

# Decision Processes in Prosocial vs. Proself Individuals: An Eye-Tracking Study of Social Value Orientation

Kaede Maeda<sup>1\*</sup>, Hirofumi Hashimoto<sup>2</sup>

<sup>1</sup>Rikkyo University, 1-2-26 Kitano, Niiza, Saitama, 352-8558 Japan

<sup>2</sup>Osaka Metropolitan University, 2-1-132 Morinomiya, Joto-ku, Osaka-shi, Osaka, 536-8525 Japan

\*Author for correspondence (k.maeda8221@gmail.com)

Social value orientation (SVO) is widely used to account for individual differences in cooperative behavior. However, the cognitive processes underlying these differences remain unclear. We tracked the eye-movements of 123 participants (82 prosocials and 41 proselfs) during the SVO task. Although individuals in both groups focused primarily on their own payoffs, prosocials devoted significantly more time and attention to their partners' outcomes. Proselfs also attended to their partners' outcomes, but to a lesser extent. These patterns suggest that individuals in both groups engage in socially relevant information gathering, whereas prosocials adopt a more deliberative and other-oriented decision-making strategy. These shared patterns of attentional monitoring may reflect a proximate cognitive mechanism supporting cooperation and partner evaluation in social dilemmas. Our findings highlight the value of eye-tracking methods in revealing the process-level foundations of social preferences.

## Keywords

prosocial behavior, eye-tracking, visual attention, information processing, social value orientation

## Introduction

Human cooperation in social dilemmas depends on how individuals weigh their own outcomes against those of others. Social value orientation (SVO) provides a well-established framework for characterizing stable differences in such motivational tendencies (Messick & McClintock, 1968; Van Lange et al., 1997). Prosocials typically strive to enhance joint outcomes or reduce inequality, whereas proselfs prioritize their own payoffs regardless of their partners' welfare. Although SVO reliably predicts cooperative behavior, the cognitive processes through which these motivational orientations shape decision making remain largely unclear.

From an evolutionary perspective, individual differences in social preferences are usually viewed as reflecting alternative strategies that may confer advantages under varying social and ecological conditions. Prosocial orientations may support long-term benefits through mechanisms such as reciprocity and reputation, whereas more self-focused strategies may prove advantageous in competitive or resource-limited contexts. Therefore, clarifying how these orientations are implemented at the cognitive level is essential for linking ultimate evolutionary accounts with proximate psychological mechanisms.

Most studies on SVO have focused on behavioral choices such as the payoff distributions selected in allocation tasks (Murphy et al., 2011). While these outcome-based measures reveal what individuals choose, they offer limited insight into the cognitive processes underlying those decisions. Accordingly, recent studies have increasingly adopted process-level approaches that capture the dynamics of social decision-making, including attention and information search (Evans, 2008; Krajbich et al., 2015). Eye-tracking, which provides a real-time record of information acquisition during decision making (Russo & Rosen, 1975), has increasingly been applied to studies associated with social and cooperative behavior.

Recent evidence suggests systematic differences in gaze allocation between prosocials and proselfs. Fiedler et al. (2013) found that prosocials devote more attention to others' outcomes and engage in more frequent gaze shifts between self and other payoffs, indicating a more integrative evaluation strategy. A related study further suggests that broader attentional engagement during social decision-making tasks is associated with cooperative behavior and indices of cognitive control (Peshkovskaya & Myagkov, 2020). Collectively, these findings indicate that attentional dynamics constitute a key proximate mechanism through which stable motivational orientations are expressed.

Several important questions remain unanswered despite these advances. Previous studies have usually relied on small samples or variations of the SVO task that limit comparability. Additionally, the extent to which attentional differences reflect motivational orientation, as opposed to a general decision style, remains unclear. Few studies have replicated or extended Fiedler et al.'s (2013) paradigm using the standardized SVO Slider Measure in combination with modern eye-tracking systems and adequately powered samples.

Therefore, the present study aimed to address these gaps by examining the eye-movement patterns of prosocials and proselfs during the SVO Slider task. By focusing on fixation durations in self- and other-payoff regions, we assessed whether prosocials allocate relatively more attention to others' outcomes and whether proselfs display a stronger self-focused attentional bias. Through this process-level analysis, we clarified the microstructure

doi: 10.5178/lebs.2026.132

Received 04 December 2025.

Accepted 15 December 2025.

Published online 03 March 2026.

© 2026 Maeda & Hashimoto



This work is licensed under the Creative Commons Attribution 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>.

of cooperative decision-making and deepened the understanding of how motivational orientations are expressed during moment-to-moment information processing.

## Methods

### Participants

A total of 126 undergraduate students participated in the study. However, data from 123 students (82 prosocials and 41 proselfs) were included in the analyses since eye-movement recordings could not be obtained from three participants due to technical issues with the eye-tracking equipment (e.g., calibration failure or data loss), despite their completion of the task. Participants were recruited from a university subject pool to take part in a broader experimental session consisting of multiple tasks. The SVO task reported in this study was completed as part of that session. No monetary incentives were provided for participation. Participants' SVO was classified based on their SVO angle scores derived from the SVO Slider Measure (Murphy et al., 2011). Specifically, SVO angle scores were computed based on the standard procedure described by Murphy et al. (2011). Following established conventions, individuals with angle scores above the prosocial threshold were classified as prosocial, while those below this threshold were classified as proself. The final sample comprised 60 females, 62 males, and 1 participant of unspecified sex (mean age = 18.92 years, standard deviation [ $SD$ ] = 1.04). The target sample size was determined pragmatically, rather than through an a priori power analysis. Based on a previous study using the SVO Slider Measure, which suggests that approximately 30–40% of participants are classified as proself (Murphy et al., 2011), we recruited more than 100 participants to ensure a sufficiently large proself group (i.e., at least 30 individuals) for reliable group-level comparisons.

### Materials & task

The short version of the SVO Slider Measure (Murphy et al., 2011) was used to assess participants' SVO. Across the six allocation trials, participants selected between sets of payoff distributions for themselves and an anonymous other. Each trial presented nine possible payoff combinations (see Supplementary Material 1), from which the participants selected their preferred distribution. Participants' responses were used to compute a continuous SVO angle index, reflecting the extent to which individuals prioritize joint versus self-maximizing outcomes. This index served as both a measure of individual differences in social preferences and the basis for classifying participants as prosocial or proself. During the eye-tracking session, the participants completed the allocation trials while their gazes were being recorded. Each display included the nine payoff options containing both "self" and "other" outcomes. Areas of interest (AOIs) were defined as the self- and other-payoff regions (see Supplementary Material 2).

### Apparatus

Instructions and payoff matrices were displayed on a 23.0" ThinkVision T23i-20 monitor. Eye-movements were recorded using a Tobii Pro Fusion device (Tobii Technology, Inc.) with a 250-Hz sampling rate. Recordings

were continuous from the calibration phase until the end of the task.

### Data processing & measures

Eye-tracking measurements were performed using the Tobii Pro Lab. For each AOI and trial, fixation-based metrics were extracted focusing on the viewing time allocated to self- vs. other-payoff information across the six decisions, including relative proportions, raw durations, and log-transformed durations. The mean fixation duration per AOI was computed for each participant by averaging the six SVO trials. Both raw and log-transformed values were analyzed since the fixation durations were right-skewed. Group differences were tested using independent-samples t-tests, and within-participant comparisons between self- and other-payoff regions were examined using paired-samples t-tests. In addition, to evaluate the interaction between social value orientation (prosocial vs. proself) and payoff target (self vs. other), we conducted a mixed-design analysis of variance (ANOVA) with SVO as a between-subjects factor and Target as a within-subjects factor.

## Results

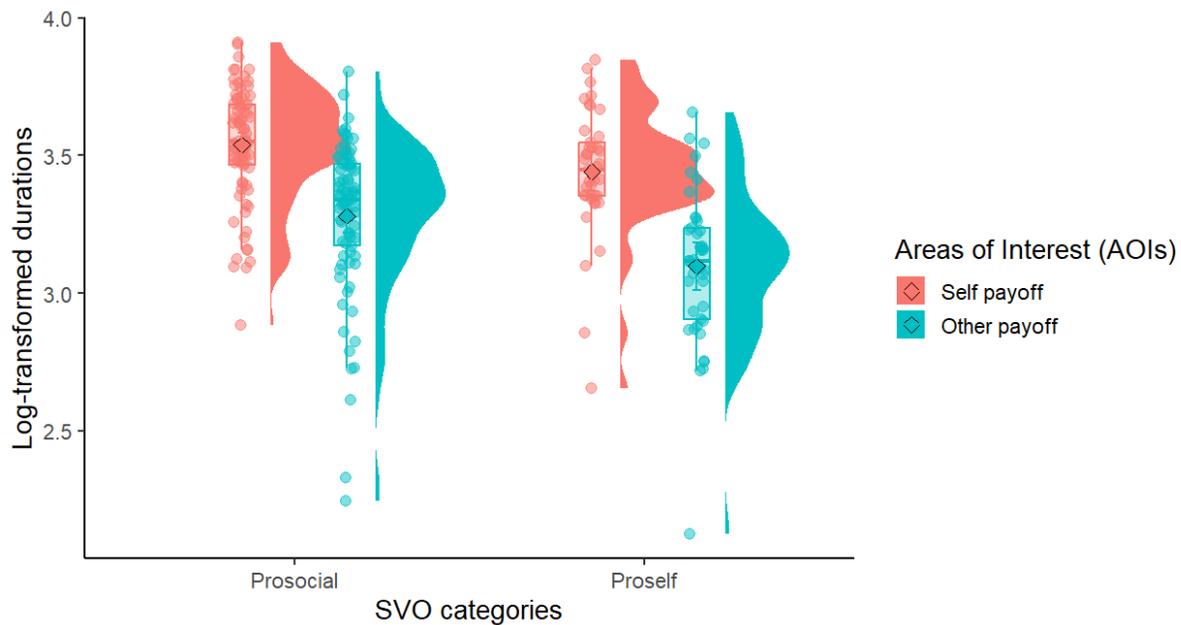
### Main effects of SVO & the target (self vs. other)

Across all trials, prosocials generally spent more time examining payoff information than proselfs. When log-transformed fixation durations were averaged across AOIs, prosocials showed longer overall dwell times ( $M = 3.41$ ,  $SD = 0.22$ ) than proselfs [ $(M = 3.27$ ,  $SD = 0.24)$ ,  $t(121) = 3.22$ ,  $p = .002$ , Cohen's  $d = 0.61$ ]. Irrespective of the SVO classification, both prosocials and proselfs tended to allocate more gaze time to their own payoffs than to their partner's. Mean log-transformed dwell times were  $M = 3.51$  ( $SD = 0.22$ ) and  $M = 3.22$  ( $SD = 0.29$ ) for self- and other-payoffs, respectively, yielding a robust within-participants effect of the target, [ $t(122) = 15.22$ ,  $p < .001$ , Cohen's  $d_x = 1.37$ ].

Follow-up between-group comparisons demonstrated that prosocials allocated more visual attention than proselfs in both types of information processing. For self-payoff fixations, prosocials exhibited longer log-transformed dwell times ( $M = 3.54$ ,  $SD = 0.21$ ) than proselfs [ $(M = 3.44$ ,  $SD = 0.23)$ ,  $t(121) = 2.36$ ,  $p = .020$ ,  $d = 0.45$ ]. A similar pattern was observed for other-payoff fixations, where prosocials also showed longer dwell times ( $M = 3.28$ ,  $SD = 0.28$ ) than proselfs [ $(M = 3.10$ ,  $SD = 0.28)$ ,  $t(121) = 3.42$ ,  $p < .001$ ,  $d = 0.65$ ]. Analyses using raw fixation durations yielded convergent results (self:  $p = .018$ ,  $d = 0.46$ ; other:  $p < .001$ ,  $d = 0.69$ ), confirming that these differences did not depend on data transformation. As shown in Figure 1, both prosocials and proselfs devoted more visual attention to self-payoff than to other-payoff information; however, prosocials exhibited overall longer fixation durations than proselfs across both payoff types.

### SVO $\times$ target (self vs. other) interaction

A mixed-design analysis of variance was conducted with SVO (prosocial vs. proself) as a between-subjects factor and Target (self vs. other) as a within-subjects factor to directly examine whether attentional allocation to self- vs. other-payoff information differed by SVO. A significant



**Figure 1.** Distribution of log-transformed fixation durations on self- and other-payoff information during the Social Value Orientation (SVO) Slider task, shown separately for prosocials and proselfs.

*Note.* Red and blue indicate fixations on self- and other-payoff AOIs, respectively. Violin plots show the distribution of participant-level mean log-transformed fixation durations averaged across trials. Box plots summarize the median and interquartile range, and points represent individual participants. Black points with error bars denote group means with 95% confidence intervals.

main effect of Target [ $F(1, 121) = 234.36, p < .001, \text{partial } \eta^2 = .66$ ] was found, indicating that participants devoted more visual attention to self-payoffs than to other-payoffs. The main effect of SVO was also significant [ $F(1, 121) = 10.37, p = .002, \text{partial } \eta^2 = .08$ ], reflecting longer overall fixation durations among prosocials than among proselfs. Importantly, the SVO  $\times$  Target interaction was significant [ $F(1, 121) = 4.85, p = .030, \text{partial } \eta^2 = .04$ ]. This interaction indicates that the magnitude of the self–other attentional asymmetry differed between prosocials and proselfs. Post hoc comparisons showed that both groups attended more to self-payoffs than to other-payoffs; however, this asymmetry was significantly larger among proselfs than among prosocials. In contrast, prosocials distributed their attention more evenly across self- and other-relevant information. Taken together, these findings indicate that although a self-focused attentional bias characterizes decision making across individuals, this bias is systematically attenuated among prosocials who adopt a broader and more balanced information-gathering strategy during social allocation decisions.

## Discussion

This study examined how prosocial and proself individuals allocate visual attention during the SVO Slider task. A central finding was that both prosocials and proselfs attended to their partners' outcomes, indicating a shared baseline for social information gathering. This suggests that even proselfs, who prioritize their own payoffs, do not ignore others entirely but attend to socially relevant cues when making interdependent decisions. However, against this shared attentional foundation, prosocials displayed a

markedly stronger pattern than prosocials: they spent more time making decisions, allocated greater visual attention to others' outcomes, and made more gaze transitions between the self and other payoffs. These differences support the view that prosocials engage in a more deliberative and integrative decision mode, whereas proselfs rely on a faster, more selective, and self-focused heuristic strategy.

These findings align with earlier studies indicating systematic differences in attentional allocation associated with social preferences. Fiedler et al. (2013) reported that prosocials devoted relatively more gaze time to others' outcomes and engaged in more frequent shifts between self- and other-payoff information, which aligns with an integrative evaluation strategy. However, these differences were observed as relative tendencies rather than absolute attentional exclusivity. Peshkovskaya and Myagkov (2020) similarly showed that greater attentional engagement during social decision-making tasks was associated with cooperative behavior and indices of cognitive control. The present study extends these findings by employing a larger sample and the standardized SVO Slider Measure, demonstrating that attentional allocation varies systematically with motivational orientation while remaining anchored in a shared decision-making framework.

From an evolutionary perspective, the observed attentional patterns likely reflect how stable social preferences are implemented at the cognitive level, rather than implying distinct or mutually exclusive strategies. Prosocials appear to maintain a broader attentional scope that incorporates both self- and other-related outcomes, reflecting stronger other-regarding concerns in attention, whereas proselfs show a relatively stronger weighting

toward self-relevant information. These patterns are better understood as quantitative shifts along a shared attentional continuum rather than representing categorical differences. Such variation aligns with the idea that human social cognition has evolved to flexibly balance self-interest and social awareness across contexts, allowing individuals to adjust their behavior in response to recurrent social dilemmas.

#### *Integration with the intuitive cooperation debate*

At first glance, the present study findings may appear inconsistent with the social heuristics hypothesis (SHH), which proposes that cooperation tends to arise from intuitive processes, while deliberation usually promotes selfish behavior (Rand et al., 2012; Rand, 2016). However, these perspectives can be integrated by recognizing that they address different levels of analysis. The SHH addresses how immediate cognitive states, such as time pressure or reflection, influence cooperation within individuals. In contrast, the present study examined stable individual differences in social motivation. From this broader perspective, prosocials may internalize cooperative heuristics through repeated social experiences. For these individuals, attending to others and integrating self–other information may function as an automatized form of deliberation that appears effortful in terms of gaze duration but is actually efficient, habitual, and guided by social norms. Therefore, the attentional patterns observed in this study do not contradict intuitive cooperation but suggest that prosocials rely on a well-practiced, other-oriented attentional style that supports intuitive prosociality.

This interpretation aligns with evidence that intuitive decision-making promotes cooperation primarily among prosocials (Yamagishi et al., 2017) and is consistent with recent findings demonstrating that cooperators allocate more attention to mutually beneficial outcomes in one-shot prisoner’s dilemma games (Maeda et al., 2023, 2025). Taken together, these findings suggest that intuitive cooperation well represents a general human default; however, this default tendency is most pronounced among individuals with prosocial motivational orientations, where it is strengthened through the interaction of deliberation and contextual factors. In contrast, deliberative processing tends to weaken rather than support such cooperative inclinations among more self-oriented individuals. In this sense, deliberation promotes cooperation only when it reinforces pre-existing prosocial motives. Therefore, humans may be better described as conditional cooperators who are intuitively inclined to consider others’ welfare while adjusting their behavior in response to the social context. This integrative account helps reconcile debates on the cognitive origins of cooperation by highlighting how intuitive tendencies and deliberative processes jointly support adaptive social behavior.

#### *Implications & future directions*

This study underscores the value of process-level analyses when investigating social preferences. Eye-tracking provides a real-time perspective on how cognitive resources are allocated during interpersonal decisions, revealing mechanisms that are inaccessible through outcome-based behavioral measures alone. Our findings add to a more

nuanced understanding of cooperation as an emergent property of the intertwined attentional, motivational, and cognitive systems. Future research should explore whether attentional patterns can be shaped by training, framing, or social context and how such modulation might enhance cooperative behavior. Additionally, cross-cultural comparisons are needed to determine the extent to which observed attentional strategies generalize across societies differing in collectivism, social trust, and moral norms.

Although the present study utilizes data from Japanese participants, this cultural specificity should not be considered a limitation. Instead, it highlights an important direction for future research. If default patterns of prosocial attention are shaped by the social environments in which individuals are embedded, examining how these patterns vary across ecological and cultural contexts represents a key empirical question. From this perspective, culturally patterned cooperation can be understood as an adaptive response to stable features of the social ecology (Hashimoto & Yamagishi, 2016; Yamagishi & Hashimoto, 2016). These considerations highlight the importance of situating attentional mechanisms of social decision-making within the broader evolutionary and cultural contexts that shape cooperative behavior.

#### **Acknowledgments**

This study was supported by Grants-in-Aid 24K16798 and 25K00868 from the Japan Society for the Promotion of Science, and by a research grant from the Foundation for the Fusion of Science and Technology.

#### **Author contribution**

KM primarily collected and analyzed the data. KM and HH jointly developed the study concept and design and contributed equally to writing the manuscript.

#### **Ethical statement**

This study was reviewed and approved by the Ethical Review Committee of the Graduate School of Literature and Human Sciences at Osaka Metropolitan University (No. 3-6).

#### **Data accessibility & program code**

Materials and data for the present study are available on OSF: <https://osf.io/5stm3>

#### **References**

- Evans, J. St. B. T. (2008). Dual-processing accounts of reasoning, judgment, and social cognition. *Annual Review of Psychology*, 59, 255–278. <https://doi.org/10.1146/annurev.psych.59.103006.093629>
- Fiedler, S., Glöckner, A., Nicklisch, A., & Dickert, S. (2013). Social value orientation and information search in social dilemmas: An eye-tracking analysis. *Organizational Behavior and Human Decision Processes*, 120(2), 272–284. <https://doi.org/10.1016/j.obhdp.2012.07.002>
- Hashimoto, H., & Yamagishi, T. (2016). Duality of independence and interdependence: An adaptationist

- perspective. *Asian Journal of Social Psychology*, 19(4), 286–297. <https://doi.org/10.1111/ajsp.12145>
- Krajbich, I., Bartling, B., Hare, T., & Fehr, E. (2015). Rethinking fast and slow based on a critique of reaction-time reverse inference. *Nature Communications*, 6, Article 7455. <https://doi.org/10.1038/ncomms8455>
- Maeda, K., Hashimoto, H., & Tanida, S. (2023). Cooperators pay more attention to the outcome of mutual cooperation in the one-shot prisoner's dilemma game: Empirical evidence from an eye-tracking study. *Letters on Evolutionary Behavioral Science*, 14(1), 8–12. <https://doi.org/10.5178/lebs.2023.101>
- Maeda, K., Hashimoto, H., & Tanida, S. (2025). The social exchange heuristic operation during a one-shot prisoner's dilemma game. In Baratgin, J., Jacquet, B., Brochier, E., & Yama, H. (Eds.), *Human and Artificial Rationalities: Advances in Cognition, Computation, and Consciousness* (pp. 55–63). Springer. <https://doi.org/10.1007/978-3-031-84595-6>
- Messick, D. M., & McClintock, C. G. (1968). Motivational bases of choice in experimental games. *Journal of Experimental Social Psychology*, 4(1), 1–25. [https://doi.org/10.1016/0022-1031\(68\)90046-2](https://doi.org/10.1016/0022-1031(68)90046-2)
- Murphy, R. O., Ackermann, K. A., & Handgraaf, M. J. J. (2011). Measuring social value orientation. *Judgment and Decision Making*, 6(8), 771–781. <https://doi.org/10.1017/S1930297500004204>
- Peshkovskaya, A., & Myagkov, M. (2020). Eye gaze patterns of decision process in prosocial behavior. *Frontiers in Behavioral Neuroscience*, 14, Article 525087. <https://doi.org/10.3389/fnbeh.2020.525087>
- Rand, D. G. (2016). Cooperation, fast and slow: Meta-analytic evidence for a theory of social heuristics and self-interested deliberation. *Psychological Science*, 27(9), 1192–1206. <https://doi.org/10.1177/0956797616654455>
- Rand, D. G., Greene, J. D., & Nowak, M. A. (2012). Spontaneous giving and calculated greed. *Nature*, 489, 427–430. <https://doi.org/10.1038/nature11467>
- Russo, J. E., & Rosen, L. D. (1975). An eye fixation analysis of multialternative choice. *Memory & Cognition*, 3(3), 267–276. <https://doi.org/10.3758/BF03212910>
- Van Lange, P. A. M., Otten, W., De Bruin, E. M., & Joireman, J. A. (1997). Development of prosocial, individualistic, and competitive orientations: Theory and preliminary evidence. *Journal of Personality and Social Psychology*, 73(4), 733–746. <https://doi.org/10.1037/0022-3514.73.4.733>
- Yamagishi, T., & Hashimoto, H. (2016). Social niche construction. *Current Opinion in Psychology*, 8, 119–124. <https://doi.org/10.1016/j.copsyc.2015.10.003>
- Yamagishi, T., Matsumoto, Y., Kiyonari, T., Takagishi, H., Li, Y., Kanai, R., & Sakagami, M. (2017). Response time in economic games reflects different types of decision conflict for prosocial and proself individuals. *Proceedings of the National Academy of Sciences*, 114(24), 6394–6399. <https://doi.org/10.1073/pnas.1608877114>