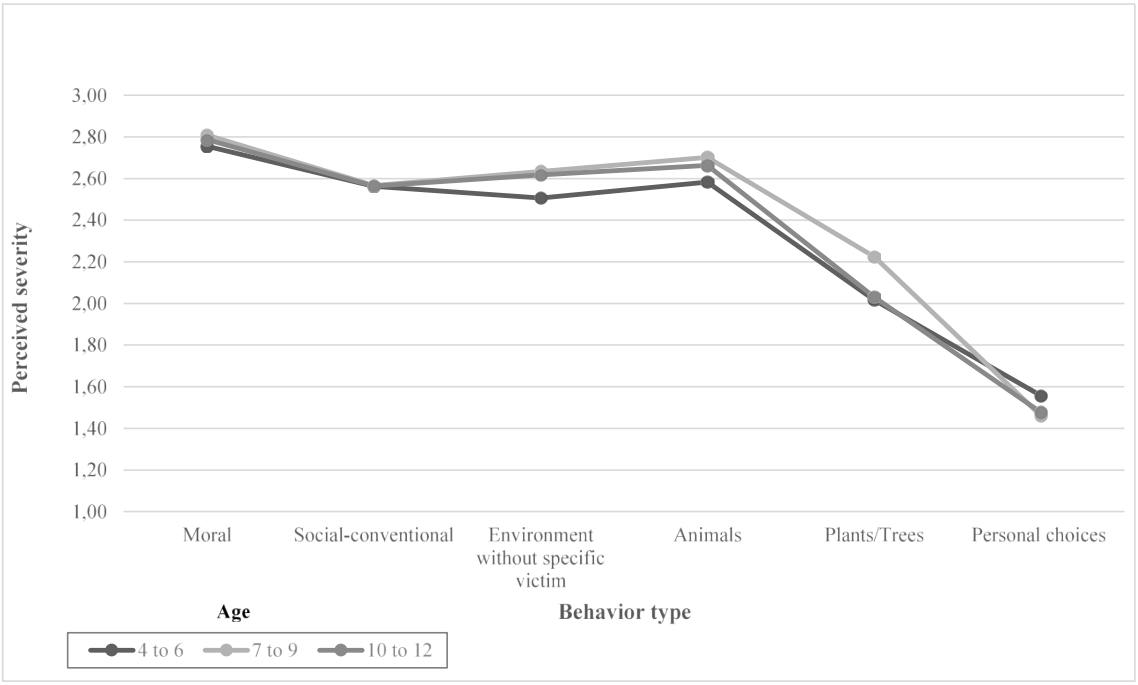

Fig 3. Behavior type × Age two-way interaction.

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Highlights

- Children's judgments of environmental harm vary according to the target victim
- Higher nature exposure is associated with judging environmental harm more harshly
- Harmful actions to plants/trees are judged less severely than hurting animals
- There are age differences in how children evaluate environmentally-harmful actions

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