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Development and Validation of Multidimensional Climate Change Distress Scale (MCCDS)

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Abstract

The prevalence and intensity of climate change, and climate change related disasters is on the rise. Nations around the world have started to focus on mitigation and adaptation towards climate change, but Pakistan is still lacking in this aspect. People are developing fear, anxiety, and negative emotions because of climate change. Therefore, it becomes necessary to focus our attention on the impacts of climate change on the mental health of the masses. The 51-item multidimensional climate change distress scale MCCDS was developed to measure the distress individuals experience due to climate change. A total of *n*=368 participants were recruited for data collection. For exploratory factor analysis, SPSS was utilized, which revealed a 7-factor solution. The factors extracted were pro-environmental behaviors, eco-hopelessness, eco-emotions, eco-health, solastalgia, need for survival, and lack of planning. The psychometric properties of MCCDS further established the reliability, and convergent validity with climate change anxiety scale. The overall results suggest that the masses experience distress due to climate change, and there is a substantial need to tackle the mental health outcomes of climate change. The results of the current study further strengthen the need for mitigation and adaptation towards climate change. Future implications, and recommendations are also discussed further.

Keywords: Climate Change, Climate Change Distress, Mental Health, Pakistan, Scale Development

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Introduction

In the recent years, climate change is rapidly increasing, causing devastating consequences for planet earth and the masses. All prior climate records were broken in 2023, and 2024 is expected to witness even higher temperatures (Mooney, 2023). Scientists have been taken aback by abrupt climate change, which has raised concerns about the dangers of extreme weather, dangerous climate chain reactions, and the possibility of destructive tipping points occurring sooner than anticipated (Mckay et al., 2022; Ripple et al., 2023).

Natural disasters are wreaking havoc on planet earth, which ultimately leads to development of mental health issues among the masses. Clayton (2020) discussed how natural disasters including hurricanes, mudslides, wildfires, and floods interfere with people's daily lives, causing depression and uncertainty. Due to lack of rehabilitation, and property loss due to climate change, the victims experience uncertainty, which ultimately results in a mental health crisis. Additionally, it has been observed that an increase in suicide has been connected to

temperature rise and extreme weather events (Cruz et al., 2020).

Previous researches have focused the effect of natural disasters on the mental health of people, but examining the relationship between climate change and its repercussions on the mental health is also gaining attention. Causing psychological distress is one of the main ways that climate change affects those who are already at risk (Koder et al., 2023). Displacement caused by natural disasters also impacts mental health (Chen et al., 2020), and the uncertainty of the situation may cause feelings of hopelessness among the victims (Procter et al., 2018). According to Berry et al. (2018) the relationship between climate change and mental health can be explained by six key principles, which range from distal to intermediate to proximate variables, each of which affects the other. Therefore, (i) immoral behavior on the part of large corporations and governments has (ii) made the underlying causes of mental illness, such as climate change, worse. Increased frequency of weather-related disasters including heatwaves, floods, and droughts is one effect of climate change. These catastrophes cause (iii) extensive harm and disruption to people and property, and (iv) strain several public resource domains, especially health-related ones. The functioning of the community is eventually strained by this (v). Deterioration of people's personal financial and emotional resources as a result affects mental health and well-being and eventually raises the risk of mental disease (vi). This framework explains the trajectory of climate change and mental health adequately, and takes into account all the variables.

Regarding the variance in climatic occurrences, Pakistan is one of the most overbearing regions (Fahad & Wang, 2019), and is at extreme risk of climate change related events (Otto et al., 2023). The floods of 2022 in Pakistan produced massive destruction (Otto et al., 2023) and caused 1,486 deaths, including 530 children, and internally displaced over 32 million people in one-third of the world's fifth most populated country (UNICEF, 2022). Despite having less than 1% of the world's greenhouse gas emissions, Pakistan is nevertheless susceptible to natural disasters because of its geographical location (Rannard, 2022). Pakistan is dealing with the negative effects of climate change, including the melting of glaciers, extended droughts, shorter winters, and earlier summers (Rasul et al., 2011).

The recent statistics are a good indicator of the impact of climate change on Pakistan. As a 3rd world country, the nation is facing a plethora of issues aside from climate change which are economic crisis, poverty, illiteracy, political instability etc. All these broad issues along with climate change take a toll on the masses of Pakistan, making the phenomena of climate change in Pakistan more multidimensional. These further stresses the importance of studying and exploring the impact of climate change on the mental health of individuals.

The above cited literature very well establishes the trajectory of climate change, natural disasters, and mental health. Multiple tools have been developed to measure the effects of climate change on the mental health such as climate change anxiety scale (Clayton & Karazsia, 2020), environmental distress scale (Higginbotham et al., 2006), scale of solastalgia (Cáceres et al., 2022), climate change hope scale for high school students (Li & Monroe, 2018), and eco-questionnaires (Ágoston et al., 2022). These scales have been developed in the western world, and according to our knowledge currently no scale exists developed in the Asian continent, or specifically in lower-middle income countries (LMIC). Therefore, the aim of the current study was to develop a multidimensional climate change distress scale (MCCDS). Climate change distress occurs due to worsening situation of the climate, increase in natural disasters, awareness, and uncertainty in the life patterns of individual. Therefore, it’s imperative to

develop a tool that measures the distress brought on by climate change specifically in the context of Pakistan.

It was hypothesized that the current scale would consist of multiple factors, along with excellent Cronbach alpha reliability. Furthermore, it was also hypothesized that the current scale would have significant positive correlation with climate change anxiety scale (Clayton & Karazsia, 2020), to establish the convergent validity of the scale.

Methodology

Procedure

The current study was conducted with an aim to develop a multidimensional climate change distress scale (MCCDS). For scale development the framework by DeVellis (2017) was utilized, and all guidelines were followed which included determining construct, generation of item pool, determining measurement format, validation study, inclusion of validation items, review by subject specialists, item evaluation, and optimizing the scale length. In order to generate item pool, multiple modalities were utilized which included opinion poll, systematic review, and generation of themes by conducting interviews. The opinion poll had dichotomous questions and were asked in both English and Urdu for a wider representation. The scales included for item pool generation were eco-questionnaires (Ágoston et al., 2022), scale of solastalgia (Cáceres et al., 2022), and climate change hope scale for high school students (Li & Monroe, 2018). Other than this, n=6 interviews were also conducted which were thematically analyzed by utilizing the guidelines by Clarke and Braune (2013). After item pool generation, the item pool was given to a panel of 6 people for expert opinion. The experts were asked to rate the items on a relevancy grid ranging from 1-4, where 1 was least relevant, and 4 was highly relevant. This was done by following the guidelines given by Yusoff (2019) on relevancy grid. The initial item pool consisted of 85 items, and after feedback from the experts' 66 items were retained. Experts gave feedback regarding the construct validity, item phrasing, and social desirability of items.

Piloting

The process of piloting was on the items retained, and data was collected from 50 participants. Out of these 50 participants, 6 responses were discarded on the basis of identification of outliers. The procedure of piloting established the validity and the understanding of items to individuals whose education level was Bachelors. The items retained after piloting were 57, which were retained on the basis of item corrected correlation. Items having item corrected correlation of less than 0.3 were removed.

Participants

After finalization of item pool, data collection was started by utilizing purposive sampling. Data was collected in person as well as through google forms. Individuals age above 18 years with fluent English literacy skills, and with education level minimum of Bachelors (BS) were recruited. Those individuals who had been a victim of any natural disaster in the past 1 year were discarded from the data. The number of responses to be collected was based on the rule of item to subject ration 1:5 (Osborne & Costello, 2004). According to this rule the total data collection requirement came to be 285. The total data collected was n=432, from which 64 responses were discarded on the basis of them being outliers, or the forms being incomplete which led to the final sample size of n=368. Data was collected via online platform as well as in person. Data was collected from different universities by approval from the relevant departments. The mean age of the participants was 22.9, among which 45.9% participants were male, and 54.1% were female. 77% among them were undergraduate students, while 23% were postgraduate students. Majority of the population belonged to urban areas accounting up to 77.4% while the remaining 22.6% belonged to rural areas. The

demographics of the participants are given in Table 1.

Table 1
Demographic Characteristics of Participants (N=368)

Characteristics	***n***	***(%)***
Age *M(SD)*	22.96(4.06)	
Gender		
Male	169	45.9%
Female	199	54.1%
SES		
Lower Class	8	2.2%
Middle Class	322	87.5%
Upper Class	38	10.3%
Education		
BS/BDS	285	77.4%
MS/MBBS	79	21.5%
PhD	4	1.1%
Occupation		
Government Sector	15	4.1%
Private Sector	48	13%
Business	14	3.8%
Freelancer	9	2.4%
Student	268	72.8%
Unemployed	14	3.8%
Marital Status		
Single	335	91%
Married	33	9%
Residence		
Urban	285	77.4%
Rural	83	22.6%
Province		
Punjab	295	80.2%
Islamabad	51	13.9%
Sindh	12	3.3%
KPK	9	2.4%
Baluchistan	1	0.3%
City		
Lahore	216	58.7%
Islamabad	64	17.4%
Karachi	7	1.9%
Peshawar	3	0.8%
Quetta	2	0.5%
Others	76	20.7%

Measures

Climate Change Anxiety Scale (Clayton & Karazsia, 2020)

Climate change anxiety scale is 5-point Likert scale where 1=never, and 5= almost always. Higher scores in the scale indicate greater climate change anxiety. The scale had good internal consistency with an alpha reliability of 0.90, and also showed good internal consistency in the current scale with an alpha reliability of 0.92 in the current study. The scale was utilized to establish the convergent validity with the current climate change distress scale.

Data Analyses

SPSS version 25 was utilized for data analysis. Principle axis factoring was used along with Promax rotation for exploratory factor analysis. A total of 7 factors were retained based on parallel analysis and scree plot as shown in Figure 1 (O'Connor, 2020). The threshold for factor loadings was set at 0.3, which is considered a good value for factor loading (SÜRÜCÜ et al., 2022).

In order to find out the internal consistency of the scale Cronbach alpha reliability was also run. In addition to this a Pearson bivariate correlation was also run between climate change anxiety scale and the current scale to establish convergent validity. Pearson bivariate correlation was also utilized to assess the correlation among the subscales of the climate change distress scale.

Results

First and foremost, the normality of data was assessed through the tests of Shapiro-Wilk and Kolmogorov Smirnov. The data was found to be normally distributed as the values were 0.30, and 0.20 respectively which were above 0.5 for both the tests. Item corrected correlation value and the value of correlation matrix was also above 0.3 (SÜRÜCÜ et al., 2022). The value of KMO was 0.88 and the value for bartlett's test of sphericity was 0.00 which are both suitable for exploratory factor analysis (SÜRÜCÜ et al., 2022).

Item 11, 23,42, 43, 49 and 57 had a factor loading less than 0.3 so they were removed independently from the factors, and the remaining number of items came to be 51. The cumulative variance of the factor analysis came to be 40.87%. The items which cross loaded were retained in the factors in which they were more relevant, or had higher factor loading. The seven components retained were pro-environmental behaviors, eco-hopelessness, need for survival, eco-emotions, eco-health, solastalgia, and lack of planning. Table 2 shows the factor loadings and the relevant items and factors.

Table 2

Factor Wise Arrangement of Factor Loadings for Exploratory Factor Analysis with Promax Rotation (N=368)

MCCDS Items	Factor Loading						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Factor 2 Eco-Hopelessness							
13. I lose hope when it comes to the future of climate change on our planet.	-.01	**.69**	-.04	.16	-.05	-.02	-.11
14. I lose hope when it comes to the situation of climate change due to human activities.	.01	**.72**	-.17	.20	.03	-.14	-.08
15. I feel helpless to take any action that would control climate change.	-.05	**.47**	.09	.16	-.02	-.04	.09

16. I feel overwhelmed when I think of the effects due to climate change are not going to be ceased.	-.13	**.41**	-.01	.19	-.08	.04	.24
17. Rapid climate change make me feel extremely pessimistic about the planet's future.	.11	**.47**	.05	.16	-.10	-.02	.16
18. I feel my hopelessness is aggravating when it comes to climate related change.	.03	**.52**	.14	.13	-.08	-.10	.15
25. I avoid news about environmental change because it makes me tense.	-.10	**.33**	.21	.01	-.08	.17	.00
27. I feel ashamed when I realize that I am polluting the environment.	.05	**.31**	-.06	-.10	-.00	.17	.22
28. Due to destruction as a result of climate change it makes me feel that the world is ending.	-.22	**.69**	-.04	-.05	-.05	-.06	.23
34. I believe we are heading towards the end of planet Earth.	.14	**.70**	-.00	-.23	.00	-.02	-.03
35. I feel a constant fear that a natural catastrophe will occur.	.16	**.50**	.11	-.07	.07	.09	-.09
Factor 3 Need for Survival (Climate Change Denial)							
24. The uncertainty due to climate change makes it difficult for me to schedule my daily activities.	-.04	.11	**.37**	.12	.16	.01	.12
26. I think there is no evidence for climate change.	.24	.09	**.47**	-.07	.10	.20	-.02
32. Climate change is not my concern on a day-to-day basis. *	-.03	.00	**.55**	-.02	-.14	.02	-.07
33. Climate change is my concern only when there is a natural disaster.	.00	.10	**.50**	-.09	-.06	.12	-.20
52. I feel general population in my country is aware with the concept of pollution leading to climate change. *	.08	.04	**.41**	-.04	.05	-.07	.136
53. I feel my survival is more important than climate change. *	.07	-.09	**.64**	-.01	.14	-.05	.04
54. I feel climate change is secondary to me as compared to my basic life necessities. *	.22	-.16	**.66**	.15	-.16	-.03	.09
55. Climate change doesn't concern me as I am financially sufficient. *	-.03	-.04	**.72**	.01	.07	-.11	-.11
Factor 4 Eco-Emotions							
3. I feel angry when I think about climate change.	-.02	.05	.05	**.73**	-.01	.13	-.08
4. I feel sad when I think about climate change.	-.00	.06	-.07	**.72**	-.07	.08	-.10

5. I feel anxious when I think about climate change.	-.02	.07	.04	**.64**	-.07	.04	-.02
6. With every passing day, climate change is impacting my mental health.	-.12	.04	.02	**.42**	.24	.21	-.21
Factor 6 Solastalgia							
1. I feel upset when I see that people are polluting the environment.	-.04	-.13	-.03	.11	-.11	**.66**	.26
2. Environmental changes being caused by human activities (burning of fossil fuels, littering, pollution, wasting resources) makes me agitated.	-.00	-.15	.07	.14	-.03	**.59**	.20
7. It's quite distressing to see my homeland being adversely impacted due to climate change.	.13	-.11	-.01	.32	.05	**.36**	.00
8. Due to climate change, depleting resources in my country is a medium of distress for me.	.05	-.10	-.03	.42	.13	**.35**	.00
9. I feel sad when I realize that the place where I am living has lost its greenery and its beautiful landscapes.	.15	.14	-.11	-.00	.05	**.49**	-.01
10. I feel sad when I see that the animals and plants in my homeland are becoming extinct due to climate change.	.04	.03	-.07	.12	.12	**.46**	.06
12. I feel my homeland's environment isn't the same as it used to be before.	.04	.21	-.12	.17	-.02	**.38**	-.00
Factor 7 Lack of Planning							
21. I feel frustrated when government fails to mitigate the effect of climate change.	.16	.16	-.00	.18	-.05	.01	**.35**
22. It is quite concerning for me as the government is unable to set the agenda of climate change as a top priority.	.13	-.02	-.03	.23	-.03	-.01	**.43**
29. I feel future generations will be facing survival challenges due to a lack of resources.	-.03	.13	.02	-.25	-.10	.29	**.71**
30. I am worried about future generations as climate change will adversely impact them.	.08	.17	-.02	-.16	-.01	.19	**.57**
31. I feel guilty when I realize that we are not leaving behind resources for the future generation.	.07	.31	.013	-.18	.06	.17	**.36**

Figure1.

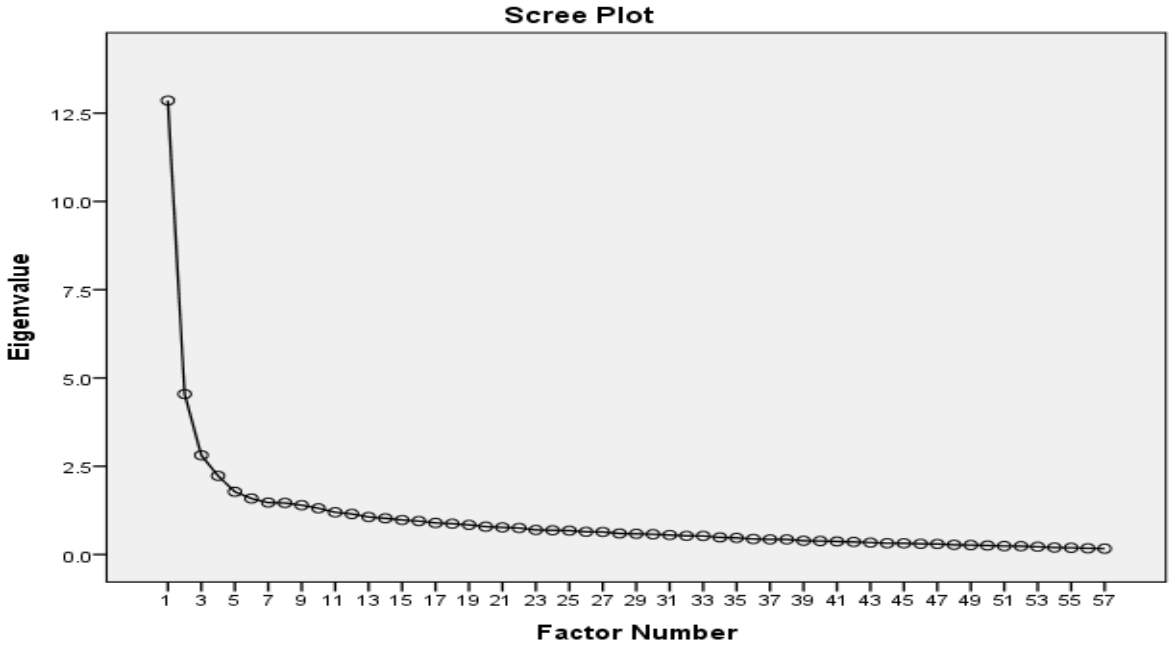

Table 3

Psychometric Properties of the Multidimensional Climate Change Distress Scale and its Sub-Scales (N=368)

Sub-Scales	*k*	M	SD	Range	α
MCCDS	51	257.15	32.64	166-339	.91
Pro-Environmental Behaviors	11	65.31	10.02	16-77	.86
Eco-Hopelessness	11	58.37	10.88	16-77	.85
Need for Survival	8	32.85	8.43	12-55	.76
Eco-Emotions	4	19.36	4.57	5-28	.80
Eco-Health	5	30.33	6.03	7-35	.75
Solastalgia	7	39.12	6.68	12-49	.83
Lack of Planning	5	27.27	5.03	10-35	.78

Table 3 shows the internal consistency of both the scale, and the subscales. The internal consistency of the scale was excellent at (α=.91). The Cronbach alpha reliabilities of the subscales were between the range of good to acceptable (Pro-Environmental Behaviors (α=.86), Eco-Hopelessness (α=.85), Need for Survival (α=.76), Eco-Emotions (α=.80),

Eco-Health (α=.75), Solastalgia (α=.83), and Lack of Planning (α=.78).

Table 4

Estimation of Convergent Validity of Multidimensional Climate Change Distress Scale with Climate Change Anxiety Scale (N=368)

Scale	Items	*M*	*SD*	1	2
Multidimensional Climate Change Distress Scale	51	257.15	32.64	-	
Climate Change Anxiety	13	29.28	11.53	.18**	-

**$p < .01$

In order to establish the convergent validity of the scale, Climate Change Anxiety Scale (Clayton & Karazsia, 2020) was utilized. The convergent validity of the current scale with climate change anxiety scale was positively correlated with (r=.20) at the level of $p<.01$, which is shown in Table 4. This verified the hypothesis of our study that climate change anxiety scale and climate change distress scale would have a significant positive relationship.

Table 5

Pearson-Bivariate Correlation of Sub-Scales of Multidimensional Climate Change Distress Scale (N=368)

Sub-Scales	*M*	*SD*	1	2	3	4	5	6	7
Pro-Environmental Behaviors	59.74	9.34							
Eco-Hopelessness	53.13	10.28	.42**						
Need for Survival	32.85	8.43	-.07	.27**					
Eco-Emotions	19.36	4.57	.30**	.46**	.02				
Eco-Health	25.64	5.44	.36**	.40**	.14**	.30**			
Solastalgia	39.12	6.68	.51**	.50**	-.07	.53**	.40**		
Lack of Planning	27.27	5.03	.61**	.57**	.03	.34**	.38**	.54**	

**$p < .01$

Table 5 shows the correlation of the subscales. A significant positive relationship was found between lack of planning, pro-environmental behaviors (r=.61), eco-hopelessness (r=57), eco-emotions (r=34), eco-health (r=.38), and solastalgia (r=.54). There was also significant positive relationship between solastalgia, pro-environmental behaviors (r=.51), eco-hopelessness (r=.50), eco-emotions (r=.53), and eco-health (r=.40). A significant positive relationship was also found between eco health, pro-environmental behaviors (r=.36), eco-hopelessness (r=.40), need for survival (r=.14), and eco emotions (r=.30). A significant positive relationship was found between eco-emotions, pro-environmental behaviors (r=.30) and eco-hopelessness (r=.46). A significant positive relationship was found between need for survival and eco-hopelessness (r=.27).

Discussion

The aim of the current study was the development of multidimensional climate distress scale, which was more indigenously and culturally relevant. Subject experts reviewed the item pool after it was developed and gave their feedback based on the relevancy of the items. Following this process, the item pool was put through a piloting phase during which more items were eliminated. Data was gathered and the scale was given a more refined form through the use of piloting. According to the results of data collection the multidimensional climate change distress scale MCCDS has seven components in all. These 7 factors were pro-environmental behaviors, eco-hopelessness, survival needs, eco-emotions, eco-health, solastalgia and lack of planning. As hypothesized the convergent validity was also established with climate change anxiety scale.

Factor Structure

Pro-environmental behavior was the first factor found via exploratory factor analysis. Pro-environmental behaviors include reducing littering, recycling, utilizing eco-friendly products instead of single-use plastics, using public transportation, and conserving electricity. The environmental attitudes, knowledge, intentions, and behaviors scale (Levine & Strube, 2012), the consumer's environmental behavior scale (Bratt, 1992), and the addressing climate change scale (Tobler et al., 2012) are examples of previously developed measures that specifically measure Pro Environmental Behaviors (PEB). Only the correlations of behavior and environmental beliefs are measured by these scales. There are items on the aforementioned scales that are unique to engaging in pro-environmental activities. The pro-environmental behavior component in the current study is different from the scales indicated in that it evaluates psychological correlates related to action and awareness.

Eco-hopelessness was identified as the second factor. The factor assesses how hopeless a person is about climate change. This is a significant psychological link since mitigating climate change requires hope. A hope scale was created by Li and Monroe (2018) for high school pupils. This scale, which comprises three subscales—personal sphere will and way, communal sphere will and way, and absence of will and way—measures the hope that students have regarding climate change. The fear of climate change events and helplessness are included in the current scale under the factor of eco-hopelessness. All around the world, people are experiencing the effects of climate change, but in Pakistan, the effects are particularly severe due to frequent floods, harsh weather, and shifting weather patterns. Given that Pakistan is more vulnerable to natural disasters as a result of climate change, this element is crucial when discussing the indigenous context.

The present scale identifies survival needs as the third factor. This component is exclusive to the scale in reference to climate change. It is essential to comprehend Pakistan's status in order to comprehend how this issue relates to climate change. Since Pakistan is currently experiencing an economic crisis (George, 2023), the needs of the majority are survival-related. The demands of vulnerable populations to survive are impacted by climate change (Ziegler et al., 2019). Because of their pre-existing medical issues, poor health outcomes, and limited access to healthcare facilities, this population experiences the effects of climate change differently (Brown et al., 2022). Climate change consequences can be amplified by the combination of factors such as low socioeconomic level, health problems, and geographic location (Torres & Casey, 2017). Since Pakistan is dealing with all of these issues in addition to other issues like poverty, unemployment, and socioeconomic decline, our scale also includes a representation of survival necessities.

The ways in which different cultures and nations are affected by climate change also differ. It is evident that the majority of people in Pakistan live in poverty. People won't be thinking about the chaos that climate change will bring about if their daily requirements for survival are in jeopardy. Because their necessities were in jeopardy both before and after the disaster, and they remain so now. As such, survival takes precedence over climate change.

Eco-emotions is another aspect that the scale has identified. People's emotions are changing as a result of climate change. Eco-emotions are a quick way to assess how someone feels about changes in their surroundings. People are experiencing emotional reactions as a result of the shifting weather and scenery. Iniguez-Gallardo et al. (2021) found that among people, feelings of guilt and anxiety were the most common, whereas feelings of helplessness, perplexity, and rage were the least common. Negative feelings about climate change are linked to symptoms of insomnia and mental health, according to a cross-sectional study done in 25 countries (Ogunbode et al., 2022). In understanding the psychological correlates of climate change, eco-emotions are integral. Anxiety and worry about climate change are more common in those with anxiety or depression diagnoses, children and adolescents, and people working in the field of climate change (Searle & Gow, 2010). Because of this, managing feelings associated with climate change becomes essential, necessitating the identification of eco-emotions.

One unique factor identified in the scale is of eco-health. Individuals are suffering from major health issues due to climate change and pollution. Based on the 2022 Air Quality Index, Pakistan is ranked third worst in the world (IQ Air, 2023), with Lahore topping the global population rank with 470 AQI (Dawn, 2023). Considering all this it is no surprise that the concern about physical health has increased in Pakistan. There is an increase in cardiovascular diseases, and progression of more serious diseases due to air pollution (Zhang et al., 2023). Additionally, it has been noted that one risk factor for atopic dermatitis is air pollution (Pan et al., 2023). Understanding the effects of climate change also makes eco-health important, therefore this component is crucial for measuring the suffering associated with eco-health.

The sixth factor which was identified was solastalgia. The distress that occurs as a result of altering landscapes, and homeland's environment is termed as solastalgia (Albrecht, 2005). Scale of solastalgia (Caceres et al., 2022), and environmental distress (Higginbotham et al., 2006) are the previously established scales on solastalgia. Pakistan has experienced changes in its weather patterns, topography, pollution levels, and resource depletion. Many people are distressed by this development. This is a crucial psychological correlate for comprehending how environmental changes affect people's mental health. As a result, adding this factor to the present scale confirms that solastalgia is a problem that occurs in Pakistan as well, and it was crucial to have an indigenous instrument to quantify this as well.

Lack of planning is the seventh factor identified in the scale. Pakistan is currently dealing with severe economic crisis in addition to political instability (Afzal, 2023). This complicates the execution of climate change policies. The first step towards adapting to and mitigating the effects of climate change is planning. Future generations would be more susceptible to the consequences of climate change if appropriate action is not taken to restore Pakistan's environment and resources. Because in the end, reduced living standards, increased pollution, and scraped resources will also have an impact on their survival. As a result, this element also perfectly captures the absence of preparation. Third-world

nations going through comparable situations might also make use of this aspect.

Correlation between Sub-scales

In the current study it was seen that a significant positive relationship was found between solastalgia and pro-environmental behaviors, eco-hopelessness, eco-emotions, eco-health and lack of planning. Previous researches have also reported a significant positive relationship between pro-environmental behaviors and solastalgia (Kuo et al., 2021; Jiao et al., 2023). As individuals realize that their environment is changing, therefore, in order to reduce this change, they engage in pro-environmental behaviors. Awareness of deterioration of one's homeland environment evokes negative emotions in individuals hence the positive relationship between solastalgia and eco-emotions. It is very evident that climate change is impacting the physical health of individuals, this in turn induces negative emotions among individuals about climate change. this trajectory of physical health and negative emotions is due to climate change hence the significant positive relationship between these two sub-scales.

A number of studies have shown a connection between hope and engaging in climate action. Positive hope increases the likelihood of engaging in pro-environmental behaviors in people (Pleeging et al., 2021; Marlon et al., 2019). However, the current study demonstrated a positive relationship between hopelessness and pro-environmental behaviors. This suggests contradicting findings, suggesting that pro-environmental behaviors are correlated with an increase in eco-hopelessness. The relationship between fear and pro-environmental behaviors can also be used to explain this, as fear may motivate people to take action to combat climate change (Jarymowicz & Bar-Tal, 2006). Hopelessness was also associated with dread of natural disasters, and fear can serve as an incentive to engage in pro-environmental activities.

In the current study it was found that there was no significant relationship between need for survival and pro-environmental behaviors, eco-emotions, solastalgia, and lack of planning. The factor need for survival prioritizes individual needs over climate change, therefor this could be one of the reasons due to which no significant relationship was found. Since the repercussions of climate change also endanger survival needs of individual so the masses might not engage in pro-environmental behaviors or hold significant emotions related to climate change. In a country like Pakistan where majority of the population is under the poverty line survival takes precedence over caring or acknowledging climate change. However, a significant relationship was observed between need for survival and eco-hopelessness. This relationship can be explained by postulating that as the situation of climate change worsens, the masses are becoming more hopeless and therefore are giving more priority to their survival as to engaging in combating climate change.

Conclusion

Pakistan, a nation in the third world, has several challenges. A handful of the problems include unemployment, illiteracy, poverty, political instability, economic crisis, and inadequate health facilities (Afzal, 2023; Anwar, 2023). Pakistan is still getting over the aftermath of the recent floods in 2023 and the floods in 2022. Pakistan's experience with climate change is therefore multifaceted and intricate. The populace of Pakistan has failed to give utmost importance to the issue of climate change because of need for survival. Natural disasters affect the western world as well, but Pakistan, a third-world nation, faces additional challenges that affect how quickly it recovers from these calamities. Because Pakistan and the western world have very distinct demographics, economies, politics, social structures, and geographical locations, their experiences with climate change are very different. This made the requirement for

an indigenous scale that was appropriate for the culture. Since the effects of climate change are not limited to Pakistan, other third-world nations as well as the west experiencing similar problems can also utilize MCCDS.

Limitations and Future Directions

The current developed scale also has some limitations. There wasn't equal representation from all the provinces of Pakistan because the majority of the data came from metropolitan of Punjab. Data can be gathered in the future from various provinces to guarantee equal and diverse representation. Confirmatory factor analysis would be done in the future to further validate the scale. The currently developed scale is in English, so it would be translated in Urdu in the future. By translating the scale into the native language, it can be administered on a wider population. The MCCDS also does not delve deeper into denial related to climate change, which can be also be explored further in the future. The current scale can also be further refined by conducting confirmatory factor analysis to further strengthen its validity and reliability. The results can be further replicated in other studies of similar nature. Furthermore, the current scale can be used with other variables such as coping strategies, denial, socio-economic status, mitigation and adaptation by exploring the correlation between these variables. The MCCDS does not screen for anxiety or sadness associated with climate change, nor does it serve as a pathology measure. It is merely a measurement of distress related to the climate change; thus, care should be used while interpreting the results. The MCCDS can also serve as a stepping stone for establishing intervention for those individuals who are experiencing distress due to climate change. Climate action is one of the strategic goals for Pakistan, which has been achieved. LMIC countries are more vulnerable towards climate change, and need to work on climate change mitigation and adaptation. This scale can serve as a source of medium for both awareness, and for working towards mitigation and adaptation by the government as well.

Ethics Statement

All the ethical standards of APA were met. The study was approved by the Ethical Review Board of University of Central Punjab, Lahore, Pakistan; however, the authors have changed their institutes since then, and completed rest of the work in their current affiliation. Informed consent was taken in written form from all the respondents to participate in this study.

Contribution of Authors

Javeria Asim: Conceptualization, Investigation, Methodology, Data Curation, Formal Analysis, Writing – Original Draft

Uzma Ilyas: Methodology, Writing - Reviewing & Editing, Supervision

Sana Ilyas: Conceptualization, Methodology, Writing - Reviewing & Editing, Supervision

Conflict of Interest

There is no conflict of interest declared by the authors.

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Data Availability Statement

The datasets of the current study are not available publicly due to ethical reasons but are available from the corresponding author [J.A.] upon the reasonable request.

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