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Social value at a distance: Higher identification with all of humanity is associated with reduced social discounting

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ABSTRACT

How much we value the welfare of others has critical implications for the collective good. Yet, it is unclear what leads people to make more or less equal decisions about the welfare of those from whom they are socially distant. The current research sought to explore the psychological mechanisms that might underlie welfare judgements across social distance. Here, a social discounting paradigm was used to measure the tendency for the value of a reward to be discounted as the social distance of its recipient increased. Across two cohorts (one discovery, one replication), we found that a more expansive identity with all of humanity was associated with reduced social discounting. Additionally, we investigated the specificity of this association by examining whether this relationship extended to delay discounting, the tendency for the value of a reward to be discounted as the temporal distance to its receipt increases. Our findings suggest that the observed association with identity was unique to social discounting, thus underscoring a distinction in value-based decision-making processes across distances in time and across social networks. As data were collected during the COVID-19 pandemic, we also considered how stress associated with this global threat might influence welfare judgements across social discounting held. Together, these findings elucidate the psychological processes that are associated with a more equal distribution of generosity.

1. Introduction

People deeply value the welfare of close family and friends but often downplay the welfare of those who are more socially distant. Yet, combating some of the biggest challenges humanity faces, such as disease, income inequality, and climate change, requires valuing the welfare of distant strangers more evenly than that of close others in order to most effectively reduce suffering and maximize the collective good (Gates & Gates, 2021; MacAskill, 2018; Pummer & MacAskill, 2020; Roser & Ortiz-Ospina, 2019; Singer, 2015). What leads people to value the welfare of distant and close others more evenly? And, when confronted with a large collective threat, are we led to socially constrict or expand how we value others?

Across cultures and human development, a hallmark of human

psychology is that we often prefer people we are personally familiar with, similar to, or categorized alongside, forming the basis for tight-knit cooperative groups while simultaneously giving rise to prejudice, discrimination, and intergroup hostility (Amodio & Cikara, 2021; Choi & Bowles, 2007; Dovidio & Gaertner, 2010; Greene, 2014). People tend to empathize more easily (Cikara, Botvinick, & Fiske, 2011; De Dreu et al., 2010; Hein, Silani, Preuschoff, Batson, & Singer, 2010; Levine, Prosser, Evans, & Reicher, 2005; Mastern, Gillen-O'Neel, & Brown, 2010), share resources (Goeree, McConnel, Mitchell, Tromp, & Yariv, 2010; Hoffman, McCabe, & Smith, 1996), and form relationships (Festinger, Schachter, & Bach, 1950; Newcomb, 1960) with those who are socially closer and more similar to themselves. Tracking the distance of other people in one's social network is so reflexive that it appears to be spontaneously computed while merely passively viewing others

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(Parkinson, Kleinbaum, & Wheatley, 2018). The aim to better understand social bias and conflict has guided social psychology since its inception (Sherif, Harvey, White, Hood, & Sherif, 1961; Tajfel, 1979), with contemporary philosophers and psychologists asserting the moral importance of reducing social bias and encouraging a more even valuation of others' welfare (e.g., Bloom, 2016; Caviola, Schubert, & Greene, 2021; Singer, 2015).

Work on 'social discounting' holds promise for providing insight into why individuals value the welfare of distant others less than that of those with whom they are close. In the laboratory, individuals are put in a hypothetical scenario of choosing between keeping resources for themselves and giving those resources to benefit others. Here, decisions depend on how socially distant others are (e.g., a close friend, an acquaintance, a distant stranger), and people consistently sacrifice more for socially close than socially distant individuals. Social discounting is well characterized by a hyperbolic function (Jones & Rachlin, 2006), such that the willingness to forego rewards for oneself declines more steeply over closer social distances and then less steeply at larger social distances:

$$SV_{Other} = \frac{A}{1+k N}$$

Where SV_{Other} is the subjective value of a reward when it is to be given to another person at a particular social distance. A is the objective, undiscounted monetary amount of a reward, N is the social distance to the potential beneficiary of one's generosity, and k is a free scaling parameter that captures the social discounting rate. A higher k value indicates that rewards lose their subjective value more quickly with increasing social distance, so that even a large amount of money will be subjectively worth a lot less than its objective amount when it is due to be given to someone socially distant to oneself.

Conversely, a low k value indicates a shallower social discounting rate, such that rewards lose their subjective value more gradually with increasing social distance to their recipient.

While social discounting is pervasive across individuals and cultures (Strombach et al., 2014; but see Tiokhin, Munira, Jesmin, & Hruschka, 2019), there are variations in the extent of this discounting with important consequences for collective welfare. For example, people with shallower social discounting rates tend to be more compassionate (Sharp et al., 2012), and contribute more in a public goods game in the laboratory (Jones & Rachlin, 2009). Perhaps most notable are differences in social discounting associated with extraordinary acts of altruism that come at a high personal cost, such as the donation of organs to strangers (Brethel-Haurwitz et al., 2018; Marsh et al., 2014). Extraordinary altruists have strikingly reduced social discounting rates compared to typical adults matched on age, gender, and ethnicity (Vekaria, Brethel-Haurwitz, Cardinale, Stoycos, & Marsh, 2017). Extraordinary altruists, like typical adults, are generous towards close others but exhibit rates of discounting that diminish much less towards progressively more distant others. In fact, extraordinary altruists sacrifice resources for very distant others to a degree that is equivalent to what a typical adult sacrifices for a close friend (Vekaria et al., 2017). What's more, recent work has found that variation in social discounting is associated with gradations in altruistic behavior, such that increasingly greater acts of altruism (e.g., acts by good samaritan award recipients, humanitarian aid workers, organ donors) are associated with progressively reduced social discounting rates (Rhoads et al., 2021).

Shallow social discounting represents a puzzling phenomenon not easily accounted for by prevailing psychological or biological theories of altruism that emphasize social bias, kin selection, reciprocity, intergroup conflict, or learned heuristics (Hamilton, 1964; Rand & Nowak, 2013; Trivers, 1971). These theories readily account for why socially or genetically close others are the preferred recipients of generosity (Burnstein, Crandall, & Kitayama, 1994; Marsh, 2019). However, no clear account currently exists for why some people value others, including strangers, more equally across social distance. Here, we explore possible psychological mechanisms — the expansiveness of one's identity and sense of morality³ — that may help explain why some people come to care for and value the welfare of others more equally across social distance. To do so, we examined the relationship between these psychological constructs and choice behavior in a social discounting paradigm.

Identity is a fundamental aspect of human life. An individual's identity is derived from the way they attach to and categorize themselves as a part of social groups at various levels of social inclusiveness (Brewer, 1991; Reicher & Haslam, 2006; Tajfel & Turner, 1979; Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). The narrowness of social identity is often emphasized in the context of intergroup discrimination and conflict. However, more recent research emphasizes the impact of more inclusive and expansive social identities on globally minded collective action (McFarland et al., 2019; Rosenmann, Reese, & Cameron, 2016). For example, identification with all of humanity (an overlapping sense of identity with and concern for all humans; McFarland, Webb, & Brown, 2012) predicts support for global human rights, donations to humanitarian aid (Hamer, McFarland, & Penczek, 2019; McFarland et al., 2012; McFarland, Brown, & Webb, 2013; Sparkman & Eidelman, 2018), and intergroup forgiveness (Hamer, Penczek, & Bilewicz, 2017, 2018). A greater identification with all humanity is also negatively associated with tendencies towards dehumanization (Hamer et al., 2017; Hamer, Penczek, & Bilewicz, 2017) and ethnocentrism (Hamer et al., 2019). Thus, people who more strongly identify with all of humanity may fundamentally value the welfare of others more equally, and therefore exhibit shallower social discounting compared to those with a narrower sense of identification.

One's sense of morality may also shape the equality of welfare judgements about close and distant others. Moral beliefs and convictions about what is right and wrong serve as powerful motivators and prescriptive constraints on behavior that can transcend pressure from authorities, the law, and other influences (Rhee, Schein, & Bastian, 2019; Skitka, 2010; Van Bavel, Packer, Haas, & Cunningham, 2012). Two aspects of morality that may be particularly relevant to shallower social discounting are (i) the expansiveness of one's moral circle and (ii) the extent to which one values impartiality directed towards the welfare of others. The extent to which one cares for others may depend in part on whether one believes an entity is more or less worthy of moral consideration. A moral circle is a metaphorical boundary drawn around entities in the world deemed worthy of moral consideration. The concept of a moral circle is often used to describe the breadth of entities across increasing social distance (from the self, to family, friends, ingroup members, outgroup members, animals, plants, inanimate objects) that are considered worthy of moral concern, and therefore, that an individual is obligated to help (Singer, 1981). Moral circles, far from static, can shift between and within individuals (Chalik & Rhodes, 2020; Crimston, Hornsey, Bain, & Bastian, 2018; Graham, Waytz, Meindl, Iyer, & Young, 2017; Waytz, Iyer, Young, Haidt, & Graham, 2019; Neldner, Crimston, Wilks, Redshaw, & Nielsen, 2018), and on a long enough timeline, appear to have historically expanded (Lecky, 1869; Pinker, 2011; Singer, 1981). People with more expansive moral circles may show shallower social discounting compared to those with more restrictive moral circles, to the extent that feeling more morally responsible for the welfare of distant others is associated with foregoing more resources for oneself in order to help others.

In addition to examining a possible contribution of the moral circle to social discounting, we also examined the contribution of moral beliefs regarding impartial beneficence. Impartial beneficence is the tendency to treat the interests of all individuals as equally morally important,

³ Morality is a set of values, concerns, intuitions, and knowledge structures about standards that guide social interactions, often in the service of regulating selfishness and promoting social-cooperative relationships (Greene, 2015; Haidt & Graham, 2007; Haidt & Kesebir, 2010; Tomasello & Vaish, 2013).

without prioritizing oneself or those with whom one is close (Everett & Kahane, 2020). People who more strongly endorse impartial beneficence seek to maximize the well-being (i.e., reduce suffering and promote happiness) of all sentient beings on the planet rather than to prioritize the well-being of compatriots, family members, or themselves over strangers. Although a relatively new concept, impartial beneficence has been shown to be positively associated with empathic concern and religiosity, is distinct from concerns about harm, and is thought to be the core aspect of utilitarianism that promotes maximizing collective wellbeing for the greater good (Capraro, Everett, & Earp, 2019; Kahane et al., 2018). Thus, greater utilitarian impartiality (i.e., impartial beneficence) may be associated with shallower social discounting (i.e., increased generosity for distant others).

An ancillary goal of the present study was to test the domain generality of the hypothesized relationships with social discounting. Social discounting (the decline in the subjective value of a reward as a function of increasing social distance to its recipient) is thought to be related to delay discounting, the decline in the subjective value of a reward as a function of increasing temporal distance to its receipt (Ainslie, 2005; Berns, Laibson, & Loewenstein, 2007: Kable, 2014: Loewenstein & Elster, 1992). Both phenomena reflect value-based decision-making that requires weighing up costs and benefits between the present self and other beneficiaries (socially distant individuals or temporally distant selves; Berkman, Hutcherson, Livingston, Khan, & Inzlicht, 2017; Buckholtz, 2015; Soutschek & Tobler, 2018) and thus both involve psychological distance in addition to perspective taking. The steepness of social discounting and delay discounting rates have been shown to be associated across individuals (Jones & Rachlin, 2009) and neuroimaging studies have revealed evidence of partially overlapping neural correlates (Hill, Yi, Spreng, & Diana, 2017; Soutschek, Ruff, Strombach, Kalenscher, & Tobler, 2016). Indeed, prevailing theoretical work emphasizes similarities across delay and social discounting domains, pointing to the role of shared domain-general psychological and neural foundations (Bellmund, Gärdenfors, Moser, & Doeller, 2018; Parkinson & Wheatley, 2015; Peer, Brunec, Newcombe, & Epstein, 2021; Tavares et al., 2015; Trope & Liberman, 2010). This evidence suggests that delay and social discounting may both be manifestations of a core underlying psychological process that results in outcomes being discounted in value with increasing psychological distance - regardless of whether that distance is in time or across social networks. Thus, while identity, morality, and collective threat were specifically hypothesized to be associated with social discounting in the present studies, it is possible that any such associations may also pertain to a domain general process that influences social as well as delay discounting. Including both social discounting and delay discounting tasks in the present research therefore enables us to assess divergent validity and identify possible associations selective to social discounting.

Investigating the roles of identity and morality in valuing others' welfare amidst the COVID-19 pandemic requires careful consideration. The pandemic has led to an unprecedented increase in anxiety arising from fear of infection, economic uncertainty, as well as shortages and scarcity of essential supplies such as personal protective equipment, food, and infamously, even toilet paper (Van Bavel et al., 2020). Anxiety and threat can have pervasive effects on the way that people think and behave: from promoting adaptive strategies to inducing uncoordinated panic (Bulley, Henry, & Suddendorf, 2017; Mobbs, Headley, Ding, & Dayan, 2020; Starcke & Brand, 2012; Tashjian, Zbozinek, & Mobbs, 2021). One possibility is that elevated anxiety arising from COVID-19 will promote self-serving biases, leading people to socially constrict who they value and with whom they share resources. Anxiety, stress, and resource scarcity have previously been found to lead people to devalue the worth of others, increase distrust and antipathy, and in turn promote discriminatory behavior when allocating resources to dissimilar and distant others (Brewer & Silver, 1978; Krosch & Amodio, 2019; Ross & Ellard, 1986; Sherif, 1966; Skitka & Tetlock, 1992). However, another possibility is that stress arising from the collective threat of COVID-19 may lead people to socially expand who they value and share resources with. Previous research has shown that acute stress can increase altruistic responses in the lab (Buchanan & Preston, 2014), increase economic cooperation (von Dawans, Ditzen, Trueg, Fischbacher, & Heinrichs, 2019), and predict real-world altruistic donations (Vieira, Pierzchajlo, Jangard, Marsh, & Olsson, 2020). Given these possibilities, in the present study, we examined how individual differences in stress related to the threat of COVID-19 was associated with social discounting. The cross-sectional nature of our study precludes causal analyses; nonetheless they can shed light on the manner in which COVID-19 stress tracks with discounting.

To summarize, the present research investigated the associations of identity and morality with decision-making about the welfare of close and distant others. Specifically, we test the hypotheses that a greater identification with all of humanity, greater regard for impartiality, and more expansive moral circle are associated with shallower social discounting (i.e., increased generosity across social distances). We also test whether increased stress when confronted with a large collective threat is associated with socially constricting or expanding welfare judgements across social distance. Finally, we tested the domain generality of hypothesized associations with social discounting by examining relationships with delay discounting. To foreshadow our results, in two preregistered studies, we found that collective identity was robustly associated with reduced social discounting. The observed relationship was specific to social discounting and did not extend to delay discounting, arguing against generality across discounting domains. We observed some evidence that increased COVID-19 related stress was associated with reduced social discounting as well. Notably, the association between collective identity with social discounting held even when controlling for COVID-19 related stress across different time points during the pandemic.

2. Cohort 1: discovery

2.1. Method

The experimental protocol was approved by the University of British Columbia Institutional Review Board (H19–02493).

2.1.1. Participants

Participants were recruited through CloudResearch Amazon Mechanical Turk Toolkit (Litman, Robinson, & Abberbock, 2016), and all were 18 years of age or older and living in the United States. As per our pre-registered data collection plan, we recruited and tested 325 participants for Cohort 1 on May 6, 2020. After the exclusion of 91 participants (see Supplementary Materials for a breakdown of all exclusions; Section 1.1), our final sample for Cohort 1 consisted of 234 participants (141 identified as male, 92 identified as female and 1 identified as nonbinary) aged 18 to 72 years old (M = 38.43, SD = 11.64). Each participant received 3 USD for completing the study, which took an average of 18.83 min (SD = 9.70).

2.1.2. Exclusions

The first exclusion criterion pertained to failed comprehension checks. These questions assessed whether participants had read and understood the task instructions. If participants failed more than one out of the three comprehension checks, they were excluded. The second criterion was if participants took less than ten minutes to complete the entire study. Participants who met the third exclusion criterion were those who shared an IP address with a previous response. These three criteria were noted in our pre-registration of Cohort 1 and 2. In addition, after collecting data from Cohort 1, we identified two more exclusion criteria (as noted in our pre-registration of Cohort 2). The fourth criterion targeted participants who included duplicate names in the social distance list as this makes the social discounting task impossible to complete. Finally, if participants included inappropriate responses (e.g., random keyboard entries) in their social distance list, they were excluded (see Table S1 for a breakdown of all exclusions).

2.1.3. Measures

The survey was administered using Qualtrics software (Qualtrics, Provo, UT). Data organization and plotting were performed with SPSS (version 27), and R studio (version 3.6.2) with packages from the Tidyverse (version 1.3.0). All survey measures are detailed below. Note that additional single questions about future outlook (see Supplementary Materials; Section 1.3) and hoarding attitudes were also included in the survey.

2.1.3.1. Social and delay discounting. Hypothetical social discounting and delay discounting tasks were used, each involving twenty-seven trials modified from Kirby, Petry & Bickel (1999; see Supplementary Materials for details; Section 1.2), presented in random order. All reward amounts were presented in US dollars and decisions were self-paced.

In the social discounting task, participants chose between receiving a smaller monetary reward for themselves versus donating a larger amount to a known other person. As per the social discounting paradigm used in Hill et al. (2017), before completing the social discounting trials, participants were instructed to provide the first names and last initials of persons belonging to positions 1, 2, 4, 10 and 15 in an imagined list of the 100 individuals closest to them. They were told that number 1 on the list would be their closest friend or relative and number 100 would be a distant acquaintance. Participants were also instructed to avoid listing financial benefactors such as their parents, grandparents, and spouse (as per Hill et al., 2017). The names provided were then inserted into the social discounting trials. An example trial would read: "Would you prefer" in the center of the screen, followed by two choice options, e.g.: "\$20 for yourself" and "\$55 for [name provided for person 1]" (see Supplementary Materials for a full list of trials; Section 1.2).

In the delay discounting task, participants chose between receiving a smaller monetary reward now versus a larger monetary reward in the future. An example trial would read: "Would you prefer" in the center of the screen, followed by two choice options, e.g.: "\$20 now" and "\$55 in 1 week".

For both the social and delay discounting tasks, individual participant data were fitted with a logistic regression function using maximum likelihood estimation in MATLAB (version 9.8, R2020a, The Math-Works, Inc., Natick, MA). The function takes into account the probability of choosing the reward for the other person (social discounting) or the larger, later reward (delay discounting), given the difference in computed subjective value between the two reward options (Kable & Glimcher, 2007; Kable & Glimcher, 2010; Lempert et al., 2020; Lempert, MacNear, Wolk, & Kable, 2020):

Social discounting:

$$P_{Other} = \frac{1}{1 + e^{-\beta \left(SV_{Other} - SV_{Self}\right)}}$$

Delay discounting:

$$P_{LL} = \frac{1}{1 + e^{-\beta (SV_{LL} - SV_{SS})}}$$

In the above equations, P_{Other} is the probability of choosing the reward for the other person, and P_{LL} is the probability of choosing the larger, later reward. *SV* _{Other} and *SV* _{LL} are the subjective values of the amounts for the other person after accounting for its magnitude and social distance, and for the larger later reward after accounting for its magnitude and delay, respectively. *SV* _{Self} and *SV* _{SS} are the subjective values of the "self" option and the "smaller, sooner" option, respectively - these are assumed to be exactly the same as the objective amount offered for "self" (social discounting) or at "zero delay" (delay discounting). β is a scaling factor that reflects the influence on decisions of the difference in subjective value between "other" and "self" options

(social discounting) or the "LL" and "SS" options (delay discounting). The subjective value of the "other" and "larger, later" option in each case was computed with a hyperbolic discounting function:

Social discounting:

$$SV_{Other} = \frac{A}{1+k N}$$

Delay discounting:

$$SV_{LL} = \frac{A}{1+kD}$$

Where A is the objective amount of the "other" or "larger, later" option, N is the social distance to the "other" option, D is the delay to the "LL" option, and k is a free scaling parameter that captures the effect of social distance or delay on SV_{Other} and SV_{LL} , respectively. A higher k value indicates that rewards lose their subjective value more quickly with increasing social distance or increasing delays to their receipt. Given that the distribution of computed k values is regularly highly skewed, these values are routinely subjected to a log-transformation (Kirby et al., 1999).

2.1.3.2. Identification with all of humanity. The Identification with all of Humanity Scale (McFarland et al., 2012) was used to measure participants' identification with others in three categories (i.e., people in my community, people in my country, and people all over the world). Across nine questions, participants indicated how much they identified with each category on a scale of 1 to 5. For example, participants would be asked: "How often do you use the word 'we' to refer to the following groups of people?" and could choose between "almost never", "rarely", "occasionally", "often", or "very often" for each of the three categories of people. A higher score in responses for one category indicates greater identification for that particular category. This self-report measure has a good internal consistency ($\alpha = .81-.89$) and test-retest reliability (r = .68-.70; McFarland et al., 2012) across identification measures.

2.1.3.3. Impartial beneficence. The Oxford Utilitarianism Impartial Beneficence subscale (Kahane et al., 2018) was used to measure participants' impartial beneficence. Participants rated, on a scale of 1 to 7 (1 = *Strongly disagree*, 7 = *Strongly agree*), how much they agreed with five statements (α = .70; Kahane et al., 2018) such as "If the only way to save another person's life during an emergency is to sacrifice one's own leg, then one is morally required to make this sacrifice". A higher score for this task indicates greater endorsement of the impartial maximization of the greater good, even at the expense of personal self-sacrifice.

2.1.3.4. Moral circles. A Moral Circles Task (modified from Waytz et al., 2019 and Crimston, Bain, Hornsey, & Bastian, 2016) was used to measure moral concern for others. Participants indicated, on a slider scale of 0 to 100 (0 = Inner circle of moral concern, 33 = 0 outer circle of moral concern, 67 = Fringes of moral concern, 100 = No moral concern), where they would place a particular entity category within their moral circles. A larger score on this task indicates greater moral concern for a particular entity category (i.e., closest family, all of your family, all of your closest friends, all of your friends, all acquaintances, all people you have ever met, all people in your country, all people on your continent, all people on earth, all animals on earth, all living things on earth, all things on earth, and all things in existence). Responses to a single question assess moral concern for an individual entity category. Multiplying the numerical rank of each category by the allocation to that category (i.e., multiplying "closest family" by 1, "all of your family" by 2..."all things in existence" by 13) and summing these values creates an overall weighted score for each participant (see Waytz et al., 2019 for a similar analysis). Larger overall weighted scores indicate overall more expansive moral concern. In this way, moral concern for both individual categories and overall moral concern can be assessed.

2.1.3.5. State and trait anxiety. State and trait anxiety were measured with a questionnaire adapted from the State and Trait Anxiety Inventory (Zsido, Teleki, Csokasi, Rozsa, & Bandi, 2020). This measure is not included in the present paper.

2.1.3.6. Demographics. A demographics questionnaire collected information on participant age, self-identified gender, and income. We also collected participant self-identified race, education, perceived socioeconomic status (SES), employment status, and the US state and city where they resided, but these data were not considered or presented here.

2.1.3.7. COVID-19 attitudes. Since this study was run in the midst of the COVID-19 pandemic, the final measure collected information on participants' attitudes and life circumstances relating to the COVID-19 pandemic through ten questions presented in random order (modified from Everett, Colombatto, Chituc, Brady, & Crockett, 2020). One of these questions related to our primary hypotheses, and asked participants to indicate how much stress they were experiencing in relation to COVID-19 (coronavirus) on a 7-point scale ($1 = No \ stress \ at \ all, 7 = Extreme \ stress$). The remaining questions are not considered here.

2.1.4. Procedure

Data collection took place on May 6, 2020. After indicating their consent to participate, participants first completed the social discounting and delay discounting tasks (the order in which the tasks were presented was counterbalanced across participants).

Participants then completed the identification with all of humanity, impartial beneficence, moral circles, state and trait anxiety, future outlook, hoarding attitudes and demographics questionnaires in a random order. Finally, they answered the COVID-19 specific questions.

At the end of the survey, participants were thanked for their participation and were provided with a link to the Centers for Disease Control and Prevention (CDC) website listing resources that may be useful in coping with COVID-19 related stress. They were also given an opportunity to provide any comments or suggestions related to the survey, or the COVID-19 pandemic.

3. Cohort two: replication

3.1. Method

The experimental protocol was approved by the University of British Columbia Institutional Review Board (H19–02493), and the measures and procedures used for Cohort 2 were identical to those used for Cohort 1. Data collection took place on July 9, 2020.

3.1.1. Participants

Participants for Cohort 2 were recruited through CloudResearch Amazon Mechanical Turk Toolkit (Litman et al., 2016), and all were 18 years of age or older and living in the United States. As per our preregistered data collection plan, we recruited an independent sample of 326 participants for Cohort 2. A total of 65 participants were excluded for the same reasons listed for Cohort 1. In addition, in Cohort 2, nine participants did not complete or attempt the survey, and were excluded from the final sample (see Supplementary Materials for a breakdown of all exclusions; Section 1.1).

Our final sample for Cohort 2 consisted of 252 participants (159 identified as male and 93 identified as female) aged 21 to 71 years (M = 38.31, SD = 11.50). Participants received 3 USD for completing the study, which took an average of 21.14 min (SD = 13.40).

4. Results

4.1. Identification with all of humanity and impartial beneficence, but not moral expansiveness, predict social discounting

In the following regression analyses, the log transformed k value for social discounting was placed as a criterion variable (see Table 1 for variable descriptives, Table 2 for Pearson correlations, and Tables 3 to 5 for regression tables). A number of prior studies demonstrate a relationship between the steepness of delay discounting and income (e.g., Green, Myerson, Lichtman, Rosen, & Fry, 1996; Hampton, Asadi, & Olson, 2018; Reimers, Maylor, Stewart, & Chater, 2009); these studies show that lower income is associated with higher delay discounting. If an individual has lower overall resources, they may be less able or less inclined to either wait for a delayed payoff or to forgo the money for another person. As noted in our pre-registration, we therefore controlled for financial income in all models. (See Figs. 1–4.)

Confirming a pre-registered hypothesis, higher total identification with all of humanity scores (indicating stronger identification with others in one's community, country, and all over the world) significantly predicted reduced social discounting (indicating greater preference for generous choices) in both cohorts (Table 3, Row 1 and 6). Table 3 shows that the magnitude of the effect was similar in the two cohorts (see 95% CIs for β s).

Confirming a pre-registered hypothesis, higher impartial beneficence scores (indicating greater endorsement of the impartial maximization of the greater good and more equitable regard for others' welfare) predicted reduced social discounting in both cohorts (Table 3, Row 2 and 7). Table 3 shows that the magnitude of the effect was similar in the two cohorts (see 95% CIs for β s).

Contrary to a pre-registered hypothesis, we found no significant association between weighted scores in the moral circles task (indicating overall expansiveness) and social discounting in either cohort (Table 3, Row 3 and 8).

We next placed total identification with all of humanity, impartial beneficence, and weighted moral circles scores as separate predictor variables against social discounting (pre-registered). We found that only greater total identification with all of humanity scores uniquely predicted reduced social discounting in both cohorts (Table 3, Row 4 and 9). Table 3 shows that the magnitude of the effect of total identification with all of humanity was similar in the two cohorts (see 95% CIs for β s).

These results were found to be robust to alternative model specifications: When the main social discounting analyses were run without income in the models (not pre-registered), the pattern of results was unchanged (see Supplementary Materials; Section 2.2). In a stepwise regression model (not pre-registered), total identification with all of humanity, impartial beneficence, and weighted moral circles scores were placed as separate predictor variables against social discounting in a stepwise regression model (with income included in the model). We found that only total identification with all of humanity was upheld as a significant predictor of reduced social discounting in both cohorts (see Supplementary Materials; Section 2.3). We also carried out an additional exploratory covariate analysis where we examined the relationship between the three predictors and the DV of social discounting while controlling (covarying) delay discounting (not pre-registered). This analysis revealed a significant relationship between identification with all of humanity and social discounting in both cohorts (see Supplementary Materials; Section 2.4). This analysis demonstrates that identification with all humanity uniquely explains variance in social discounting that is not explained by whatever domain general discounting processes are shared between social and delay discounting.



Fig. 1. Discovery cohort. 1a depicts the social discounting paradigm. 1b and 1c present social discounting outcomes (proportion of trials where 'other' was chosen and the hyperbolic decay of subjective value over social distance). 1d depicts the delay discounting paradigm. 1e and 1f present delay discounting outcomes (proportion of trials where 'later' was chosen and the hyperbolic decay of subjective value over temporal distance). 1g indicates the null correlation between social and delay discounting values (proportion of other reward and larger, later reward chosen, respectively), r = .117, p = .075. 1h presents income and age distributions.

4.2. Social and moral predictors do not reliably predict delay discounting

In these regression analyses, the log transformed k value for delay discounting was placed as a criterion variable. Models for which we did not have directional hypotheses or those that were specific to delay discounting can be found in Supplementary Materials. In all models in the main text, we controlled for financial income (see Supplementary Materials for exploratory results not controlling for financial income; Section 2.2).

As per our pre-registration, we were interested in examining whether the mechanisms associated with social and delay discounting were selective or generalizable across domains. Therefore, for each of the social and moral variables, we tested if, as with social discounting, they were associated with delay discounting. In Cohorts 1 and 2, identification with all humanity scores did not significantly predict delay discounting (Table 4, Row 1 and 5). Impartial beneficence scores also did not significantly predict delay discounting in Cohort 1 and 2 (Table 4, Row 2 and 6). On the other hand, higher moral circle scores significantly predicted greater delay discounting, but only in Cohort 1 (Table 4, Row 3). When we placed total identification with all of humanity, impartial beneficence, and weighted moral circles scores as separate predictor



Fig. 2. Replication cohort. 2a depicts the social discounting paradigm. 2b and 2c present social discounting outcomes (proportion of trials where 'other' was chosen and the hyperbolic decay of subjective value over social distance). 2d depicts the delay discounting paradigm. 2e and 2f present delay discounting outcomes (proportion of trials where 'later' was chosen and the hyperbolic decay of subjective value over temporal distance). 2g indicates the correlation between social and delay discounting values (proportion of other reward and larger, later reward chosen, respectively), r = .171, p = .006. 2h presents income and age distributions.



Social discounting

Fig. 3. 3a depicts correlates of social discounting (presented as the proportion of other rewards chosen), delay discounting (presented as the proportion of larger, later rewards chosen), identification with all of humanity, impartial beneficence, and moral circles scores in the discovery cohort. 3b presents the correlation between identification with all of humanity scores and proportion of 'other' rewards chosen in the discovery cohort, r = .29, p < .001. 3c presents the correlation between impartial beneficence and proportion of 'other' rewards chosen in the discovery cohort, r = .24, p < .001. 3d depicts correlates of social discounting, delay discounting, identification with all of humanity, impartial beneficence, and moral circles scores in the replication cohort. 3e presents the correlation between identification with all of humanity, impartial beneficence, and moral circles scores in the replication cohort. 3e presents the correlation between identification with all of humanity scores and proportion of 'other' rewards chosen in the replication cohort, r = .29, p < .001. 3f presents the correlation between impartial beneficence and proportion of 'other' rewards chosen in the replication cohort, r = .29, p < .001. 3f presents the correlation between impartial beneficence and proportion of 'other' rewards chosen in the replication cohort, r = .29, p < .001. 3f presents the correlation between impartial beneficence and proportion of 'other' rewards chosen in the replication cohort, r = .29, p < .001. 3f presents the correlation between impartial beneficence and proportion of 'other' rewards chosen in the replication cohort, r = .29, p < .001. 3f presents the correlation between impartial beneficence and proportion of 'other' rewards chosen in the replication cohort, r = .29, p < .001.



Fig. 4. 4a presents the correlation between identification with all of humanity scores and proportion of 'later' rewards chosen in the discovery cohort, r = -.12, p = .068. 4b presents the correlation between impartial beneficence and proportion of 'later' rewards chosen in the discovery cohort, r =-.16, p = .014. 4c presents the correlation between identification with all of humanity scores and proportion of 'later' rewards chosen in the replication cohort, r = -.09, p= .144. 4d presents the correlation between impartial beneficence and proportion of 'later' chosen in the replication cohort, r = -.18, p < .01. In contrast to social discounting, there were no positive associations between delay discounting and scores on identification with all of humanity and impartial beneficence.

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variables against delay discounting, we found that the model was not significant in both Cohorts 1 and 2^4 (Table 4, Row 4 and 8).

4.3. COVID-19 related stress predicts social discounting

Because our study was conducted during the COVID-19 pandemic, we sought to explore the relationship between COVID-19 related variables and social discounting (controlling for financial income). In Cohort 1, we found that greater stress related to the pandemic significantly predicted reduced social discounting (Table 3, Row 5). However, this association between COVID-19 related stress and social discounting was not replicated in Cohort 2 (Table 3, Row 10).

Given the significant association between COVID-19 related stress and social discounting found in Cohort 1, we pre-registered a regression model with all social and moral variables as predictors for Cohort 2. We were interested in the possibility that COVID-19 related stress would itself be predicted by identification with all humanity, moral circle, and impartial beneficence measures. Again controlling for income, we found that total identification with all of humanity and weighted moral circles, but not impartial beneficence, scores had separate and significant associations with stress related to the COVID-19 pandemic in Cohort 1 (Table 5, Row 1). Unlike in Cohort 1, identification with all of humanity in Cohort 2 did not uniquely predict stress related to the COVID-19 pandemic, while impartial beneficence and weighted moral circle did (Table 5, Row 2).

In order to examine the sensitivity of our findings, we reran all analyses in Sections 4.1 and 4.2 whilst controlling for COVID-19-related stress (not pre-registered). We found that the overall pattern of results stayed the same (see Supplementary Materials; Section 2.5).

5. Discussion

The human capacity to maximize global welfare has been greatly expanded in modern society as a result of medical, economic, and technological advancements (Bloom, 2016; MacAskill, 2018; Pinker, 2011; Pummer & MacAskill, 2020; Singer, 2015). Our ability to help others in need has, for many people, extended beyond benefiting family members, friends, and community members in our immediate physical environment, to saving the lives of distant strangers on the other side of the world. Indeed, some of the biggest threats currently facing humanity require a coordinated and collective response (Pummer & MacAskill, 2020; Roser & Ortiz-Ospina, 2019). While we may have the physical resources and ability to address these plights and maximize human welfare, the lives of distant others are often steeply discounted. Here, we investigated what influences people to value the welfare of distant and close others more equally. The findings from two cohorts confirm our hypotheses that greater identification with all of humanity predicted shallower social discounting (i.e., increased generosity across social distances) — even after controlling for COVID-19 pandemic-related stress. We also found some evidence that impartial beneficence was associated with a shallower social discounting. However, while this association was significant in the single regression models it was not significant in the multiple regression models, suggesting that impartial beneficence predicts social discounting insofar as it is related to identification with all of humanity.

By contrast, and contrary to our expectation, having a more expansive moral circle was not correlated with reduced social discounting. Importantly, we also found a dissociation between social discounting and delay discounting, such that even though individual across-domain discounting rates were rigorously well-matched, the variables that predicted social discounting did not reliably predict delay discounting. This suggests that the determinants of social discounting cannot be subsumed under a general value-based decision-making account that would treat distance in time and across social networks as equivalent. These results are discussed in turn below.

While social identity and self-concept tend to be fairly stable (Diehl, Jacobs, & Hastings, 2006; Trzesniewski, Donnellan, & Robins, 2003), the way that one views oneself as an individual and as part of social groups is malleable across time and environments (Gore, 2005; McCrae & Costa Jr, 1988). The present findings suggest that an inclusive identification with all of humanity is associated with valuing the welfare of distant others more equally to that of close others (i.e., reduced social discounting). An interesting question to consider is whether, and in what ways, stable individual differences in identification with all of humanity (Hamer et al., 2019) can be fostered and developed across the lifespan.

Here, we examined two aspects of morality that we predicted would be associated with caring more equally about the welfare of distant others: the expansiveness of one's moral circle and the extent to which one values impartial beneficence. As noted earlier, although there was an association with impartial beneficence in the single regression model this was not observed in the multiple regression model when identification of all of humanity was included. Thus, the association between impartial beneficence and social discounting may be driven by its shared variance with identification of all of humanity. Or, to the extent that there is a unique association with impartial beneficence and social discounting, it is less robust than the unique association between identification with all of humanity and social discounting. We found little to no evidence of an association between social discounting and the expansiveness of moral circles in either a single or multiple regression model. In understanding these results, a few possibilities are important to note.

First, while the philosophical concept of a moral circle has been around the intellectual block for a long time (Lecky, 1869; Singer, 1981), it has only more recently been empirically investigated (e.g., Crimston, Bain, Hornsey and Bastian, 2016; Graham et al., 2017; Waytz et al., 2019). Thus, we are open to the possibility that our operational definition of the moral circle may not align with all views of the concept from philosophy and would urge caution in interpreting the absence of evidence in the present datasets as evidence of absence. Another posthoc explanation is that the wide range of entities that the moral circle measured here encompasses (including non-human animals, microorganisms, and non-living entities) may make it less sensitive to allocation decisions in the social discounting task in contrast to identification of all of humanity, since the social discounting task, and identification with all of humanity exclusively involves human targets.

Our results should also not be taken to imply that moral circle and impartial beneficence are the only two relevant dimensions of morality that could be associated with social discounting, or that particular moral beliefs will always *reduce* social discounting. Indeed, recent work from our lab and others has shown that although valuing others' welfare is generally viewed as morally good (Anderson, Crockett, & Pizarro, 2020;

⁴ At the suggestion of a reviewer, we conducted post-hoc multivariate multiple regression analyses to test the effect of identification with all humanity, impartial beneficence, and weighted moral circle scores on the combined social and delay discounting outcome variables. There was a statistically significant effect of identification with all humanity on the combined discounting dependent variables (Cohort 1: F(2, 228) = 3.669, p = .027, Pillai's Trace = 0.031; Cohort 2: F(2, 246) = 3.641, p = .028; Pillai's Trace = 0.029). In the singleoutcome models reported in the main text (i.e., the multiple regression models reported in Tables 3 and 4) - which yield identical coefficients to those generated via the multivariate multiple regression approach --- this significant difference is revealed to be unique to social (and not delay) discounting, where we find that, in the models with all social and moral predictor variables, greater total identification with all of humanity scores only uniquely predicts reduced social discounting (both cohorts). In Cohort 2, there was also a statistically significant effect of impartial beneficence on the combined discounting dependent variables (F(2, 246) = 4.154, p = .017; Pillai's Trace = 0.033). However, this was not the case in Cohort 1 (Pillai's trace, Cohort 1: F(2, 228) =2.169, p = .117; Pillai's Trace = 0.019), and the effect of impartial beneficence was not significant in either cohort in the single-outcome models reported in the main text predicting social or delay discounting from all three social and moral predictors.

Barasch, Levine, Berman, & Small, 2014; Bostyn & Roets, 2016; Bostyn, Sevenhant, & Roets, 2018; Carlson & Zaki, 2018; Pizarro, Uhlmann, & Bloom, 2003), people who donate resources to socially distant others instead of close others are predominantly viewed as less moral than those who donate to family members and friends instead of distant others (Everett, Faber, Savulescu, & Crockett, 2018; Law, Campbell, & Gaesser, 2021; McManus, Kleiman-Weiner, & Young, 2020). These findings suggest that conventional moral evaluations of welfare gains may be sensitive to tradeoffs in social distance. Rather than making definitive claims about social discounting and morality, we view the present study as taking an important step towards uncovering a relationship between social discounting and inclusive moral beliefs that compel more equal concern regardless of social distance, and a view of increased moral concern for socially closer others as biased and discriminatory (for a review see Graham et al., 2017).

An exciting avenue for future research would be to explore additional dimensions of morality that serve to expand or contract how people value the welfare of more distant others. One potential candidate is to explore the relationship between Moral Foundations Theory and social discounting, which proposes that different sets of moral values may be associated with more universal concern for others (individualizing values) vs. more parochial concerns that tie us to small groups (binding values) (Graham et al., 2017; Haidt & Graham, 2007). Consistent with this framework, endorsement of individualizing values has been shown to be positively correlated with an expanded moral circle whereas endorsement of binding values was correlated with a narrowed moral circle (Crimston et al., 2016). However, there are two caveats. First, as noted, we did not observe an association between our moral circle measure and social discounting in the current studies. Second, it remains to be seen how moral foundations relate to identification with all of humanity. Future research will be needed to assess this relationship.

Our findings have implications for efforts in philosophy and philanthropy to foster lifestyles and charitable giving that do the "most good". Due to widening imbalances of wealth and need between those living in affluent and developing nations, the resources of those living in wealthier societies can lead to the greatest gains in welfare when donated to strangers living in developing countries (GiveWell, 2019). The modern moral philosophy and social movement of effective altruism argues that all of human life should be equally valued regardless of social proximity and thus, charitable giving should be guided by whether it leads to the largest gain in welfare rather than whether someone is psychologically or physically close versus distant (Singer, 2015). Yet, people rarely make donation decisions in a way that equally values others' welfare and thus maximizes collective good (Berman, Barasch, Levine, & Small, 2018; Caviola et al., 2021). Our results suggest that the expansiveness of one's identity and possibly the degree to which one values impartial beneficence are associated with caring more equally about distant and close others' welfare. As a result of their relationships with social discounting, these cognitive factors may promote effective altruism. Finally, the current findings may have implications for understanding populations who exhibit remarkably reduced social discounting rates, such as extraordinary altruists who donate organs and other body tissues to distant strangers (Marsh et al., 2014; Vekaria et al., 2017). Our findings raise the possibility that such populations engage in these extraordinary prosocial behaviors in part because of abnormally expansive and inclusive identities.

While reducing social discounting and valuing others more equally across social distance seems admirable, it may come with unintended consequences that impact relationships and cooperation. Previous work has shown that people who decide to help distant others instead of closer others — even when the level of need and welfare gains are explicitly greater for distant others (Law et al., 2021) — are rated as worse friends, family members, and community members, and are selected less often as cooperative partners (Everett et al., 2018; Law et al., 2021; McManus et al., 2020). Valuing others more equally may come at the cost of

signaling that one is a less reliable social partner and impoverishing the quality of close relationships. Whether or not this is the case, understanding tradeoffs in wellbeing associated with equitable social discounting is an important target for future research.

We note a few important limitations in our study design. First, although participants completed the study online, we cannot rule out the possibility that measuring all variables via self-report may introduce some social desirability bias. In particular, items assessing identity, morality, and even social discounting may be limited in their validity due to participants' desire to provide more socially acceptable answers. However, it is worth noting that there was no evidence of ceiling effects for these variables and a wide range of scores were obtained from both cohorts. In fact, the mean proportion of trials where participants chose to allocate funds to another beneficiary was less than 0.50 in both cohorts, and the identification with all of humanity, impartial beneficence and moral expansiveness scales used in the present study have previously demonstrated strong construct validity (Crimston et al., 2016; Kahane et al., 2018; McFarland et al., 2012).

Second, our findings reveal a correlational and not a causal link between social discounting and identification with all of humanity. As discussed, there may be other variables such as prejudice (Amodio & Cikara, 2021) that may change how a person views themself as part of social groups, thus influencing how much they discount socially. Nonetheless, one's identity and morality are still likely to play important roles in how decisions are made about close and distant others. Indeed, it is worth noting that identity and morality are relatively stable individual differences over time (e.g., Hamer et al., 2019). Moreover, that the findings replicate in a second cohort at a different point in time and are still present after controlling for stress relating to the COVID-19 pandemic speaks to the robustness of our results.

Third, our findings may hinge on methodological factors employed in the present study and it will be important to replicate this work using varied task designs. For example, in our social discounting task, participants only considered individuals up to position 15. Our procedures were inspired by Hill et al., 2017, who also used both a delay and social discounting task and selected their social distances such that the two tasks would be well matched in terms of discounting patterns. Had we included positions that were farther down the list (e.g., position 100), patterns of discounting may have been different in the present study, and this could have altered the nature of the associations observed. In addition to this limitation, we note that participants were instructed to avoid listing financial benefactors in our social discounting task (as per Hill et al., 2017; also see Sellitto, Neufang, Schweda, Weber, & Kalenscher, 2021). Our rationale was to avoid potential confounding effects of financial dependence (e.g., If I forgo money more often for my partner relative to my sibling, is that because my partner is socially closer to me or is it simply because my partner and I share a bank account and therefore giving to them is essentially giving to myself?). Nonetheless, in doing so, we also risked that participants excluded individuals for whom they are closest, thereby undermining the efficacy of the manipulation of social distance and the potential to observe stronger relationships with other variables. Moreover, determining financial dependence is not straightforward and participants may have interpreted the instructions differently. Future studies should assess the consequences of including versus excluding financial benefactors, in addition to including clear instructions of how financial benefactor is defined.

A strength of our study is that we included measures of both social and delay discounting in order to assess the domain generality of observed associations. We went to great lengths during piloting to design the social and delay discounting tasks to be carefully matched in terms of their psychometric properties, as can readily be observed in the similarity of k values across measures. Extant theoretical views often emphasize similarities in decision-making about other individuals and about one's "future selves" (Ersner-Hershfield, Garton, Ballard, Samanez-Larkin, & Knutson, 2009; Parfit, 1971). For example, making a decision to save money for retirement — a sacrifice by the present self to benefit the future self - is analogous in some sense to a decision to sacrifice that same amount of money for another individual entirely. Accordingly, a wide body of research points to shared domain-general psychological and neural bases of intra- and inter-personal decisionmaking (Bellmund et al., 2018; Parkinson & Wheatley, 2015; Peer et al., 2021; Tavares et al., 2015; Trope & Liberman, 2010). Indeed, in our study, social and delay discounting were modestly correlated (in cohort 2; also see Jones & Rachlin, 2009). Critically, however, in emphasizing similarities, the contributions of distinct mechanisms supporting different domains may be overlooked. Here, we found evidence of dissociable associations as the correlations with identity with all of humanity and impartial beneficence were specific to social discounting. The absence of significant or reliable and robust associations with delay discounting also suggests a unique psychological basis underlying the observed relationships. While delay and social discounting share many analogous features, the present results underscore how they are not equivalent and are likely to have various unique cognitive determinants (Bialaszek, Ostaszewski, Green, & Myerson, 2019). Likewise, Jones and Rachlin (2009) found that social — but not delay — discounting predicted charitable donations in the context of a public goods task. Consistent with this idea, prior work shows that these forms of discounting may rely on highly overlapping neurocognitive mechanisms (Hill et al., 2017) but also show neural dissociation. Elucidating their shared as well as distinct mechanisms remains an important consideration for future research.

6. Conclusion

As a whole, our findings shed light on multifold psychological processes that may or may not contribute to humans allocating a more equal distribution of generosity. Expansiveness of identity with all humans may be an important target for fostering a more equal distribution of generosity.

Open science

Pre-registrations can be found at: https://aspredicted.org/dq3pv.pdf (Cohort 1) and https://aspredicted.org/7x6c8.pdf (Cohort 2). Data has been made available on the Open Science Framework website at: htt

Appendix A. Appendix

Table 1

Descriptive statistics of study variables.

ps://osf.io/23hc4/?view_only=fafac20afa214f5f8bc9cfe62a12658e

Author contributions

All authors conceptualized the design, Y.T. collected the data, all authors analyzed the data and wrote the paper. All authors approved the final version of this manuscript.

CRediT authorship contribution statement

Young Ji Tuen: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing. Adam Bulley: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing, Visualization. Daniela J. Palombo: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing, Supervision, Funding acquisition. Brendan Bo O'Connor: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing, Supervision, Funding acquisition.

Declaration of Competing Interest

None.

Data availability

Data has been made available on the Open Science Framework website at: https://osf.io/23hc4/?view_only=fafac20afa214f5f8bc9cf e62a12658e

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Study variable	Cohort 1 (<i>n</i> = 234)		Cohort 2 (<i>n</i> = 252)		
	M (SD)	Range	M (SD)	Range	
Delay discounting (log k)	-1.14 (0.94)	-2.82-0.25	-1.15 (0.94)	-2.82-0.25	
Social discounting (log k)	-1.16 (1.00)	-2.91-0.25	-1.37 (1.02)	-2.91-0.25	
Moral circle (weighted)	5278.37 (1660.46)	1125–9100	5196.11 (1797.92)	0-8422	
Identification with all of humanity	87.90 (20.92)	28-135	89.87 (20.93)	30-135	
Community	31.09 (7.76)	9–45	31.03 (7.73)	9–45	
Country	29.67 (7.30)	9–45	30.23 (7.75)	9–45	
World	27.15 (8.59)	9–45	28.61 (8.26)	9–45	
Impartial beneficence	20.00 (8.03)	5–35	21.14 (7.53)	5–35	
COVID-19-related stress	3.89 (1.69)	1–7	4.00 (1.65)	1–7	

Table 2

Pearson correlations between key study variables.

Variables	1	2	3	4	5	6
1. Delay discounting (log k)	_					
Cohort 1						
Cohort 2						
 Social discounting (log k) 		-				
Cohort 1	0.128*					
Cohort 2	0.153*					
3. Identification with all of humanity			-			
Cohort 1	0.060	-0.280**				
Cohort 2	0.034	-0.275**				
4. Impartial beneficence				-		
Cohort 1	0.109	-0.232^{**}	0.593**			
Cohort 2	0.121	-0.247**	0.601**			
5. Moral circles (weighted)					-	
Cohort 1	-0.167*	0.006	-0.159*	-0.114		
Cohort 2	-0.118	-0.061	-0.164**	-0.122		
COVID-19-related stress						-
Cohort 1	0.063	-0.155*	0.324**	0.289**	0.084	
Cohort 2	0.060	-0.114	0.298**	0.397**	0.076	
* $p < .05.$ ** $p < .01.$						

Table 3

Summary of single-outcome univariate and multiple regressions examining associations between social and moral predictors and social discounting, controlling for financial income.

Cohort	Predictor variables	F	R^2	Standardised coefficient (β)	95% CI for β		t
					Lower bound	Upper bound	
1	Identification with all of humanity	9.88	.079***	276	402	150	4.31***
	Impartial beneficence	7.08	.058***	230	356	104	3.61***
	Moral circles (weighted)	0.56	.005	.009	121	.138	0.13
	Multiple regression	5.49	.087***				
	Identification with all of humanity			218	377	060	2.72**
	Impartial beneficence			106	261	.049	1.35
	Moral circles (weighted)			040	166	.087	0.62
	COVID-19 related stress	3.45	.029*	156	284	028	2.40*
2	Identification with all of humanity	10.24	.076***	269	393	146	4.29***
	Impartial beneficence	8.60	.065***	240	362	119	3.90***
	Moral circles (weighted)	1.44	.011	061	185	.063	0.97
	Multiple regression	6.77	.099***				
	Identification with all of humanity			207	361	054	2.66**
	Impartial beneficence			134	283	.015	1.77
	Moral circles (weighted)			111	232	.009	1.82
	COVID-19 related stress	2.52	.020	110	234	.013	1.76

*p < .05. **p < .01. *** p < .001.

Table 4

Summary of single-outcome univariate and multiple regressions examining associations between social and moral predictors and delay discounting, controlling for financial income.

Cohort	Predictor variables	F	R^2	Standardised coefficient (β)	95% CI for β		t
					Lower bound	Upper bound	
1	Identification with all of humanity	0.42	.004	.061	070	.192	0.91
	Impartial beneficence	1.39	.012	.109	020	.238	1.67
	Moral circles (weighted)	3.33	.028*	168	295	040	2.58*
	Multiple regression	2.19	.037				
	Identification with all of humanity			033	196	.130	0.403
	Impartial beneficence			.110	049	.270	1.36
	Moral circles (weighted)			160	290	031	2.44*
2	Identification with all of humanity	0.16	.001	.036	092	.165	0.56
	Impartial beneficence	1.87	.015	.122	002	.247	1.93
	Moral circles (weighted)	1.75	.014	118	242	.006	1.87
	Multiple regression	1.84	.029				
	Identification with all of humanity			076	235	.084	0.94
	Impartial beneficence			.153	002	.307	1.94
	Moral circles (weighted)			112	237	.014	1.75

*p < .05. **p < .01. *** p < .001.

Table 5

Summary of single-outcome multiple regressions examining associations between social and moral predictors and COVID-19 stress, controlling for financial income.

Cohort	Predictor variables	F	R^2	Standardised coefficient (β)	95% CI for β		t
					Lower bound	Upper bound	
1	Multiple regression	9.49	.142				
	Identification with all of humanity			.270	.116	.423	3.46***
	Impartial beneficence			.147	004	.297	1.92
	Moral circles (weighted)			.145	.023	.268	2.34*
2	Multiple regression	13.78	.182***				
	Identification with all of humanity			.122	025	.268	1.64
	Impartial beneficence			.345	.203	.487	4.78***
	Moral circles (weighted)			.138	.023	.253	2.37*

*p < .05. **p < .01. ***p < .001.

Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cognition.2022.105283.

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