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High School Students' Psychological Distances to Climate Change in Rural Southern Maryland

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ABSTRACT

With the academic consensus thoroughly agreeing that climate change is anthropogenic, research is examining the public's perceptions of climate change through the psychological distance framework to ultimately develop climate change prevention strategies. Researchers generally agree that psychological proximity predicts climate concern, and concern predicts action. To fill the gap in the research surrounding youth perceptions of climate change, this study investigates students' psychological distance to climate change in a rural southern Maryland high school. Analysis of participants' open-ended and closed-ended responses suggest that youth who have been exposed to firsthand climate change-associated events and impacts tend to have proximal perceptions of climate change and high climate concern. This research supports direct and interactive exposure to impacted ecosystems to proximize climate change, influence climate concern, and ultimately encourage action. Future research should investigate youths' perceptions in developing countries and other climate sensitive locations, as well as using experimental approaches to further investigate the relationship between psychological distance, concern, and action in youth populations.

Introduction

The United Nations defines climate change (CC) as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" (UNFCCC, 1992). The scientific community widely agrees that anthropogenic CC is a formidable threat to environmental and social structures on Earth (IPCC, 2021; Cook et al., 2016; AAAS, 2009). With greenhouse gas emissions from corporate energy and material production being a significant cause, large-scale climate protection approaches are required to mitigate climate impacts (Shaftel, 2022; Heede, 2013). These approaches require widespread climate protection behaviors and policy support (known as climate action) by citizens and consumers to implement. However, psychological barriers often prevent people from taking climate action. (Gifford, 2011).

Consequently, an emerging field of study is investigating individuals' CC perceptions to develop strategies for encouraging climate action in people worldwide. Youth are an essential demographic to research because they will soon inherit the responsibility of remedying climate destruction while simultaneously becoming the first generations to experience living in a world increasingly impaired by long-term climate impacts. Providing the next generations with a thorough understanding of CC's consequences and avenues to proactively protect the Earth is crucial. However, high school age youths' (grades 9-12) CC perceptions are under-researched. Therefore, this study investigated youth CC perceptions through the dimensions of psychological distance in an under-researched area to give insight into methods of encouraging youth to take climate action.

Literature Review

The psychological distance framework was created by Liberman and Trope (2008). It measures "the extent to which an object is removed from an individual" through four dimensions: spatial, perceived geographical distance; temporal, perceived distance in time; social, perceived separation from an individual or group; and hypothetical, perceived certainty that something exists. Climate communication researchers use the psychological distance framework to measure CC perceptions.

Spence et al. (2012) first conducted research applying psychological distance to CC in a survey of adult UK citizens. They found that lower psychological distance correlates with greater CC concern and concern predicts climate action. Spence et al.'s methods and findings revolutionized the field by establishing the connections between psychological distance and CC concerns, leading to further research in the field. In a subsequent study, Singh et al. (2017) researched the factors influencing an individual's climate policy support by quantitatively surveying adults' perceived psychological distance, climate efficacy, and policy support. Singh et al. support Spence et al.'s finding that lower psychological distance predicts higher concern which can encourage action, as well as revealing that discrepancies between psychological distance, concern and policy support may be created by low climate efficacy (the belief that one's actions can affect climate protection). Building on the previous research, Loy and Spence (2020) used an experimental approach to investigate UK adults' climate perceptions by exposing adult UK participants to varying CC-related media before surveying them. They found that media emphasizing the socio-spatial proximity to CC reduced psychological distance, predicting climate action. Based on their findings, Loy and Spence agreed that reducing psychological distance can encourage climate action.

While the relationship between climate perceptions and actions is complex, the academic community generally agrees that psychological distance influences concern, and concern influences action (Spence et al., 2012; Singh et al., 2017; Feldman, 2021; Loy and Spence, 2020). However, most previous research on psychological distance to CC primarily studied adult populations, while research on youth tended to use other measures. Despite this, these studies can still yield vital information about youths' climate perceptions. One such study, Feldman (2021), surveyed Australian university students about participation in climate strikes to investigate motivators of climate action. Feldman found that participation decisions were influenced by concern for the future, positive views of the future, and environmental efficacy, suggesting that concern can encourage climate action in youth. Lee et al. (2020) took a different approach, analyzing 51 articles on children and adolescents' CC beliefs, knowledge, and concern. They found that CC knowledge encouraged belief, and belief encouraged concern. However, belief was lower in high-income countries where children believed that CC affected others more than themselves. Youth from high-income, individualistic democratic countries like the US were unwilling to take personally inconvenient action, suggesting they perceive CC as psychologically distant.

Only one study had directly surveyed youths' climate perceptions using the psychological distance framework. This study was conducted by Gubler et al. (2019) on 587 secondary school students throughout Bern, Switzerland. They found that the participants tended to perceive CC as psychologically distant, regarding it as a faraway phenomenon that did not significantly affect them. Furthermore, psychological distance was the best predictor of a participant's climate concern. Gubler et al. established that youths' psychological distance predicts concern, aligning with findings from similar studies on adult demographics and the results of the previously mentioned studies on youth (Spence et al., 2012; Feldman, 2020; Lee et al., 2020). However, the study is limited by its scope. I sought to fill the gap in the research by first conducting a similar study in an under-researched location to expand the base of knowledge surrounding youths' climate perceptions. Secondly, I conducted a narrowly focused study in an area with evident climate impacts. Thirdly, I also chose to conduct a study with both quantitative and qualitative elements to thoroughly understand participants' climate perceptions. This study addresses many issues within the current literature. First, youth may have diverse perceptions due to their unique circumstances; large-scale studies may dilute these perspectives. Furthermore, many vulnerable

areas on Earth play crucial roles in environmental and societal processes. Understanding the perceptions of youth who live in these locations is necessary to encourage effective climate action to protect these crucial environments.

One such location, the Chesapeake Bay watershed (located in the Eastern United States) is a diverse ecosystem that is both home to a plethora of wildlife and an integral part of the culture and livelihoods of many people who live within it (Chesapeake Bay Foundation, 2022b; National Parks Service, 2018). However, CC-caused environmental damage is evident (Chesapeake Bay Foundation, 2022a; Najjar, 2010). Therefore, this study examined youths' perceptions of their psychological distance and CC concerns in a rural southern Maryland high school to investigate how strategies for encouraging climate action can be implemented based on the unique circumstances of youth in different locations.

Methodology

To address the gap in the research, I conducted an exploratory mixed-methods survey. In the social sciences, survey research is ideal for studies in which individuals are the "unit of analysis" and aim to measure unobservable data such as attitudes, behaviors, or beliefs. A questionnaire survey provided participants with an anonymous and unobtrusive survey experience, encouraging truthful responses (Bhattacherjee, 2012; Leedy and Ormrod, 2019). Furthermore, a digital research design allowed for participant ease of use and ensured that participants could complete the survey remotely. Additionally, a convergent mixed-method approach allows researchers to investigate sub-questions within their larger research question to "reveal various, complementary facets of the phenomenon under investigation" (Leedy and Ormrod, 2019). Accordingly, quantitative analysis of closed-ended questions yielded a thorough overview of the participants' perceptions of CC, while qualitative analysis of open-ended questions revealed a deeper understanding of circumstances surrounding participants' psychological distance to and concern about CC. This study was conducted with the assumptions that the scales used were reliable and accurate and that participants answered truthfully. Furthermore, all items and information in this study that was adapted from outside sources was obtained with permission.

Participants and Design

I used a digital questionnaire to provide participants with an anonymous and unobtrusive survey experience. Participants were first asked five open-ended questions (Table 1) about the factors and experiences that have influenced their understanding and concern about CC. The open-ended section was placed first to reduce fatigue during completion and prime participants for the subsequent closed-ended questions. These questions allowed the participants to describe their personal experiences with CC, gaining deeper insight than what purely closed-ended questions would allow.

Table 1. Open-Ended Questions.

Question Label	Question
1	What factors, experiences, etc. have influenced your level of concern about climate change?
2	What thoughts, images, or feelings arise when you think about climate change?[1]
3	Please describe any events or effects on your local area/community that you believe have been caused by climate change.
4	How has your experience with nature and the local environment shaped your concern about climate change?
5	Where and how have you learned about climate change and its effects?

[1]Question 2 was adapted from Gubler et al. (2019).

The second section contained twenty-two questions assessing participants' psychological distance, self-reported knowledge, and concern, and original questions measuring participants' perceptions of education and exposure to local impacts (Table 2).

Table 2. Closed-Ended Questions.

Construct	Label	Statement	Cronbach's α
Self-reported knowledge	1	How much do you think you know about climate change?	N/A
Spatial	1	Climate change is affecting the area where I live.[1, 3]	0.526
	2	My first thoughts about climate change are about how it will impact the area where I live.[1, 3]	
	3	Climate change is mostly affecting areas that are far away from me.[2]	
Temporal	1	The impacts of climate change will be mostly felt far in the future.	0.682
	2	The impacts of climate change can already be felt now.[1]	
	3	As long as I live, the impacts of climate change will be only felt very weakly.	
Social	1	Climate change impacts will be particularly strong for people that are like me and think like me.[1]	0.750
	2	Climate change will particularly affect me, my family, and my friends.[1]	
	3	Climate change will particularly affect people who have similar desires and goals in life as I do.[1]	
Concern	1	When I think about the effects of climate change, I worry a lot.	0.802
	2	The more I know about the effects of climate change, the more I'm worried.	
	3	The thought of the effects of climate change worries me every day	
	4	I classify the effects of climate change as harmless.[1]	
Hypothetical	1	I question if climate change is a serious threat at all.[3]	0.709
	2	I believe that humans are responsible for current climate change.[1, 3]	
	3	I am certain that climate change is happening.[1]	
Education	1	I have received a thorough education in school about the causes of and science behind climate change.	0.822
	2	School has taught me how I have an impact on climate change and what I can do to reduce it.	
	3	I believe that climate change should be taught in schools.[2]	
Local	1	I am worried that climate change will affect/is affecting the local environment (including waterways).	0.656
	2	I have seen/felt evidence of climate change where or near where I live.	

Note. The questions used to measure spatial, temporal, social, and hypothetical distance and concern were adapted from Gubler et al. (2019). All were graded on a 5-point Likert scale ranging from 1, "strongly disagree" to 5, "strongly agree," except for self-reported knowledge, which ranged from 1, "very little," to 5, "a lot."

[1]Item was reversed scored.

[2]Item was excluded from the analysis.

[3]Question has been edited from the original for clarity.

Next, participants' relationship with the natural environment was measured using the Extended Inclusion of Nature in Self scale (EINS) (Martin and Czellar, 2016). This item included four questions that were graded on a 7-point Likert scale (Figure 1). The section also included a shortened version of the Environmental Portrait Value Questionnaire (EPVQ) adapted from Bouman et al. (2018), which contained ten questions assessing participants' value orientations (Table 3) to identify possible motivators and detractors of climate concern.

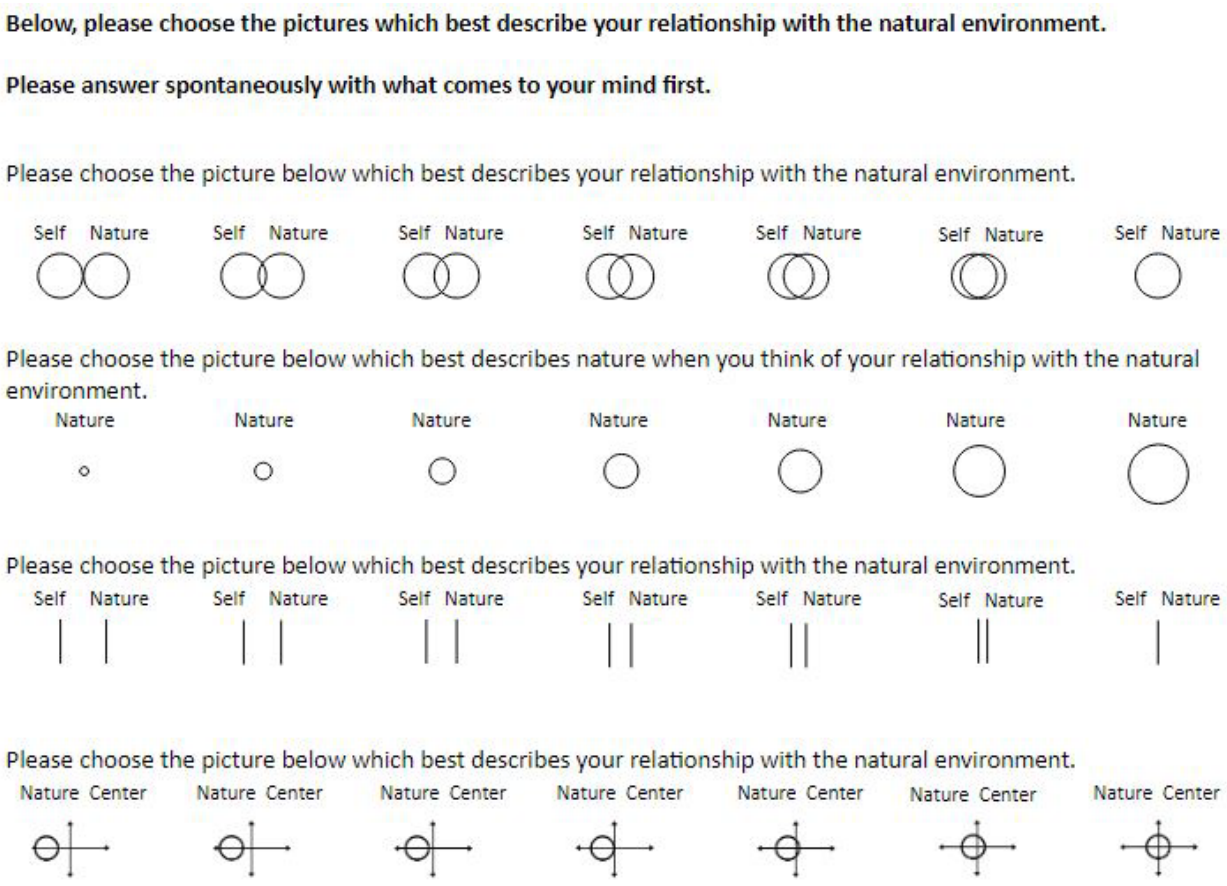

Figure 1. Extended Inclusion of Nature in Self Scale

Table 3. Environmental Portrait Value Questionnaire.

Value	Label	Statement	Cronbach's α
Biospheric	1	It is important to me to protect the environment.	0.740
	2	It is important to me to respect nature.	
Altruistic	1	It is important to me to take care of those who are worse off.	0.777
	2	It is important to me that every person is treated justly.	

	3	It is important to me to be helpful to others.	
Hedonic	1	It is important to me to have fun.	0.755
	2	It is important to me to do things I enjoy doing.	
Egoistic	1	It is important to me to have money and possessions.	N/A
	2	It is important to me to work hard and be ambitious.[2]	
	3	It is important to me to be influential.[2]	

Note. These questions were adapted from Bouman et al. (2018) and were graded on a 7-point Likert scale ranging from 1 “not at all like me” to 7 “very much like me.” A 1 represents that the question was reversed scored. A 2 denotes an item that was excluded from the analysis due to a low Cronbach’s alpha value.

The final section of the questionnaire assessed demographic characteristics: grade in school, gender, race, total annual household income, and political orientation. Demographic questions were included to understand the participants and investigate how participants' demographics impact their CC perceptions.

After obtaining approval from the school's Institutional Review Board, data was collected from December 2021 to January 2022. Participants were recruited through posters placed around the school of study and personal contacts. Students were required to be currently enrolled in grades 9-12 at the high school of study and currently residing in southern Maryland to participate. After receiving informed consent from the students, a survey link was sent to their school email. Participants’ emails and personal information were not collected. All data collected was destroyed after the study’s completion to ensure participant anonymity and privacy.

Analysis

I conducted a descriptive statistical analysis to understand and characterize the participants and their perceptions. I also conducted a correlational analysis. This method allows researchers to examine “the extent to which differences in one variable are associated with differences in one or more other variables,” making this method ideal for investigating the relationships between each variable (Leedy and Ormrod, 2019). Psychological distance was scored so that higher values denoted distant perceptions and low values meant proximal perceptions. For variables measured on a 5-point Likert scale, mean values above 2.5 were classified as high or psychologically distant, while values below 2.5 were classified as low or proximal. Incomplete responses were deleted pairwise. However, reliability tests revealed that the unadjusted Chronbach’s alpha values of the “Spatial” and “Egoistic” variables were under 0.5, which is widely regarded as unacceptably low. Spatial Item 3 was removed from the spatial variable for improved reliability. Egoistic Item 1 was converted into the "Materialistic" variable because it was the most directly relevant to climate change, as materialism can lead to consumption. Statistical analyses were conducted on the software JASP (2021).

To analyze the open-ended questions, I conducted a thematic analysis. This qualitative analysis method “entails searching across a data set to identify, analyze, and report repeated patterns” and is applicable across a wide range of research designs, making it ideal for my study (Kiger and Varpio, 2020). Following the process outlined by Kiger and Varpio, I thoroughly familiarized myself with the data before sorting it into preliminary categories based on the question assigned to each response. I started with a deductive approach to preliminary coding by finding connections within each question's answers, assuming that every response was attempting to answer its respective question. After reviewing and refining the codes, I regrouped them into descriptive categories based on connections in the data using inductive reasoning. Therefore, I was able to create themes that transcended predetermined categories. Although care was taken to remain objective during analysis, it was conducted by one researcher and is therefore subjected to the biases of a singular interpretation. Responses containing two or more blank or one-word answers were excluded from the analysis.

Results

The total number of participants was 42. Eleventh-graders were overrepresented (64.286%), followed by ninth-graders (19.048%), twelfth-graders (14.286%), and finally, tenth-graders (2.381%). White students were the most populous (71.429%), followed by students of two or more races (14.286%). Black/African American, Hispanic/Latino, and Asian students made up the remaining participants with 4.762% each. The median annual total household income was $125,000-150,000. The most populous political orientation represented was somewhat liberal/left-leaning (38.095%), followed by "I do not know" and neutral responses (26.19%), very liberal/left-leaning (23.81%), and somewhat conservative/right-leaning (9.756%). Finally, the mean self-reported knowledge was 3.095, with the majority (54.762%) reporting average knowledge. The distributions of responses to psychological distance and concern items are shown below.

Descriptive Statistics

First, participants spatially perceive climate change as slightly distant (M=2.810). While they believe that it impacts both local and faraway areas, their first thoughts are not about local impacts. Figure 2 shows the levels of participant agreement with the spatial distance items.

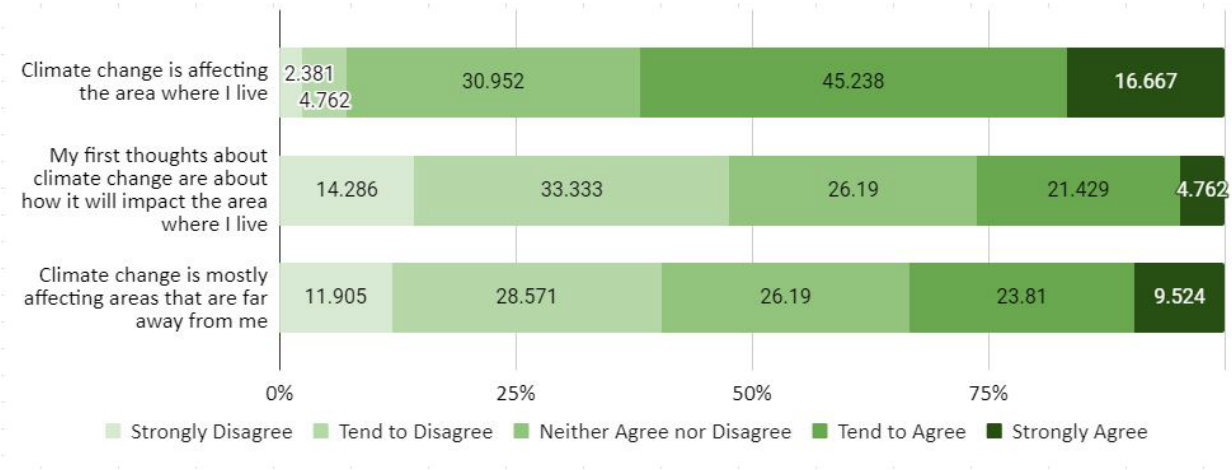

Figure 2. Perceived Spatial Distance to Climate Change by Agreement in Percent.

The temporal distance results (M = 2.260) indicate that participants strongly agree that CC is currently occurring and that impacts will be felt in their lifetime. Figure 3 displays agreement to each temporal statement.

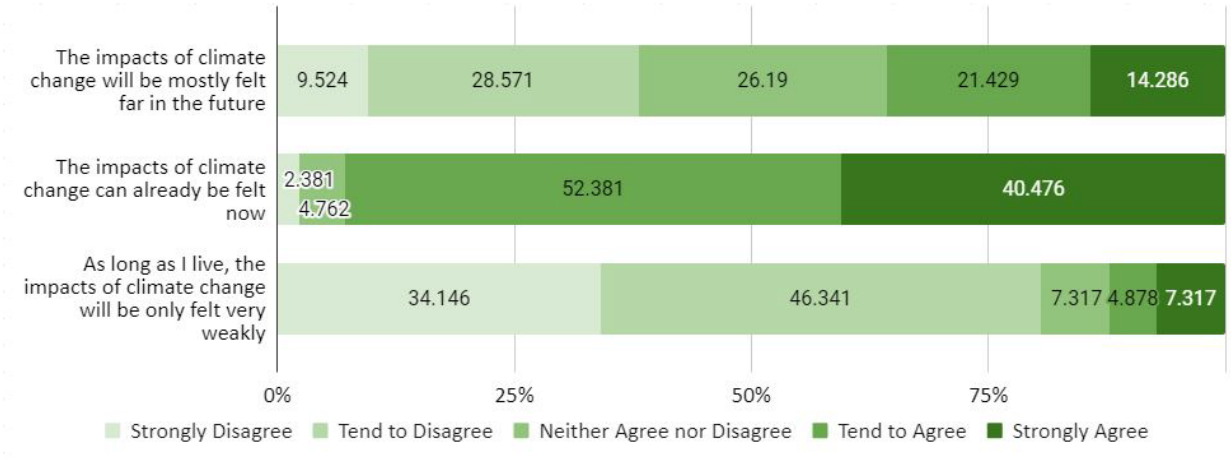

Figure 3. Perceived Temporal Distance to Climate Change by Agreement in Percent.

Social distance was relatively large (M=3.049), suggesting that participants mostly believe climate change impacts people unlike themselves more strongly (e.g., people in developing countries). Below, figure 4 displays agreement with social distance statements.

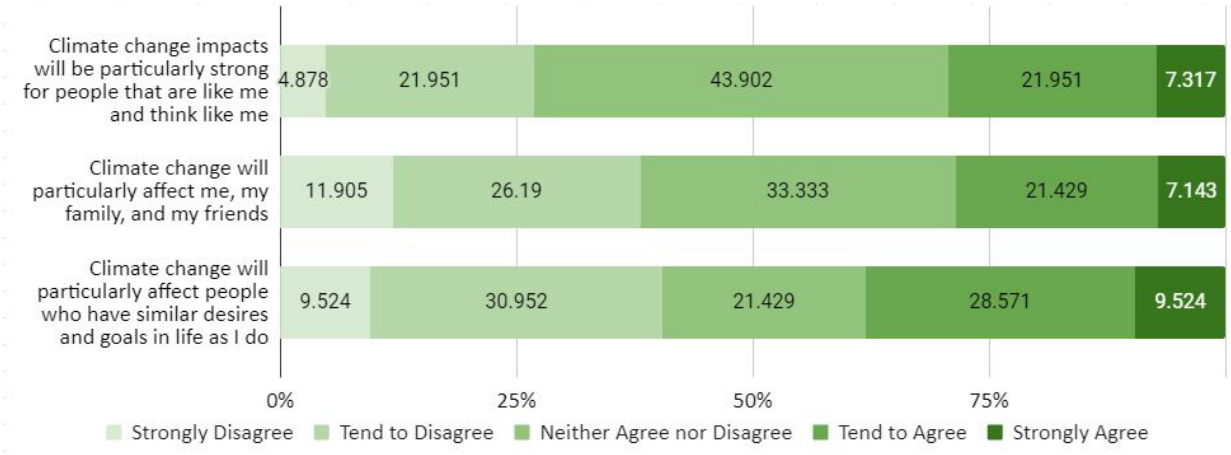

Figure 4. Perceived Social Distance to Climate Change by Agreement in Percent.

Hypothetical distance was very proximal (M=1.651), showing that participants already acknowledge CC as a real and human-caused threat. Hypothetical distance agreement is shown in Figure 5.

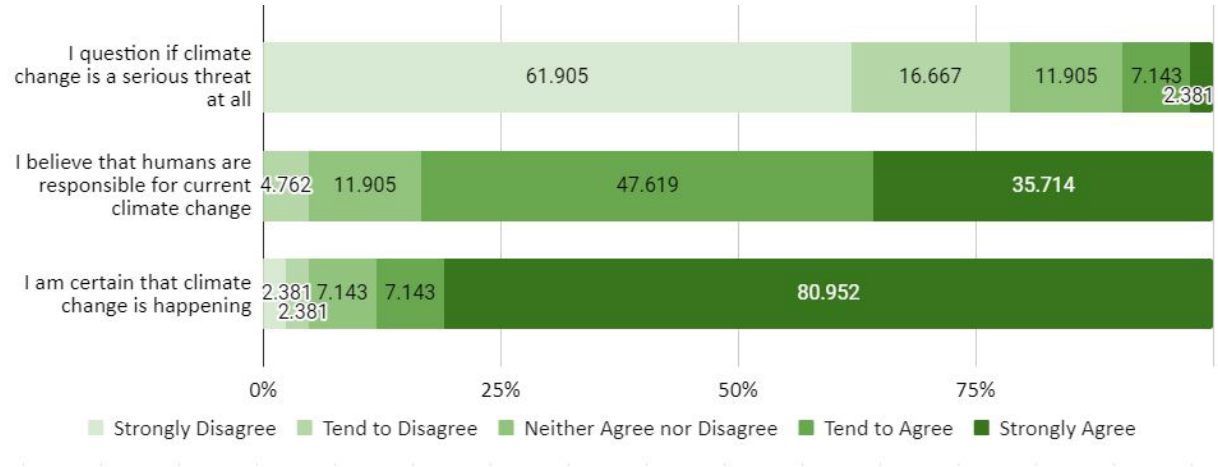

Figure 5. Perceived Hypothetical Distance to Climate Change by Agreement in Percent.

Overall concern was very high (M = 3.685). Figure 6 displays agreement to each item measuring CC concern.

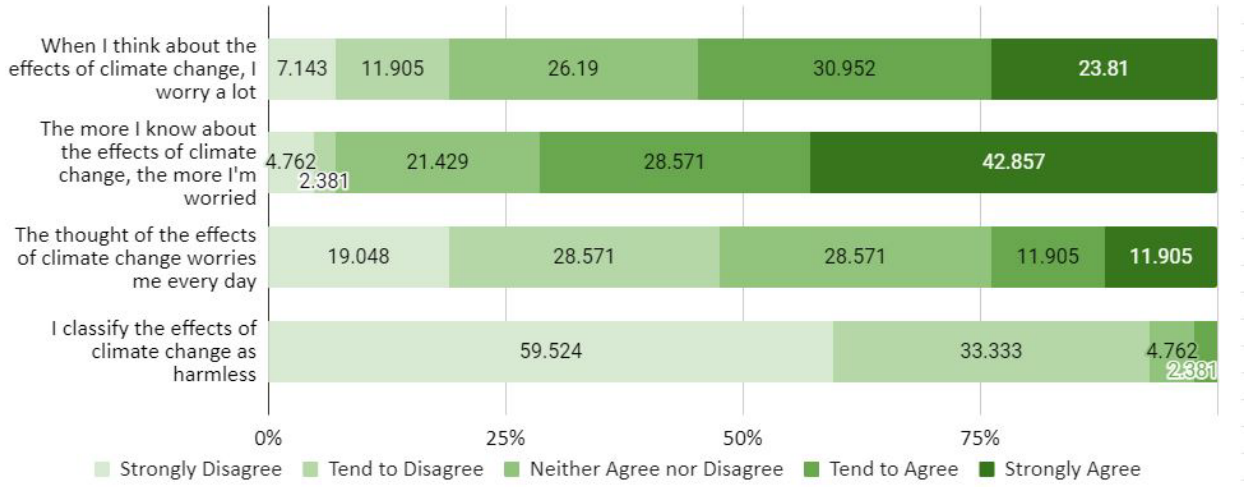

Figure 6. Climate Concern by Agreement in Percent.

Participants had divided opinions concerning education about CC, trending slightly toward a more positive perception (M=3.155). Perceptions of CC education are shown in Figure 7.

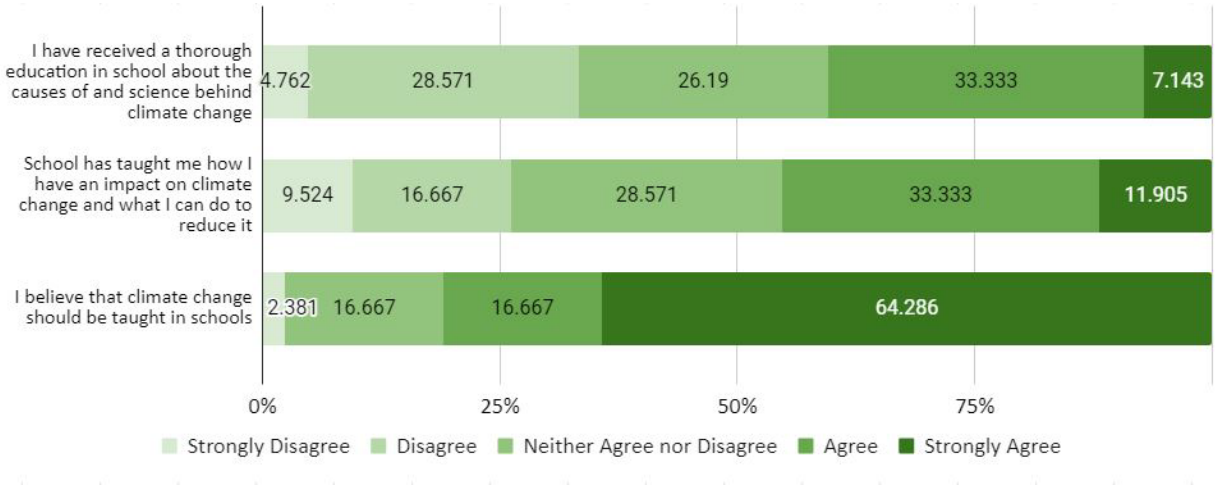

Figure 7. Perceptions of Climate Education in Schools by Agreement in Percent.

Finally, participants reported relatively high perceptions of local impacts (M = 3.871). Local CC perceptions by agreement are shown in figure 8.

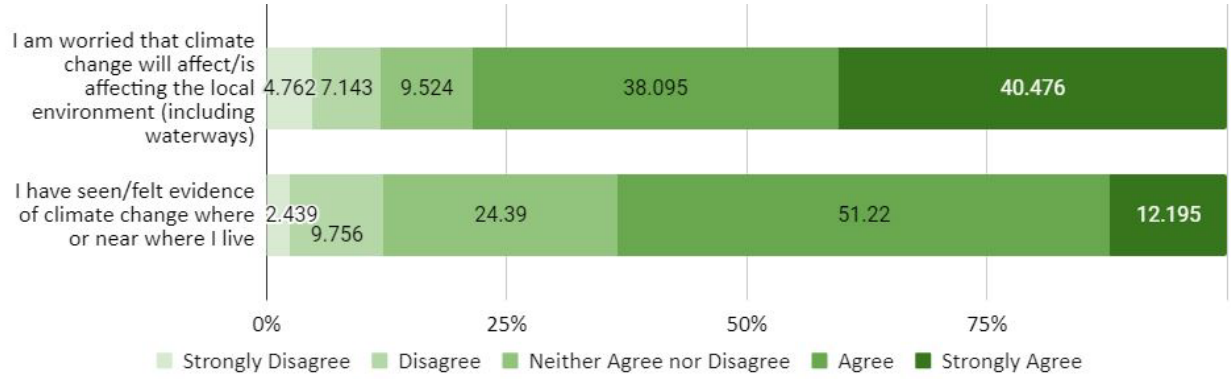

Figure 8. Perceptions of Exposure to Local CC Impacts by Agreement in Percent.

Correlational Analysis

The statistically significant results of the correlational analysis are presented in Table 4.

Table 4. Significant Pearson's Correlations Among Variables.

Variable	Concern	Spatial	Temporal	Social	Hypothetical	INS	Local	Hedonic
Grade		.340 *						
Gender	.358 *				-.325 *		.390 *	
Mean Psych. Dist	-0.745 ***							
Social	-.44 **	.575 ***						
Hypothetical	-.727 ***		.661 ***					
Knowledge					-.459 **			
INS	.441 **			-.36 *				
Education			.341 *					
Local	.772 ***	-.459 **	-.68 ***	-.65 ***	-.69 ***	.336 *		

Biospheric	.63 ***		-.418 **		-.388 *	.477 **	.368 *	
Altruistic	.426 **						.318 *	
Hedonic			.35 *				-.32 *	
Materialistic							-.313 *	.362 *

Note. Only significant correlations are shown. INS indicates the "inclusion of nature in self." Grade was scored from 1 to 4 in ascending order, and gender was scored so that Male = 0 and Female = 1.
* p < .05, ** p < .01, *** p < .001

Mean psychological distance is strongly negatively correlated with concern, meaning concern increases as psychological distance decreases (as climate change is perceived as proximal). Similarly, except for spatial, each individual dimension is also negatively correlated with concern. Furthermore, the spatial and social dimensions and the hypothetical and temporal dimensions are correlated with each other. Additionally, exposure to local impacts is negatively correlated with every dimension of psychological distance and positively correlated with concern. Other notable variables significantly correlated with concern are biospheric values, altruistic values, the inclusion of nature in self, and exposure to local impacts, which is also negatively correlated with every dimension of psychological distance.

Thematic Analysis

After collecting the eligible free responses and coding them, five major common themes stood out. Two participants were excluded from the analysis for submitting two or more one-word responses. Table 5 summarizes these themes and their respective sub-themes below.

Table 5. Thematic Analysis Results.

Theme	**Description**
Subtheme	Significant Example
1.) Life factors encourage climate concern	**Relates to the factors, circumstances, or experiences in a participant's life that impacted the development of their climate concern**
(a) Love for nature	"I've always loved nature. The ocean in particular. Issues regarding pollution and ice melting in the ocean are probably what have really made me concerned about climate change."
(b) Religion and lifestyle	"My personal spirituality, as well as growing up in a family of vegetarians, and being one myself, that heightens my concern for animals in nature as well."
(c) Exposure to nature	"I live really close to the woods, so I've always been around nature growing up. Living so close to nature I would say has made me really concerned about climate change, because irreversible climate change would mean permanent changes in the environment I practically grew up in."
(d) Environmental education experiences	"We went to Elms [Environmental Education Center] every year in elementary school and I feel like I felt all the nature leaving as we got older. Everything felt fragile and almost in danger of evaporating out of existence...This unnerved me in a way that I did not recognize at the time, but I now know has greatly contributed to my feelings toward climate change."
2.) Association of global impacts and events with climate change perceptions	**Relates to distant, widespread, or general events and phenomena that participants associate with the development of their perceptions and concerns about climate change**

(e) Natural disasters	"Extreme weather events that have happened in recent years, such as the severe freezing in Texas in early 2021."
(f) Polar ice melt and sea-level rise	"I think about polar ice caps melting, rising in water levels"
(g) Changing worldwide weather and temperature patterns	"The fact that temperatures are getting continuously hotter and ice caps keep melting; increases concerns"
(h) Large-scale resource use and environmental destruction	"The excessive use of cars is definitely a big factor but also farm animals such as cows"
3.) Association of local impacts and events with climate change perceptions	**Relates to local or firsthand events or phenomena that participants associate with the development of their perceptions and concerns about climate change**
(i) Local temperature and weather changes	"I've noticed how much less snow there was during the wintertime and how much warmer it was outside during this season. It's crazy to see how different past weather reports for the same time of year, the winter in particular, can be so drastically different."
(j) Local ecological disruption	"I have noticed weird patterns with biotic factors such as animals and some plants. I live right near the wood and It seems that because of the weird weather at times, animals get confused and they come out. Plants tend to thrive at different times of the year. I noticed during the fall, the trees didn't stop photosynthesizing for a while. Chery blossoms came late as well."
(k) Impacts on the Chesapeake Bay and local watershed	"Southern Maryland is surrounded by the Chesapeake Bay, which makes climate change seem very 'close to home.' Flooding is now more common because climate change's effect on sea levels."
4.) Psychological distress caused by climate change	**Relates to the overwhelmingly negative emotions that participants reported in association with climate change**
(l) Fear and anxiety	"I just immediately feel very palpable fear and dread when I think about it."
(m) Sadness and loss	"I feel sad and discouraged when I think about climate change and the affects that it already has had on our world."
(n) Anger and frustration caused by inaction or politicization of climate change	"Annoyance and confusion as to why there is so little being done by governments and leaders around the world to combat the climate crisis."
(q) Desire to act	"I want to protect what little stabillity we have in our environment, and makes me feel like I HAVE TO DO SOMETHING"
5.) Climate knowledge from various sources	**Relates to the methods by which participants learned about climate change through traditional or nontraditional means**
(r) Science classes in school	"My elementary and middle school education contributed greatly towards my climate change knowledge. Fieldtrips to the Elms [Environmental Education Center] and projects regarding the environment sparked my interest originally."
(s) Social and internet-based media	"I learned about climate change through social media. I often find climate change-related posts as I scroll through social media. This general information sparked my interest in learning about how climate change effects me and this region."
(t) News media	"I have mostly kept up with climate change by reading articles about it online and catching occasional news clips about it when my mom has the news on."

(u) Personal inquiry	"I have learned by mainly doing my own research into the different topics surrounding climate change."
(v) Communication with family and peers	"I've learned about climate changes and its effects through mainly family, my sisters are all aware of the issues regarding climate change and have talked openly about it"
(w) Articles, documentaries, television, videos, magazines, or books	"Documentaries and TV shows about climate change have had the biggest influence on my knowledge and concern of climate change. Without them I don't believe I would think about climate change in any particular way."
(x) Environmental education opportunities	"I have learned about climate change and its effects mostly through my science class and elementary/ middle school field trips. We used to take trips to elms which focused on environmental education."

Note. Examples are directly transcribed from participant responses.

Discussion

This research yields important new understandings for climate change communication and has interesting implications for effective approaches to encourage climate action in youth on an international and local level. Conclusions were drawn with the assumption that climate concern encourages action, as supported by previous research in the field (Spence et al., 2012; Singh et al., 2017; Feldman, 2021; Loy and Spence, 2020).

These results suggest that participants believe CC impacts distant areas and people unlike themselves to a stronger extent. They also firmly believe that climate change is real, tend to believe it is happening now, and perceive it as a threat. Interestingly, responses to spatial and social items (Figures 3 and 5) also suggest that participants may believe that CC is affecting both local and distant areas, as well as both people like and unlike themselves, but has more substantial impacts on faraway locations and “different” people. Similarly, the temporal results (Figure 4) suggest that participants may believe increasingly severe climate impacts will occur in the future regardless of CC's severity within their lifetimes.

A comparison with results from Gubler et al. (2019) in Figure 9 reveals that participants have substantially smaller spatial, social, and hypothetical perceptions of climate change and higher concerns. In other words, they perceive it as more real, immediate, and impactful on themselves and their location. However, the temporal distance is nearly identical to Gubler et al., suggesting that youth in different locations similarly perceive climate change as an immediate threat. Overall, participants generally had more proximal perceptions of psychological distance than the participants in Gubler et al.

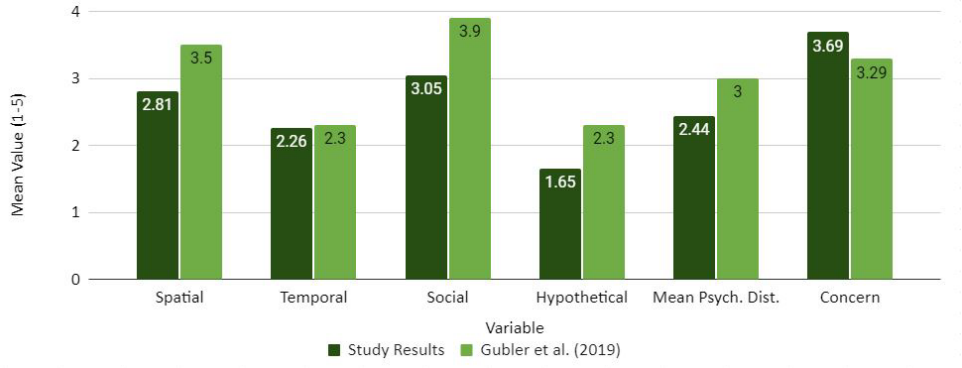

Figure 9. Comparison of Statistical Results with Gubler et al. (2019).

Exposure to Local Climate Impacts

These differences may be explained by participants' proximity to the Chesapeake Bay watershed, a sensitive environment in which climate impacts are evident (Chesapeake Bay Foundation, 2022a; Najjar, 2010). In addition to the correlation between exposure to local impacts and psychological proximity, evidence can be found within the thematic analysis. Participants frequently reported seeing local impacts in their environment. Furthermore, Theme Three reveals that participants considered these local impacts when perceiving climate change, supporting the role of local environmental exposure as a potential motivator of concern. For example, one participant stated: "In Maryland most of us live in costal [sic] areas and climate change could increase the rise of the tides and cause flooding in the area, another thing is that it could disrupt the fishing and farming land we have here." This participant discussed CC as spatially and socially proximal.

Within Theme Four, participants also frequently reported worry for the local environment caused by local impacts, such as "There are a lot of algae blooms all around our area on the water. The temperature is unpredictable and warmer on average than it used to be…that is deeply concerning for me." Some participants reported even more direct experiences; for example, one participant stated, "I live on a farm, therefore the nature and local environment directly effects [sic] me and my lifestyle. More specifically, I find the increasing heat each year more difficult because it increases my responsibilities of farm work. Due to this, my concern for climate change grows annually." These findings suggest that exposure to real and observable impacts in local environments may encourage psychological proximity in youth, supporting previous findings that direct experiences in nature can encourage environmental behaviors (Rosa and Collado, 2019). Therefore, future research could perform similar studies on youth in other sensitive environments in different areas of the world, especially in industrializing countries and areas where CC impacts are prominent.

Local Impacts, Environmental Education, and Concerns

Similarly, local environmental exposure was commonly found to be both a source of participants' climate education and a driver of their concerns within Themes One and Five. A specific connection between education and concern was found to be environmentally-oriented field trips to the school system's Elms Environmental Education Center. The county public elementary school curriculum includes yearly trips to Elms, in which students are exposed to the local watershed and learn about the environment through field trips with hands-on activities and active learning (Elms Environmental Center, 2021). Furthermore, these programs combine many elements found in previous research to encourage climate action, including direct environmental exposure, building CC's personal relevance, engaging activities, scientific interaction, and community projects (Corner et al., 2015; Monroe et al., 2017; Ojala and Lakew, 2017, Rosa and Colllado, 2019).

These results affirm that the environmental education experiences provided by these programs can effectively encourage CC education, concern, and ultimately action in youth who attend. Participants' generally positive perceptions of CC education in schools and frequency of reporting school-related programs as a source of climate education suggest that the current environmental and climate education programs have positively impacted climate action. Together, these findings suggest that these approaches can be built upon, focusing on local awareness and action-based approaches to encourage CC action. To better understand the effectiveness of school environmental education programs on a larger scale, further research could investigate whether the content of environmental education programs across the world employs effective methods of encouraging climate action.

Temporal Perceptions and Climate Media

The mean temporal distance is nearly identical to Gubler et al. (2019) and is similar to studies of youth in other locations such as the UK, suggesting that youth in different locations with similar circumstances may similarly

perceive CC as immediate (Corner et al., 2015). The growing worldwide prevalence of media discussing contemporary climate impacts may explain these similar temporal perceptions. First, Theme Five of the thematic analysis shows that media is a significant source of information, with social and news media mentioned by 30 participants. Second, participants reported evidence of temporal proximization. For example, one participant stated that "looking at comparative images of how the world has changed in recent decades, especially those of the polar ice caps, is a very strong eye-opener to the amount of damage climate change has done."

These findings suggest that news and media highlighting contemporary climate impacts can raise concern and encourage action through temporal proximization, corroborating previous findings such as Loy and Spence (2020). However, Singh et al.'s (2017) study on adults found conflicting results, prompting further research on whether temporal proximity increases CC concern and action across different age demographics. Future research should also examine the impacts of CC-related media in developing countries, as most research was conducted in highly-developed countries.

Socio-Spatial Perceptions of Climate Change

Participants frequently reported concern about their local environmental and social structures caused by environmental disruption in their environment. These perceptions suggest spatial and social proximity and tend to be described in detail through specific examples, supporting the results of Schuldt et al. (2019) that direct experiences may have a stronger effect on concern than indirect exposure. However, while Theme Three suggests that spatial proximity is related to climate concern, Theme Two reveals that participants also considered global, spatially distant impacts when perceiving climate change.

These findings support the correlational results that although spatial distance does not directly correlate with concern, it may play a role in determining psychological distance through the social dimension. Similar results were reported in Spence et al. (2012) and Gubler et al. (2019), supporting their findings that communicating certain spatially distant yet socially proximal impacts can effectively encourage concern. Future research could use an experimental approach to examine the inter-dimensional relationships of psychological distance on youth demographics to investigate this connection further.

Climate Concern

Mean concern is slightly higher than in Gubler et al., being 3.685 compared to 3.29, potentially resulting from more direct exposure to CC impacts. Despite the high concern, most participants reported that this worry does not tend to impact them daily (Figure 7). This may be due to other, more immediate stresses such as schoolwork and social pressures, as discussed in Corner et al. (2015). However, Theme Four reveals participants' emotions surrounding CC, overwhelmingly those of worry, fear, and sadness, aligning with high climate concern. These results are similar to those of Australian and Swedish youth and American adults (Corner et al., 2015).

These findings suggest that youth are deeply emotionally affected by the threat of CC, containing many potential avenues for encouraging climate action. For example, worries for wildlife and the environment, including specific worry for the welfare of polar bears, were frequently mentioned, supporting education and media messaging that discusses CC impacts on animals as a method of increasing concern in youth. This aligns with research concluding that approaches focused on connecting youth with CC on a "deeper" emotional level tend to have favorable outcomes compared to approaches only focused on increasing knowledge (Ojala and Lakew, 2017).

Furthermore, this research supports findings that building climate concern through discussions of the future could be an effective way of encouraging climate action (Feldman, 2021; Ojala and Lakew, 2017). However, care must be taken to ensure that youth do not experience severe psychological distress from concern-

building approaches. This is especially important considering that the research suggests hopeful future portrayals may also be effective in encouraging youth climate actions (Feldman, 2021; Ojala and Lakew, 2017).

Education and Communication

Participants reported various climate education sources, with most mentioning multiple (Theme Five). Many participants reported seeking information of their own accord through various sources, suggesting that approaches for encouraging action could utilize a variety of media types. Many participants also reported learning from family members, suggesting that encouraging climate action in adults may effectively reach youth. This supports previous findings that parents and peers are a source of CC knowledge and beliefs (Gubler et al., 2019). However, some studies, including Ojala and Lakew (2017), reported conflicting results, implying that further research should investigate the impact of family and peers on youths' CC perceptions.

In summary, these findings suggest that youth who have been exposed to firsthand events and impacts that they associate with CC tend to have proximal perceptions of CC and high climate concern. Overall, these results align with those of similar studies focused on youth in different countries, suggesting that the findings and implications of these studies can be extrapolated to include youth living in different locations under similar circumstances. However, these studies tend to focus on western and developed countries, so future research should study youth in areas including Southeast Asia, South and Latin America, Africa, and developing countries to obtain a worldwide representation of youths' psychological distance to CC.

Limitations

While this research yielded critical new data and understandings, its limitations must be considered. First, the area of focus was limited to a single school. When comparing results with studies on broader population samples, the concentrated demographic and small sample size must be considered. Furthermore, the most effective recruitment strategy was through peer contacts, resulting in many participants being high-performing junior students from the school's global studies program. Therefore, this group is likely over-represented in the results. Also, it is important to mention that no causal relationships can be proven through these findings.

Future research could use an experimental approach to investigate the relationship between psychological distance, concern, and action in youth populations. Other avenues for research include similar exploratory studies on youth populations in other under-researched locations to better understand how exposure to and interaction with local environments impacts youths' psychological distance to and concern about climate change, especially in other sensitive environments such as industrializing countries. Future research is still needed to unearth the complexities of this crucial topic.

Conclusions and Implications

This study found that students in a rural southern Maryland high school perceive climate change as both a local and global threat. Furthermore, they tend to have more proximal perceptions of climate change than their secondary school counterparts from Switzerland, as reported in Gubler et al., which may be attributed to their exposure to a sensitive environment with evident climate impacts. However, the studies align in that youth tend to have high levels of climate concern and varying perceptions through the different dimensions of psychological distance. These findings suggest that youth in different circumstances have different climate perceptions but that the processes behind these perceptions may be similar, suggesting that the findings and implications of these studies can be extrapolated to include youth living in different locations under similar circumstances.

On a local scale, this study suggests that youth's exposure to the environment and experiences living in a rural area near a watershed contributed to their CC awareness and concern. This research supports direct and interactive exposure to impacted ecosystems to proximize climate change, influence climate concern, and ultimately encourage action.

In practice, this could include the support and expansion of existing environmental learning programs as well as the implementation of further education and awareness approaches through various sources, including in schools and digital media, that focus on emphasizing the urgency of climate protection and teaching achievable methods of climate action. Programs such as those implemented by the county of study's school system could be bolstered and expanded to promote further awareness and concern in the youth who attend.

Furthermore, action-encouraging programs could focus on impacting youth emotionally and inspiring a desire to act for a positive future. Policymakers and educators should consider these approaches as an effective method of encouraging climate action in the generations of youth who have grown up in an increasingly climate-affected world. The natural world should not just be viewed as merely the victim of human-caused climate disruption, but also as an integral part of encouraging the necessary sentiments, actions, and support for climate protection policy in the countless youth across the world who are witnessing the impacts of climate change on the natural world around them.

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