

Psychological Studies

Enhancing nature conservation and health: Changing the focus to active pro-environmental behaviours

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| Abstract: | <p>Most research about the promotion of pro-environmental behaviours has focused on actions conducted at home (e.g., energy saving). While acknowledging their relevance, the effect of such behaviours on the mitigation of two of the most relevant global environmental problems (climate change and biodiversity loss) is relatively small. We present a literature review with two main objectives. First, to introduce the concept of active pro-environmental behaviours. These are a combination of outdoor physical activities and pro-environmental behaviours. The latter involve behaviours that have a minimum impact on the environment, or even have positive consequences for the environment. Active commuting and tree planting are examples of active pro-environmental behaviours. The second objective is to discuss the relevance of active pro-environmental behaviours for people's health and sustainability and, thereby, to encourage more research and efforts towards the promotion of these behaviours. We conclude by suggesting how stakeholders can promote active pro-environmental behaviours.</p> | |

Enhancing nature conservation and health: Changing the focus to active pro-environmental behaviours

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Informed consent

For this type of study informed consent is not required.

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1 **Enhancing Nature Conservation and Health: Changing the Focus to Active Pro-Environmental**

2 **Behaviours**

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4 Most research about the promotion of pro-environmental behaviours has focused on actions conducted at home
5 (e.g., energy saving). While acknowledging their relevance, the effect of such behaviours on the mitigation of two
6 of the most relevant global environmental problems (climate change and biodiversity loss) is relatively small. We
7 present a literature review with two main objectives. First, to introduce the concept of active pro- environmental
8 behaviours. These are a combination of outdoor physical activities and pro-environmental behaviours. The latter
9 involve behaviours that have a minimum impact on the environment, or even have positive consequences for the
10 environment. Active commuting and tree planting are examples of active pro- environmental behaviours. The
11 second objective is to discuss the relevance of active pro-environmental behaviours for people's health and
12 sustainability and, thereby, to encourage more research and efforts towards the promotion of these behaviours.
13 We conclude by suggesting how stakeholders can promote active pro- environmental behaviours.

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15 Keywords: ecological behaviour; environmental attitude; human-nature connection, physical inactivity

1 1. Introduction

2 Environmental issues such as climate change and biodiversity loss threaten human and non-human life
3 (Myers, 2017; Steffen et al., 2015). Environmental educators and researchers agree that the Earth's ecological
4 balance strongly depends on people's pro-environmental behaviours (PEB, Steffen et al., 2015; Wynes &
5 Nicholas, 2017), and promoting sustainable behaviours is one of the main goals of environmental education
6 (Duerden & Witt, 2010; Zint, 2012). PEB have been defined as behaviours that harm the environment as little as
7 possible, or even benefit the environment (Steg & Vlek, 2009), and environmental psychologists have long been
8 interested in PEB (Milfont, Amirbagheri, Hermanns, & Merigó, 2019).

9 The aim of the present review is to introduce the concept of active-PEB and to highlight the relevance
10 that these types of behaviours have for the conservation of nature and the promotion of people's health. We
11 define active-PEB as behaviours that have a minimum impact on the environment, or even have positive effects
12 on it, and that are conducted through the practice of outdoor physical activity (OPA). Most of the literature
13 about PEB has been focused on behaviours that make a moderate contribution to the mitigation of global
14 environmental issues like climate change and biodiversity loss, such as energy savings at home (Larson,
15 Stedman, Cooper, & Decker, 2015; Wynes & Nicholas, 2017). For instance, Wynes and Nicholas (2017)
16 calculated the amount of CO₂ emissions people can avoid in developed countries by engaging on different PEB.
17 They concluded that **some commonly studied PEB, such as energy conservation at home, result on a smaller**
18 **reduction of CO₂ emissions compared to other PEB (e.g., choosing not to use private motor vehicles). Even**
19 **though the relevance of these PEB with moderate effects on the health of the environment is acknowledged**
20 **(Wynes & Nicholas, 2017),** we believe it is equally necessary to focus research and environmental education
21 programs on behaviours that strongly contribute to the mitigation of global environmental issues. This is
22 especially important considering the urgent need to face environmental problems (Steffen et al., 2015). In fact,
23 Steffen et al.'s (2015) seminal work found that climate change and biodiversity loss are major problems that can
24 alone destabilize the Earth system. Some active-PEB are among the most effective behaviours to mitigate
25 climate change (e.g., active commuting) and biodiversity loss (e.g., participating on nature-based citizen
26 science). Active-PEB gather the benefits of both OPA and PEB (Figure 1). Thus, we discuss their relevance to
27 humans' health and the environment. As active-PEB are considered to be more relevant to the mitigation of
28 global environmental problems than commonly investigated PEB (e.g., energy saving at home), we discuss the
29 importance of efforts of researchers and educators to promoting active-PEB, and provide some suggestions
30 towards this goal.

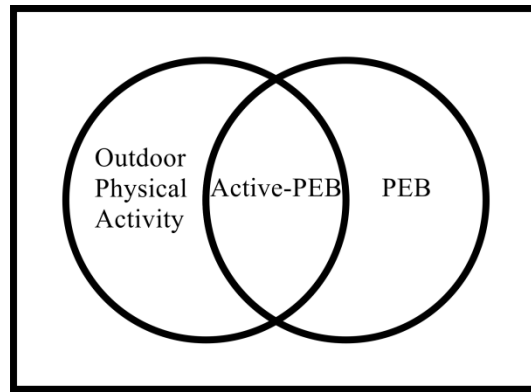


Figure 1. Active pro-environmental behaviours (active-PEB): Outdoor physical activity while conducting PEB.

2. Distinct Types of Active-PEB

Given the definition of active-PEB provided above as well as the literature review conducted (Larson et al., 2015; Markle, 2013; Wynes & Nicholas, 2017), we distinguish two types of active-PEB: active commuting (Markle, 2013), and land stewardship behaviours (Larson et al., 2015) (Table 1). The first category includes behaviours such as walking, cycling or taking the public transportation for a functional (e.g., commuting to work) or leisure purpose (e.g., going to the cinema). Overall, people could engage on these behaviours on a daily basis, but barriers like lack of high quality public transportation, cycling lanes and fitness may prevent it (Saunders, Green, Petticrew, Steinbach, & Roberts, 2013; She, King, & Jacobson, 2017).

The second category, land stewardship behaviours, consist on individual or collective physical efforts to improve the quality of outdoor private or public areas (Larson et al., 2015). These efforts improve the habitat (e.g., beach) of animals (i.e., marine fauna), as well as human-nature interactions by enhancing the quality of the environment (Larson et al., 2015; Wyles, Pahl, Holland, & Thompson, 2017). Land stewardship behaviours may also occur on a daily basis, such as growing fruits and vegetables in one's garden, or sporadically through, for instance, improving the quality of an outdoor public area via a tree planting project.

Table 1

Categories and examples of active-PEB

| Category | Examples of active-PEB |
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|----|------------------|---|
| 1 | Active commuting | 1. Using public transportation, cycling or walking instead of using one's |
| 2 | | private motor vehicle. |
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| 7 | Land stewardship | 1. Growing fruits and vegetables. |
| 8 | | 2. Tree planting. |
| 9 | | 3. Helping to improve the quality of outdoor public areas (e.g., collecting |
| 10 | | litter on the beach). |
| 11 | | 4. Participating on nature-based citizen science (e.g., collecting data for a |
| 12 | | wildlife study). |
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3. The Relevance of Active-PEB for Nature Conservation and People's Health

PEB have been linked to a mitigation of environmental problems (Evans, 2019), and several researchers have pointed out the association between PEB and people's health (Clayton et al., 2015; Myers, 2017; Steffen et al., 2015). More precisely, while mitigating environmental problems, the health issues that might spring from these environmental problems can also be reduced. For example, the mitigation of climate change consequences such as floods (Environmental Protection Agency 2016), agricultural collapse (Myers 2017) and government destabilization (Gillis 2017) prevent health issues such as deaths, stress and depression (Clayton et al., 2015; Evans, 2019). Clayton et al. (2015) pointed out that natural disasters can kill many people, destroy their homes and favourite places, and have negative psychological impacts. Similarly, Evans (2019) highlights that droughts, floods, and severe storms diminish quality of life, elevate stress, and produce psychological distress.

Researchers have described different pathways leading to PEB, and direct contact with nature seems to be one of the most meaningful ones (Chawla & Derr, 2012; Rosa & Collado, 2019). Positive experiences in nature can lead to PEB through, for instance increased environmental knowledge (Kuo, Barnes, & Jordan, 2019) and connectedness to nature (Rosa, Profice, & Collado, 2018). Direct experiences in nature are especially relevant for people's health as they generally involve OPA, which has plenty of benefits for people's health (Coon et al., 2011). For instance, OPA has been associated to reduced obesity (She et al., 2017) and anxiety (Bratman, Daily, Levy, & Gross, 2015), prevention of diabetes (Saunders et al., 2013), increased self-esteem

1 (Barton, Bragg, Pretty, Roberts, & Wood, 2016) and well-being (Carrus et al., 2017). In spite of these benefits,
 2 in the last decades there has been a decline in OPA (Soga & Gaston, 2016). In fact, 3.2 million deaths per year
 3 are attributable to insufficient physical activity (World Health Organization, 2019).

4 Considering the background specified above, we believe that active-PEB can provide unique benefits to
 5 people's health and nature conservation, as they combine the positive effects of OPA with the benefits of PEB.
 6 Some of these unique aspects of active-PEB are described in Table 2.

7
 8 Table 2

9 *Unique benefits of active-pro-environmental behaviours*

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- They favour sustainability and, at the same time, have positive benefits to people's health due to the practice of physical activities outdoors and contact with nature.
 - Commuting by taking the public transportation, walking or cycling instead of using a private motor vehicle reduces CO₂ emissions which, in turn, reduce air pollution and global warming.
 - Gardening, tree planting, beach cleaning and nature-based citizen science favour biodiversity conservation and positive direct experiences with nature. This active exposure to nature may enhance people's health as well as their environmental knowledge and attitudes.
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11 **3.1. Positive Effects of Active Commuting**

12 The relation between active commuting and people's health has received considerable attention among
 13 researchers (King & Jacobson, 2017; Saunders et al., 2013; She et al., 2017). For instance, research conducted
 14 with national data in United States identified that a 1% increase in public transport use would decrease the
 15 prevalence of obesity by 0.22% (She et al., 2017). This relation was identified after controlling for several
 16 confounding factors, such as preference for means of transport, amount of physical activity not related to means
 17 of transport, education, health resources, and income. According to Saunders et al.'s (2013) systematic review,
 18 active commuting is also linked to other health benefits, such as preventing diabetes.

19 Given that active commuting is one type of active-PEB, it also has positive effects for nature
 20 conservation. The most straightforward benefits relate to the reduction of CO₂ as a consequence of a less
 21 frequent use of private motor vehicles (Wynes & Nicholas, 2017). As an example, in Brazil, after seven days of
 22 strike led by the drivers of trucks in charge of delivering fuel to gas stations, the air pollution in the city of São
 23 Paulo was cut down to half (Ziegler, 2018). Thus, avoiding the use of private motor vehicles by walking,
 24 cycling or taking the public transportation is a feasible way to reduce CO₂ emissions and, at the same time,
 25 increase OPA (Saunders et al., 2013).

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2 3.2. Positive Effects of Land Stewardship Behaviours

3 Several researchers have highlighted the benefits that land stewardship behaviours have for people's
 4 health (Cox et al., 2017; Whitburn, Linklater, & Milfont, 2018; Wyles et al., 2017). For instance, Whitburn,
 5 Linklater and Milfont (2018) found a direct and positive association between tree planting participation and
 6 psychological restoration. The restorative aspects of these experiences in natural areas are mainly attributed to
 7 the relational dynamics between the person and the natural environment (Staats, 2012), which lead to a faster
 8 and more complete restoration of psychological resources than experiences in urban environments. Similarly,
 9 Wyles et al. (2017) found that participating in an organized activity to clean a beach is a meaningful experience
 10 (an eudemonic aspect of well-being) and psychologically restorative. In addition, Cox et al. (2017) found that
 11 time spent in gardens was positively associated with social cohesion, and negatively linked to depression.

12 Regarding nature conservation, land stewardship behaviours can mitigate biodiversity loss and climate
 13 change (Cabral et al., 2017; Lewis, Wheeler, Mitchard, & Koch, 2019; Schuttler, Sorensen, Jordan, Cooper, &
 14 Shwartz, 2018; Wyles et al., 2017). For example, by participating on nature-based citizen science people can
 15 help directly (improving the quality of habitat of non-human animals) and/or indirectly (collecting data that
 16 support conservation efforts) to mitigate biodiversity loss. Nature-based citizen science refers to the public
 17 engagement in scientific research in contact with nature through voluntary data collection (Schuttler et al., 2018;
 18 Wyles et al., 2017). These types of activities positively affects people's environmental knowledge and
 19 engagement on PEB (Schuttler et al., 2018). The beach cleaning and rock pooling activities conducted in the
 20 Wyles et al.'s (2017) study are examples of nature-based citizen science. According to Domroese and Johnson
 21 (2017), the main motivations of volunteers in citizen science are learning, contributing to scientific knowledge,
 22 and participating in outdoor recreational activities.

23 Moreover, land stewardship behaviours are, by definition, conducted in direct contact with nature
 24 (Larson et al., 2015). As indicated above, positive experiences in nature often lead to PEB (Chawla & Derr,
 25 2012; Rosa & Collado, 2019). Several ideas have been offered to explain why experiences in nature could play a
 26 formative role in PEB. These explanations include an increased sense of connectedness with nature (Rosa et al.,
 27 2018) and increased environmental knowledge (Otto & Pensini, 2017). For example, in Kals, Schumacher and
 28 Montada's (1999) study, adults' present and past experiences in nature led to a strong emotional affinity toward
 29 nature and increased interest in nature topics. These, in turn, predicted people's willingness to engage on PEB.

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2 **4. Practical Implications and Future Research**

3 Promoting PEB is one of the main goals of environmental educators (Duerden & Witt, 2010; Zint,
4 2012) and environmental psychologists (Milfont et al., 2019; Steg & Vlek, 2009). The greatest part of literature
5 about the promotion of environmental behaviours has focused on the processes and factors leading to PEB that
6 are commonly conducted at home, such as energy conservation (Larson et al., 2015; Wynes & Nicholas, 2017).
7 While acknowledging the importance of such work, researchers have encouraged a stronger focus on behaviours
8 that are more meaningful both for the environment and people's health (Saunders et al., 2013; Schuttler et al.,
9 2018; Wynes & Nicholas, 2017). In this review, we focus on active-PEB as a type of PEB that is conducted
10 outside while being physically active. This type of PEB combines the benefits of OPA reported by previous
11 researchers (e.g. Coon et al., 2011) with the positive effects of conducting PEB (Steffen et al., 2015; Wynes &
12 Nicholas, 2017). In line with previous studies (Larson et al., 2015; Schuttler et al., 2018; Wynes & Nicholas,
13 2017), we believe that the two types of active-PEB described above (i.e., active commuting and land
14 stewardship) are among the most beneficial behaviours for people's health and environmental conservation. As
15 indicated, active commuting is one of the most relevant behaviours to mitigate climate change and air pollution.
16 In addition, land stewardship behaviours can mitigate biodiversity loss by improving the quality of the habitat of
17 non-human animals (e.g., urban garden and beach), providing data to support conservation actions, increasing
18 connectedness to nature, and environmental knowledge (Cabral et al., 2017; Crawford, Holder, & O'Connor,
19 2017; Schuttler et al., 2018). Thus, designing environmental education programs that promote active-PEB seems
20 to be more relevant for the mitigation of global environmental issues than employing our efforts on other, less
21 environmentally impactful PEB such as saving energy at home (Larson et al., 2015; Wynes & Nicholas, 2017).

22 Previous studies have found a positive link between active-PEB and people's general health (Soga,
23 Gaston, & Yamaura, 2017), connectedness to nature (Whitburn et al., 2018), physical activity (Wells, Myers, &
24 Henderson, 2014), healthy diet (Wells et al., 2018), environmental knowledge (Lewandowski & Oberhauser,
25 2017) and other PEB like water and energy savings (Markle, 2013). Taken together, these findings suggest that
26 active-PEB play a unique role in increasing people's OPA, health, and nature conservation. However, while
27 people can engage on many active-PEB daily, they normally do not (Aguilar-Farias et al., 2018; Williams,
28 Borghese, & Janssen, 2018). Thus, studies focused on a deeper understanding of the psychological factors that
29 motivate people's engagement on active-PEB are needed. For example, given that active-PEB are a kind of

1 PEB, they are likely to be influenced by people's cognitive, affective and experiential connection to nature (Ives
 2 et al., 2017). Thus, promoting human-nature interactions may favour people's engagement on active-PEB. There
 3 is evidence indicating that occasional contact with nature constitutes a significant experience for some people
 4 (Cox et al., 2017; Craig, Fischer, & Lorenzo-Arribas, 2018), but these experiences do not normally lead to a
 5 strong sense of care and concern for the environment. A close examination of how frequent contact with nature
 6 is related to active-PEB and their possible predictors (e.g., connectedness to nature, environmental place
 7 attachment, etc.) is needed.

8 Another line of future research involves the study of if and how outdoor nature activities during
 9 childhood lead to active-PEB both during childhood and later in life. Several studies have reported that OPA
 10 during childhood predict OPA during adulthood (Larson, Whiting, & Green, 2011; Rosa et al., 2018; Thompson,
 11 Aspinall, & Montarzino, 2008) and PEB (Evans, Otto, & Kaiser, 2018; Rosa et al., 2018). Future studies
 12 examining the link between childhood nature experiences such as education in outdoor settings (Otto & Pensini,
 13 2017), visits to parks (Crawford et al., 2017), botanical gardens (Sanders, Ryken, & Stewart, 2018), and nature-
 14 based summer camps (Collado, Staats, & Corraliza, 2013) and active-PEB are needed.

15 We believe it is also worth to evaluate what communication strategies best promote active-PEB.
 16 Previous studies suggest framing PEB in terms of their benefit to the environment as well as to people's health
 17 is more effective for stimulating these behaviours than solely communicating the environmental benefits
 18 (Maibach, Nisbet, Baldwin, Akerlof, & Diao, 2010; Truelove & Gillis, 2018). If the same holds true for
 19 promoting active-PEB remains for future research.

20 Finally, policy makers could boost people's engagement on active-PEB by, for instance, increasing
 21 neighbourhood walkability (Corseuil Giehl, Hallal, Brownson, & D'Orsi, 2017) and cycling lanes (Kienteka, De
 22 Camargo, Fermino, & Reis, 2018), and improving the quality of public transportation (She et al., 2017). In turn,
 23 the promotion of land stewardship behaviours seems plausible through applied research and projects such as the
 24 ones conducted by the Institute Earthwatch (e.g., nature expeditions), tree planting (Whitburn et al., 2018),
 25 community and school gardens (Cabral et al., 2017; Wells et al., 2018, 2014).

26 5. Conclusion

27 Along this paper we introduced the concept of ~~active pro-environmental behaviours~~ (active-PEB),
 28 presented a list of active-PEB classified into active commuting and land stewardship behaviours, and discussed
 29 reasons why active-PEB are important for people's health and nature conservation. We also discussed the

1 pathways by which stakeholders can promote active-PEB. Active-PEB have the potential to mitigate climate
 2 change and biodiversity loss, while improving people's health. Thus, future studies aimed at increasing people's
 3 engagement in active-PEB are warranted.

4 **Compliance with Ethical Standards**

6 **Ethical approval**

8 For this type of study ethical approval is not required.

10 **Informed consent**

11 For this type of study informed consent is not required.

13 **Conflict of Interest**

14 On behalf of all authors, the corresponding author states that there is no conflict of interest.

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