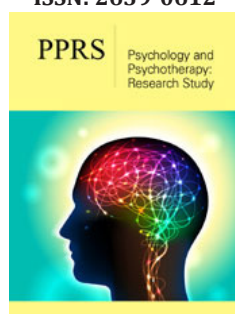


Coastal Environments as Healing Landscapes: The Public Health Benefits of Living by The Coast

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Abstract

This study investigated the impact of coastal residence in childhood and in adulthood on wellbeing. A sample of 651 university students completed a questionnaire survey of participants' perception of coastal areas, their relatedness to nature generally, their emotional experiences of being by the sea and their mental wellbeing. The findings showed that all positive dimensions of coastal perception were correlated with wellbeing and supports the hypothesis that residential proximity to the coast has a more positive effect on wellbeing compared to inland residence. The outcomes suggested that those residing in communities on the coast as children experienced a higher level of nature relatedness and higher positive dimensions of coastal perception. The project illustrates the need for these natural areas be recognised as significant public health resources and that this must be reflected as part of environmental policy.

Keywords: Coastal living; Wellbeing; Nature; Relatedness

Introduction

Rapid economic development and large scale industrial and agricultural advancement since the beginning of the twentieth century have disconnected the very delicate link between humans and nature [1]. Given the evidence of a positive link between nature and human health this may be an important consideration for the future of health care [2,3]. There has been a resurgence of interest in the therapeutic benefits of blue spaces (places near water) across a spectrum of disciplines, including human geography and environmental psychology [4]. There is a growing interest in the relationship between humans and coastal areas in recent years [5-10]. Systematic research into such benefits has emphasised the role of coastal environments as important public health resources [11,12]. Early investigations of this topic in English and Irish populations have found that those living in coastal communities' report better general health and wellbeing in comparison to their counterparts inland [13-15].

Hooyberg et al. [16] outlined four mechanisms that may explain how living near the coast produces positive health outcomes. Firstly, it has been suggested that the characteristics of coastal environments redirect attention from the demands and routines of daily life, which can aid the restoration of depleted emotional and cognitive resources, aid stress reduction and support positive mental health [17-20]. Even views of an aquatic landscape from the home can be beneficial to mental health [21-24].

Secondly, there is evidence to suggest that coastal blue spaces support physical wellbeing as it promotes exercise and other recreational activities [17,25]. An individual is more likely to achieve the recommended levels of physical activity when natural environments are more accessible [26,27]. It has been suggested that living closer to the coast can be a protective measure against childhood obesity Wood et al. [28] and may slow the decline of muscular strength in the elderly [29].

Thirdly, blue spaces foster social cohesion and a sense of belonging through social interaction [3,30]. When compared to other semi-natural environments, children enjoyed family visits to the beach the most [31]. Much of the literature surrounding the therapeutic

benefits of blue spaces has been related to the biophilia hypothesis, defined as an “innate tendency to focus on life and lifelike forms, and in some instances, to affiliate with them emotionally” [32]. The biophilia hypothesis implies that humans carry an affection for animals, plants, and all other living organisms, as well as a preference for natural environments from our evolutionary past. Evidence of the biophilia hypothesis can be found in aspects of life that modern humans may take for granted. This includes zoos, the popularity of outdoor activities for recreation, the relationships with both wild and domesticated animals and the general fondness for natural scenery, often depicted in art and literature as a symbol of our internal lives [3,32-34].

It is also necessary to point out that negative responses to natural environments are also considered to be an innate biological reaction, known as biophobia. Biophobia has been described as the negative ‘biological preparedness’ response to threatening natural stimuli such as heights and snakes [35,36]. Large, imposing natural environments may also engender feelings of foreboding and threat as individuals may feel they are being confronted “with their own finitude” [37].

Indeed, beyond even these dichotomous categories of positive and negative, it is possible that natural environments may instil an ambivalent response [38]. Many classic nature writers have described their journeys through the wilderness as eliciting great fear but also heightened positive emotions [39]. Recent empirical evidence has found that different types of environmental encounters can elicit ambivalent emotional states that can combine the emotions of fear, awe, respect, and happiness Van Den Berg & Ter Heijne et al. [40] Biophilia is an extension of our psychological need for relatedness, propounding that connections to the natural world can assuage the need for belonging. It has been suggested that the act of connecting with the natural world satisfies relatedness needs and some experimental research has found that when individuals feel that their sense of belonging has been threatened, they turn to nature [41].

The aim of the present study was to investigate experience of nature, sense of relationship with nature, emotional response to nature and mental wellbeing and to explore if this differed for participants who had lived in a coastal area as a child or had more recently moved to live in a coastal area.

Methods

Participants

The study sample consisted of 651 university students in Northern Ireland. The sample included 494 females (76%), 137 males (21%) and 20 participants identified themselves as other (2%). The sample was contacted via an electronic mailing list across 4 campuses of a university in Northern Ireland. Their mean age was 23.8 years (SD = 5.65; range 18-46).

Materials

All participants received a self-administered questionnaire, distributed via the online surveying platform Qualtrics that

assessed the variables of interest via the measures listed below. Childhood and current dwelling location: Following questions relating to age, gender and year of study, participants were asked to indicate the location in which they grew up, “Which of the following best describes the area where you spent most of your childhood?” with five possible responses:

Village, or rural area on the coast (n= 243),

Village, or rural area inland (n= 298),

Large Town or City (n=110).

Participants were also asked to indicate the type of location in which they currently live: “Which of the following best describes the area where you now live?” with the same five responses:

Village, or rural area on the coast (n= 273),

Village, or rural area inland (n= 262),

Large Town or City (n=116).

Psychological Effects Inventory. This 28-item measure was used by Peng et al. [24] to study the effects of ocean views in Japan. The 28 question items were classified into five subscales: the passage of time (five items), magnitude and awe (six items), peace of mind (seven items), charm and longing (five items) and threat (five items). Participants were asked to reflect upon a time when they had visited the coast and asked to respond to each item on a Likert-type scale in which, 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree and 5 = Strongly Agree. Each of these subscales were scored using the mean of the item responses.

Nature Relatedness Scale [42]. This scale assesses individual differences in the cognitions, affect, and experiences people have with nature and is a measure of biophilia. The dimensions of Nature Relatedness (NR) were broken down into three factors: NR-Self, NR-Perspective and NR Experience. The first factor, NR-Self, which seeks to understand an individual’s personal connection to nature and includes items “My relationship to nature is an important part of who I am” and “I think a lot about the suffering of animals”. NR-Perspective identifies an external, nature-related worldview where questions reflect a person’s sense of responsibility in terms of individual human behaviours and the consequences those behaviours may have on the natural world, for example, “Conservation is unnecessary because nature is strong enough to recover from any human impact”. NR-Experience, measures desire to be out in nature and level of comfort in those natural settings with statements such as “I enjoy being in the outdoors, even in unpleasant weather”. This aspect of nature relatedness is typically found in people that pursue wild natural environments and maintain a fascination and awareness of the natural world.

Participants were asked to rate 21 statements on how well each item describes them: “Please indicate whether you agree or disagree with the following statements about your connection with nature or the natural world”. Participants were asked to use a five-point Likert-type scale as used previously. The scale identifies two distinct groups of nature enthusiasts and those not engaged in

nature activities and correlates with environmental attitudes and self-reported behaviour [42]. Experiential states [43], Participants were asked to imagine themselves beside the sea and rate how they would feel in terms of 14 experiential states (relaxed, a sense of awe, a sense of freedom, refreshed, connectedness, isolated, anxious, alive, contemplative, talkative, sense of fun, empathy, loneliness, and serenity). Responses were recorded on a 5-point scale (Strongly disagree [1] to Strongly Agree [5]).

Short Warwick-Edinburgh Mental Wellbeing Scale (SWEMWBS) This measure, originally developed by Tennant et al., (2007), is a seven-item scale of a population's mental well-being that examines subjective wellbeing and psychological functioning. The SWEMWBS focuses solely on positive aspects of mental health, in which all items are phrased positively and covers most aspects of mental wellbeing, including hedonic and eudemonic perspectives. It is scored by summing responses to each item answered on a 1 to 5 Likert scale.

Procedure

The five-part questionnaire was presented in electronic format and was administered to students via the online survey platform Qualtrics and was completely voluntary and anonymous, i.e., no personal data was collected except, age, gender, and year of study. Furthermore, no compensation was provided. Informed consent was obtained at the beginning of study, before participants had access to the questionnaire. In addition, participants were made aware that they could withdraw at any time by choosing not to submit the questionnaire. The study was conducted in accordance with the Psychologists Ethical Principles and Code of Conduct of

the BPS and was approved by the ethics committee for the School of Psychology in Ulster University.

Result

The aim of this study was to explore the relationship of living in a coastal area, as opposed to living inland, or in a city, either as a child or currently. Participants were assessed on their perception of coastal areas, their relatedness to nature generally, their emotional experiences of being by the sea, and their mental wellbeing. As participants were asked where they lived as a child and where they currently live in terms of by the coast, inland, or in a city, the first analysis looked at the frequency distribution across these categories as shown in Table 1 below.

Table 1: Distribution of area lived as a child by area currently lived in.

		Current Dwelling			Total
		Coast	Inland	City	
Childhood dwelling	Coast	189	39	15	243
	Inland	66	201	31	298
	City	18	22	70	110
Total		273	262	116	651

The distribution would suggest that there hasn't been a significant level of mobility in that of those who lived at the coast as a child the vast majority continue to live there. Similarly, for those who lived inland as children. The next step in analysis was to use one-way Analysis of Variance (Anova) to explore differences between coastal, inland, and city living both as a child and currently. The descriptive statistics for this are shown in Table 2.

Table 2: Means and standard deviations by area lived in as a child and currently.

	Childhood Dwelling						Current Dwelling					
	Coastal (N=273)		Inland (N=262)		City (N=116)		Coastal (N=155)		Inland (N=183)		City (N=62)	
	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd
Passage of Time	3.57	1.07	2.79	1.1	2.79	1.1	3.51	0.97	2.83	1.14	2.63	1.23
Magnitude and Awe	3.76	1.32	2.85	1.43	2.79	1.13	3.71	1.29	2.89	1.43	2.59	1.26
Peace of mind	3.79	1.35	2.75	1.62	2.76	1.36	3.79	1.38	2.75	1.58	2.47	1.36
Charm and Longing	3.45	1.05	2.89	0.99	2.82	0.64	3.42	1.05	2.9	0.97	2.71	0.71
Threat	2.23	1.33	3.07	1.49	3.26	1.39	2.34	1.4	3.02	1.52	3.33	1.24
Nature Relatedness Self	3.49	1.05	2.81	1.1	2.77	0.99	3.39	1.08	2.85	1.06	2.68	1.1
Nature Relatedness Perspective	3.66	1.17	2.81	1.22	2.71	1.29	3.54	1.25	2.82	1.25	2.73	1.17
Nature Relatedness Experience	3.33	1.02	2.76	0.96	2.7	0.85	3.22	0.88	2.82	1.09	2.69	0.95
Eudemonia	3.75	1.23	2.7	1.45	2.76	1.31	3.59	1.37	2.8	1.37	2.65	1.39
Apprehension	2.78	0.73	3.3	0.84	3.31	0.95	2.92	0.69	3.2	0.93	3.35	0.94
Wellbeing	24.89	3.59	21.42	4.45	20.97	4.83	25.09	3.53	21.08	4.45	20.39	4.28

There were main effects for the area lived in as a child on Passage of time ($f(2,648)=38.60, p<.001$), Magnitude and Awe ($f(2,648)=65.74, p<.001$), Peace of Mind ($f(2,648)=83.40, p<.001$), Charm and Longing ($f(2,648)=25.09, p<.001$), Threat ($f(2,648)=62.22, p<.001$), Nature Relatedness Self ($f(2,648)=35.92, p<.001$), Nature Relatedness Perspective ($f(2,648)=59.27, p<.001$), Nature Relatedness Experience ($f(2,648)=26.50, p<.001$), Eudemonia ($f(2,648)=81.27, p<.001$), Apprehension

($f(2,648)=20.70, p<.001$), and Wellbeing ($f(2,648)=55.75, p<.001$). Bonferroni correction shows that in all cases the significant effect was between coastal living and each of inland and city living. The difference between inland and city living did not reach significance on any variable. Those who lived at the coast as a child scored higher on all variables except threat and apprehension on which they scored lower.

There were main effects for the area lived in currently on Passage of time ($f(2,648)=45.34$, $p<.001$) Magnitude and Awe ($f(2,648)=38.75$, $p<.001$), Peace of Mind ($f(2,648)=104.53$, $p<.001$), Charm and Longing ($f(2,648)=27.93$, $p<.001$), Threat ($f(2,648)=51.26$, $p<.001$), Nature Relatedness Self ($f(2,648)=28.53$, $p<.001$), Nature Relatedness Perspective ($f(2,648)=44.08$, $p<.001$), Nature Relatedness Experience ($f(2,648)=15.95$, $p<.001$), Eudemonia ($f(2,648)=56.40$, $p<.001$), Apprehension ($f(2,648)=13.49$, $p<.001$), and Wellbeing ($f(2,648)=87.08$, $p<.001$). Again, Bonferroni correction shows that in all cases the significant

effect was between coastal living and each of inland and city living. The difference between inland and city living did not reach significance on any variable. Those who currently live at the coast scored higher on all variables except threat and apprehension on which they scored lower. However, given that the majority who lived at the coast as a child continued to do so currently probably means that we are getting a measure of the impact of current experience rather than that as a child. The next analysis used Pearson Correlations to explore significant relations between the different measures and wellbeing (Table 3).

Table 3: Descriptive statistics (Means, Standard deviations, and Pearson Correlations)

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

	Mean (Sd)	1	2	3	4	5	6	7	8	9	10	11
1 Age	23.76 (5.66)											
2 Passage of Time	3.37 (0.70)	0.02										
3 Magnitude and Awe	3.83 (1.08)	0.14	.66**									
4 Peace of mind	3.86 (1.27)	0.05	.71**	.89**								
5 Charm and longing	3.37 (0.84)	-0.04	.65**	.74**	.67**							
6 Threat	2.51 (1.36)	-0.06	-.31**	-.53**	-.57**	-0.15						
7 Nature Relatedness Self	3.43 (0.69)	0.12	.66**	.82**	.76**	.72**	-.33**					
8 Nature relatedness Perspective	2.68 (0.88)	-0.11	-.31**	-.55**	-.58**	-0.15	.78**	-.35**				
9 Nature Relatedness Experience	3.13 (0.52)	0.05	.24**	0.16	0.06	.36**	.25**	.37**	.23*			
10 Eudemonia	27.96 (7.26)	0.07	.46**	.70**	.71**	.56**	-.48**	.62**	-.49**	0.14		
11 Apprehension	14.89 (4.06)	-0.05	-.42**	-.57**	-.67**	-.37**	.68**	-.43**	.62**	0.11	-.44**	
12 Wellbeing	3.33 (0.77)	-0.05	.38**	.29**	.39**	.33**	-.27**	.34**	-0.17	.31**	.33**	-.38**

The first interest here are the correlations with wellbeing and all positive dimensions of coastal perception (Passage of Time, Magnitude and Awe, Peace of Mind and Charm and Longing) are significantly positively correlated with wellbeing. The other dimension (Threat) was inversely correlated with wellbeing. Nature relatedness (self) and Nature relatedness (experience) also correlate positively with wellbeing. Eudemonia positively correlates with wellbeing and Apprehension is inversely correlated. Looking

at emotional response to being by the sea Eudemonia is positively correlated with Passage of Time, Magnitude and Awe, Peace of Mind and Charm and Longing, and inversely with Threat. It is also positively correlated with Nature relatedness (self) and Nature relatedness (perspective). The reverse pattern of correlations appears for Apprehension. To explore these relationships in more depth a Hierarchical Multiple Regression Analysis (HMRA) was used with wellbeing as the dependent variable. See Table 4.

Table 4: HMRA of predictors of Wellbeing.

	B	Std. Error	β
Step 1: $R^2 = .01$, $F(3,114) = 0.39$, $p = .758$			
Sex	0.101	0.17	0.056
Age	-0.008	0.013	-0.059
Year of study	-0.041	0.063	-0.064
Step 2: $R^2\Delta = .23$, $F(5,109) = 6.61$, $p < .001$			
Sex	0.214	0.157	0.119
Age	-0.002	0.012	-0.014
Year of study	-0.038	0.06	-0.058
Passage of Time	0.227	0.14	0.208
Magnitude and Awe	-0.362	0.157	.509*
Peace of mind	0.249	0.128	.414*
Charm and Longing	0.245	0.137	0.269

Threat	-0.107	0.065	-0.191
Step 3: $R^2\Delta = .13$, $F(3,106) = 7.09$, $p < .001$			
Sex	0.315	0.15	.175*
Age	0.011	0.011	0
Year of study	-0.033	0.057	-0.052
Passage of Time	0.116	0.133	0.106
Magnitude and Awe	-0.53	0.166	.747**
Peace of mind	0.384	0.123	.639**
Charm and Longing	0.12	0.132	0.132
Threat	-0.2	0.074	-.355**
Nature Relatedness Self	0.108	0.174	0.097
Nature Relatedness Perspective	0.045	0.119	0.052
Nature Relatedness Experience	0.585	0.143	.396***
Step 4: $R^2\Delta = .02$, $F(2,104) = 1.30$, $p = .276$			
Sex	0.259	0.156	0.144
Age	-0.002	0.011	-0.015
Year of study	-0.044	0.057	-0.069
Passage of Time	0.138	0.135	0.126
Magnitude and Awe	-0.472	0.169	.664**
Peace of mind	0.297	0.139	.494*
Charm and Longing	0.082	0.135	0.09
Threat	-0.148	0.081	-0.263
Nature Relatedness Self	0.095	0.175	0.086
Nature Relatedness Perspective	0.084	0.122	0.097
Nature Relatedness Experience	0.573	0.145	.388***
Eudemonia	0.004	0.013	0.041
Apprehension	-0.039	0.024	-0.207
Total $R^2 = .31$			
* $p < .05$. ** $p < .01$ *** $p < .001$			

Sex, age, and year of study were entered on the first step but did not account for a significant percentage of the variance in wellbeing. The dimensions of perception of coast were entered on the second step and accounted for 23% of the variance. Magnitude and Awe ($\beta = .664$, $p < .01$) and Peace of Mind ($\beta = .494$, $p < .05$) were the individual significant predictors of wellbeing. Relatedness to Nature dimensions were entered on the next step and accounted for a further 13% of the variance. Nature Relatedness (experience) ($\beta = .388$, $p < .001$) was the significant predictor of wellbeing. This suggests that in this sample having experienced a sense of magnitude and awe, a sense of peace of mind on the coast and having experienced a feeling of relatedness to nature are the main contributors to a sense of wellbeing.

Discussion

The primary goal of this study was to examine the possible effects of living in a coastal community as opposed to inland areas, or cities, both in childhood residence and current residence. The results indicated that all positive dimensions of coastal perception (Passage of Time, Magnitude and Awe, Peace of Mind and Charm and Longing) have significant positive correlations with

wellbeing. The Threat dimension had an inverse correlation with wellbeing. The measures for Nature Relatedness (self) and Nature Relatedness (experience) also exhibited positive correlations with wellbeing. Finally, the measures for Eudemonia indicated a correlation with wellbeing and Apprehension had an inverted correlation. The present findings support previous literature that residential proximity to the coast has an increased positive influence on wellbeing, compared with residents of non-coastal locations [7,18,24]. Thus, this study supports current evidence that living near the sea and having a connection to nature is associated with positive wellbeing, contributing to the nascent literature on this topic.

After adjusting for gender, age, year of study, and present and childhood residential locations, there is a clear increase in individual wellbeing, when living in proximity to the coast in childhood. Participants that lived in coastal locations as children exhibited the greatest levels of magnitude and awe, charm and longing, NR Self and NR Experience. Therefore, the researchers for this study posit that engaging with coastal locations may lead to better wellbeing, as the value of magnitude and awe comes with greater experience of coastal locations. NR Self and NR Experience had a significant

correlation with a sense of wellbeing. This would suggest that the participants who spent their childhood visiting nearby coastal environments and have encountered feelings of nature relatedness, maintain a stronger sense of connection to nature, when compared with participants that moved to the coast in adulthood, or indeed, inland residents.

The findings of this report demonstrate that there are several positive psychological benefits and behaviours that promote wellbeing in coastal regions. The suggestion being that those who live near the coast are more likely to take advantage of these opportunities for increased wellbeing. Living in coastal communities provides several advantages that are more strongly associated with positive outcomes and reductions in negative effects. The data suggests that residing in coastal locations as children can have a positive effect on the individuals' psychological wellbeing. These results can be used to explain the benefits of coastal living, suggesting that exposure to coastal zones may contribute to stress reduction, promote physical activity, and encourage positive social interactions, which are all commonly associated with positive health outcomes [44,45]. Access to coastal environments has also been previously correlated with higher levels of physical activity than those who live inland and have less access to the coast [46,47]. Visits to the beach have been associated with promoting social cohesion with family and encourage a more positive relationship with nature.

However, the outcome of the independent t-test analysis implies that dimensions of the Psychological Effects Inventory were lower for individuals that have more recently relocated to coastal regions. NR has been positively correlated with positive effect in this study and suggests a strong connection with nature could facilitate hedonic wellbeing. The researchers therefore propose that individuals who have commonly experienced nature relatedness as children are more likely to maintain that deep connection to nature as they become older. This is reflected in the literature, demonstrating natural environments' efficacy in aiding stress recovery and alleviating negative emotions [34].

The present findings are consistent with past research that addresses the importance of developing meaningful bonds with the natural environment during childhood [48,49]. The current hypothesis that participants from a coastal childhood would be significantly different from those of inland participants in terms of the research variables has been supported. Participants from coastal communities reported stronger positive perceptions of coastal environments, more positive affective connections, and stronger behavioural attitudes towards nature than participants of inland backgrounds. Therefore, the findings support the argument that past experiences of natural coastal environments play an important role in the formation of positive affective relationships with the natural world [50].

This data may also provide further evidence to advocate for the use of coastal environments in mental health care as NR may help sustain positive emotions and mediate symptoms of various mood or affective disorders. Utilising nature relatedness could be potentially used as an alternative treatment for children with

attention deficit disorders [47], as well as the novel approach of using surfing to attenuate symptoms Post-Traumatic Stress Disorder (PTSD) in combat veterans and improve social skills for children with autism spectrum disorder [48-52]. However, this study may present an argument in favour of formally integrating outdoor coastal environments in education for the purpose of wellbeing. Growing up visiting coastal blue spaces may play a role in the avoidance of feelings of anxiety, loneliness, and isolation [43]. Environmental education from a young age could possibly help maintain or restore nature connectedness if it inspires interest and curiosity with the natural world.

However, there are a few caveats that must be considered with the findings of this study generally. Our sample was disproportionately female, a group that historically have an increased likelihood of responding favourably to natural environments than their male counterparts [53,54]. Additionally, the degree to which the present findings could be generalised to a wider population must be recognised. This sample was undergraduate students and is not representative of the general population.

In summary, this study provided further evidence that living near the coast is of considerable benefit to human wellbeing. Projects such as this further illustrate the powerful influence of natural environments on human psychological health. Given the need for a more engaged, pro-environmental population, the researchers strongly advocate for the greater acknowledgement of the coast as an important public health resource. This emotional and enduring shared connection to the sea in coastal communities must be reflected in coastal management policy and practice. As the global community seeks to restore the health of the ecosystem, doing so could make a significant contribution to the rehabilitation of human mental health [55,56].

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