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Be Good to Your Mother (Earth): The Relationship between Anthropomorphising Nature, Financial Insecurity, and Support for Pro-environmental Policies in the Context of the Coronavirus Pandemic

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Abstract

Anthropomorphism of nature is known to be related to pro-environmental outcomes; however, little is known about these variables in the context of the coronavirus pandemic. The economic impact of the prolonged lockdowns may disrupt the historical relationship between these variables, as financial insecurity may compete with environmental concerns for consideration. This study examined the relationship between anthropomorphism of nature the context of COVID-19, and pro-environmental support, and the potential moderating role of financial insecurity in this relationship. It was hypothesised that anthropomorphism of nature in the context of COVID-19 would have a lesser effect on pro-environmental support for individuals who experienced financial insecurity during the pandemic. Participants (N=615; Msex=48.71, SDsex=17.50; 70% female) completed self-report measures of anthropomorphism of nature, anthropomorphism of nature in the context of COVID-19, financial insecurity, and a measure of support for pro-environmental policies in the economic recovery from COVID-19. Results demonstrated that, after controlling for general anthropomorphism of nature, anthropomorphism of nature in the context of COVID-19 predicted pro-environmental support (R2 = .05, F(4, 610) = 8.36, p < .001). However, contrary to expectation, pro-environmental support was higher in those experiencing financial insecurity compared to those who were financially secure (β = -2.65, BootSE=.93, p = .004, 95% BootCI [-4.47, -0.83]). Financial insecurity also did not moderate the relationship between anthropomorphism of nature in the COVID-19 context and pro-environmental support. Furthermore, the general tendency to anthropomorphise nature was not a significant predictor of support for pro-environmental policies. These findings have important implications for understandings of anthropomorphism, financial insecurity, and environmental protection as well as for public policy on economic recovery in response to the coronavirus pandemic.

Introduction

The COVID-19 coronavirus that first appeared in Wuhan, China, in late 2019, has rapidly swept across the globe, and the ensuing pandemic has resulted in as-yet-untappable loss of life and severe economic hardship (Helm, 2020). Despite the devastating impact of the pandemic, there have been notable ancillary environmental benefits, such as improved air quality stemming from reduced industry and transport, and reduced human pressure on flora and fauna (Corlett et al., 2020). However, these advantages are likely to be short-lived as countries ease lockdowns. In addition, support for environmental protection in the post-coronavirus context will encounter new unforeseen challenges. For instance, conservation-focused policies will have to compete with new urgent priorities aimed at swift economic recovery (Corlett et al., 2020). Indeed, according to the United Nations Partnership for Action on Green Economy (PAG), countries will spend over 20 trillion dollars (US) in efforts to recover from the economic fallout of the pandemic. Therefore, the pandemic has raised a multitude of as-yet-unanswered questions surrounding the future of conservation efforts. Some have asserted that the experience of the coronavirus will lead to a greater acalrity for addressing conservation, and others have taken an opposing stance, claiming that the pandemic has induced a short-term myopia that will inhibit support for the long-term endeavours of environmental protection (Helm, 2020). A starting point in trying to envisage the likely trajectory of conservation challenges (and therefore enabling preparedness to tackle those challenges) is understanding the individual and collective experience of the virus with reference to nature.

Keywords:
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Anthropomorphism presents a unique lens through which to investigate the experience of the coronavirus pandemic. Anthropomorphism refers to the tendency to instil human characteristics upon non-human animals and objects (Guthrie, 2002), with the anthropomorphism of nature involving instilling such characteristics onto nature (Tam, 2015). The tendency to anthropomorphise can extend beyond projecting human-like traits, to ascribing cognitive, affective, and behavioural inferences (Waytz et al., 2010a). The crucial consequence of seeing non-human objects as possessing agency is the notion that they can experience suffering, and are thus worthy of human-like moral consideration and care (Gray et al., 2007). The anthropomorphising of nature can occur in a general sense, but also specifically in the context of COVID-19, as can be seen, for example, in comments by the Secretary General of the United Nations, António Guterres. On World Environment Day (5 June 2020), they stated that nature is "sending us a clear message" (Guterres, 2020). This is an archetypal example of imbuing nature with humanlike cognition. Indeed, this can provide connectedness to nature, which in turn promotes environmentally-responsible behaviour, ostensibly to alleviate the suffering experienced by nature (Tam, 2015; Tam 2019). It is therefore no surprise that anthropomorphism of nature is seen as a powerful mobilising force for conservation efforts (Tam, 2015). The study of anthropomorphising nature in the context of COVID-19, however, is in its infancy.

In the period before the coronavirus pandemic, there was a peak in Australians’ support for action on climate change (Quick & Bennett, 2020), particularly in response to the Australian bushfires. According to a poll conducted in January 2020, 47% of Australians expressed concern about climate change (compared to 37% in 2019), and 73% agreed that leadership on the bushfire response required the Prime Minister to lead action on climate change (Quick & Bennett, 2020). When the experience of major natural events are viewed in concert with the anthropomorphism of nature, it could be expected that the relationship between anthropomorphising nature in the COVID-19 context and support for environmental protection will extend to support for pro-environmental policies in the post-coronavirus era. However, there may be a more nuanced interaction at play in the context of the financial insecurity induced by the pandemic, as individuals may prioritise their immediate financial needs over concern for the environment. Such competition is explained by Maslow’s (1943) hierarchy of needs, where abstract or longer-term concerns are attended to only after immediate economic needs are met. For instance, Kahn and Kotchen (2011) found reduced support for climate change mitigation policies during times of economic hardship, whereby online searches for “global warming” declined during times of higher unemployment. It is therefore possible that pandemic-induced financial insecurity will reduce support for pro-environmental policies. Due to the recency of these events, there is a dearth of literature investigating this relationship. This research therefore aims to examine the potential role of anthropomorphising nature in the COVID-19 context in predicting support for environmentally-focused policies. We also examine whether the experience of financial insecurity influences the strength of this relationship.

Anthropomorphism

The term anthropomorphism is derived from anthropos, meaning human, and morphe, meaning shape (Guthrie, 1993). Faithful to its etymological roots, anthropomorphism refers to the ascribing of human characteristics to nonhuman animals, inanimate objects and natural phenomena (Guthrie, 1993), whether real or imagined (Epley et al., 2007). The imbuing of humanlike traits should be distinguished from animism, which involves projecting life onto non-living entities (Epley et al., 2008). Rather, anthropomorphism extends the notion from simply being alive, to the possession of humanlike mental capacities, including emotion, cognition, and intentionality (Waytz et al., 2010a).

Anthropomorphism theoretical framework

Developmental psychology

From a developmental perspective, the tendency to anthropomorphise is seen as first arising in childhood. According to Piaget and colleagues (1973), humans are born with an implicit belief in the universality of life. This doctrine is an inevitable consequence of egocentrism in early childhood, where the external world is seen as extension of the self and therefore imbued with self-like attributes. Through this process, children conceptualise external objects as having desires, emotions and thoughts that are akin to that of the self. As children grow to understand themselves as separate from other entities, they accommodate the notion that some entities (e.g., inanimate objects) are not capable of thought. Therefore, anthropomorphism is seen as an unsophisticated cognitive perspective that will be eliminated (or reduced) over time.

Evolutionary psychology

Anthropomorphism can also be seen from an evolutionary standpoint. Accordingly, anthropomorphism is seen to stem from a perceptual adaptation developed to monitor acute threats in the environment (Guthrie 2002). Guthrie (2002) provides an illustrative example: if a jogger were to exercise in an area known for bears, an ambiguous stimulus in the environment may be misinterpreted as a bear (rather than a boulder), reflecting the evolutionary strategy that it is better to be overcautious than risk a life-threatening encounter. From this view, animism and anthropomorphism should be seen as existing on a continuum (Guthrie, 2002), where each species use their highest form of cognitive organisation to ensure maximal threat detection. In this case, non-human animals may employ a level of animism, and humans may employ a level of anthropomorphism, each to the extent that it represents the bounds of their respective cognitive frameworks.

Social cognitive psychology

According to social-cognitive perspectives, humans anthropomorphise what they cannot comprehend (Epley et al., 2007). From this stance, humans have no phenomenological knowledge of what it means to be nonhuman (Nagel, 1974; Gould, 1996), and therefore when interacting with foreign entities, human models are used to predict behaviour (Marchesi et al., 2019). This is closely aligned with the narrower concept of intentional stance in philosophy (Dennet, 1987), being the use of intentions, beliefs, and desires (i.e., mental states) to explain and predict the behaviour of entities. In taking an intentional stance to predict behaviour, humans: (1) make a decision to treat an object as a rational agent, (2) ascribe beliefs that the agent ought to have, (3) ascribe desires that the agent ought to have, and (4) accept that the object will act to further those ascribed goals (Dennet, 1987). By extension, anthropomorphism is then seen as the upshot of a human strategy to predict and explain the behaviour of external objects with reference to mental states. Therefore, individuals may anthropomorphise not only to ensure threat detection as detailed above in relation to evolutionary theory, but also to facilitate cognitive understanding and behaviour prediction of nonhuman entities, the latter of which can also be said to have patent evolutionary benefits.

Anthropomorphism of nature and pro-environmental behaviour

Anthropomorphising non-human entities can have important repercussions for how these entities are treated, including whether they are seen as accountable for their actions, and whether they should be treated with consideration and care. For instance, Waytz and colleagues (2010a) found that anthropomorphism was positively related to beliefs that destroying a non-human entity (e.g., flowers, a computer) was morally wrong. An anthropological perspective can shed further light, for example, on cultures that engage in anthropomorphism, such as the Itza Maya community in Guatemala who believe that rainforest habitat is imbued with spirits. This culture engages in more sustainable ecological activities when compared to other communities in

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the same geographic area that do not anthropomorphise the rainforest (Atran et al., 2010). Indeed, the anthropomorphism of nature refers to the attribution of human-like qualities to nature (Tam, 2015). Support for the relationship between anthropomorphism of nature and environmental concern is also evident in experimental research by Ketron and Natetelich (2019). In that study, placards containing anthropomorphic messages in bathrooms were more successful in reducing use of paper towel when compared to messages that did not contain such anthropomorphic cues. Most recently, Karpińska-Krakowiak and colleagues (2020) found that negatively framed environmental messages prompted water conservation intention (i.e., taking shorter showers) and waste reduction behavioural intention (i.e., reduced use of plastic straws, bottles, and cutlery) when coupled with anthropomorphic cues, via the use of human face features in advertisement images.

In relation to factors that explain the relationship between the anthropomorphism of nature and pro-environmental behaviour, the strength of the relationship is partly determined by the moderating role of empathy (Sevillian et al., 2007). Indeed, research by Tam (2013a, 2015) has illustrated the importance of empathy in motivating pro-environmental action, as a response to the perceived suffering of nature. Pro-environmental actions may also occur out of a desire to appease an anthropomorphised nature, and can involve fear of nature’s (further) retaliation (e.g., Hornborg, 2021). Increased connectedness to nature (Tam et al., 2013b) and anticipatory guilt (Ahn et al., 2014) have also been shown to mediate the relationship between anthropomorphism and pro-environmental behaviour. Recently, the mediating role of environmental guilt for human degradation of nature was explored in research by Tam (2019). They found that individuals who anthropomorphise nature were more likely to experience guilt for environmental degradation, and those individuals were then more likely to: participate in Earth Hour (study 1); to participate in environmental protests (study 2); and organize public environmental protests (study 3). This research is notable as it expanded consideration of environmental protection to include public participation, not just private behaviour (e.g., reduced electricity use) as is the case in the preponderance of existing literature.

The above discussion illustrates a clear link between the anthropomorphism of nature and pro-environmental behaviour. Despite this, there is little research that has examined these variables in the context of the coronavirus (COVID-19) pandemic. While the anthropomorphism of nature can occur in a general sense, as noted in the literature outlined above, the anthropomorphism of nature can also occur within domain-specific contexts, including specifically within the context of the COVID-19 pandemic. The anthropomorphism of nature in the context of COVID-19 refers to the attribution of human-like qualities to nature specifically regarding the COVID-19 pandemic whereby nature is an intentional agent who has brought about the pandemic (Pensini & McMullen, 2022). Indeed, this can include motivations of retaliation as part of nature’s response (c.f., Pensini & McMullen, 2022). Examples of this abound in popular media and discourse. These anthropomorphic interpretations suggest that nature is, for example, ‘sending us a message’ with this pandemic for the way (at least some) human groups are treating nature (e.g., Guterres, 2020). Recent research investigating anthropomorphism of nature in the context of COVID-19 has showed that it is related in expected ways to connectedness to nature, general anthropomorphism of nature, and pro-environmental support. Specifically, Pensini and McMullen (2022) showed support for a serial mediation model, whereby connectedness to nature positively predicted the general tendency to anthropomorphise nature. This general tendency to anthropomorphise nature then predicted the domain-specific anthropomorphism of nature in the context of COVID-19, which predicted limiting travel, via support for travel restrictions. Thus, there is some evidence to illustrate the occurrence and role of anthropomorphising nature in the COVID-19 context in predicting pro-environmental support. The present study sought to extend this research and examine the role of anthropomorphising nature in the context of COVID-19 in predicting support for pro-environmental economic policies. Given the extensive economic impacts of the pandemic, the current study also sought to examine the role of financial security in this relationship. Support for pro-environmental policies is operationalised in the present study in accordance with the definition put forward by Kachi and colleagues (2015), as “individual support for new regulatory policies”.

Financial insecurity and environmental protection

Whilst the relationship between anthropomorphism of nature in the context of COVID-19 and support for a green economic recovery is plausible, there are a multitude of pandemic-specific contextual factors that may impact the strength of this relationship. In particular, the crippling economic impact of the pandemic may have unforeseen consequences for environmental protection efforts. In June 2020, the Australian unemployment rate rose to a twenty-two year high of 7.4% and retail turnover fell by 17.7% in April 2020 (seasonally adjusted) (Australian Bureau of Statistics, 2020). Similar trends have been found in other countries, such as Spain, Germany, and the United Kingdom (Su et al., 2021). Indeed, the ILO Monitor (2021) reports a 12-month global loss of 255 million full-time jobs, equivalent to 9 percent of global working hours. Theorists have argued that individuals have a limited capacity for concern and that this must be apportioned among often-competing priorities (Kenny, 2020). Indeed, prior literature examining people’s views on the environment and the economy has shown evidence for numerous clusters or ‘types’ of opinions representing various attitudes toward economic growth and the environment (e.g., Drews et al., 2019; Drews et al., 2018; Drews & van den Bergh, 2016; Tomasselli et al., 2019). Indeed, these opinions on the economy and environment are thought to intersect with other social and cultural issues, such as well-being and inequality (Victor & Dolter, 2017). Recent research from Drews et al. (2019), for example, along with earlier research (e.g., van den Bergh & Ricklis, 2012), has shown evidence for three main attitudinal types: growth, agrowth, and degrowth, with these clusters being evident for both public and scientist samples (Drews et al., 2019). As evidenced, the most prevalent attitudinal type was agrowth (scientists 44%, public 43%), which represents a support for public policy that moves away from economic growth, thereby allowing considerations of well-being and sustainability to be more easily integrated into society (Drews et al., 2019). Green growth corresponded to beliefs that economic growth and environmental sustainability are possible to achieve concurrently, and was supported by around one third of the samples (scientists 31%, public 29%). Degrowth, on the other hand, has the goal of stopping economic growth to achieve environmental sustainability goals and was supported by 25% of scientists and 18% of the public. Ten percent of the public also fell into an indifferent attitudinal type, indicating a lack of interest or awareness about the topic (Drews et al., 2019). Other research (e.g., Drews et al., 2018) has evidenced similar conceptualisations of public attitudes of the economy alongside environmental sustainability concerns. Research by Tomasselli et al. (2019) similarly showed evidence for public falling into one of three attitudinal clusters. Here, these clusters corresponded to the assured (41%) believing in indefinite economic growth and the role of technology in achieving environmental sustainability, the ambivalent (36%) who did not express a strong opinion about the issue, and the concerned (23%) who believed economic growth was finite and was concerned about environmental sustainability. Overall, these studies illustrate the diversity in views around the economy and the environment, with tensions between environmental and economic goals being evident. The extent to which these attitudes continue in the context of the COVID-19 pandemic and how the public considers these issues looking forward beyond the pandemic is, however, not clear.

While environmental protection may have been seen as important when the economy was functioning optimally, major economic decline may shift the rank and weight of priorities as attention focuses on individual and national economic needs (Kenny, 2020). The history of the relationship between economic downturns and decreased support for
climate change policy buttress this contention. For instance, the 2008 Global Financial Crisis coincided with a decrease in public support for conservation and an increase in climate change scepticism (Ratter et al., 2012). Furthermore, rises in unemployment were found to be associated with reduced concern for climate change (Brulle et al., 2012), and increased climate change scepticism (Scruggs & Benegal, 2012).

The basis for this relationship can be understood with reference to Maslow’s (1943) hierarchy of needs. During times of economic strain, value emphasis fluctuates to accommodate pressing short-term economic needs (Inglehart, 2008; Maslow, 1943). Environmental protection values may therefore be de-emphasised in efforts to reduce the dissonance arising from two competing priorities (Scruggs & Benegal, 2012). In support for this theoretical framework, Kollmuss and Agyeman (2002) argue that environmental issues are not characterised as urgent because environmental degradation occurs too slowly to be perceptible to the majority of individuals. Accordingly, the economy is rationally prioritised as a more pressing concern when weighed against the environment (Kollmuss & Agyeman, 2002). The co-occurrence of economic downturn and reduced support for environmental protection was explored experimentally by Kenny (2018b), where study participants were asked a question about the economy either before or after being asked about their views on climate change. Results indicated that priming thoughts of the economy influenced views on the urgency of action required to mitigate climate change. Participants with nonpositive perceptions of the economy were less likely to support urgent action on climate change compared to participants with positive economic perceptions.

When the above collection of research is viewed in combination with the strong theoretical underpinnings of Maslow’s hierarchy of needs, it is apparent that the relationship between anthropomorphising nature in the context of COVID-19 and support for pro-environmental economic policies may be influenced by financial insecurity. Due to the recency of the pandemic, this possibility is yet to be empirically explored. Financial insecurity is operationalised in the present study in accordance with the definition put forward by Buchler and colleagues (2009), as “the inability to pay bills on time,” as this provides an objective measure of experiencing financial problems.

The present study

The present study sought to build upon prior research examining the relationship between the anthropomorphism of nature and environmental protection. In particular, it provides a direct investigation into anthropomorphism in the context of the COVID-19 pandemic. Therefore, the primary aim of the present research was to determine whether anthropomorphism of nature in the context of COVID-19 predicts support for public policies to protect the environment. In addition, in light of the unique role that financial insecurity may play with respect to environmental attitudes (c.f., Kenny, 2020) and the current fragility of the economy, the secondary aim of the present study was to investigate the possibility that the relationship between anthropomorphism of nature and support for pro-environmental policies may be different for individuals who do or do not experience financial insecurity. It was therefore hypothesised that the anthropomorphism of nature in the context of the coronavirus pandemic will predict increased pro-environmental support. Specifically, it was expected that anthropomorphising nature in the context of COVID-19 will have a lesser effect on pro-environmental support for those who experience financial insecurity during the pandemic.

Method

Participants

Participants were comprised of 615 individuals from the Australian general community (175 males (28.5%), 431 females (70.2%), two non-binary (0.3%) and six preferred not to say (1.0%)), with one failing to provide their gender. Of the 567 participants who provided data, ages ranged from 18 to 89 and participants were, on average, 48.71 years old (SD = 17.50). Further demographic information is provided in Appendix A. Recruitment was via advertisements on social media (Facebook) and snowball sampling. Data was collected between 14 January 2021 and 28 February 2021. Snowball sampling was conducted via direct email to the first author’s family and friends. As a recruitment incentive, participants were offered the opportunity to enter a prize draw to win a $50 supermarket shopping voucher. Individuals under 18 years old or not proficient in the English language were excluded from participation. The study was approved by the University Human Research Ethics Committee before data collection commenced.

The minimum sample size was 222, determined using the minimum sample size suggested by G*Power (Faul et al., 2009) to detect a small effect, $f^2$ of .05, with 3 predictors ($\alpha = .05$ and $\beta = .80$).

Measures

Anthropomorphism of nature in the COVID-19 context

Seven items were used to evaluate anthropomorphism of nature in the context of the COVID-19 pandemic. The measure assesses perceptions that the COVID-19 pandemic was an intentional act of nature, by asking about nature’s intentionality in bringing about the pandemic, as well as whether the COVID-19 pandemic is a retaliation from nature. Example items include “Nature is sending us a message with the COVID-19 pandemic” and “COVID-19 is a response from Nature, who has had enough of how poorly we’ve treated her.” See Pensini and McMullen (2022) for these items. The items were rated on a 7-point Likert scale from 1 (strongly disagree), to 10 (strongly agree). Scores were summed with higher scores indicating higher anthropomorphism of nature in the context of COVID-19. This measure directly assesses the variable of interest and hence shows high face validity. Demonstrating the construct validity of this measure, a Pearson correlation between the general tendency to anthropomorphise nature (measured via the items used by Tam et al. (2013b), and described below), showed a significant moderate to strong positive correlation with this measure, $r = .52, p < .001$. This indicates that the variables are associated yet independent constructs that shared 27% of variance. Cronbach’s alpha for this measure was $\alpha = .88$, demonstrating good internal consistency.

Anthropomorphism of nature

Anthropomorphism of nature was assessed with the five items from Tam and colleagues (2013b). This measure explores the general tendency to ascribe humanlike characteristics (such as free will, intentions, and consciousness) to nature (e.g., “To what extent does nature have a mind of its own?”). Items were rated on an 11-point Likert scale from 0 (not at all), to 10 (very much). Scores were summed, with higher scores indicating higher levels of anthropomorphism of nature. Previous studies indicate excellent internal consistency ($\alpha = .97$; Tam et al., 2013b) and good internal consistency respectively ($\alpha = .81$; Liu et al., 2019). No other reliability or validity information has been published for this scale. Cronbach’s alpha in the present study was $\alpha = .88$, demonstrating good internal consistency.

Financial insecurity

Seven items from Buchler et al. (2009) were used to assess financial difficulty. The instructions were adapted to capture the experience of financial insecurity since the beginning of the COVID-19 pandemic in Australia (i.e., “Please indicate with a Yes or No answer if you have you experienced any of the following problems since March 2020”). This measure assesses financial problems across different domains including; paying bills; rent or mortgages; selling items; going without meals; not being able to heat homes, and asking family, friends or welfare organisations for money. Participants’ overall score for this measure was binary coded, whereby each participant could have an overall score of either 1
(experienced financial security) or 0 (did not experience financial insecurity). This measure was chosen as inability to pay is seen to be a more objective measure of financial difficulty when compared to other measures that assess subjective experience of financial difficulty or distress (Buchler et al., 2009). Furthermore, this variable was dichotomised as financial insecurity is not strictly cumulative, whereby the experience of financial insecurity across a single domain may be sufficient to create insecurity. Additionally, the magnitude of financial difficulty is not necessarily equal for each survey item (i.e., the level of financial difficulty may be different for those experiencing inability to pay rent compared to those experiencing an inability to buy food). No prior reliability (e.g., test-retest reliability) or validity information has been reported for this measure; however, the items clearly and directly assess inability to pay, demonstrating high face validity.

**Pro-environmental policy support**

Ten items were created for this research in order to assess support for pro-environmental policies in the economic recovery from the COVID-19 pandemic (see Appendix B). This measure assesses support for policy measures that have been proposed in the Australian public domain in 2019 and 2020. It assesses support for policies across different fields including transport, technology, electricity, sustainability, and agriculture (e.g., “investment in research on low-emission farming and agriculture”). Policy proposals were gleaned from position papers and survey results from political, scientific, and policy groups in Australia (Leviston et al., 2015 (CSIRO); The Greens, 2020; Quick & Bennett, 2020 (The Australia Institute)), support for which represents a pro-environmental position. Items were rated on a 6-point Likert scale from 1 (not acceptable), to 6 (very acceptable), with two items reverse-scored. A 6-point-scale was chosen to prevent misuse of the midpoint, for instance, where participants use it as a “dumping ground” to avoid taking a stance on an issue (Chyung et al., 2017). Scores were summed, with higher scores indicating higher levels of support for pro-environmental policies. Cronbach’s alpha for this measure was \( \alpha = .88 \), indicating good internal consistency.

**Procedure**

Individuals were approached using snowball sampling via an email from the researchers that contained the study advertisement. The study was also advertised to the general public using paid advertising on the social media platform, Facebook. Individuals who wished to participate clicked on a link in the advertisement that directed participants to the survey hosting platform, Qualtrics. An Explanatory Statement containing background information on the study was provided. The study contained four parts, starting with demographic information, followed by the measures of anthropomorphising nature in the context of COVID-19, anthropomorphism of nature, financial security, and finally the measure of support for pro-environmental policies. Participants did not have to answer each question in order to progress through the survey. At the end of the study, participants were directed to a separate website to enter their contact details for the prize draw. Consent was implied by completion of the study measures. The study took approximately 15 minutes.

**Design**

This study employed a cross-sectional correlational design. To test the hypothesis, a moderated multiple regression, via PROCESS Macro Model 1 (Hayes, 2017), with mean centering, was used to determine whether the effect of anthropomorphising nature in the context of COVID-19 on pro-environmental policy support changed or was influenced by a financial insecurity. The general tendency to anthropomorphise nature was entered as a covariate to examine the predictive role of general anthropomorphism of nature. The inclusion of this covariate thereby allows for interpretations around the anthropomorphism of nature to be attributed with confidence to anthropomorphism of nature in the context of COVID-19 and not by virtue of its relation to general anthropomorphism of nature. SPSS version 26 was used for all analyses.

**Results**

**Data cleaning and assumption testing**

There were 46 missing data points, and Little’s MCAR test indicated the data was Missing Completely at Random \( (X^2 (7) = 7.40, p = .338) \). As the missing data did not exceed 5% of cases for any variable (maximum of 1.5%) and the final sample size for analysis exceeded 600, missing data was not imputed (Field, 2018). There was one case removed as they displayed evidence of acquiescence in their responses. The statistical assumptions for moderated multiple regression were tested and were found to be suitable to proceed with the analysis.

**Initial data inspection**

**Descriptive statistics and preliminary analysis**

First, Table 1 shows the relevant descriptive statistics for the anthropomorphism of nature, anthropomorphism of nature in the context of COVID-19, and pro-environmental policy support. Second, Table 2 shows the frequencies for the dichotomous categorical variable, financial insecurity and no financial insecurity.

**Correlations**

To map the bivariate relationships, a preliminary set of correlations were conducted. Significant weak negative correlations were observed for the correlation between anthropomorphism of nature and financial insecurity \( (r_{pb} = -.10, p = .019) \), and financial insecurity and pro-environmental policy support \( (r_{pb} = -.13, p = .002) \). A significant weak positive correlation for anthropomorphism of nature in the context of COVID-19 and pro-environmental policy support was also observed \( (r = .18, p < .001) \). With respect to general anthropomorphism of nature, this variable was not correlated with financial insecurity \( (r_{pb} = -.07, p = .098) \), or pro-environmental policy support \( (r = .05, p = .225) \).

**Inferential analysis**

A moderated multiple regression was conducted to determine if, after controlling for general anthropomorphism of nature, the relationship between the anthropomorphism of nature in the COVID-19 context and support for pro-environmental policies was stronger for those who were financially secure when compared to those experiencing financial insecurity. The overall model accounted for a significant 5.2% of variance in support for pro-environmental policies, \( R^2 = .05, F(4, 610) = 8.36, p < .001 \). First, the anthropomorphism of nature in the context of COVID-19 positively predicted support for pro-environmental policies, \( B = .23, BootSE= .05, p < .001, 95\% \text{BootCI} [.13, .34] \). Second, support for pro-environmental policies was found to be higher for those experiencing financial insecurity compared to those who were financially secure, \( B = -.65, BootSE= .93, p = .004, 95\% \text{BootCI} [-.4.47, -.83] \). Despite these main effects, the interaction between financial security and anthropomorphising nature in the context of COVID-19 was not significant, \( B = .17, BootSE= .10, p = .078, 95\% \text{BootCI} [-.02, -.36] \), indicating no moderating effect. The general tendency to anthropomorphise nature also was not a significant predictor of support for pro-environmental policies, \( B = -.05, BootSE= .04, p = .170, 95\% \text{BootCI} [-.12, .02] \).

**Discussion**

**Key findings**

This study sought to examine the role of anthropomorphising nature in the COVID-19 context in predicting support for environmentally-focused policies. This study also investigated the potential moderating
role of financial insecurity in influencing the strength of this relationship. Results of the study demonstrated that, while general anthropomorphism of nature was not a significant predictor of pro-environmental support, anthropomorphising nature in the context of COVID-19 did predict pro-environmental support. Results also demonstrated that individuals experiencing financial insecurity had significantly higher levels of pro-environmental support when compared to those who were financially secure. Interestingly, this observation was in the opposite direction to that which was expected. Finally, financial insecurity did not moderate the relationship between anthropomorphising nature in the COVID-19 context and pro-environmental policy support, failing to support the hypothesis.

Comparison with previous research

Anthropomorphism and pro-environmental support
The present finding that anthropomorphism of nature in the context of COVID-19 predicted pro-environmental support aligns with past literature on anthropomorphism of nature and pro-environmental outcomes (Ketron & Natelich, 2019; Tam, 2019; Karpinska-Krakowiak et al., 2020), including research investigating the anthropomorphism of nature in the COVID-19 context (e.g., Pensini & McMullen, 2020). The imbuimg of humanlike traits on non-human entities like nature facilitates a view of non-human entities as capable of emotional experience and agency (Wazzyt et al., 2010b). If capable of emotional experience, such as pain, they are then seen as worthy of moral consideration and care (Gray et al., 2007; Wazzyt et al., 2010a). The results of the present study support this rationale, and further extend this notion to the specific area of anthropomorphising of nature in the context of COVID-19. In fact, the anthropomorphism of nature in the COVID-19 context adds to the literature that illustrates this pandemic may be interpreted in anthropomorphic terms, with nature intentionally bringing about the virus. We have shown that a domain-specific consideration of anthropomorphism (that is, anthropomorphism of nature in the context of COVID-19) is important to consider over a general anthropomorphism of nature when considering domain-specific pro-environmental actions. However, whether this support for pro-environmental policies occurs due to a concern and care for nature, to alleviate guilt, or whether it may be out of fear for nature’s further retaliation against humans requires further investigation.

Financial insecurity and pro-environmental support
The finding that those experiencing financial insecurity have higher levels of pro-environmental support when compared to those that did not experience financial insecurity is in direct opposition to past research. The preponderance of research in this area has found that negative economic conditions reduce enthusiasm for environmentally-focused policies, as long-term environmental agendas are side-lined in favour of more pressing economic concerns (Kahn & Kotchen, 2011; Carmichael & Brulle 2017; Scruggs & Benegal, 2012). However, it should be noted that some researchers have not confirmed the link between financial insecurity and reduced pro-environmental support (e.g., Kenny 2018a; Mildenberger & Leiserowitz, 2017). For example, a study of New Zealand longitudinal data, found no relationship between changing household financial circumstance and declines in pro-environmental attitudes (Kenny 2018a). Similarly, in a United States study utilising individual-level panel data, neither local economic conditions nor individual economic security explained decreased prioritisation of environmental policy or reduced belief in anthropogenic climate (Mildenberger & Leiserowitz, 2017). It is possible that results could differ depending on local geography, depending on the extent that certain countries more directly experience the effects of climate change. However, Mildenberger and Leiserowitz (2017) found that neither local weather, nor media coverage of climate change were related to support for climate change policy. Interestingly, the authors did find that the environmental record of a respondent’s elected representative (e.g., congressman or senator) was related to a respondent’s support of climate change policy. Furthermore, reductions in climate change policy support during economic downturns were more pronounced amongst Republican supporters when compared to Democratic supporters. Therefore, the role of shifting political cues is a potential factor that should be further explored. Hence, there is past evidence in support of either reduced pro-environmental support during economic downturns, or the lack of a relationship between these two factors. However, to date there is no known support for the findings of the present study.

An alternative explanation for the surprising findings may be found by considering the distinctive environmental context of the coronavirus pandemic. The pandemic is inextricably linked to nature, as the virus is a natural phenomenon that was transmitted through elements of nature, namely non-human animals. This natural event, via the ensuing lockdowns, was in large part responsible for the economic downturn. The involvement of nature in economic hardship adds a layer of complexity to the causal mechanisms at play. Earlier research on economic downturns (e.g., the Global Financial Crisis) and environmental policy support suggest that worsening economic conditions lead to reduced issue salience and risk perception around environmental issues which in turn reduces public support for environmental policies (Kahn & Kotchen, 2011). In the present situation, environmental issue salience and risk perception may actually be heightened due to the connection between the environment (the aetiology of the coronavirus) and the economic downturn. Therefore, the contrast between the present findings and earlier research may be a feature of the uniqueness of the present situation. The potential particularity of the link between the environment and the cause of economic instability in the context of the coronavirus pandemic is supported by theory explaining the relationship between environmental and economic issues. Kollmuss and Agyeman (2002) extend Maslow’s (1943) hierarchy of needs theory to assert that economic concern is prioritised because environmental deterioration is too gradual to be perceived as pressing. However, in the present study, the natural origins of the coronavirus pandemic may have made environmental issues seem particularly urgent. Therefore, it is possible that for people that directly experienced economic hardship from the pandemic, the urgency of environmental issues is more pronounced, resulting in increased pro-environmental support. This alternative explanation could be investigated, for example, by examining and comparing literature on past natural disasters causing economic hardship (e.g., floods), or

Table 1
Descriptive Statistics for Continuous Study Variables.

|                           | M (SD)    | Minimum | Maximum | Possible Range |
|---------------------------|-----------|---------|---------|----------------|
| Anthropomorphism of nature| 21.07 (14.45) | 0       | 50      | 0 - 50         |
| Anthropomorphism of nature in the COVID-19 context | 21.06 (9.68) | 0       | 49      | 0 - 49         |
| Pro-environmental policy support | 56.26 (11.36) | 14      | 70      | 10 - 70        |

Note. N=615.

Table 2
Descriptive Statistics for Financial Insecurity.

|                      | Percent | Frequency |
|----------------------|---------|-----------|
| Financial insecurity | 38.2    | 235       |
| No financial insecurity | 61.8  | 380       |
by replicating the present study and including a measure of perceived human culpability for the pandemic.

**Moderating role of financial insecurity**

Financial insecurity did not moderate the relationship between anthropomorphising nature in the COVID-19 context and pro-environmental support, whereby financial insecurity did not influence the strength of the relationship. While this finding was unexpected, this may be in part be due to a mismatch between the specificity of the measure of financial insecurity (individual level) and the measure of pro-environmental support (national level). Williams and colleagues (2021) recently asserted that an observed lack of association between anthropomorphism of whales and general conservation behaviour (Maguire et al., 2020) could be the result of a misalliance in the precision of the two measures. Furthermore, Kachi and colleagues (2015) found that an individual’s perception of their own economic situation did not impact their support for climate-change mitigation policies in the USA and Germany. However, a negative perception of the national economy did predict reduced support for climate change policy in the USA.

**Strengths and limitations**

One of the main strengths of the present study is that it is amongst the first research to investigate anthropomorphism of nature and pro-environmental support, through the novel context of the coronavirus pandemic. The current body of research is small, with a recent review noting that only 15 studies of good quality have examined the relationship between anthropomorphism and pro-environmental variables (Williams et al., 2021). Moreover, although some past studies have examined anthropomorphism of nature (Tam, 2019; Tam et al., 2013b), the majority have used animals as targets (e.g., Wang & Bas-sow, 2019) and little is known about the moderators of the relationship between the anthropomorphism of nature and pro-environmental out-comes (Williams et al., 2021).

All participants were Australian, and the pro-environmental policies scale canvassed attitudes based on policy proposals currently advocated by Australian political parties and interest groups. While assessing support for actual policy proposals may have higher ecological validity with respect to than in assessing abstract ecological attitudes, future research would need to consider the generalisability of these results to other samples and settings. Also, as we have only cross-sectional data, we can make no claims about the causal relations between variables. Finally, the use of bespoke measures for the predictor and outcome variables is a limitation, particularly as this is a widespread practice in research on anthropomorphism and pro-environmental variables (Williams et al., 2021). This research is also limited as we did not examine participants’ attributions of the origins of the COVID-19 virus. Given that not every-one holds the belief in the natural origin of the virus, and in fact some may believe the virus is man-made (e.g., Relman, 2020), this would have implications regarding the tendency to anthropomorphise of nature in the context of COVID-19.

**Implications**

The present study contributes to an existing body of research on anthropomorphism by confirming a predictive relationship between the anthropomorphism of nature in the COVID-19 context, and pro-environmental support. These findings contribute to a more nuanced understanding of the power of beliefs about nature to impact attitudes toward environmental protection. In particular, the present study sheds light on the conditions that are conducive to garnering support for environmental policies, which can have serious political implications. If the precursors to strong public support can be better understood, they can be leveraged to increase pro-environmental public opinion. This is imperative, as if political leaders are aware that their constituency favour environmental policies, they are more likely to introduce them (Anderson et al., 2017; Kenny, 2020). This has particular timely relevance, as 54% of Australian CEOs recently reported having to stop or slow sustainability initiatives during the pandemic (Deloitte, 2021).

The theoretical implications of this study are also noteworthy. The unexpected finding that financially insecure individuals had higher levels of pro-environmental support when compared to their financially secure counterparts, may propel a re-examination of the nature and weight of categories prioritised according to Maslow’s (1943) hierarchy of needs theory. The implications of this study are theoretically provocative, and may inspire exploration into how existing theories are interpreted and adapted in accordance with changing societal experiences and needs.

**Future research**

Although the present study confirmed the relationship between anthropomorphism of nature in the COVID-19 context and pro-environmental support, further investigation is needed to understand the unexpected finding that financially insecure individuals had higher levels of pro-environmental support when compared to their financially secure counterparts. Specifically, future research should investigate the role of beliefs as to the aetiology of the coronavirus in predicting en-vironmental issue salience. Future research could also consider alterna-tive explanations, such as the role of political identity. Mildenberger and Leiserowitz (2017) found that reductions in climate change policy sup-port during economic downturns were more pronounced amongst Re-publican supporters when compared to Democratic supporters. Research of the aforementioned nature would provide clarity and nuance to cur-rent theory on environmental and economic prioritisation within the purview of Maslow’s (1943) hierarchy of needs.

Future research should test Williams and colleagues’ (2021) assertion that a mismatch in the specificity of measures can impact findings on the relationship between anthropomorphism and pro-environmental outcomes. For instance, it would be useful to investigate whether indi-vidual financial insecurity may be more likely to impact individual en-vironmentally focused behaviour (e.g., recycling etc.), and perceptions of security of the national economy may be more likely to be related to pro-environmental action at the national level.

Future research should also investigate the influence of time spent in nature during the pandemic on the relationship between the anthropomorphism and pro-environmental support. Recent evidence suggests that during lockdowns, individuals had time to explore local greenspaces in their communities as wider travel was restricted (Rousseau & Deschacht, 2020). This is important as time in nature is related to increased connectedness to nature (Coughlan et al., 2022; Nisbet et al., 2019; Pensini et al., 2016), and one of the mechanisms by which anthropomorphism influences pro-environmental outcomes is through enhanced connectedness to nature (Tam et al., 2013b). There-fore, future research should investigate the role of nature exposure and awareness of nature-related topics as mechanisms by which anthropo-morphism of nature influences pro-environmental support in the context of the pandemic.

Finally, future research should consider how to capitalise on links between anthropomorphism of nature in the COVID-19 context and pro-environmental support for practical benefit. For example, nega-tively framed anthropomorphic cues encourage sustainability behaviour (Karpinska-Krakowiak et al., 2020), and priming long-term environmental goals can influence pro-environmental behaviour (Arnesty et al., 2014; Lee et al., 2020). The use of both priming and anthropomor-phism to enhance risk salience is supported by evolutionary theory positing that humans are attuned to potential threats to their survival (Neuberg et al., 2011). By using anthropomorphic cues and highlight-ing the health of the planet as a direct threat to individual survival, this may facilitate ameliorating action by way of pro-environmental support. The potential avenues for psychological research that have real-world
implications for the trajectory of pro-environmental behaviour are thus abundant.

Conclusion

In conclusion, the present study contributes to the fast-developing area of research on the impacts of the coronavirus pandemic, and deepens our understanding of the relationship between humans and the environment. Results of the present research were unexpected, indicating that, although anthropomorphism of nature in the COVID-19 context predicted pro-environmental support, there was no moderating effect of financial insecurity. Moreover, those experiencing financial insecurity had higher levels of pro-environmental support when compared to those that did not experience financial insecurity. Future research should aim to explore this complex relationship, through attempts to replicate and extend these findings. Explorations of this nature will assist in the development of a more comprehensive understanding of the role of anthropomorphism and financial insecurity in predicting pro-environmental outcomes.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could appear to influence the work reported in this paper.

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Appendix A

Additional Demographic Information.

Descriptive Statistics for Education, Employment Status, Employment Type, Employment Continuity in 12 Months and Hours Worked in 12 Months.

| Demographic Characteristic       | Percent | n  |
|----------------------------------|---------|----|
| Education                        |         |    |
| Less than Year 12                | 6.2     | 38 |
| Year 12                          | 11.2    | 69 |
| Vocational or trade              | 15.1    | 93 |
| Bachelor’s degree                | 36.8    | 226|
| Master’s degree                  | 29.5    | 181|
| PhD or higher                    | 1.1     | 7  |
| Employment                       |         |    |
| Unemployed                       | 39.2    | 241|
| Retired                          | 6.3     | 39 |
| Stay-at-home parent              | 12.5    | 77 |
| Student                          | 10.7    | 66 |
| Permanent employee               | 22.1    | 136|
| Fixed-term contract employee     | 2.6     | 16 |
| Casual employee                  | 6.5     | 40 |
| Employment continuity in 12 months|      |    |
| Extremely unlikely               | 7.7     | 37 |
| Unlikely                         | 6.9     | 33 |
| Neutral/Unsure                   | 27.9    | 134|
| Likely                           | 20.4    | 98 |
| Extremely likely                 | 37.2    | 179|
| Hours of work in 12 months       |         |    |
| Significantly less hours          | 8.3     | 38 |
| Slightly less hours               | 7.4     | 34 |
| The same hours                    | 67.2    | 307|
| Slightly more hours               | 10.5    | 48 |
| Many more hours                   | 6.6     | 30 |

Appendix B

Support for Pro-Environmental Policies Scale.

Instructions: A number of policy measures have been proposed to stimulate the economy following the economic impact of the coronavirus pandemic. Using the following scale, please indicate how acceptable the following policy measures are to you.

1. Not acceptable
2. 3 4 5 6 (Very acceptable).
3. Increased tax for the export of fossil fuels (e.g. coal and gas).
4. Investment in research on low-emission farming and agriculture.
5. Building new cycleways and bike lanes.
6. Removal of emissions reduction targets to speed up approvals for new gas projects.*
7. Grants for environmentally sustainable small businesses.
8. Financial incentives (e.g. tax breaks) for buying new electric cars.
9. Retrofitting social housing and Government buildings like hospitals and schools to make them more energy efficient (e.g. improved heat insulation, solar storage, recycled water use).
10. Government funding for new mining coalmines.*
11. Development of solar and wind electricity infrastructure.
12. Building new parks and community gardens in cities.

Note: * indicates item is reverse-scored.

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