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Procedia - Social and Behavioral Sciences 38 (2012) 253 – 263

Procedia
Social and Behavioral Sciences

AicE-Bs 2010 Kuching

Asia Pacific International Conference on Environment-Behaviour Studies, Grand
Margherita Hotel, Kuching, Sarawak, Malaysia, 7-9 December 2010

Nature as a Moderator of Stress in Urban Children

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Abstract

The study shows empirical evidence of the moderator effect that school and home nearby nature has on children. A total of 172 children were interviewed and data about their stress level, the amount of nature they perceive around them and frequency of exposure to adversity were collected. The nearby nature at home and in the school for each of the children was measured using a designed scale. The results suggest that nature bolsters children's resilience so that those children who have more contact with nature cope better with adversity than those who do not have daily access to nature.

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Keywords: Nature; children; moderator effect; stress

1. Antecedents

Nowadays, people spend less time in contact with nature than they did a few decades ago and this change in our lifestyle is negatively affecting our health as well as the natural world. This disconnection from nature and its negative consequences have been gathered by Louv (2005) in the term "Nature Deficit Disorder" and, even though it is not a recognized illness, empirical evidence supports this idea. Following

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this line of research, the present investigation intends to study whether nearby nature, such as nature in the school area as well as in the home area, would have any benefits on children's psychological health.

In regards to children, several studies have proved that the disconnection from the natural world is negatively affecting their physical (Ordemir & Yilmaz, 2008) and mental health (Taylor, Kuo & Sullivan, 2002; Wells, 2000) and, at the same time, is reducing children's affinity towards the natural world (Collado & Corraliza, 2011; Wells & Lekies, 2006). Part of these negative effects is produced by the lack of opportunities for psychological restoration that is usually supported by natural environments. It is well known that the natural world is the most suitable environment to recover from a task that requires attention, in other words, the natural environment is the best place to get our attention capacity back (Kaplan & Kaplan, 1989) and, therefore, to achieve an effective psychological functioning. Some studies about the restorative effects of nature in children show that spending time in nature is good for children's cognitive functioning (Well, 2000), nature helps children to cope with their problems, to think clearly and to feel free and relaxed (Korpela, Kytta & Hartig, 2002), it decreases the symptoms of ADHD (Attention Deficit Hyperactivity Disorder) in children who suffer from this illness (Taylor & Kuo, 2009) and it increases the self-discipline of girls whose houses have views to natural elements (Taylor, Kuo & Sullivan, 2002), among others.

In order to achieve a better understanding of the positive effects that contact with nature has on children, the nature buffering hypothesis argues that nature buffers the negative effects produced by stressful situations to which children are exposed. In other words, it is not a direct effect of nature on children, like the ones described when talking about the restorative effects of nature, but a mediator effect in which nature acts as an intermediate between two variables, in this case between the adverse situations to which children are exposed and the stress level that they suffer from that exposure (the negative effect).

The most relevant study done about the nature buffering hypothesis was carried out by Wells and Evans (2003). The authors' sample was formed by children from rural areas of the State of New York. Wells and Evans (2003) suggest that houses' nearby nature is an additional tool to deal with stressful events so that the stress level suffered by the children who live in a more natural environment should be lower than the one showed by children whose contact with the natural world is less frequent.

Their results confirmed that children who lived in more natural areas coped better with (and were less vulnerable to) adversity than those who did not have access to natural environments. Moreover, children who were more vulnerable - those who suffered stressful events more frequently - were the ones who benefited the most.

The aim of the present study is to evaluate whether the nearby nature existing in places where children spend their time (residential and school areas) moderates the effects produced by the stressful events children are exposed to. It was decided to take into account the nature existing in school areas as children spend many hours in the school environment, and it is compulsory for them to be there. Moreover, even if there are only a few studies evaluating the influence that nature existing in the school environment has on children's wellbeing, the evidence shows that when playgrounds are more natural, children are healthier (Ozdemir & Yilmaz, 2008), they play more and their activities are more diverse (Lindholm, 1995).

In order to study the nature buffering hypothesis, this research, as the one done by Wells and Evans (2003), is based on the Moderator Model of Baron and Kenny (1986). These authors claim that the moderator is a "qualitative (e.g., sex, race, class) or quantitative (e. g., level of reward) variable that affects the direction and/or the strength of the relation between an independent or predictor variable and a dependent or criterion variable". In the present study, the dependent variable or the outset is the children's stress level and the independent variable is the frequency of stressful events suffered by children, measured in an objective way.

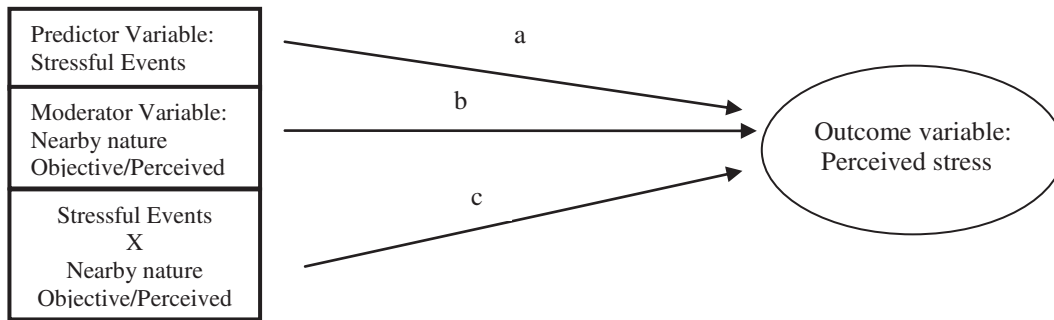


Fig. 1. Moderator model. Adapted from Baron & Kenny (1986, 1174)

The moderator hypothesis (Fig. 1) is supported if the interaction (Path c) is significant (Baron & Kenny, 1986). There can also be significant effects for the predictor and the moderator (paths a and b), but they do not indicate a moderator effect.

The present research studies if there are any direct effects of nature – whether path a is significant- or direct effects of the stressful events – whether path b is significant – on the outset variable (perceived stress or stress level). Moreover, the possible moderator effect of nearby nature is studied, in other words, whether path c is significant.

The objectives of the investigation are mainly three. First, to evaluate the positive effects that nearby nature has on children. Second, to get a better understanding of the nature buffering hypothesis. Third, to include for the first time in the study of the nature buffering hypothesis, the nature in the school area as well as the nature perceived by the children.

2. Methodology

2.1. Participants

The sample was formed by 172 children (53% boys and 47% girls) aged 10 to 13 ($M = 11.3$; $SD = .673$).

2.2. Instruments

- **Nearby Nature Observational Scale (Collado, 2009):** This instrument registers the amount of nature children have access to. It is divided into two subscales that measure the amount of nature in the school area and the nature in the home area. The first subscale includes variables such as the amount of natural elements in the school playground or how natural the views are, among others. The subscale of the home area includes variables such as the views from the house windows or the walking distance to the nearest park. Each of the variables of these subscales was given score and with the final score the home areas and the school areas are divided in four groups: non natural, mixed, natural and very natural. The nearby nature global score is calculated combining the nearby nature in the home area and the nearby nature in the residential area. By doing so, a single score of the nearby nature the child has access to is obtained.
- **Perceived Stress Scale (Martorell, Sánchez, Miranda & Escrivá, 1990):** This instrument is formed by 50 items: 25 items are used to measure the stress level of the children taking into consideration the

stressful events registered in the home area and 25 items that register the stress level associated to stressful events in the school area. Participants are asked to indicate whether they feel nervous or tense when they are in the situations described in the scale, and the frequency of them. For example, in the situation “Before taking an exam” the child can answer: 1 (never or almost never), 2 (sometimes), 3 (most of the time) or 4 (always or almost always). The final score indicates the stress level at home, in the school and the global score is the average between the 2 subscales.

- **Perceived Nature Questionnaire:** It measures the perception that the child has about the nearby nature in his or her surroundings, i.e.: “I think that my house is in a natural surrounding” or “I consider that the playground in my school is natural”. The child can answer: 1 (not at all), 2 (yes, there is a bit of nature), 3 (yes, there is some nature) or 4 (There is a lot of nature). The nature that people perceive has been used in previous studies as an indicator of the amount of nature existing in a place (Hur, Nasar & Chun, 2010).
- **Stressful Events Questionnaire:** It is based in the Stressful Events Repertoire of Lewis (Lewis, Seigel & Lewis, 1984). Among the 20 stressful situations described by the authors, 5 have been selected. These five are the ones that have been described as being the main sources of psychological distress (not spending enough time with the parents, parents argue when the child is present, not having enough time to do their homework, having nothing to do and not having enough money to spend on what they want). Participants were asked about the frequency of occurrence of each of these events in the last year (1, it never happened to me to 5, it happened to me all the time). It needs to be noticed that this instrument is not a scale and that it is intended to collect data about the frequency of occurrence of each of the events. As Lewis et al. (1984) recommend, in this study each of the stressful events have been used individually. It could be considered that if the five stressful events occurred to a child at the same time he or she would be very stressed, but that does not mean that a frequent exposure to just one of them would produce less stress.

2.3. Procedure

Data were collected collectively in four primary schools chosen according to the amount of nature existing in the school and in its surroundings: very natural (San Julián School), natural (Fuente del Oro School), medium amount of nature – mixed school (Santa Ana School) and non natural (Santa María de la Expectación School). To check the amount of nearby nature in each of the school the Nearby Nature Observational Scale was used.

All the self reported instruments were filled in by the children with the present of one of the researchers. The average time for the data collection was 35 minutes. Children were asked for their addresses and all the houses were visited in order to register the amount of nature near the houses.

3. Results and Discussion

3.1. Perceived nature, perceived stress and frequency of stressful events. Descriptive data

The perceived nature in the four schools is statistically different ($F_{(125, 730)} = 3.17, p < .001$) as well as the perceived stress level ($F_{(3, 171)} = 4.19, p < .01$) (see Tables 1 and 2).

Table 1. Means and standard deviations for the nature perceived in each school and the stress level showed in each school

	San Julián Very natural		Fuente del Oro Natural		Santa Ana Mixed		Santa María de la Expectación Non Natural	
	M	SD	M	SD	M	SD	M	SD
Nature Perceived in the schools	4	0.00	3.22	.66	2.88	.73	1.75	.60
Strees level in the school	2.31	.49	2.58	.63	2.34	.52	2.66	.54

Table 2. Student’s t-test using perceived nature in the school and stress level in the school as dependent variables.

	Very natural-non natural	Very natural-mixed	Natural-non natural	Natural-mixed	Mixed-non natural
t student for perceived nature	22.09**	-9.15**	5.36**	-14.56**	-4.63**
t student for stress level	-2.84**	Non significant differences	-2.13*	Non significant differences	-1.99*

* p < .05; ** p < .01

The objective stress is linked to the frequency of exposure of the child to the stressful events. In this way, the amount of times that children are exposed to the stressful event *not spending enough time with the parents*, changes significantly among the four schools, ($F_{(3,170)} = 6.12$), $p < .01$). Children from the very natural school are the ones who suffer *not spending time with their parents* more frequently, ($M = 2.94$; $SD = 1.32$) and children from the non natural school are the ones who spend more time with their parents, ($M = 1.91$; $SD = 1.16$). See Fig. 3.

There are also significant differences in the frequency of the stressful event *not having enough money to spend on what they want* ($F_{(3,170)} = 3.46$, $p < .05$). However, the differences are not significant for any of the three other stressful events registered: *not having enough time to do their homework*, *having nothing to do* and *parents argue when the child is present*.

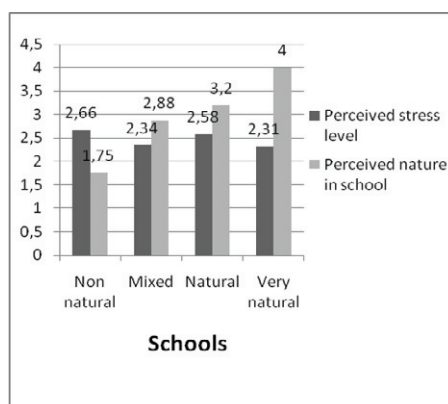


Fig. 2. Perceived stress level and perceived nature in the school among the four schools

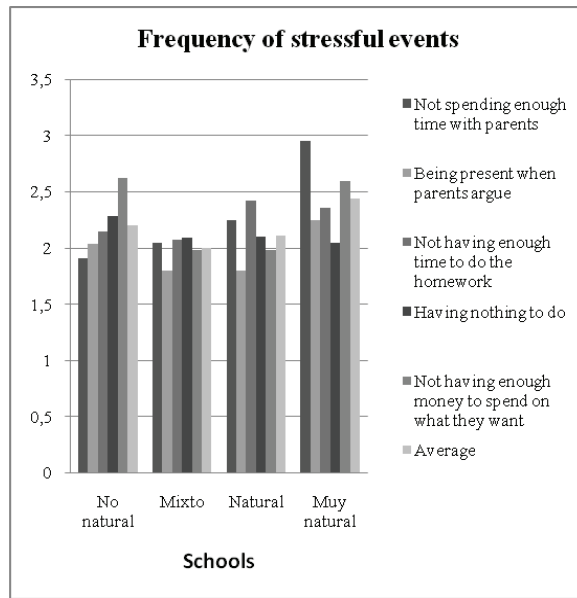


Fig. 3. Frequency of stressful events among the four schools.

3.2. Relation of the frequency of stressful events and nearby nature with the perceived stress level

Variance analysis were carried out in order to check whether there is a relation between the frequency of stressful events and the perceived stress level, taking the stress level as the dependent variable and the frequency of each of the stressful events as the factor. Results show that there are significant differences in children’s stress level according to the amount of time they are exposed to their parents arguments ($F_{(4,170)} = 7.35; p < .01$). In the same way, there are also significant differences in children’s stress level according to the frequency of the stressful event *not having enough time to do their homework*, ($F_{(4,170)} = 3.45, p < .05$) and also depending on the frequency of exposure to the stressful event *not having enough money to spend on what they want*, ($F_{(4,170)} = 2.45, p < .05$). It can be concluded that the stressful events have a direct effect on the perceived stress level.

At the same time, perceived nearby nature also affect children’s stress level directly. The Pearson correlations in Table 3 show that there is a significant negative correlation between the perceived nearby nature (at school and daily) and the nearby nature measured objectively (in the home area and global) and the stress level, so that the higher the amount of nature the lower the stress level. These results corroborate the idea that nearby nature has a direct positive effect on children’s wellbeing. Moreover, the variance analysis show that children’s stress level varies according to the amount of nature children perceive in the school ($F_{(3,170)} = 4.07, p < .01$). The amount of nature that a school has and the nature children perceive in the school influence students stress level.

Table 3. Correlation between nearby nature and perceived stress (average and in the school)

	Perceived nature in the school	Perceived nature at home	Daily perceived nature	Objective nature in the school	Objective nature at home	Daily nature
Average total stress level	-.302**	.070	-.155**	-.087	-.087	-.138*
Stress level in the school	-.196**	-.095	-.009	-.025	-.192**	-.257

* $p < .05$; ** $p < .01$

3.3. Stress level according to nearby nature and the frequency of stressful events

Nature buffering hypothesis suggests that nearby nature moderates the negative effect (perceived stress) produced by the stressful events so that children who have more nature around them suffer less stress than those who do not have nature in the surroundings, even when both groups of children are exposed to the same frequency of stressful events. One example of how the stress level diminishes in the presence of nature can be seen in Figure 4. There are four groups of children: the first two groups are children who suffer a low frequency of the stressful event *not spending enough time with the parents* and groups 3 and 4 are children who suffer a high frequency of this stressful event. As shown in Figure 4, there are significant differences in the perceived stress level in the four groups, $F_{(3,123)} = 6.37$, $p < .01$. Moreover, the stress level is also different among those children who are exposed to the same frequency of stressful event. As it can be seen in Figure 4, the stress level of children from groups 1 and 2 is different, even though they are exposed to *not spending time with their parents* with the same frequency. These differences are significant ($t = -3.16$, $p < .05$) meaning that children in group 2 show a higher stress level ($M = 2.85$; $SD = .49$) than children in group 1 ($M = 2.53$; $SD = .57$). Moreover, the nature perceived in the school is different in these two groups, being higher in group 1 ($M = 3.76$; $SD = .50$) than in group 2 ($M = 1.83$; $SD = .38$). This difference is statistically significant ($t = 14.00$, $p < .01$). In the same way, it has been proven that there are significant differences in the perceived stress level of children in group 3 ($M = 2.29$; $SD = .50$) and 4 ($M = 2.55$; $SD = .60$), being $t = -2.46$, $p < .05$. The perceived nearby nature in the school area is also different in these two groups ($t = 15.61$, $p < .01$), being higher the perceived nature in group 3 ($M = 3.53$; $SD = .55$) than in group 4 ($M = 1.70$; $SD = .46$; See Figure 4). The combination of the other stressful events and the nearby nature brought us to similar results.

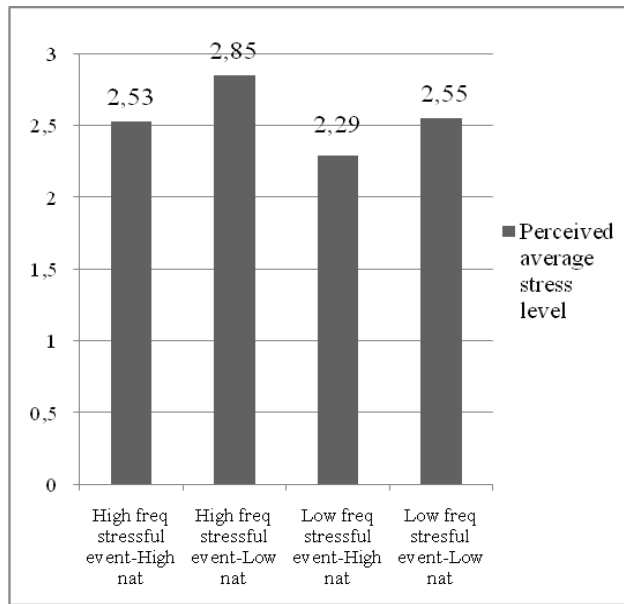


Fig. 4. Perceived stress according to the interaction between *not spending enough time with the parents* and perceived nature in the school.

It can be concluded that children’s stress level diminishes as the amount of nearby nature increases. However, even though a moderator effect can be foreseen, it cannot be assured that there is a moderator effect. In order to study the possible moderator effect, a new variable called *Interaction between nature and the stressful event* has been calculated, where each stressful event is each of the stressful events registered and where nature is each kind of measure of nature taken into consideration. For this study, the interaction variables that more significantly affect children’s stress level have been chosen.

3.4. The moderator effect of nearby nature

Using hierarchical regression analyses, the possible moderator effect of the different types of nature measured has been addressed. Four interaction effects were found significant. First of all, the stress level produced by the stressful events *having nothing to do* was moderated by the nature children perceive in their school, when the stress level at home and the stress level in the school were taken as dependent variables. As it can be seen in Table 4, the effect of the perceived nature in the school is significant, $F_{(1,170)} = 49.51; p < .01$. This means that children who perceive more nature in their school area show a lower stress level than those whose school is non natural. The next line points out that the stress level is also influenced by *having nothing to do* and, therefore, those children how frequently experience having nothing to do are the ones who are more stressed, $F_{(1,169)} = 11.12; p < .01$. Finally, the last line represents the interaction between the perceived nearby nature in the school area and the stressful event. The interaction effect is also statistically significant meaning that nearby nature in the school area moderates the stress produced by having nothing to do, $F_{(1,168)} = 8.73, p < .001$. As it can be seen in Figure 5, there is an interaction effect represented by the union of both lines of the graph. According to Figure 5, when the frequency of the stressful event is low, the stress level shown by the children is low, being considerable low when the school playground is perceived as natural by the children. However, when the

frequency of the stressful event is high the stress level is also high, even with the presence of nearby nature.

Table 4. Regression of children’s stress level in the school onto perceived nature in the school, having nothing to do and interaction of perceived nature in the school x having nothing to do.

Model	Predictor	Total R ²	Δ R ²	F(Δ R ²)	df	b	SEb	β	p
Main effect	Perceived nature in the school	.226	.226	49.514**	1,170	.238	.034	.475	.000
Main effect	Having nothing to do	.273	.048	11.125**	1,169	-.110	.033	-.219	.001
Interaction	Perceived nature in the school x having nothing to do	.309	.0036	8.737**	1,178	.096	.033	.745	.004

* p < .05; ** p < .01

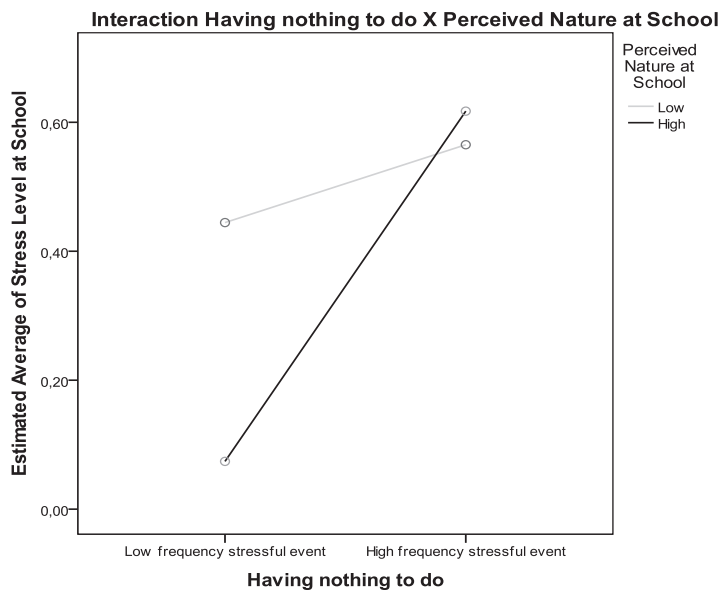


Fig. 5. Interaction effect between the stressful event *having nothing to do* and the perceived nature in the school

Similar results we obtained for the following interactions: 1) Interaction between perceived nature in the school and the stressful event *having nothing to do*, taking stress at home as the dependent variable. 2) Interaction between perceived nature in the home area and the stressful event *parents arguing while the child is present*, taking the stress at home as the dependent variable, and finally 3) Interaction between perceived nature in the school area and the stressful event *not spending enough time with their parents*, taking the global stress level as the dependent variable.

4. Conclusions

Nearby nature moderates the negative effects produced by stressful events. In this way, those children who have more access to natural areas are able to cope better with stress and therefore their stress level is lower than it would be expected if nature was not acting as a protective factor. The impact of stressful events on children is weaker when the amount of nearby nature is higher.

In contrast to previous studies (Wells and Evans, 2003), the present investigation has taken into consideration not only the nearby nature measured in an objective way (with a scale) but also the moderator effect of the nature that children perceive. The data collected in this study show that the perceived nature in the four schools is different and that the stress level of the children in each school also differs from one to another. It can be concluded that children in the very natural school are able to cope better with stress than children who attend classes in the non natural school, and this reinforces the importance that the amount of nature that children have in their school and its surroundings.

To sum up, four interaction effects were found significant meaning that a moderator effect of nearby nature does exist. The low accessibility to the natural world, more frequent in today's society, negatively affects children's wellbeing and reduces their capacity to cope with adversity. With this idea in mind, it can be concluded that including natural elements in home and school areas is important to children. Children's health and wellbeing also depend on the way that these environments encourage children's contact with nature.

Acknowledgement

This research has been carried out supported by the Spanish Ministry of Sciences and Innovation (PSI 2009-13422).

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