



Longitudinal relations between climate change concern and psychological wellbeing

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ABSTRACT

Concerns about the effects of climate change are mainstream, and the climate crisis might have greater psychological impact on younger people. We hypothesise that climate concern will have detrimental links with psychological wellbeing over time, and that this association will be more pronounced among younger adults. We test our pre-registered predictions using two waves of an annual national probability panel study—the New Zealand Attitudes and Values Survey ($N = 13,453$). Cross-lagged models examining effects within the same individuals over time indicated that climate concern predicted a small residual increase in psychological distress, but not in life satisfaction, one year later. However, there was no evidence that the associations varied across age. These longitudinal findings indicate a novel link between climate concern and psychological distress, which is apparent across the adult lifespan.

1. Introduction

The 2018 report by the United Nations describing impacts of global warming increases above 1.5° (Intergovernmental Panel on Climate Change, 2018) prompted headlines such as “We have 12 years to limit climate change catastrophe, warns UN” (Watts, 2018). The thinktank Breakthrough reported that human civilisation will effectively end by 2050 due to climate change (Spratt & Dunlop, 2019), while Bendell's (2018) review concluded that there will be an inevitable societal collapse in the near future. Such publications on impending climate disaster reportedly caused some readers to seek therapy to deal with grief and despair for the future of the planet (Tsjeng, 2019); and public concern regarding climate change and its effects is prominent and has recently increased (Hughey et al., 2019; Leiserowitz et al., 2018)—illustrated by multiple large-scale global climate strikes in 2019 (Laville & Watts, 2019). Hence, general feelings of concern about the consequences of climate change may be damaging people's psychological wellbeing independent from any first-hand experiences of climate change (see de Matos et al., 2016; Halleröd, 2009; Powers et al., 1992).

Research on the association between climate change and psychological wellbeing has focused on the effects of changing physical environments on individuals' psychological experiences (e.g., Albrecht et al.,

2007; Berry et al., 2010; Clayton et al., 2017; Obradovich et al., 2018; Trombley et al., 2017). There is more limited research on the links between psychological wellbeing and anticipation of climate change effects; that is, potential emotional distress and anxiety caused by an individual's awareness of the possible extreme climate change effects expected to occur in the future (Fritze et al., 2008). Pathologisation of climate concern may be inappropriate given climate concern, distress, or anxiety is not a disorder; it is a rational response to a real and salient threat facing the world in the near future (see Sarchet, 2019; Verplanken & Roy, 2013). Moreover, climate concern might elicit adaptive responses such as hope and greater motivation to perform pro-environmental behaviours (Ojala, 2012; Verplanken et al., 2020).

Nonetheless, measures of climate distress or worry have been shown to be associated with psychological distress (e.g., Searle & Gow, 2010; Stewart, 2021). Climate anxiety—a related concept to climate concern—has also been shown to predict emotional and cognitive dysfunction (Clayton & Karazsia, 2020). This prior research has established that climate change anxiety encompasses distress and impedes typical functioning; this finding is internally valid as “climate anxiety” represents a form of anxiety. However, the associations are not surprising since such measures already contain dysfunctional aspects in their items. Here we investigate if a “pure” measure of climate change

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concern—as opposed to anxiety or worry—is related to measures of psychological wellbeing in a longitudinal context.

Moreover, anticipatory awareness of climate risks may be more pronounced for younger adults (Milfont et al., 2021; Searle & Gow, 2010), or experienced in a qualitatively unique way by younger relative to older generations (as suggested in a review by Fritze et al., 2008). Furthermore, as age increases, regard to the future tends to decrease (Lomranz et al., 1986), so that thoughts and care about events in the future is relatively weakened for older relative to younger people. If concern about climate change is understood to be an anticipation of the future effects of climate change, then those who are thinking more about their future are reasonably going to be affected at a greater level. Moreover, given that young people show a higher regard for the future and many will be alive to see the more severe outcomes of climate change, it can be expected that younger individuals may have greater climate concern. As such, the relationship between climate concern and psychological wellbeing is expected to depend on (be moderated by) age, such that the hypothesised negative relationship between climate concern and psychological wellbeing will be heightened for younger individuals relative to older individuals.

This brief report provides longitudinal findings on these two predictions regarding climate concern and psychological wellbeing in a national sample of New Zealanders. We hypothesised that higher levels of climate concern would be associated with a residual decrease in psychological wellbeing across one year (H1), and that this negative association would be moderated by age such that it is stronger for younger individuals (H2). We also report models including gender and socioeconomic status as covariates.

2. Method

2.1. Sample and Procedure

We utilised data from the New Zealand Attitudes and Values Survey (NZAVS), which is a longitudinal national probability panel survey (Sibley, 2021). Data collection began in 2009 and has continued annually, with participants largely recruited through random selection from the New Zealand electoral roll. The current study utilised data from Time 9 (2017) and Time 10 (2018), with a total of 14,049 participants retained in these survey waves. The Supplementary Material provides further information on the NZAVS sample included in this study.

Available data for our analyses comprised 13,453 participants for one wellbeing measure (i.e., the Kessler-6) and 13,473 for the second (i.e., Personal Wellbeing Index; differences due to missing data); the mean age was 51.59 ($SD = 13.45$; range = 18–98 years old), and 63.4% of participants indicated that they are women. Our selection of waves and measures, as well as the analytic plan were pre-registered in the Open Science Framework: <https://osf.io/3acyt/>.

2.2. Measures

Participants rated their concern about climate change with a single item (“I am deeply concerned about climate change”; 1 = *Strongly Disagree* to 7 = *Strongly Agree*).

Two forms of psychological wellbeing were assessed using distinct measures (see Supplementary Materials for all items). The Kessler-6 (Kessler et al., 2010) comprises six items and it is a clinically relevant measure assessing psychological distress via symptoms of depression and anxiety, and participants rated how much each symptom applied to their experience over the last 30 days (0 = *None of the time* to 4 = *All of the time*). The Personal Wellbeing Index (PWI; Cummins et al., 2003) comprises four items measuring life satisfaction, and participants rated their satisfaction with each of the distinct life aspects (0 = *Completely dissatisfied* to 10 = *Completely satisfied*). An average score for each wellbeing measure was calculated. Internal reliability for both scales was acceptable at Time 9 (Kessler-6, $\alpha = .85$; PWI, $\alpha = .85$) and Time 10

(Kessler-6, $\alpha = .75$; PWI, $\alpha = .73$).

We also included both gender and socioeconomic status as covariates given their established links with environmental concern (e.g., Milfont et al., 2015; Xiao & McCright, 2015) and psychological wellbeing (e.g., Chandola & Jenkinson, 2000). Socioeconomic status was assessed through the 2013 New Zealand Deprivation Index. This index accounts for eight socioeconomic deprivation variables (see supplementary materials) and ranks meshblocks in an ordinal scale (1 = least deprived, to 10 = most deprived) based on New Zealand Census Data (see Atkinson et al., 2014). A meshblock is a small geographical area usually containing between 100 and 200 people. Participants were assigned to a “meshblock” by their residential address as given in the NZAVS. Mean scores indicated moderate deprivation in our sample ($M = 4.53$, $SD = 2.70$).

3. Results

In the Supplementary Material, we provide detailed sampling information, results of attrition analysis, as well as descriptive statistics and correlations between variables across waves. Given the sample size, the critical value for statistical significance in all analyses was set at $p < .01$.

A one-sample t -test indicated mean climate concern scores are statistically greater than the midpoint of the scale at Time 9 ($t(13,452) = 85.39$, $p < .001$) and Time 10 ($t(13,452) = 94.64$, $p < .001$), suggesting that people in our sample generally experienced deep concern about climate change. Overall though, the sample had relatively low Kessler-6 scores and high PWI scores suggesting good overall psychological wellbeing. As expected, climate concern and Kessler-6 scores were significantly, positively associated, although weakly. Unexpectedly, there was no evidence that climate concern scores and PWI scores were statistically associated (see Table S5 for correlations).

We tested our hypotheses by conducting a cross-lagged model in Mplus version 8.4. A cross-lagged model calculates the directional associations between two variables assessed at two measurement waves, while statistically adjusting for the “stability” of a given variable across time by covarying for the association between each variable at both measurement waves. We conducted two similar sets of analyses for each of the two wellbeing indicators. The wellbeing indicator at Time 10 (2018) was regressed on climate concern at Time 9 (2017), age, and climate concern at Time 9 \times age interaction, testing respectively the hypothesis that climate concern has a negative association with psychological wellbeing longitudinally (H1), and the hypothesis that younger individuals experience stronger negative psychological effects because of climate concern (H2). This model also included the wellbeing indicator at Time 9 to allow for residualisation of wellbeing indicator scores, as well as climate concern at Time 10 to test the alternative longitudinal association that wellbeing predicts climate concern scores.

Fig. 1 presents the results from the cross-lagged analysis of climate concern and the Kessler-6. As expected, there was substantial stability in both climate concern ($\beta = 0.77$, $t = 163.45$, $p < .001$, 99% CI [0.76, 0.78]) and Kessler-6 scores ($\beta = 0.71$, $t = 116.87$, $p < .001$, 99% CI [0.70, 0.73]) across time. Regarding the cross-lagged effect, greater climate concern at Time 9 was associated with a small residual increase in Kessler-6 scores at Time 10 ($\beta = 0.02$, $t = 3.63$, $p < .001$, 99% CI [0.01, 0.04]), supporting H1. By contrast, there was no evidence for the alternative longitudinal association that Kessler-6 scores at Time 9 were associated with residual change in climate concern at Time 10 ($\beta = 0.01$, $t = 1.96$, $p = .050$, 99% CI [−0.004, 0.03]). There was also no evidence that age moderated the relationship between climate concern and Kessler-6 scores ($\beta = -0.003$, $t = -0.58$, $p = .561$, 99% CI [−0.02, 0.01])—thus, no evidence to support H2 that younger (vs. older) people had poorer psychological outcomes resulting from climate concern.

Fig. 2 presents the results from the cross-lagged analysis of climate concern and the PWI, which had substantial stability across time ($\beta = 0.77$, $t = 160.59$, $p < .001$, 99% CI [0.76, 0.78]). Regarding the cross-

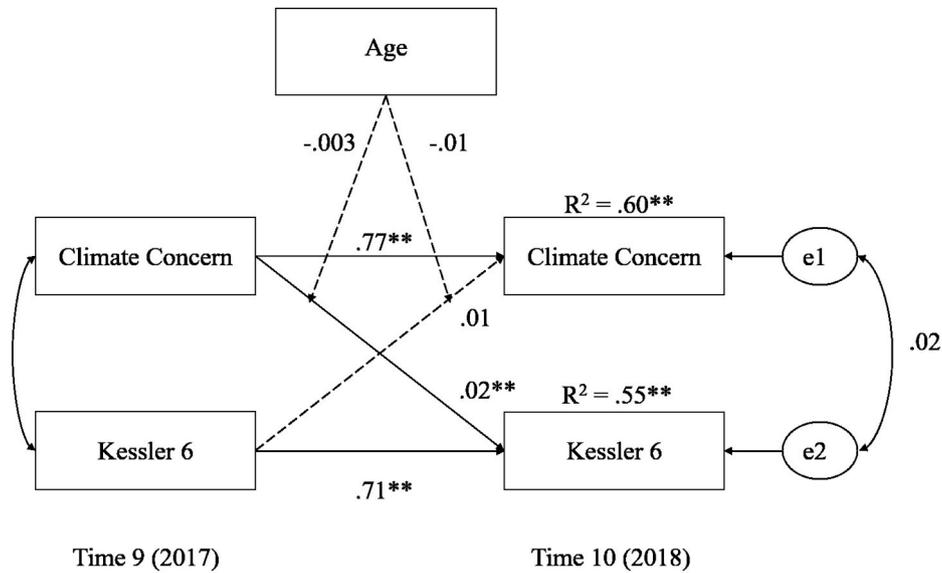


Fig. 1. Cross-lagged model for the link between climate concern and psychological distress (Kessler-6), moderated by age. Note. The path model reports standardised coefficients. Age pathways indicate moderation effects. ** $p < .001$. $N = 13,453$.

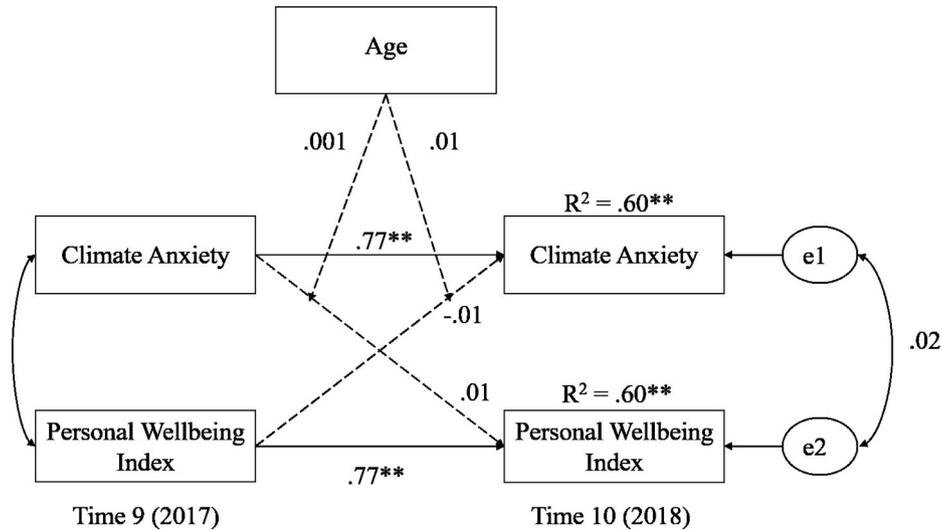


Fig. 2. Cross-lagged model for the link between climate concern and life satisfaction (Personal Wellbeing Index), moderated by age. Note. The path model reports standardised coefficients. Age pathways indicate moderation effects. ** $p < .001$. $N = 13,473$.

agged effect, no evidence was found for a longitudinal association of climate concern at Time 9 and a residual decrease in PWI scores at Time 10 ($\beta = .01, t = 2.40, p = .017, 99\% \text{ CI } [-0.001, 0.03]$), providing no support for H1. Similarly, no evidence was found of the inverse longitudinal association of PWI scores at Time 9 and climate concern at Time 10 ($\beta = -0.01, t = -1.02, p = .307, 99\% \text{ CI } [-0.02, 0.01]$). Also, there was no evidence that age moderated the relationship between climate concern and PWI scores ($\beta = 0.001, t = 0.12, p = .905, 99\% \text{ CI } [-0.01, 0.02]$). Thus, no evidence to support H2 that younger (vs. older) people had poorer psychological outcomes resulting from climate concern.

The above results remained the same in additional models covarying for gender and socioeconomic status. Full results from covariate testing are available in the Supplementary Material.

4. Discussion

We contribute research on the negative link between climate-related concern and psychological wellbeing, testing a longitudinal model of

climate concern, wellbeing, and age. We found that climate concern was associated with a small increase in psychological distress one year later; however, there was no statistically significant longitudinal association between climate concern and life satisfaction. These findings held when accounting for both gender and socioeconomic status as covariates. Hence, climate concern was longitudinally associated with a clinically relevant measure of psychological distress, but no evidence was found for a longitudinal link with life satisfaction; thus, only partial support for H1 was found.

Concern is a diluted form of anxiety linked to worry (American Psychological Association, 2020). The small relationship we found between climate concern and psychological distress may therefore demonstrate that concern regarding climate change has a weaker link with wellbeing in comparison to climate anxiety which demonstrates cognitive and functional impairment (c.f., Clayton & Karazsia, 2020). Further, concern as opposed to other more severe emotional responses to climate change such as stress, anxiety, or hopelessness—demonstrated predictors of wellbeing in Searle and Gow’s (2010) study—may also lead

to protective outcomes for people's wellbeing. For instance, perhaps heightened concern predicts greater engagement in pro-environmental behaviour, that in turn predicts wellbeing (see Ojala, 2012). Further research testing the same longitudinal association with a comprehensive measure of climate anxiety (e.g., Clayton & Karazsia, 2020) alongside climate concern and behavioural responses (c.f. Searle & Gow, 2010) would unconfound the potential costs and benefits of heightened concern for wellbeing and pro-environmental behaviours.

It could be argued that the effect size of the longitudinal association of climate concern and psychological distress is inconsequential given its small size (see Cohen, 1992). However, given the nature of the climate concern item used which does not share content overlap with the psychological distress measure and considering the observed association is between measurements one year apart, the effect is theoretically relevant. This is contrary to previous studies that have relied on cross-sectional data and climate-related and wellbeing measures that do overlap (e.g., Clayton & Karazsia, 2020; Searle & Gow, 2010). Thus, although small in size, any psychological distress change accounted by climate concern is likely independent of stress in people's day-to-day lives and is likely to be indicative of a chronic and permanent concern.

Intriguingly, there was no evidence that climate concern was linked with life satisfaction. While psychological distress and life satisfaction were related as wellbeing measures (see Table S5), Greenspoon and Saklofske (2001) assert that an increase in distress may not lead to a decrease in life satisfaction and vice versa. It is perhaps the case that an innate positive bias towards self-esteem, control, and optimism—as suggested to be important for homeostasis of wellbeing (see Cummins & Nistico, 2002)—prevents climate concern, and associated distress, from impacting life satisfaction.

Researchers have suggested that younger individuals experience more severe or qualitatively different climate concern (Fritze et al., 2008; Searle & Gow, 2010); perhaps explained by their differences in future orientation (Lomranz et al., 1986). The interaction between climate concern and age linked to psychological wellbeing one-year later was non-significant for the measures of psychological distress and life satisfaction; with and without covariates included. Thus, no evidence was found to indicate that younger individuals' psychological wellbeing is more negatively affected by climate concern (H2). However, younger people in our sample *did* have slightly higher levels of climate concern on average. Thus, perhaps higher future orientation in younger individuals leads to climate concern, and in turn contributes to (but does not magnify) the negative consequences for psychological wellbeing.

Notwithstanding these novel findings, it is worth noting limitations of our research. The current sample did not include individuals below the age of 18. Further research into younger populations is critical to assess potential moderating effects of age, including the potential for a different qualitative makeup of their climate concern (Fritze et al., 2008). In particular, adolescents are at the forefront of climate activism (e.g., Greta Thunberg and the School Strike for Climate Movement) and have indicated notable concern about the future of the planet. A recent Australian survey reported that four out of five Australians aged 14–23 reported being “somewhat” or “very” anxious about climate change, and 17% reported losing sleep because they are worrying about climate change (ReachOut, 2019). Furthermore, adolescent New Zealanders expressed high levels of concern about climate change in an open-ended survey with comments such as feeling “scared the earth will not last” (Fleming et al., 2020, p. 3). Thus, researchers should consider the potential for magnified or unique effects of climate concern for adolescents.

Previous research on climate-related anxiety, distress or worry has utilised US (Clayton & Karazsia, 2020; Leiserowitz et al., 2018; Stewart, 2021; Verplanken & Roy, 2013), Australian (Searle & Gow, 2010) and European (Verplanken & Roy, 2013) samples. The addition of a New Zealand sample to this field is beneficial since it is an island nation that might be affected by rising sea levels sooner than other countries in

multiple ways. Hence, New Zealanders may display differences in climate concern in comparison to previously sampled populations. However, our sample still encompasses a primarily Western view of climate change (over 83% of participants were European New Zealanders) and thus does not represent the Non-Western nations which have the highest climate risk (Eckstein et al., 2019). Furthermore, indigenous groups often have a connection to the land that extends beyond Western conceptualizations (see Cowie et al., 2016), meaning that indigenous voices present in our sample are not fully captured by current environment and climate-related measures. Hence, future research in Non-Western contexts and indigenous populations with appropriate measures is essential.

In sum, our results provide novel longitudinal findings of a relationship between climate concern and psychological distress. Although small, this association is empirically important due to the likely unique effect climate concern has on psychological distress. But no longitudinal association was observed for life satisfaction, supporting previous assertions that life satisfaction and psychological distress function independently. A richer understanding of climate concern and anxiety would be supported by utilising a more comprehensive measure and investigating further the roles of age and ethnicity.

Author note

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CRedit authorship contribution statement

Sarah E. McBride: Formal analysis, Writing – original draft, Writing – review & editing. **Matthew D. Hammond:** Formal analysis, Writing – review & editing, Supervision. **Chris G. Sibley:** Data curation, Writing – review & editing, Funding acquisition. **Taciano L. Milfont:** Conceptualization, Writing – review & editing, Supervision.

Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jenvp.2021.101713>.

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