

# The Impact of Values, Nature Contact, and Childhood Nature Experience on Pro-environmental Behavior: A Systematic Review

Kemas Mohd Saddam Abd Somad, Ayyu Latifah Budyaningrum and Putu Danindya Krisnadhi Dewi  
*Faculty of Psychology, Universitas Diponegoro, Jl. Prof. Soedarto SH, Semarang, Indonesia*

**Keywords:** Values Orientation, Nature Contact, Childhood Nature Experience, Pro-environmental Behavior, Systematic Literature Review.

**Abstract:** Environmental issues caused by human activities have been threatening the sustainability of both people and the planet. Thus a shift towards a more environmentally friendly society has become very important. Promoting pro-environmental behavior is seen to be the first key to reach sustainability. The role of values, contact with nature, and childhood nature experiences seem to be important in predicting pro-environmental behavior on the individual level. Therefore, this article aims to systematically review the relation between values orientation, nature contact, and childhood nature experience with pro-environmental behavior respectively. We identified articles related to the topic from the following databases: ScienceDirect, Scopus, and ProQuest. A total of 1241 articles were found with only 21 matching the inclusion criteria thus eligible to be reviewed. Based on our review, values orientation such as biospheric and altruistic values predicted pro-environmental behavior mainly through a chain of effects, while egoistic values showed contradicting results on pro-environmental behavior according to the situational cues which was explained in the paper. Contact with nature did not show constant results in predicting pro-environmental behavior, thus reasons and suggestions were investigated. Childhood nature experiences influenced pro-environmental behavior in adulthood through positive and emotional bonding with the natural environment.

## 1 INTRODUCTION

Anthropogenic environmental issues such as climate change, biodiversity loss, lack of clean water resources, and pollution are threatening environmental sustainability (Arora et al., 2018). Human activities, mainly rooted in economics, without paying attention to the environmental impact such as overconsumption, inefficient energy use, and irresponsible waste management are accounted for the issues (Schröder et al., 2019; Alabi et al., 2019). Unsustainable behavior on the individual level then affects a larger scale of production or the wider environment. Therefore, changes in human behavior become very important to ensure the sustainability of both people and the environment. In order to make that happen, promoting people to act more pro-environmentally would play a crucial role.

Pro-environmental behavior is defined as a behavior that undertakes the intention change and gives benefit to the environment (Stern in Vicente-Molina et al., 2018). Pro-environmental behavior, as

the name suggests, can serve to protect the environment as a whole and the ecosystem from the destructive impact of human activities (Kiatkawsin & Han, 2017; Stern, 2000). Larson et al. (2015) identified four dimensions of pro-environmental behavior comprising conservation lifestyle behavior, social environmentalism, environmental citizenship, and land stewardship. Conservation lifestyles refer to behaviors such as recycling, energy conservation, eco-friendly consumption, etc. Social environmentalism is related to engagement in social movement for the environment (joining environmental organization). Environmental citizenship refers to civic engagement like pro-environmental voting. While land stewardship is related to activities on improving the local wildlife (conservation). However, a question was raised on the factors that influence these behaviors.

Research has shown that values are important as a predictor of pro-environmental behavior (De Groot & Steg, 2007). Values are desirable goals or standards that serve as guiding principles, transcend specific situations, and form a system of priorities

(Schwartz, 1992). However, values may not be directly translated into pro-environmental behavior, meaning it is mainly mediated by other constructs. Hence several theoretical frameworks tried to explain the relation (Stern, 2000; Werff & Steg, 2016). Further, values that are held by a person related to the environment may not always be actualized into an actual behavior despite its transcending trait (Steg et al., 2014a).

The theories that are commonly used in defining the role of values in predicting pro-environmental behavior are Value-Belief-Norm Theory (VBN) by Stern et al. (1999) and the new parsimonious Value-Identity-Personal Norm (VIP) model by Werff & Steg (2016). VBN posits value as a predictor of pro-environmental through a causal chain of effects in relation to beliefs and personal norms by being the antecedent (Stern et al., 1999). Four values orientation were identified to be a significant antecedent of pro-environmental behavior: biospheric, altruistic, egoistic, and hedonic (Steg et al. 2014b). Biospheric values are related to concern on the welfare of nature, altruistic values are focused on other people's welfare, egoistic values are associated with self-promoting and guarding individual's resources, while hedonic values are focused on personal gratification and satisfaction (Stern et al., 1993; Steg et al., 2014, in Nordfjærn & Rundmo, 2019). However, several researches have combined the biospheric and altruistic values forming a single orientation, bio-altruistic values, in the sense that both were activated by a morality that transcends fulfillment of one's need to the welfare of nature and humanity (Nordlund & Garvill, 2002; van Riper & Kyle, 2014; Kim & Seock, 2019).

The VIP model proposes that feelings of moral obligation are influencing people to engage in environmental behavior and further reflect how people see themselves as pro-environment (Werff & Steg, 2016). This model was developed to understand pro-environmental behavior through analyzing the relations among biospheric value, environmental self-identity, and personal norms (Ates, 2020). In the VIP model, biospheric values are the first and core component that determined one's pro-environmental action which affected environmental self-identity and consequently personal norms. The reason why only biospheric values were included is that only these values were found to be significantly related to the other variables in the causal and sequential chain of VBN (Werff & Steg, 2016).

Besides values orientation, contact with the natural environment seems to be important in

predicting pro-environmental behavior (Rosa & Collado, 2019). Contact means any form of human interaction with the living nature of plants and animals, together with the air, water, and geographical landscapes (Martin et al., 2020; Hartig et al., 2014). Keniger et al. (2013) classified three types of contact with nature which are intentionally, indirectly, and incidentally. Further explained that activities of being in nature with direct attention like gardening are considered to be intentional, experiencing nature without being physically present in nature itself like watching nature videos is considered to be indirect, and experiencing nature through a by-product of another activity like encountering greenspaces is considered to be incidental. However, direct contact with nature is found to be the best way of connecting with nature compared to the indirect one (Lumber et al., 2017; Mayer et al., 2009). By establishing contact with nature the propensity of people to be engaged in pro-environmental behavior is likely to be increased as well (Rosa & Collado, 2019).

The past can shape an individual's future because it shapes identity, so can past experiences in nature, especially in childhood (Prévot et al., 2018). Bardi & Goodwin (2011, in Steg, 2016) said that the values systems are formed throughout childhood thus creating a stable orientation of their behavior. The process started from the first time children establish contact with nature, what is called microsystem interaction, as a site for the journey of coexistence with nature which determines a pathway of environmentalism in adulthood (Jensen & Olsen, 2019). However, children's direct contact with the natural environment has been declining over the recent decades thus affecting their care for nature (Soga & Gaston, 2016; Chawla, 2020). Researchers have found that childhood nature experiences influenced positive attitudes towards biodiversity and willingness to coexist (Hosaka et al., 2017), greater contact with nature, and further pro-environmental behavior in adulthood (Rosa et al., 2018). Therefore, either the past or the present experience in nature is suggested to be important in influencing pro-environmental behavior.

As humans' behaviors are causing more damage to the environment, there's a need to change people's lifestyles to be more sustainable. By understanding the antecedents of pro-environmental behavior, whether it's innate psychological constructs like values or the experience in nature itself both in the past and the present, we can then design interventions or develop policies that promote pro-environmental behavior as a way to

achieve sustainability. However, questions were raised whether each value orientation constantly predicts pro-environmental behavior, whether contact with nature alone is enough to predict pro-environmental behavior, and whether childhood nature experiences are significant enough to predict pro-environmental behavior in adulthood. Therefore, this study aims to systematically review the relation between values orientation, nature contact, and childhood nature experience with pro-environmental behavior respectively.

## 2 METHODS

We conducted a systematic literature review following the PRISMA guidelines (Page et al., 2021) in order to find the relationship between values orientation and pro-environmental behavior, nature contact and pro-environmental behavior, as well as childhood nature experience and pro-environmental behavior. The literature research was initiated in June 2021 by collecting articles from ScienceDirect, Scopus, and ProQuest. We used the following keywords on the literature search phase: 1) “biospheric value” OR “altruistic value” OR “egoistic value” OR “hedonic value” AND “pro-environmental behavior”; 2) “nature contact” AND “pro-environmental behavior”; 3) “childhood” AND “nature experience” AND “pro-environmental behavior”.

We used the following inclusion criteria to find relevant articles: 1) Articles related to values orientation (biospheric, altruistic, egoistic, and hedonic) and pro-environmental behavior, nature contact and pro-environmental behavior, and childhood nature experience and pro-environmental behavior; 2) the sample used was adult or aged 18 and above; 3) research or conference articles; 4) published in the last 10 years (2011-2021); 5) written in English.

In addition, the following exclusion criteria were used to help excluding irrelevant articles: 1) Review/conceptual articles; 2) subjects used in the study were aged below 18; 3) outside area of interest such as sustainable agriculture and fisheries; 4) studying the effect of values/nature contact/childhood nature experience on pro-environmental intention, attitude, and willingness (not actual reported behavior); 5) using values conceptualization and measurement that is not based on VBN or VIP.

## 3 RESULTS

A PRISMA flow diagram was developed to summarize the article selection process (see Figure 1). We identified 1301 articles which consisted of 815 articles in ScienceDirect, 111 articles in Scopus, and 375 articles in ProQuest. A total of 45 articles were excluded automatically by the reference automation tools (Mendeley), 11 articles were excluded by using the tools feature to detect duplicates, and 4 articles were excluded because of insufficient article details, resulting in 1241 articles for title/abstract screening. We screened the articles that mentioned the reviewed variables in the title, abstract, or keywords to be included. A total of 1111 articles were excluded resulting in 130 articles to be retrieved. 10 articles were not accessible leaving 120 articles to be assessed for eligibility. Finally, we excluded 99 articles based on the exclusion criteria which left 21 articles consisting of 18 articles on values relation with pro-environmental behavior, 1 article on nature contact relation with pro-environmental behavior, and 2 articles on nature contact and childhood nature experience relation with pro-environmental behavior.

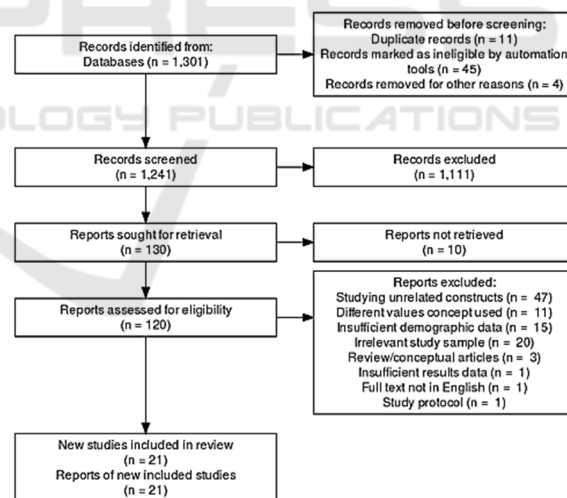


Figure 1: PRISMA Flow Diagram for Systematic Literature Review.

We further summarized the findings into two tables that differ the finding of value orientation influence on pro-environmental behavior (see Table 1) with findings from nature contact and childhood nature experience influence on pro-environmental behavior (see Table 2). The population from all of the studies we included

consists of Asia, Australia, Europe, America, and Canada.

We found 18 articles related to value orientation. From the findings, we separate the form of pro-environmental behavior into general pro-environmental behavior and specific pro-environmental behavior. Results on the general pro-environmental group that consists of 6 articles show that values are directly and indirectly influenced pro-environmental behavior through mediators, such as personal norms (van Riper & Kyle, 2014; Kim & Seock, 2019), environmental worldviews (van Riper & Kyle, 2014), environmental self-identity (Balundé et al., 2019; Ajibade & Boateng, 2021; Wang et al., 2021), ecological grief, and climate change belief (Marshall et al., 2019). On the other hand, some studies showed egoistic values indirectly affected the decrease of the likelihood of engagement in pro-environmental behavior (van Riper & Kyle, 2014; Ajibade & Boateng, 2021).

Van Riper & Kyle on 2014 researched the influence of bio-altruistic value and egoistic value on pro-environmental behavior through some mediators. This study revealed environmental worldviews' influence is sequential to other mediators, starting from giving influence to awareness of consequences, affecting ascription of responsibility, and personal norm. The study conducted by Balundé et al. (2019) also found similar results where biospheric values indirectly affect pro-environmental behavior through environmental self-identity, but this research also specified the influenced behaviors like recycling, environmental activism, and fuel-efficient driving while sustainable transport use was not significantly predicted. Biospheric and altruistic value were also found to affect climate change belief and ecological grief that influence pro-environmental behavior in the study conducted by Marshall et al. (2019). Unlike the other values, egoistic value seems to influence the decreasing effect on the likelihood to engage in pro-environmental behavior indirectly. The study conducted by van Riper & Kyle (2014) showed that egoistic values both negatively and directly influence personal norms thus causing the decrease of pro-environmental behavior engagement. A study by Ajibade & Boateng in 2021 also supports the previous finding. From the conducted study, results show that egoistic value has a relation to less effective engagement in pro-sustainable behavior.

Specific pro-environmental behavior groups consisted of 12 articles with several different outcome variables as follows: planting native vegetation, fuel-efficient driving, purchase behavior, sustainable clothing purchase behavior, preserving nature and biodiversity action, pro-environmental personal practice & habitual behavior, voting behavior, trash separation behavior, green technology purchasing frequency, and green consumer behavior showed different yet related result with one another (Raymond et al., 2019; Werff et al., 2013; Nguyen et al., 2016; Nguyen et al., 2017; Fornara et al., 2020; Gkargkavouzi et al., 2019; Aguilar-Luzón, 2020; Pivetti et al., 2020; Ajibade & Boateng, 2021; Berman Caggiano et al., 2021; Wu & Zhu, 2021).

From the reviewed study, it's known that on the purchase behavior outcome variable, biospheric and altruistic values seem to hold a big role in one's personal norms (Nguyen et al., 2016; Nguyen et al., 2017). Other purchase behavior study that analyzes sustainable clothing purchase behavior found that self-transcendence values (biospheric & altruistic) positively influenced attitude towards sustainable clothing and sustainable clothing purchase behavior, while self-enhancement (egoistic & hedonic) values negatively influenced positive attitude toward sustainable clothing and did not have a significant direct effect on sustainable clothing purchase behavior (Jacobs et al., 2018). Results of the study conducted by Berman Caggiano et al. (2021) also found that biospheric and altruistic value are positively associated with environmental concern and green lifestyle orientation that indirectly influence green technology purchasing frequency. A correlational study by Aguilar-Luzón et al. (2020) found a positive relation between biospheric and altruistic values with pro-environmental voting behavior. However several findings showed contrary results where biospheric, altruistic, and egoistic values appeared to have a significant effect on environmental concerns but did not predict planting intention or behavior (Raymond et al. 2011). Findings in a study that was conducted by Pivetti et al. (2020) on trash separation behavior shows that biospheric values and egoistic values did not predict pro-environmental attitude-behavior but altruistic values did.



Table 1: Values orientation influence on pro-environmental behavior.

Reference	Country	Values orientation	Mediator variables	Other constructs	Outcome variables	Results
Raymond et al. 2011)	Australia	Biospheric value, altruistic value, & egoistic value	Personal norms, awareness of consequences, environmental concern, & place attachment	-	Pro-environmental behavior (planting of native vegetation)	Biospheric, altruistic, & egoistic values each have a significant effect on environmental concern. Environmental concerns did not predict planting intention or behavior. Thus value orientations did not predict native planting intention or behavior.
Werff et al. (2013)	Netherlands	Biospheric value	Energy-saving self-identity	Intention to reduce energy	Energy use (fuel-efficient driving)	Biospheric value influenced fuel-efficient driving through energy-saving identity.
van Riper & Kyle (2014)	Visitors of ecoregion in California: Anacapa and Santa Cruz	Bio-altruistic values & egoistic values	Personal norms, environmental worldviews, ascription of responsibility, and awareness of consequences	-	Pro-environmental behavior	Bio-altruistic values indirectly affect pro-environmental behavior through personal norms. Mediation through environmental worldviews also present which further sequentially influence awareness of consequences, affecting ascription of responsibility, and personal norm.  Egoistic values directly and negatively influence personal norms which decrease the likelihood of engagement in pro-environmental behavior.
Nguyen et al. (2016)	Vietnam	Biospheric values	Attitude Towards Environmental Protection, Subjective Norms, Perceived Inconvenience, Environmental Self-Identity, & Purchase Intention	-	Pro-Environmental Purchase Behavior	Biospheric values positively influenced attitude towards environmental protection and environmental self-identity which translated into pro-environmental purchase behavior of energy-efficient appliances.  Biospheric value influenced subjective norms which then indirectly influenced pro-environmental purchase behavior of energy-efficient appliances through purchase intention.  Biospheric value negated the effect of perceived inconvenience related to pro-environment purchase behavior which then has a positive effect on pro-environmental purchase behavior of energy-efficient appliances.
Nguyen et al. (2017)	Vietnam	Altruistic value	Personal norms, environmental attitudes, subjective norms, & perceived barriers	-	Pro-environmental purchase behavior	Altruistic values positively affected personal norms, environmental attitudes, subjective norms, and perceived barriers that influenced pro-environmental purchase behavior.
Jacobs et al. (2018)	Germany	Self-transcendence values (biospheric-altruistic) & self-enhancement values (egoistic-hedonic)	Positive attitude towards sustainable clothing	Online and catalog shopping affinity, Preference for durability, Fashion consciousness, & Price sensitivity	Sustainable Clothing Purchase Behavior	Self-transcendence values positively and directly influenced the positive attitude towards sustainable clothing and sustainable clothing purchase behavior in which the association is stronger on attitude than behavior.  Self-enhancement values negatively and directly influenced positive attitude towards sustainable clothing but did not have a significant direct effect on sustainable clothing purchase behavior, thus the influence on behavior is mediated by attitude.
Balundė et al. (2019)	Lithuania	Biospheric values	Environmental Self-Identity	-	Pro-Environmental Behavior	Biospheric values correlated positively with pro-environmental behavior such as recycling, environmental activism, and fuel-efficient driving but correlated negatively while not significant with sustainable transportation use.  Biospheric value had a significant indirect relationship with pro-environmental behavior when mediated with environmental self-identity on behaviors like recycling and environmental activism but not with fuel-efficient driving and sustainable transportation.

Table 1: Values orientation influence on pro-environmental behavior (cont.).

Reference	Country	Values orientation	Mediator variables	Other constructs	Outcome variables	Results
Fornara et al. (2020)	Belgium, Finland, Germany, Italy, Slovenia, Netherlands, United Kingdom	Biospheric values	Moral norm, perceived behavioral control, general pro-environmental beliefs, awareness of consequences, and ascription of responsibility	Injunctive norm	Action for preserving nature and biodiversity	Biospheric value directly influenced action for preserving nature and biodiversity. The mediation through perceived behavioral control was also found. A sequential chain of effect from biospheric values to moral norms which influenced action for preserving nature and biodiversity through general pro-environmental beliefs, awareness of consequences, and ascription of responsibility was supported.
Gkargkavouzi et al. (2019)	Greece	Biospheric values	Identity, perceived behavioral control, subjective norms, personal norms, ecological worldview, awareness of consequences, ascription of responsibility, attitude, and intention to adopt pro-environmental behavior	Demographic Factors	Pro-environmental personal practice & habitual behavior	Biospheric values influenced pro-environmental personal practices & habitual behavior from a sequential chain of mediation. All of the effect relations in the path analysis were significant thus can be concluded biospheric values indirectly influenced personal practices and habitual behavior.
Kim & Seock (2019)	United States	Bio-altruistic values & egoistic values	Personal norms	Social norms	Pro-environmental behavior	Bio-altruistic and egoistic values are positively related to personal norms which influenced pro-environmental behavior.
Marshall et al. (2019)	Australia	Biospheric values, altruistic value, egoistic value, & hedonic value	Climate change belief, ecological grief	-	Pro-environmental behavior	Pro-environmental behavior was influenced by biospheric and altruistic values. Biospheric value, altruistic value, and egoistic value affected Reef Grief as ecological grief. Besides that, biospheric value and altruistic value influenced climate change belief. People with climate change beliefs are more likely to feel reef grief and show pro-environmental behavior.  Hedonic values were found to be insignificant in predicting reef grief, environmental behavior, and climate change beliefs.
Aguilar-Luzón et al. (2020)	Spain	Biospheric value, socio-altruistic value, egocentric value	-	Environmental belief, connectivity with nature	Pro environmental voting behavior	Pro-environmental voters are inclined more to biospheric and altruistic values with a lower inclination to adhere to egocentric values. There is also a significant positive correlation between biospheric values and altruistic values with pro-environmental vote, while the correlation between egoistic values and pro-environmental vote was negative.
Pivetti et al. (2020)	Southern Italy	Egoistic value, altruistic value, & biospheric value	Attitude and behavioral intention	Level of knowledge, internal attribution, social norms, & political trust	Trash separation behavior	Biospheric values and altruistic values were highly correlated with attitude, behavioral intention, and trash separation behavior while egoistic values were not.  Biospheric and egoistic values influence on attitude towards recycling was not significant wherein attitude strongly predicted behavioral intention and trash separation behavior. Only altruistic values were influential in predicting attitude thus affecting trash separation behavior.
Ajibade & Boateng (2021)	Portland	Biospheric value, altruistic value, & egoistic value	Environmental self-identity	-	Pro-sustainable behavior	Biospheric and altruistic values are positively related to environmental self-identity that are significantly associated with pro-sustainable behavior. Whereas egoistic value is related to less effective engagement in pro-sustainable behavior.

Table 1: Values orientation influence on pro-environmental behavior (cont.).

Reference	Country	Values orientation	Mediator variables	Other constructs	Outcome variables	Results
Berman Caggiano et al. (2021)	United States & Canada	Biospheric values & altruistic values	Environmental Concern & Green Lifestyle Orientation	Demographic Factors	Green Technology Purchasing Frequency	Biospheric and altruistic values associated positively with environmental concern and green lifestyle orientation, thus indirectly influenced green technology purchasing frequency.
Lee et al. (2021)	Upo Wetland visitors	Biospheric value	-	Sustainable intelligence, destination social responsibility (DSR), visit experience	Pro-environmental behavior	Biospheric values had a positive influence on pro-environmental behavior.
Wang et al. (2021)	Netherlands & China	Biospheric value	Environmental self-identity	-	Pro-environmental behavior	Biospheric value influenced pro-environmental behavior through environmental identity as a mediator variable
Wu & Zhu (2021)	China	Biospheric values & egoistic values	Ecological Worldview & Personal Norms	Love of Nature	Green consumer behavior	Biospheric values positively predicted ecological worldview which influenced low-cost green consumption behavior and personal norm. The latter predicted both low and high-cost green consumer behavior.  Egoistic values did not significantly predict ecological worldview thus no conclusion was made.

Table 2 contains reviews of the influence nature contact and childhood nature experience have on one's pro-environmental behavior. After screening, 3 articles related to the topics were found. All the findings mainly discuss nature experience but, in a way refers to nature contact as well. Rosa et al. (2018) conducted a study with the purpose to explain the relationship between childhood nature experience and pro-environmental behavior with current nature contact and nature connectedness as the mediator variables. The study found current nature contact influenced pro-environmental behavior directly and childhood nature experience influenced connectedness to nature and pro-environmental behavior indirectly that manifested through current nature contact. A study conducted by Křepelková et al. (2020) as well supports the influence of childhood nature experience on pro-environmental behavior in adulthood by the mediation of affection. The other form of pro-environmental behavior and its correlation with experiences of nature is shown through bio-diversity practices in the research conducted in Paris by Prévot et al. (2018). Findings suggest that individuals with nature experiences engagement will implement biodiversity conservation practice more than people who did not.

#### 4 DISCUSSION

Our findings on values orientation mainly suggested that biospheric and altruistic values were significant predictors of pro-environmental behavior, either directly or indirectly more than egoistic and hedonic values, which both latter mainly deter one to act environmentally friendly. The findings supported the VBN theory (Stern, 2000) and VIP model (Werff & Steg, 2016) where most of the influence of values on pro-environmental behavior was mediated by other constructs related to beliefs (environmental worldview, awareness of consequences, ascription of responsibility, and other types of specific beliefs), personal norms, and identity. We also found other constructs that were mediating the influence on pro-environmental behavior such as subjective norms, attitude, and perceived behavioral control, thus reflecting the Theory of Planned Behavior by Ajzen (1991).

Some studies however revealed conflicting findings, where biospheric or altruistic values did not predict pro-environmental behavior directly or indirectly (Raymond et al., 2011; Pivetti et al., 2020), biospheric values did not predict sustainable transportation use (Balundè et al., 2019), different biospheric values effect on fuel-efficient driving (Werff et al. 2013; Balundè et al., 2019), and

Table 2: Nature contact and childhood nature experiences influence on pro-environmental behavior.

Reference	Population	Variable	Mediator variables	Other constructs	Outcome variables	Results
Prévot et al. (2018)	Paris	Experiences of nature	-	Knowledge about biodiversity, connectedness with nature	Pro-biodiversity practices	Correlation between experiences of nature and pro-biodiversity practices was found. Individuals who engaged in nature experiences implemented biodiversity conservation practices more than those who did not.
Rosa et al (2018)	Brazil	Positive childhood nature experiences	Current contact with nature (frequency) & nature connectedness	-	Pro-environmental behavior	Current contact with nature directly influenced pro-environmental behavior while also partially explained with nature connectedness mediation.  Childhood nature experiences indirectly influenced connectedness to nature and pro-environmental behavior by the mediation of current contact with nature.
Křepelková et al. (2020)	Moravian (part of Czech Republic)	Interaction with nature in childhood (one-time childhood experiences and long-term childhood experiences)	Interaction with nature in adulthood (frequency), affective mediator (emotional connection with nature), and cognitive mediator	-	Pro-environmental behavior in adulthood	One-time and long-term interaction with nature in childhood indirectly influenced pro-environmental behavior in adulthood by the mediation of affective mediator.  Interaction with nature in adulthood correlated with pro-environmental behavior but did not have a significant effect on the path analysis.

egoistic values that positively predicted reef grief or personal norms which in turns influenced engagement in pro-environmental behavior (Marshall et al., 2019; Kim & Seock, 2019).

The conflicting findings on biospheric and/or altruistic values may have some situational factors that prevent the causal effect to form (Raymond et al., 2011; Pivetti et al., 2020; Balundé et al., 2019). If we look further at the outcome variables, these studies targeted specific pro-environmental behaviors which are native planting behavior, trash separation behavior, and sustainable transportation use where perceived costs and benefits (economically or socially) may play important roles that deter them from doing the behaviors (Steg, 2016). In terms of economic cost, we can apply the condition on Balundé et al. (2019) study on the effect biospheric values have on sustainable transportation use. Using public transportation instead of personal vehicles can be considered effortful thus hinder one from doing such behavior. While social cost can be applied to Pivetti (2020) and Raymond et al. (2011) study. Specifically, in

Pivetti (2020) study, social norm and internal attribution play a great role in predicting trash separation behaviors in Italy suggesting that it was more of social responsibility rather than values-oriented behavior. While Raymond et al. (2011) study stated that the injunctive norms on the use of land for production rather than conservation may have a greater effect on the behavioral decision than the values. Thus, in line with Steg (2016) regarding the perceived social cost which can deter or promote one to act environmentally friendly. People are more likely to act pro-environment when they think others do the same (descriptive norms) or when they think others approve the behavior (injunctive norms). In addition, hedonic values orientation or principles held by a person may direct to socially desirable behavior in order to avoid pain and achieve pleasure (Ahn, et al., 2020; Steg, 2016). Therefore, it can be concluded that both social influence and innate tendency to act in socially desirable ways can promote or prevent one to act environmentally friendly. We suggest further research to focus on the socio-cultural and economical aspects of the



population studied and its influence on values orientation and pro-environmental behavior. We also found conflicted findings where biospheric values in one study affected fuel-efficient driving (Werff et al. 2013), while in another study did not (Balundé et al., 2019). Therefore, pointing out research in the future to investigate this.

The contrary findings on the egoistic values' positive effect on reef grief (emotional suffering related to reef losses) or personal norms may have something to do with the values themselves (Marshall et al., 2019; Kim & Seock, 2019). Individuals with higher egoistic values orientation tend to focus on the fulfillment of self rather than beyond self, this is somehow contradictory with the findings in the previously mentioned studies. However, Marshall et al. (2019) and Kim & Seock (2019) explained something similar that if conserving nature benefits the individuals and it surpasses the perceived cost, one's with egoistic values orientation would likely be engaged in that behavior. This could be purely influenced by individual reasoning or by the community. Therefore, also in line with the explanation about the situational cause of biospheric and altruistic values that did not predict pro-environmental behavior discussed above. However, this also indicates egoistic values, not just biospheric and altruistic, might be influential in promoting pro-environmental behavior at least in some situational cues which will be discussed in the following paragraph.

De Groot & Steg (2009) and Steg (2016) have discussed the importance of creating a balance between activating biospheric and altruistic values and reducing the conflict with egoistic and hedonic values. Activating biospheric and altruistic values alone do not always predict pro-environmental behavior especially if the behavior is perceived to be costly (socially or economically), conflicting with their egoistic and hedonic interest, e.g. buying organic foods, reducing car use, traveling using public transports. However, when people's pro-environmental behaviors are only based on egoistic or hedonic values, as soon as performing the behaviors no longer benefits them, are perceived to be too costly, or become less pleasurable then they will stop performing those behaviors. It can be concluded that in the end, biospheric and altruistic values are the ones that predict pro-environmental behavior the most stable. Hence policies should focus on how to form and activate people's bio-altruistic values while also making pro-environmental behavior less costly therefore reducing the conflicts between bio-altruistic values and egoistic-hedonic values.

Research findings on the influence of nature contact showed some contradictory outcomes. Prévot et al. (2018) study shows nature contact, specifically everyday experiences, correlated positively with pro-biodiversity practices. Křepelková et al. (2020) study suggests that interaction with nature correlates with pro-environmental behavior but does not have a significant effect on the path analysis. However, a contrary finding by Rosa et al. (2018) shows that current contact with nature has a significant direct effect on pro-environmental behavior and indirectly through nature connectedness. However, Rosa et al. (2018) and Křepelková et al. (2020) studied the frequency of contact with the natural environment effects on pro-environmental behavior, which opens up another discussion about whether frequency equals to engagement. Therefore, we suggest research in the future to focus on the engagement, especially mindful engagement, to nature and its relation with pro-environmental behavior. According to a review article on the relationship between experiences in nature and environmental behavior, the types of natural environment exposures, activities, also the subject's socio-demographic status should be considered as well (Rosa & Collado, 2019).

Our review on the relation between childhood nature experience and adult pro-environmental behavior shows relatable findings. For childhood nature experiences to affect future pro-environmental behavior, the experiences have to include some type of positive emotional bonding or connection with nature, therefore, inducing emotional connectedness thus shapes preferences to coexist with nature. We suggest research in the future to focus on studying the nature experience and connectedness to nature in the children themselves. We also suggest for schools to include educational activity in the outdoors and for parents to let the children have meaningful and emotional contact with the natural environment. Several studies about building connection to nature in children through education and activities have been done in the past to further support this (Barrable, 2019; Barrable et al., 2021).

Finally, to synthesize, future research should focus on the forming of bio-altruistic values orientation in children, having mindful engagement with nature, and connecting to nature as the prerequisites needed to engage in more environmentally friendly behavior. It's also suggested to consider socio-cultural and economic aspects where the study is conducted. Researchers in

the future should consider activating people's biospheric and altruistic values on designing intervention or making it nature-based to promote pro-environmental behavior. While in terms of policymaking, there's an urgency on making environmental education from an early age accessible to all thus hoping it would form a stable biospheric orientation for future generations. In addition, making sustainability less costly would encourage people to act pro-environmentally and reduce the conflict in their values system.

This paper also comes with limitations. We only included studies that used subjects on the age of 18 and above, which may lead to the omission of several findings, especially on the study about nature contact and childhood nature experiences. Further, we also excluded articles that did not address actual pro-environmental behavior as the dependent variable. In the process of abstract screening, we also can not make sure all of the papers excluded were completely irrelevant even with the help of inclusion criteria and keywords matching. Regardless of the limitations, we hope that our paper can help in understanding the impact of values orientation, nature contact, and childhood nature experiences on pro-environmental behavior.

## 5 CONCLUSION

Anthropogenic environmental issues have been threatening the sustainability of the people and the planet. Pro-environmental behavior is seen to be the key to change people's lifestyles to be more sustainable. By understanding the factors that influenced this behavior, which we specifically limit to values orientation, nature contact, and childhood nature experience, we can then design intervention or develop policy to promote the behavior. Our literature review showed that values orientation mainly biospheric and altruistic values positively influence pro-environmental behavior which can be directly or indirectly through mediating variables that formed a causal chain of effect. We found contradictory outcomes on nature contact relation with pro-environmental behavior studies where results vary on each reviewed article, thus suggesting further research or systematic review on investigating nature contact as an independent variable while the mediator could be nature connectedness. Our review on childhood nature experience influence on pro-environmental behavior showed the effects were mediated by emotional factors, therefore suggesting parents or educational

practitioners give their child a time to form an emotional connection with nature thus further predict pro-environmental behavior in adulthood. To conclude, we suggest interventions to consider activating biospheric and altruistic values or making the intervention nature-based. We also suggest policymakers consider forming biospheric or altruistic orientations in people from a young age through environmental education that is accessible to all. Making pro-environmental behavior less costly is also suggested to reduce the conflict in people's value system, thus it's more likely for them to act environmentally friendly.

## AUTHOR'S CONTRIBUTION

KMSAS conceived the study, drafted the manuscript, and designed the search strategy. KMSAS, ALB, and PDKD collected and analyzed the literature. KMSAS, PDKD, and ALB worked on writing the manuscript. All authors were involved in revising the manuscript and have agreed to the final content.

## ACKNOWLEDGEMENTS

We would like to thank Fakultas Psikologi Universitas Diponegoro for holding the International Conference on Psychological Studies (ICPSYCHE 2021) that gave us a medium to present our study.

## CONFLICT OF INTEREST

The authors declared no conflict of interest.

## REFERENCES

- Aguilar-Luzón, M. C., Carmona, B., Calvo-Salguero, A., & Castillo Valdivieso, P. A. (2020). Values, environmental beliefs, and connection with nature as predictive factors of the pro-environmental vote in Spain. *Frontiers in Psychology*, 11. <https://doi.org/10.3389/fpsyg.2020.01043>
- Ahn, I., Kim, S., & Kim, M. (2020). The relative importance of values, social norms, and enjoyment-based motivation in explaining pro-environmental product purchasing behavior in apparel domain. *Sustainability*, 12(17), 6797. <https://doi.org/10.3390/su12176797>
- Ajibade, I., & Boateng, G. O. (2021). Predicting why people engage in pro-sustainable behaviors in Portland

- Oregon: The role of environmental self-identity, personal norm, and socio-demographics. *Journal of Environmental Management*, 289, 112538. <https://doi.org/10.1016/j.jenvman.2021.112538>
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Alabi, O. A., Ologbonjaye, K. I., Awosolu, O., Alalade, O. E. (2019). Public and environmental health effects of plastic wastes disposal: A review. *Journal of Toxicology and Risk Assess*, 5(021). <https://doi.org/10.23937/2572-4061.1510021>
- Arora, N. K., Fatima, T., Mishra, I., Verma, M., Mishra, J. & Mishra, V. (2018). Environmental sustainability: Challenges and viable solutions. *Environmental Sustainability*, 1, 309-340. <https://doi.org/10.1007/s42398-018-00038-w>
- Ates, H. (2020). Merging theory of planned behavior and value identity personal norm model to explain pro-environmental behaviors. *Sustainable Production and Consumption*, 24, 169-180. <https://doi.org/10.1016/j.spc.2020.07.006>
- Balundė, A., Perlavičiūtė, G., & Steg, L. (2019). The relationship between people's environmental considerations and pro-environmental behavior in Lithuania. *Frontiers in Psychology*, 10(OCT). <https://doi.org/10.3389/fpsyg.2019.02319>
- Barrable, A. (2019). Refocusing environmental education in the early years: A brief introduction to a pedagogy for connection. *Education Sciences*, 9(1), 61. <https://doi.org/10.3390/educsci9010061>
- Barrable, A., Booth, D., Adams, D., & Beauchamp, G. (2021). Enhancing nature connection and positive affect in children through mindful engagement with natural environments. *International Journal of Environmental Research and Public Health*, 18(9), 4785. <https://doi.org/10.3390/ijerph18094785>
- Berman Caggiano, H., Kumar, P., Shwom, R., Cuite, C., & Axsen, J. (2021). Explaining green technology purchases by US and Canadian households: The role of pro-environmental lifestyles, values, and environmental concern. *Energy Efficiency*, 14(5). <https://doi.org/10.1007/s12053-021-09959-8>
- Chawla, L. (2020). Childhood nature connection and constructive hope: A review of research on connecting with nature and coping with environmental loss. *People and Nature*, 2(3), 619– 642. <https://doi.org/10.1002/pan3.10128>
- De Groot, J. I. M., & Steg, L. (2007). Value orientations and environmental beliefs in five countries: Validity of an instrument to measure egoistic, altruistic and biospheric value orientations. *Journal of Cross-Cultural Psychology*, 38(3), 318–332. <https://doi.org/10.1177/0022022107300278>
- De Groot, J. I. M., & Steg, L. (2009). Mean or green: Which values can promote stable pro-environmental behavior? *Conservation Letters*, 2, 61-66. <https://doi.org/10.1111/j.1755-263X.2009.00048.x>
- Fornara, F., Molinario, E., Scopelliti, M., Bonnes, M., Bonaiuto, F., Cicero, L., Admiraal, J., Beringer, A., Dedeurwaerdere, T., de Groot, W., Hiedanpää, J., Knights, P., Knippenberg, L., Ovenden, C., Horvat, K. P., Popa, F., Porrás-Gomez, C., Smrekar, A., Soethe, N., Bonaiuto, M. (2020). The extended Value-Belief-Norm theory predicts committed action for nature and biodiversity in Europe. *Environmental Impact Assessment Review*, 81. <https://doi.org/10.1016/j.eiar.2019.106338>
- Gkargkavouzi, A., Halkos, G., & Matsiori, S. (2019). Environmental behavior in a private-sphere context: Integrating theories of planned behavior and value belief norm, self-identity and habit. *Resources, Conservation and Recycling*, 148, 145–156. <https://doi.org/10.1016/j.resconrec.2019.01.039>
- Hartig, T., Mitchell, R., De Vries, S., & Frumkin, H. (2014). Nature and health. *Annual Review of Public Health*, 35, 207–228. <https://doi.org/10.1146/annurev-publhealth-032013-182443>
- Hosaka, T., Sugimoto, K. & Numata, S. (2017). Childhood experience of nature influences the willingness to coexist with biodiversity in cities. *Palgrave Communications*, 3, 17071. <https://doi.org/10.1057/palcomms.2017.71>
- Jacobs, K., Petersen, L., Hörisch, J., & Battenfeld, D. (2018). Green thinking but thoughtless buying? An empirical extension of the value-attitude-behaviour hierarchy in sustainable clothing. *Journal of Cleaner Production*, 203, 1155–1169. <https://doi.org/10.1016/j.jclepro.2018.07.320>
- Jensen, A. K., & Olsen, S. B. (2019). Childhood nature experiences and adulthood environmental preferences. *Ecological Economics*, 156, 48–56. <https://doi.org/10.1016/j.ecolecon.2018.09.011>
- Kiatkawsin, K., & Han, H. (2017). Young travelers intention to behave pro-environmentally: merging the value-belief-norm theory and the expectancy theory. *Tourism Management*, 59, 76–88. <https://doi.org/10.1016/j.tourman.2016.06.018>
- Keniger, L., Gaston, K., Irvine, K., & Fuller, R. (2013). What are the benefits of interacting with nature? *International Journal of Environmental Research and Public Health*, 10(3), 913–935. <https://doi.org/10.3390/ijerph10030913>
- Kim, S. H., & Seock, Y.-K. (2019). The roles of values and social norm on personal norms and pro-environmentally friendly apparel product purchasing behavior: The mediating role of personal norms. *Journal of Retailing and Consumer Services*, 51, 83–90. <https://doi.org/10.1016/j.jretconser.2019.05.023>
- Křepelková, Š. D., Krajhanzl, J., & Kroufek, R. (2020). The influence of interaction with nature in childhood on future pro-environmental behavior. *Journal of Baltic Science Education*, 19(4), 536–550. <http://dx.doi.org/10.33225/jbse/20.19.536>
- Larson, L. R., Stedman, R. C., Cooper, C. B., & Decker, D. J. (2015). Understanding the multi-dimensional structure of pro-environmental behavior. *Journal of*

- Environmental Psychology, 43, 112–124. <https://doi.org/10.1016/j.jenvp.2015.06.004>
- Lee, C.-K., Olya, H., Ahmad, M. S., Kim, K. H., & Oh, M.-J. (2021). Sustainable intelligence, destination social responsibility, and pro-environmental behaviour of visitors: Evidence from an eco-tourism site. *Journal of Hospitality and Tourism Management*, 47, 365–376. <https://doi.org/10.1016/j.jhtm.2021.04.010>
- Lumber R., Richardson M., & Sheffield D. (2017). Beyond knowing nature: Contact, emotion, compassion, meaning, and beauty are pathways to nature connection. *PLOS ONE* 12(5), e0177186. <https://doi.org/10.1371/journal.pone.0177186>
- Marshall, N. A., Thiault, L., Beeden, A., Beeden, R., Benham, C., Curmook, M. I., Diedrich, A., Gurney, G., Jones, L., & Marshall, P. A. (2019). Our environmental value orientations influence how we respond to climate change. *Frontiers in Psychology*, 10. <https://doi.org/10.3389/fpsyg.2019.00938>
- Martin, L., White, M. P., Hunt, A., Richardson, M., Pahl, S., & Burt, J. (2020). Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours. *Journal of Environmental Psychology*, 68, 101389. <https://doi.org/10.1016/j.jenvp.2020.101389>
- Mayer, F. S., Frantz, C. M., Bruehlman-Senecal, E., & Dolliver, K. (2009). Why is nature beneficial?: The role of connectedness to nature. *Environment and Behavior*, 41(5), 607–643. <https://doi.org/10.1177/0013916508319745>
- Nguyen, T. N., Lobo, A., & Greenland, S. (2016). Pro-environmental purchase behaviour: The role of consumers' biospheric values. *Journal of Retailing and Consumer Services*, 33, 98–108. <https://doi.org/10.1016/j.jretconser.2016.08.010>
- Nguyen, T. N., Lobo, A., & Greenland, S. (2017). The influence of Vietnamese consumers' altruistic values on their purchase of energy efficient appliances. *Asia Pacific Journal of Marketing and Logistics*, 29(4), 759–777. <http://dx.doi.org/10.1108/APJML-08-2016-0151>
- Nordfjærn, T., & Rundmo, T. (2019). Acceptance of distinctiveness to driving and pro-environmental transport intentions: The role of value structure, environmental beliefs and norm activation. *Transportation*, 46(6), 2381–2396. <https://doi.org/10.1007/s11116-018-9950-z>
- Nordlund, A. M., & Garvill, J. (2002). Value structures behind pro environmental behavior. *Environment and Behavior*, 34(6), 740–756. <https://doi.org/10.1177/001391602237244>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372. <https://doi.org/10.1136/bmj.n71>
- Pivetti, M., Melotti, G., Vespa, M., Cappabianca, F., Troilo, F., & Placentino, M. P. (2020). Predicting recycling in Southern Italy: An exploratory study. *Resources, Conservation and Recycling*, 156. <https://doi.org/10.1016/j.resconrec.2020.104727>
- Prévot, A.-C., Cheval, H., Raymond, R., & Cosquer, A. (2018). Routine experiences of nature in cities can increase personal commitment toward biodiversity conservation. *Biological Conservation*, 226, 1–8. <https://doi.org/https://doi.org/10.1016/j.biocon.2018.07.008>
- Raymond, C. M., Brown, G., & Robinson, G. M. (2011). The influence of place attachment, and moral and normative concerns on the conservation of native vegetation: A test of two behavioural models. *Journal of Environmental Psychology*, 31(4), 323–335. <https://doi.org/10.1016/j.jenvp.2011.08.006>
- Rosa, C. D., & Collado, S. (2019). Experiences in nature and environmental attitudes and behaviors: Setting the ground for future research. *Frontiers in Psychology*, 10, 763. <https://doi.org/10.3389/fpsyg.2019.00763>
- Rosa, C. D., Profice, C. C., & Collado, S. (2018). Nature experiences and adults' self-reported pro-environmental behaviors: The role of connectedness to nature and childhood nature experiences. *Frontiers in Psychology*, 9. <https://doi.org/10.3389/fpsyg.2018.01055>
- Schröder, P., Vergragt, P., Brown, H. S., Dendler, L., Gorenflo, N., Matus, K., Quist, J., Rupprecht, C. D. D., Tukker, A., & Wennersten, R. (2019). Advancing sustainable consumption and production in cities - A transdisciplinary research and stakeholder engagement framework to address consumption-based emissions and impacts. *Journal of Cleaner Production*, 213, 114–125. <https://doi.org/10.1016/j.jclepro.2018.12.050>
- Schwartz, S. H. (1992). Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. In M. P. Zanna (Ed.), *Advances in Experimental Social Psychology*, 25, 1–65. Academic Press. [https://doi.org/10.1016/S0065-2601\(08\)60281-6](https://doi.org/10.1016/S0065-2601(08)60281-6)
- Soga, M., & Gaston, K. J. (2016). Extinction of experience: the loss of human–nature interactions. *Frontiers in Ecology and the Environment*, 14(2), 94–101. <https://doi.org/10.1002/fee.1225>
- Steg, L. (2016). Values, norms, and intrinsic motivation to act proenvironmentally. *Annual Review of Environment and Resources*, 41, 277–292. <https://doi.org/10.1146/annurev-environ-110615-085947>
- Steg, L., Bolderdijk, J. W., Keizer, K., & Perlaviciute, G. (2014a). An integrated framework for encouraging pro-environmental behaviour: The role of values, situational factors and goals. *Journal of Environmental Psychology*, 38, 104–115. <https://doi.org/10.1016/j.jenvp.2014.01.002>
- Steg, L., Perlaviciute, G., Werff, E., & Lurvink, J. (2014b). The significance of hedonic values for environmentally relevant attitudes, preferences, and actions. *Environment and Behavior*, 46(2), 163–192. <https://doi.org/10.1177/0013916512454730>

- Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3), 407–424. <https://doi.org/10.1111/0022-4537.00175>
- Stern, P. C., et al. (1999). A value-belief-norm theory of support for social movements: The case of environmentalism. *Human Ecology Review*, 6(2), 81–97.
- van Riper, C. J., & Kyle, G. T. (2014). Understanding the internal processes of behavioral engagement in a national park: A latent variable path analysis of the value-belief-norm theory. *Journal of Environmental Psychology*, 38, 288–297. <https://doi.org/10.1016/j.jenvp.2014.03.002>
- Vicente-Molina, M. A., Fernández-Sainz, A., & Izagirre-Olaizola, J. (2018). Does gender make a difference in pro-environmental behavior? The case of the Basque Country University students. *Journal of Cleaner Production*, 176, 89–98. <https://doi.org/10.1016/j.jclepro.2017.12.079>
- Wang, X., der Werff, E., Bouman, T., Harder, M. K., & Steg, L. (2021). I am vs. we are: How biospheric values and environmental identity of individuals and groups can influence pro-environmental behaviour. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.618956>
- Werff, E., & Steg, L. (2016). The psychology of participation and interest in smart energy systems: Comparing the value-belief-norm theory and the value-identity-personal norm model. *Energy Research & Social Science*, 22, 107–114. <https://doi.org/10.1016/j.erss.2016.08.022>
- Werff, E., Steg, L., & Keizer, K. (2013). The value of environmental self-identity: The relationship between biospheric values, environmental self-identity and environmental preferences, intentions and behaviour. *Journal of Environmental Psychology*, 34, 55–63. <https://doi.org/10.1016/j.jenvp.2012.12.006>
- Wu, L., & Zhu, Y. (2021). How love of nature promotes green consumer behaviors: The mediating role of biospheric values, ecological worldview, and personal norms. *PsyCh Journal*, 10(3), 402–414. <https://doi.org/10.1002/pchj.430>