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Selectivity in Prosociality Among Older Adults: The Moderation Effect of Self- and Other-Oriented Motivation

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Prosociality tends to increase with age, but whether older adults (OA) are more willing than younger adults (YA) to extend their prosocial behaviors beyond close social circles remains a topic of debate. This study aimed to address this controversy and explore the underlying mechanisms of age-related differences in prosociality through the lens of social discounting and gain-and-loss framing. One hundred twenty-three younger adults and 135 older adults participated in a social discounting task (measuring prosocial tendencies toward various social relationships) with various framings (self-oriented framing, other-oriented framing, and control condition). Compared to younger adults, older adults exhibited higher overall prosociality and treated socially close and distant others more evenly, indicating lower levels of selectivity in prosociality. Notably, the interaction effect between age and framing revealed that other-oriented framing amplified the prosocial tendencies of older adults, particularly toward socially distant others but not younger adults. These findings suggest other-oriented framing specifically reduced older adults' selectivity in prosociality, highlighting their prioritization of others' welfare and aversion to others' losses. This supports the notion that older adults' prosociality may be driven by other-oriented motivation rather than self-interest.

Public Significance Statement


Promoting inclusivity in prosocial behavior is crucial for fostering social harmony, encouraging individuals to extend kindness beyond their close social circles. This study investigated the motivations behind prosocial behavior toward various social relationships across different age groups, finding that other-oriented motivation significantly increased older adults' prosocial actions beyond their close social circles. Therefore, understanding the mechanisms driving inclusivity in prosocial behavior as people age can empower older adults to build strong connections and contribute to a more harmonious community.

Keywords: selectivity in prosociality, framing effect, social discounting, other orientation

Prosociality refers to the willingness to engage in behaviors that benefit others (Sparrow et al., 2021). Accumulating evidence from studies using self-report, behavioral, and neural measures suggests that older adults (OA) show increased prosociality compared to

younger adults (YA) worldwide (Bailey et al., 2021; Cutler et al., 2021; D. Li et al., 2024; Mayr & Freund, 2020; Sparrow et al., 2021). However, researchers have not reached a consensus on whether increased prosociality with age is universally directed toward

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The authors have no conflicts of interest to disclose. The research was approved by the Institutional Review Board of the School of Psychological and Cognitive Sciences at Peking University (study title: Age Differences in Social Discounting and Potential Factors; protocol number: 2020-03-11). This study was funded by the National Natural Science Foundation of China (Grant 31871121 awarded to Xin Zhang). The authors thank Keyu Xue and Chao Chen who contributed to the data collection and Shawn Hemelstrand who provided suggestions on writing.

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others or if it primarily focuses on socially close others. The selectivity in prosociality refers to the extent to which individuals differentiate between socially close others and socially distant others in prosocial contexts. Higher levels of selectivity indicate that individuals treat socially close and distant others less equally and show a greater preference for socially close others. The existing literature presents conflicting evidence on how age influences selectivity in prosociality toward various social relationships (Cutler et al., 2021; Gong et al., 2019; Pornpattananangkul et al., 2019). The question of whether older adults extend prosociality beyond their close social circles more than young adults is perplexing and cannot be easily explained by prevailing theories. From an evolutionary perspective, which emphasizes kin selection and reciprocity (e.g., Hamilton, 1964; Kurzban et al., 2015), it is argued that individuals' prosociality is driven by self-interest and concurs with higher levels of selectivity in prosocial behaviors. On the other hand, there are also propositions suggesting that prosocial behaviors in later life reflect pure altruism driven by other-oriented motivation (e.g., Hubbard et al., 2016; Mayr et al., 2024), which in turn leads to lower levels of selectivity in prosociality. To test these two perspectives, the present study examined age-related differences in prosociality, particularly focusing on selectivity toward others of different social distances, while highlighting the influence of self-interest and other-oriented motivations. Through this investigation, we aimed to gain a deeper understanding of the underlying mechanisms of prosociality among older adults.

Age Differences in Prosociality and the Role of Social Distance

How prosociality changes across adulthood has attracted increased attention from scholars in recent years. Converging evidence from real-life and experimental laboratory situations, such as various economic paradigms, self-report scales, and reports on charitable giving, has found that older adults tend to exhibit higher levels of prosocial behavior than do younger adults (D. Li et al., 2024; Sparrow et al., 2021). For example, data from the World Giving Index has demonstrated a global trend where older contributors donate more money to charities compared to younger contributors (Charities Aid Foundation, 2022). Additionally, in laboratory settings, older adults have been found to contribute more money to others in various economic games, such as dictator games, when compared to younger adults (Engel, 2011; Matsumoto et al., 2016). Despite a large body of findings indicating that prosociality increases with age, the influence of social relationships on older adults' inclination to engage in prosocial behaviors remains unclear. Although socioemotional selectivity theory provides valuable insights into age-related shifts in social preferences, especially the increased prioritization of close relationships in older adults (Carstensen et al., 1999, 2006), it may not fully account for the motivations driving age-related prosocial behavior toward diverse social relationships. It is questionable whether older adults exhibit greater prosociality than younger adults when the recipient is someone socially distant.

Examining the influence of social relationships can help to understand the motivations behind prosociality (Bailey et al., 2021; Clark et al., 2015; Maner & Gailliot, 2007; Nikitin & Freund, 2021). Prominent biological models of altruism, including kin selection and reciprocity, propose that individuals are especially inclined to assist and benefit those who are genetically or socially close, thereby

promoting the survival of their own genes (e.g., Hamilton, 1964; Kurzban et al., 2015). For instance, Cutler et al. (2021) conducted a cross-national study across 67 countries, revealing that older adults donated more to national than international charities in 62% of the countries. This finding supports the argument that older adults' increased prosociality is partially explained by self-serving motivations operating within the context of in-group preferences. In contrast, other research suggests the existence of pure altruism—actions driven solely by a genuine concern for the well-being of others, without any expectation of personal benefit (Hubbard et al., 2016; Mayr et al., 2024). This other orientation leads people to emphasize the needs and welfare of strangers, prompting them to help and benefit socially distant others regardless of personal cost. Hubbard et al. (2016) found a strong age-related increase in general benevolence, positively correlated with a neural pure-altruism index. This suggests that pure altruism, manifested as genuine concern for others, contributes significantly to age-related differences in prosocial behavior. Nevertheless, these studies offer only indirect evidence on the role of social relationships, as Cutler's research focused on broad categories of social distance (e.g., national vs. international), while Hubbard's study relied on self-report measures.

Previous research has shown that prosocial behavior follows a hyperbolic function of social distance, a phenomenon known as social discounting (Jones & Rachlin, 2006). This model is valuable for examining how social distance influences prosocial behavior in old age and for differentiating between self-interest and other-oriented motivations. To the best of our knowledge, only two studies have investigated age-related differences in prosociality while considering the impact of various social distances (Gong et al., 2019; Pornpattananangkul et al., 2019), but their findings are inconsistent. Gong et al. (2019) used a scenario-based social discounting task and found that older adults exhibited higher social discounting (preferring closer others in donations) than younger adults. This is consistent with socioemotional selectivity theory (Carstensen et al., 1999, 2006) and previous studies showing a stronger social preference in older age (e.g., Fung et al., 2008; Zhang et al., 2011). In contrast, Pornpattananangkul et al. (2019), using a classic social discounting task, found older adults less selective across social distances in prosocial behavior than younger adults. This suggests older adults are more prosocial toward even socially distant others, contradicting the prevailing notion of increased selectivity with age. Hence, further investigations might be needed to get a comprehensive understanding of the role of social distance on age-related differences in prosociality.

Age Differences in Selectivity Through the Lens of Framing

Previous studies have examined the underlying mechanisms of selectivity in prosociality through framing (Feng et al., 2021; J. Li et al., 2020; Sellitto et al., 2021). For example, when the framing emphasizes self-related outcomes, loss framing (compared to gain framing) could make individuals less prosocial (e.g., Fiedler & Hillenbrand, 2020) and more likely to show a selective bias for close social relationships (Everett et al., 2015). In other words, such self-related loss framing intensifies motives to maximize self-interest. If individuals engage in prosocial behaviors toward others with the belief that they will ultimately benefit themselves in turn (De Dreu & Nauta, 2009), the fear of losing personal resources can hinder

individuals from engaging in such acts or expecting future reciprocal benefits from others. Hence, the desire to protect one's own interests and avoid personal losses overshadows the inclination to help others, resulting in more self-centered behaviors, and greater selectivity toward socially close others in prosocial contexts.

On the other hand, other studies have found that when the framing highlights the outcomes of others, loss framing (compared to gain framing) can increase individuals' prosociality (Cochard et al., 2020; Feng et al., 2021) and reduce their selectivity toward socially distant others (J. Li et al., 2020; Sellitto et al., 2021). These findings suggest that individuals have a fairness concern and are less willing to inflict losses on others (J. Li et al., 2020; Sellitto et al., 2021). For example, people tend to be more prosocial toward others, including socially distant others, when the prosocial context is framed as preventing a monetary loss to others rather than granting others a gain (Sellitto et al., 2021). Since the concern is about fairness, other-oriented motivation is less dependent on social distance, thus resulting in lower levels of selectivity toward socially close others.

However, previous studies have mainly focused on younger adults. There is still a lack of understanding regarding how framing influences older adults' selectivity of prosocial behaviors. To our knowledge, only one study has examined the influence of aging, framing, and social distance on decision making, but it was about decision making in the medical domain (Chen et al., 2023) rather than specifically addressing prosocial behaviors. Building upon evidence from age differences in risk decision making, we propose that the phenomenon of age-related loss aversion could also be applied to prosocial behavior. According to goal orientation theory (Depping & Freund, 2012; Ebner et al., 2006), as individuals age, their goals tend to shift from resource acquisition toward resource maintenance and loss prevention. In other words, older adults are more likely to prioritize the preservation of existing resources and minimizing potential losses, while younger adults focus on maximizing gains. Thus, in the loss (vs. gain) framing, older adults are expected to be more sensitive to potential losses and demonstrate a greater inclination to avoid losses compared to younger adults (Best & Charness, 2015).

Furthermore, unlike risky decision making, prosocial behaviors involve outcomes for different parties (self and others). The framings of loss can influence both selfish and selfless motivations by directing attention toward either oneself or others (Feng et al., 2021; J. Li et al., 2020; Sellitto et al., 2021). In such cases, the effect of self-oriented loss framing may differ from that of other-oriented loss framing on age-related differences in the selectivity of prosocial behaviors. The self-oriented loss framing may increase older adults' concern for self-interest and increase their selectivity toward socially close others. In contrast, when the framing highlights the outcomes of others, other-oriented loss framing could amplify individuals' other orientation and reduce selectivity toward socially distant others (Chen et al., 2023).

The Present Study

The present study aimed to investigate the underlying mechanisms of age-related differences in prosocial behaviors through the lens of social discounting and framing effects. Specifically, we aimed to contrast two perspectives: self-interest and other-oriented motivations. According to self-interest motivation, individuals

prioritize their own losses over the welfare of others. Considering that older adults tend to preserve their existing resources and minimize potential losses more so than their younger counterparts, we expect that self-oriented framing would lead to reduced prosocial behavior and increased selectivity toward close social relationships among older adults relative to younger adults. However, if other orientation is the underlying mechanism, older adults may be less concerned about personal welfare but more sensitive to the losses experienced by others, more so than younger adults. From this perspective, older adults' selectivity in prosociality is less likely to be influenced by self-oriented framing, while other-oriented framing would enhance their prosocial tendencies and reduce their selectivity more so than those of younger adults.

To address these questions, one experiment was conducted to examine the role of self-oriented (vs. other-oriented) framing on selectivity of prosociality across ages. The finding contributes to our understanding of how self-interest and other orientation influence individuals' selectivity in prosociality across ages. According to the above arguments, we proposed that:

Hypothesis 1: From a prosocial perspective (Mayr et al., 2024; Pornpattananangkul et al., 2019), older adults were expected to show higher levels of overall prosociality than younger adults.

Hypothesis 2a: Based on predictions that loss aversion may intensify motives to maximize self-interest, it was expected that in self-oriented framing, older adults would increase their selectivity toward socially close others compared to younger adults when self-loss was emphasized.

Hypothesis 2b: In contrast to Hypothesis 2a, we proposed a competing hypothesis suggesting the presence of pure altruism in older adults. Considering that other-oriented motivation may be intensified by loss framing, it was expected that in the context of other-oriented framing, older adults would display lower levels of selectivity compared to younger adults if others' potential loss was emphasized.

Method

Transparency and Openness

This study design, hypothesis, and analytic plan were not pre-registered. De-identified data, analytic code, and necessary materials from the experiment are deposited on the Open Science Framework (Lin & Lu, 2022). We report how we determined our sample size, any data exclusions, all manipulations, and all measures in this study.

Participants

A total of 123 younger (32 males; 18–28 years of age, $M_{\text{age}} = 21.64$, $SD = 2.50$) and 135 older (26 males; 58–88 years of age, $M_{\text{age}} = 66.74$, $SD = 5.51$) Chinese adults were recruited via ads posted on social media or distributed in urban communities. Sensitivity analysis was conducted to examine whether the sample size was sufficient. The results revealed that the overall sample size was adequate and that the power to detect the interaction between age and framing was good (power = 0.96). The data were collected between 2019 and 2021. The study passed the ethical approval of

Peking University (study title: Age Differences in Social Discounting and Potential Factors; protocol number: 2020-03-11). All participants received monetary compensation for their participation.

Measures

The present study adopted a 2 (age: younger and older) \times 3 (framing: self-oriented, other-oriented, control) \times 8 (social distance: 1, 2, 3, 5, 10, 20, 50, and 100) mixed design, wherein social distance was a within-subject variable, and the others were between-subject variables. All younger and older participants were randomly assigned to three conditions of framing (self-oriented, other-oriented, control).

Social Discounting Paradigm

The social discounting task used in the formal study was adopted from previous studies (e.g., Jones & Rachlin, 2006). First, participants needed to familiarize themselves with the concept of social distance. They were asked to rate a list of people in their social environment (1 = *closest*; 100 = *most distant*) and then write down the names or the relationships of those whose social distance was equal to 1, 2, 3, 5, 10, 20, 50, 100 (e.g., *mother* = ~1, *total stranger* = ~100). Second, participants were asked to make a series of hypothetical binary choices between keeping money for themselves (e.g., “¥145 for yourself [selfish option]”) and splitting money to benefit another person at different social distances (e.g., “¥75 for yourself and ¥75 for person *N* [generous option]”). There were three conditions for framing (Figure 1). In the control condition, the own payoff in the generous option always appeared positive (a constant gain of ¥75). The money for own payoff in the selfish option varied from ¥75 to ¥165. In the self-oriented framing, own payoff in the generous option was described negatively, which refers to relative loss between own payoff in the generous option and own payoff in the

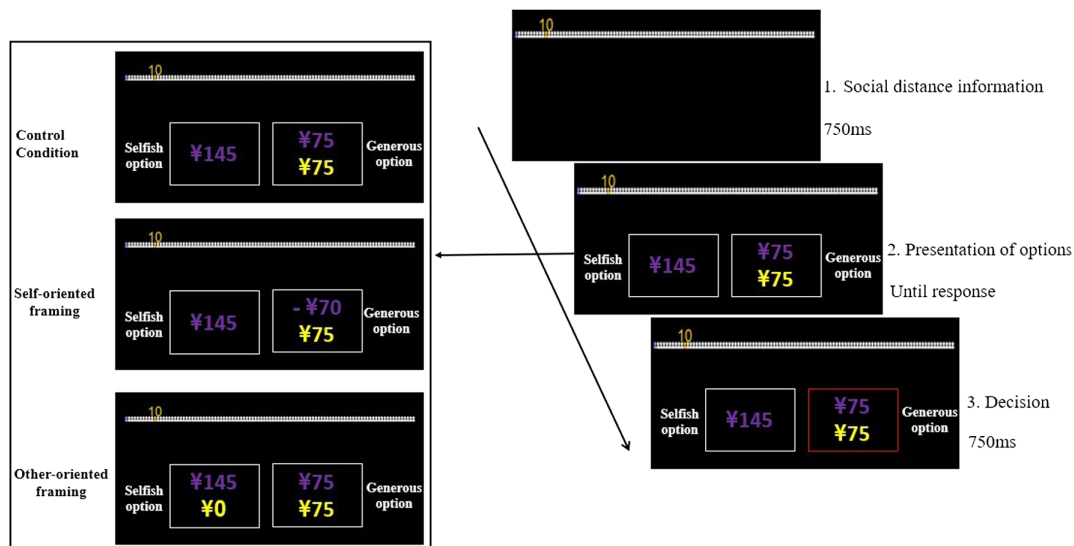
selfish option. Participants will relatively lose specific amount of money (from –¥0 to –¥90) if they choose to share the money with others (the generous option) compared to keeping all the money themselves (the selfish option). Moreover, the manipulation of other-oriented framing was conducted in the selfish option. In the control condition, the selfish option only displayed the money for the participants themselves. In contrast, in the other-oriented framing, the selfish option included an additional zero value of others, representing the zero income of others. It is important to note that the monetary value across three framings is equivalent.

To incentivize participants' engagement in the experiment, at the end of the social discounting task, one trial of the participants' choices (either the selfish option or generous option) was randomly drawn, and 10% of the own payoff (i.e., the money for self in the selfish or generous option) was paid out as extra reward.

Cognition and Demographics

A recent meta-analysis of 51 studies assessing potential moderators of age differences in prosociality indicates that income may influence age-related prosocial behavior (D. Li et al., 2024). Considering the potential confounding effect of cognition and other demographic variables, participants were also asked to complete the following four cognitive tests: forward and backward digit span tests, the digit symbol substitution test (Wechsler, 1997), and a verbal fluency test (Tombaugh et al., 1999) after finishing the social discounting task. A higher score indicates better cognitive functioning. Finally, participants' demographic information, including age, gender (1 = *males*, 2 = *females*), education level (from 1 = *primary school* to 4 = *graduate*), self-rated health status (from 1 = *very poor* to 5 = *very good*), and self-rated household income (from 1 = *lowest* to 10 = *highest*) were also measured.

Figure 1
An Example Trial in the Social Discounting Task Across Conditions



Note. See the online article for the color version of this figure.

Procedure

The present study involved participants completing a series of tasks in a private room with a computer. Participants were randomly allocated to different conditions. Before the formal study, each participant read and signed an informed consent form. Next, the experimenter introduced the social discounting task and verified the participants' comprehension of the task under various conditions. To familiarize themselves with the concept, participants first went through 10 practice trials of the task. This ensured that they understood the task structure and framing before proceeding. Once the participants demonstrated their understanding, they completed the formal social discounting task. After finishing the social discounting task, participants completed four cognitive tests and responded to demographic questions. Finally, participants received payment for their participation.

Results

Descriptive Statistics

The demographic details of participants were shown in Table 1. Significant age-related differences in education level, $F(1, 252) = 494.20, p < .001, \eta_p^2 = .66$; self-rated health status, $F(1, 252) = 46.44, p < .001, \eta_p^2 = .16$; and household income, $F(1, 252) = 18.76, p < .001, \eta_p^2 = .07$, were found. As for cognitive functioning, significant age-related differences were found in forward digit span, $F(1, 252) = 118.36, p < .001, \eta_p^2 = .32$; backward digit span, $F(1, 252) = 289.82, p < .001, \eta_p^2 = .54$; digit symbol substitution, $F(1, 252) = 974.23, p < .001, \eta_p^2 = .79$; and verbal fluency, $F(1, 252) = 226.86, p < .001, \eta_p^2 = .47$. These variables were controlled for covariates in the following analyses.

The Fitting Results of Social Discounting

We used classic hyperbolic discount function (i.e., Equation 1) to fit the group median value over eight social distances ($D = 1, 2, 3, 5, 10, 20, 50$, and 100):

$$v = V / (1 + k \cdot D). \quad (1)$$

where v = discounted value of the reward; V = undiscounted value of the reward; D = social distance; and k = a constant measuring degree of social discounting (i.e., social discount rate). The fitting

process was conducted by Python (Version 3.7). The curves of different groups were displayed in Figure 2. As shown in Table 2, the hyperbolic discount function sketched the relationship between choice and social distance quite well ($R^2 \geq .85$), which replicated the prior typical social discounting model (Jones & Rachlin, 2006, Pornpattananangkul et al., 2019). Moreover, two important indicators were adopted as the dependent variables. First, the area under the curve (AUC) represents overall generosity independent of social distance (Margittai et al., 2015). A larger AUC value indicates a higher level of generosity. Second, the steepness of the curve represents the social discount rate (k), indexing individuals' social selectivity toward different social distances. A larger k value indicates a higher level of prosocial selectivity, that is, the participant would be more generous to socially close others while more selfish to socially distant others (Gong et al., 2019).

Age Differences in Overall Prosociality

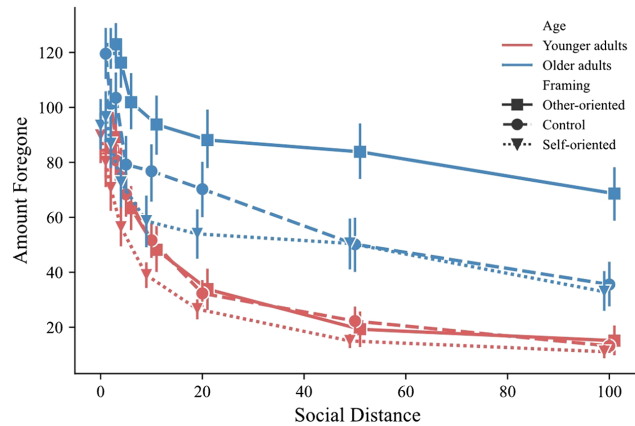
First, to investigate age differences on overall prosociality in different framings, the transformed AUC values were submitted to a 2 (age: younger and older adults) \times 3 (framing: self-oriented, other-oriented, control) analyses of covariance. After controlling for covariates (e.g., income, cognition), there was no significant interaction between age and framing (please see Figure 3a), $F(2, 248) = 2.18, p = .12, \eta_p^2 = .02$. However, a significant main effect for age was found, $F(1, 248) = 14.64, p < .001, \eta_p^2 = .06$. Older adults ($M = 8.39, SE = .16$) exhibited higher levels of overall prosociality than did younger adults ($M = 7.22, SE = .18$). In addition, the main effect for framing was also significant, $F(2, 248) = 6.62, p < .01, \eta_p^2 = .05$. Participants showed lower levels of overall prosociality in the self-oriented framing ($M = 7.43, SE = .13$) compared to both control condition ($M = 7.91, SE = .13; p = .003$) and other-oriented framing ($M = 8.07, SE = .13; p = .002$). There was no difference between control condition ($M = 7.91, SE = .13$) and other-oriented framing ($M = 8.07, SE = .13; p = 1.00$). These results remained consistent after accounting for individual differences in cognitive performance.

Age Differences in Selectivity in Prosociality

Next, to examine age differences in selectivity across different framings, the transformed k values were then submitted to a 2

Table 1
Descriptive Information Across Three Conditions

Variable	Control condition		Self-oriented framing		Other-oriented framing	
	Younger adult	Older adult	Younger adult	Older adult	Younger adult	Older adult
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)
Sex (male/female)	10/30	7/37	11/30	7/40	11/31	12/32
Age	20.48 (2.17)	68.30 (6.52)	21.49 (2.58)	65.38 (3.25)	22.90 (2.14)	66.64 (6.03)
Education level	3.85 (0.43)	2.43 (0.66)	3.93 (0.26)	2.57 (0.85)	4.00 (0.00)	2.09 (0.64)
Self-rated health status	3.50 (0.96)	2.73 (1.00)	3.32 (0.91)	2.74 (0.92)	3.64 (0.93)	2.61 (0.87)
Household income	5.03 (1.46)	4.25 (1.74)	4.88 (1.31)	4.09 (1.65)	5.40 (1.43)	4.52 (1.41)
Forward digit span	8.90 (0.30)	7.34 (1.27)	8.98 (0.16)	8.15 (1.18)	8.95 (0.22)	7.64 (1.26)
Backward digit span	6.55 (1.48)	4.20 (1.34)	7.02 (1.48)	4.28 (1.38)	7.40 (1.06)	4.09 (1.16)
Digit symbol substitution	49.90 (9.28)	22.86 (7.05)	51.49 (7.53)	24.51 (7.62)	53.05 (6.53)	21.14 (5.84)
Verbal fluency	16.00 (3.17)	10.48 (3.47)	16.78 (3.10)	10.70 (3.05)	16.83 (2.44)	11.48 (2.72)

Figure 2*Prosociality as a Hyperbolic Discount Function of Social Distance*

Note. See the online article for the color version of this figure.

(age: younger and older adults) \times 3 (framing: framing: self-oriented, other-oriented, control) analyses of covariance. After controlling for covariates (e.g., income, cognition), it was found that the interaction between age and framing was significant (please see Figure 3b), $F(2, 248) = 3.17, p = .04, \eta_p^2 = .03$. A simple main effect analysis revealed that there was no difference among framings for younger adults, $F(2, 248) = 0.33, p = .72, \eta_p^2 = .003$, but there was a significant effect of framing on older adults, $F(2, 248) = 4.48, p = .01, \eta_p^2 = .04$. The social discounting rate of older adults in the other-oriented framing ($M = -6.66, SE = .76$) was smaller than in the self-oriented framing ($M = -4.47, SE = .65$) and control condition ($M = -4.49, SE = .73$). It indicated that, compared to the self-oriented framing, the other-oriented framing led older adults to be less selective, treating socially close and distant others more equally. Furthermore, a simple main effect analysis also revealed that age-related differences were much pronounced in the other-oriented framing, $F(1, 248) = 17.54, p < .001, \eta_p^2 = .07$ (younger adults: $M = -1.24, SE = .79$; older adults: $M = -6.66, SE = .76$), than in the self-oriented framing, $F(1, 248) = 7.44, p = .01, \eta_p^2 = .03$ (younger adults: $M = -1.36, SE = .75$; older adults: $M = -4.47, SE = .65$), and control condition, $F(1, 248) = 4.79, p = .03, \eta_p^2 = .02$ (younger adults: $M = -1.90, SE = .72$; older adults: $M = -4.49, SE = .73$). These findings indicated that, compared to the self-oriented framing, the other-oriented framing

amplified the age-related differences in selectivity to a greater extent. In addition, a significant main effect for age was found, $F(1, 248) = 13.85, p < .001, \eta_p^2 = .05$. The social discount rate of older adults ($M = -5.21, SE = .53$) was smaller than younger adults ($M = -1.50, SE = .57$), suggesting that older adults were less selective toward different social relationships. There was no significant main effect for framing, $F(2, 248) = 1.63, p = .20, \eta_p^2 = .01$. These results remained consistent after accounting for individual differences in cognitive performance.

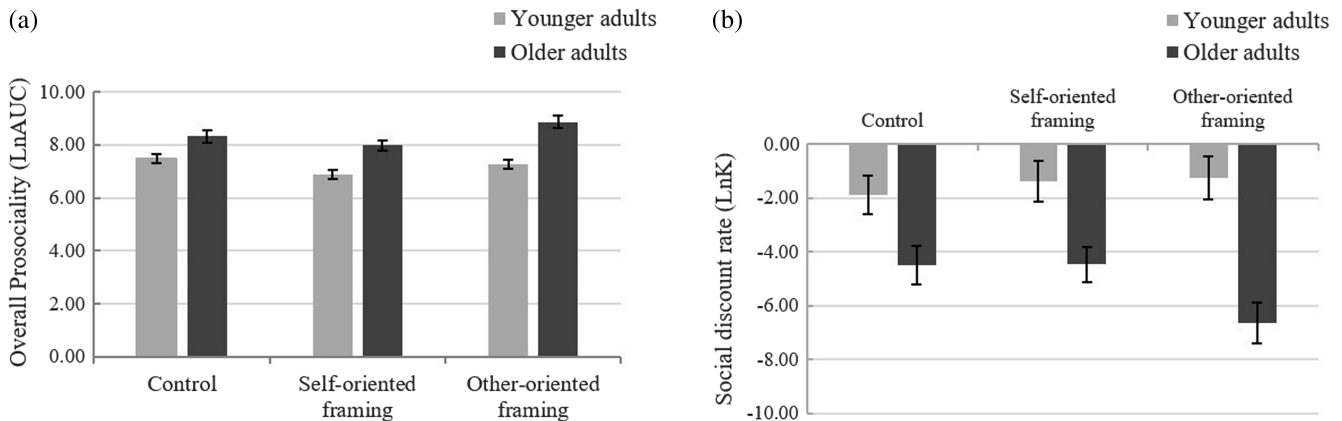
Discussion

There are presently only two studies (Gong et al., 2019; Pornpattananangkul et al., 2019) that use the social discounting task to investigate the effect of different social distances on age-related prosociality, and their findings are inconsistent. The conflicting pattern observed in these studies could potentially be explained by the way the social discounting task was framed. Pornpattananangkul et al. (2019) utilized the classical social discounting task in which the options that were presented as selfish and generous were presented in a positive light. Such positive presentation of the choices allowed participants to gain money regardless of whether they chose the selfish or generous option. In contrast, Gong et al. (2019) employed a revised social discounting task that utilized negative framing, implying that participants suffered a personal loss as a result of their donating money. To address the conflicting findings in prior research, the present study investigated how framing impacted age-related differences in prosociality toward different social distances from the perspective of self- versus other-oriented motivations. To the best of our knowledge, the present study is the first to systematically investigate the effect of self-oriented and other-oriented framing on prosociality among younger and older adults. First, results revealed that older adults exhibited higher levels of overall prosociality and lower levels of selectivity compared to younger adults, which is consistent with the findings of Pornpattananangkul et al. (2019) and supports our first hypothesis. More importantly, older adults did not exhibit reduced prosocial behavior or increased selectivity of prosociality under self-oriented framing relative to younger adults. In contrast, the other-oriented framing enhanced older adults' overall prosociality and decreased their selectivity toward nonclose others. These findings support the second competing hypothesis that the increased prosociality and reduced selectivity observed in older adults are driven by other-oriented motivation rather than self-interest. Moreover, these results highlighted an asymmetric relationship between loss aversion and self-other orientation.

Table 2*Estimated Parameters and Goodness-of-Fit Indices of the Hyperbolic Functions*

Parameter	Control condition		Self-oriented framing		Other-oriented framing	
	Younger adult	Older adult	Younger adult	Older adult	Younger adult	Older adult
V	93.83	107.95	103.0	90.60	109.88	114.49
k	0.08	0.03	0.15	0.03	0.12	0.01
R^2	0.98	0.97	0.99	0.85	0.99	0.95
RMSE	4.88	5.00	2.19	8.52	2.73	4.28

Note. Both R^2 and RMSE index the goodness of fit of the function. V = undiscounted value of the reward; k = social discount rate; R^2 = R -squared; RMSE = root-mean-square error.

Figure 3*Overall Prosociality and Social Discount Rate of Different Groups*

Note. LnAUC = natural log transformation of the area under the curve; LnK = natural log transformation of the social discount rate.

Hidden-Zero Effect on Social Discounting

The present study used a hidden-zero paradigm to frame other-oriented loss in the social discounting task. The hidden-zero paradigm was first examined in temporal discounting studies (Magen et al., 2008). The typical delay discounting paradigm comprises a smaller sooner reward and a larger later reward (e.g., “Would you prefer [A] US\$4.3 today OR [B] US\$7.5 in 22 days?”). Based on the classic temporal discounting paradigm, Magen et al. (2008) inserted a zero into each alternative (e.g., “Would you prefer [A] US\$4.3 today and US\$0 in 22 days OR [B] US\$0 today and US\$7.5 in 22 days?”). Such reframing increased the tendency to choose the larger later reward over the smaller sooner reward, which has been termed “the hidden-zero effect” (Dang et al., 2021; Magen et al., 2008).

Similarly, a zero value for others was inserted to highlight negative outcome (i.e., receiving nothing) for others when participants chose to keep money for themselves (e.g., “¥145 for yourself and ¥0 for person N [option A]” or “¥75 for yourself and ¥75 for person N [option B]”). In the present study, we found no significant differences in overall prosociality (i.e., AUC) between the control condition and the other-oriented framing condition. However, there was an interaction between age and framing regarding the selectivity toward different social relationships (i.e., social discount rate).

Notably, the simple main effect analysis revealed that older adults were more sensitive to the explicit-zero framing, compared to their younger counterparts. Specifically, the explicit-zero framing reduced older adults’ social discounting rate, leading them to treat various social distances more evenly. This was the first study to explore the hidden-zero effect in social discounting. The hidden-zero effect is pronounced among older adults relative to younger adults, indicating that older adults are more likely to be influenced by the saliency of other-oriented negative outcomes and motivated by other-oriented motivation.

Other Orientation Prevails in Shaping Prosociality in Older Age

Why might the increased prosociality observed in older adults be driven by other-oriented motivation rather than self-interest?

One possible explanation is the ego-transcendence account, which proposes that as people age, their personal goals expand beyond purely self-interests to more enduring sources of meaning in life (Brandtstädter et al., 2010). Previous research shows that increased prosocial behavior in older adults reflects a motivational shift toward ego-transcendent goals (Isaacowitz et al., 2021). Because prosocial behavior is strongly linked to emotional well-being and life meaning (e.g., Klein, 2017; Nelson et al., 2016), engaging in such acts may enhance a sense of meaning, fulfilling ego-transcendent goals. The present study found that older adults exhibited increased prosociality along with lower levels of selectivity in their prosocial behaviors. This supports the notion of ego-transcendent goals, which motivate older adults to expand their focus beyond just themselves and close others.

It is also important to understand our findings in the context of socioemotional selectivity theory, from which the ego-transcendence account is derived (Brandtstädter et al., 2010; Carstensen et al., 1999, 2006). Socioemotional selectivity theory proposes that as perceived time horizons shorten with age, people become increasingly selective, investing greater resources in emotionally meaningful goals (Carstensen et al., 1999, 2006). This is widely evidenced by older adults’ stronger preference for close relationships, driven by the emotional fulfillment these close relationships provide (e.g., Fung et al., 2008; Zhang et al., 2011). However, the present study expands the understanding of the socioemotional selectivity theory by suggesting that older adults are not solely focused on preferring close others in prosocial contexts. Prior research demonstrates a strong link between prosocial behavior and enhanced feelings of life meaning and emotional well-being (Aknin et al., 2020; Klein, 2017; Nelson et al., 2016). In this regard, as people age, emotionally meaningful goals could be achieved not only from close social relationships but also by contributing to socially distant others. Furthermore, highlighting the plight (in this case, receiving zero) of others can trigger stronger other orientation, which motivates older adults to engage in prosocial behavior toward nonclose others. This process does not seem to occur among younger adults.

In addition, the present studies did not find evidence supporting the notion that older adults exhibited greater loss aversion toward their own losses. However, they did reveal that older adults showed

greater loss aversion toward the losses of others. These findings are not typically in line with the idea that older adults are more strongly oriented toward avoiding losses, as suggested by the goal orientation theory (Depping & Freund, 2012; Ebner et al., 2006). One possible explanation is that previous studies on loss aversion have primarily focused on risky decision making for oneself (Depping & Freund, 2012; Ebner et al., 2006). Yet, in the prosocial context, at least two people are involved. Between self and others, older adults may place a higher value on the welfare of others, leading to increased sensitivity toward others' losses and greater loss aversion in relation to others' loss. Another possible explanation is that the positive impact of engaging in prosocial behavior may distract older adults from aversion of personal losses. Extensive evidence has demonstrated the various beneficial effects of prosocial behavior across different stages of adult life (e.g., Midlarsky et al., 2018), such as enhancing positive mood, life satisfaction, and meaning in life (Caprara & Steca, 2007; Hui et al., 2020). The positive and meaningful nature of engaging in prosocial acts may reduce older adults' focus on potential personal losses. Future studies should explore these possibilities.

Limitations and Future Directions

There are several limitations in the present study. First, the social discounting task employed an asymmetric incentive structure where participants earned money proportionally to their choices, but the hypothetical "other" person at varying social distances did not actually benefit. This design choice may have confounded the effect of age on self- and other-oriented motivations. To enhance the validity of future research, it could be beneficial to make the incentives for self and other symmetrical, such that the money allocated to the other person is real, rather than hypothetical. Second, this study was conducted in an Eastern culture (Mainland China) that emphasizes collectivism. Previous findings show that people from collectivist cultures strive to maximize their collective value and prioritize the welfare of society (Markus & Kitayama, 1991). These features of collectivism may make social discounting less likely to occur (Ishii & Eisen, 2018). For example, horizontal collectivism was found to be associated with a smaller social discount rate (Booyesen et al., 2021). Thus, cross-cultural studies are welcome to further test the generalizability of selectivity in prosociality across different age groups in the future. Third, females constituted a large proportion of the sample. Previous studies have found a gender difference in social discounting among younger adults (Olson et al., 2016), where younger females with higher levels of empathy exhibit lower levels of selectivity compared to younger males. However, it remains unknown about the gender effect on the selectivity of prosociality among older adults. Further studies could explore the gender effect on social discounting across different age groups. Last, the present study only compared the differences between younger and older adults and did not include middle-aged adults. Due to the restricted age range of the sample, it remains unclear whether the relationship between age and prosociality in social discounting is linear or curvilinear across the adult lifespan. Future studies should investigate such hypotheses.

Despite the limitations, the present study employed different framings to elucidate whether selectivity of prosociality in older age was driven by self-interest or other orientation. Our findings help

extend socioemotional selectivity theory (Carstensen et al., 1999, 2006) by showing that older adults do not always exhibit stronger social preference toward close others. At least in the prosocial domain, the selectivity of older adults can be reduced when the plight of others (in our case, getting zero) is highlighted. In addition, these findings contribute to our understanding of the relationship between age and loss aversion. They highlight the need to consider the motivation of other orientation when studying loss aversion in the context of aging.

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