

Impulsive Selfish and Contemplated Prosocial Behavior in Children

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Abstract

Cooperation is required for human beings to survive and thrive. In the past decade, to deepen the understanding of human cooperation, more attention has been paid to default prosocial behavior and calculated selfish behavior in the adult population. Whether prosocial behavior is due to an intrinsically altruistic nature or to internalized social norms remains controversial. We approached this question by examining the relationship between cognitive control and decision time, and prosocial behavior in children. We analyzed the data obtained from 226 children aged from 8 to 11 years. The results indicated that greater cognitive control and longer decision time were independently associated with promoted prosocial behavior. That is, the intuitive cooperation model of prosocial behavior established in the adult population may not be supported in children. Although cognitive control was positively associated with prosocial behavior, even children with poor cognitive control promoted prosocial behavior when they were given sufficient decision time. Our findings support the view that prosocial behaviors are automated as habits by the internalization of social norms through lived experiences, and that human beings have an intrinsically selfish nature.

Introduction

The question of whether human beings are naturally selfish or prosocial has occupied social scientists for a long time. Over the last decade, social scientists have approached this question by examining the relationship between cognitive control (also referred to as executive function), decision time in social decision-making, and prosocial behavior^{1,2}. Previous literature illustrated the nature of intuitive prosocial³ and heuristic cooperation⁴ in humans as evidenced by the shorter prosocial decision time, relative to selfish decision time^{5,6}. Additionally, the prosocial behavior is promoted under cognitive load⁷⁻⁹ and time pressure^{5,6}, suggesting that humans have a default prosocial nature but behave selfishly when using cognitive control and sufficient decision time. However, since all the above previous studies focused on the adult population, whether the suggested human prosocial nature is true nature, or formed by the internalization of social norms through lived experiences, remains unknown. To address this question, we tested the impact of cognitive control and decision time on prosocial behavior among children.

Results

A total of 226 children completed this study. Participants' demographic data and performance in the flanker and social mindfulness tasks are presented in Table 1. The results of multiple regression analyses are summarized in Table 2. The interference score on the flanker task reflects the ability of cognitive control (lower score indicates better cognitive control). A socially mindful choice, in the social mindfulness task, reflects on the magnitude of prosocial behavior (higher score indicates greater prosocial behavior). The mean time taken to respond in the social mindfulness task was seen as a measure of decision time. The socially mindful choice was significantly associated with interference score and decision time, after controlling for confounders (Table 2). These results indicated that better cognitive control and a longer decision time were associated with a higher proportion of prosocial behavior, and these associations were independent of each other. In the intra-individual level analysis, the decision time of socially mindful choices was significantly longer than that of the socially hostile choices ($t_{286} = 2.01, p = .046$, Cohen's $d = .15$; Table 1). This result indicated that the positive association between the decision time and the probability of prosocial behavior was also observed at the intra-individual level. The interference score was significantly positively and negatively associated with decision time when participants made socially mindful choices and socially hostile choices, respectively (Table 2), after controlling for confounders. These results indicated

that children with poorer cognitive control need a longer decision times to switch between selfish and prosocial behavior.

Table 1
Characteristics of the study participants

Variables	<i>N</i> (%) or mean (<i>SD</i>)
<i>N</i>	226
Sex	
Boys	113 (50%)
Girls	113 (50%)
Grade	
3rd grade	82 (36%)
4th grade	40 (18%)
5th grade	104 (46%)
Socioeconomic status	
Maternal education ^a	
Junior high school	1 (0%)
High school	37 (17%)
Vocational school or junior college	93 (42%)
Undergraduate studies	73 (33%)
Graduate studies	15 (7%)
Paternal education ^b	
Junior high school	3 (1%)
High school	37 (17%)
Vocational school or junior college	30 (14%)
Undergraduate studies	107 (49%)
Graduate studies	42 (19%)
Household income ^c	
Less than 3,000,000 yen	4 (2%)
3,000,000 to 6,000,000 yen	33 (15%)
6,000,000 to 9,000,000 yen	91 (42%)
more than 9,000,000 yen	87 (40%)
Flanker task	
Reaction time (ms)	

Note: ^a*N* = 221, ^b*N* = 220, ^c*N* = 217, ^d*N* = 220.

Variables	<i>N</i> (%) or mean (<i>SD</i>)
Congruent condition	469 (66)
Incongruent condition	497 (74)
Interference	29 (19)
Accuracy (%)	
Congruent condition	93 (8)
Incongruent condition	85 (10)
Social mindfulness task	
Number of socially mindful choice (<i>n</i>)	13 (5)
Percent of socially mindful choice (%)	50 (20)
Decision time (ms)	
Control trial	2561 (1694)
Experiment trial	2567 (1401)
Socially mindful choice	2690 (2075)
Socially hostile choice ^d	2567 (2075)
<i>Note:</i> ^a <i>N</i> = 221, ^b <i>N</i> = 220, ^c <i>N</i> = 217, ^d <i>N</i> = 220.	

Table 2
Results of multiple regression analyses

Dependent variables												
	Number of socially mindful choice				Decision time on the socially mindful choice				Decision time on the socially hostile choice			
Independent variables	β	<i>SE</i>	<i>z</i>	<i>p</i>	β	<i>SE</i>	<i>z</i>	<i>p</i>	β	<i>SE</i>	<i>z</i>	<i>p</i>
Interference	-.14	.07	-2.11	.04	.06	.02	2.42	.02	-.09	.04	-2.06	.04
Decision time	.19	.08	2.36	.02	.96	.03	35.56	<.001	.29	.05	5.69	<.001
Confounders												
School	-.19	.07	-2.64	.008	-.02	.02	-0.96	.34	.005	.05	0.12	.91
Sex (girls = 0, boys = 1)	-.07	.06	-1.08	.28	-.09	.02	-4.27	<.001	.09	.04	2.14	.03
Grade	-.06	.07	-0.80	.42	.002	.02	0.09	.93	.04	.05	0.91	.36
Maternal education	-.004	.08	-0.05	.96	-.006	.03	-0.25	.81	-.06	.05	-1.21	.23
Paternal education	-.03	.08	-0.41	.68	.05	.03	2.04	.04	-.12	.05	-2.38	.02
Household income	-.01	.07	-0.17	.87	-.01	.02	-0.41	.68	-.03	.05	-0.61	.54
Reaction time on the congruent condition	.08	.07	1.02	.31	-.01	.03	-0.51	.61	.08	.05	1.59	.11
Decision time on the control trial	-.06	.08	-0.80	.42	-.05	.03	-1.93	.05	.60	.05	11.74	<.001

Note: *SE* = standard error; multicollinearity was inconsequential (variance inflation factor values < 1.6).

Discussion

The present study was designed to understand the relationship between cognitive control and decision time, and prosocial behavior among children. The main findings showed that better cognitive control and a longer decision time were positively associated with promoted prosocial behavior, and found that the relationship was inverted from results seen in adults⁵⁻⁹. Further, the mean proportion of a socially mindful choice (50%) in the present study is smaller than that found in the adult population (60-70%) as examined in previous studies^{10,11}. These findings, coupled with the fact that prosocial behavior increases with advancing age¹², suggest that the true nature of human beings is selfish, and previously reported default prosocial nature in an adult population⁵⁻⁹ is formed through the internalization of social norms through life in society.

The present study also extends previous findings by exhibiting the independent and interactive relationship between cognitive control and decision time, and prosocial behavior. Previous literature focused either on the impact of cognitive control or that of decision time on prosocial behavior⁵⁻⁹. This study provided evidence that better cognitive control and a longer decision time were independently associated with promoted prosocial behavior. In the intra-individual level analysis, prosocial behavior took a longer decision time relative to selfish behavior, indicating that children could switch their default selfish behavior to prosocial behavior when taking longer decision time. Additionally, the difference in decision time between prosocial and selfish behavior was moderated by cognitive control, indicating that children with poorer cognitive control needed a longer decision time to switch their default selfish behavior to prosocial behavior. These results have the important implication that even children who have poor cognitive control can promote prosocial behavior by taking sufficient decision time.

Given the cross-sectional nature of this study which does not manipulate decision time, the present results should be interpreted with caution. It is noteworthy that self-paced decision time can be affected by both the levels of deliberation and decision conflict. Several adult studies manipulated decision time by imposing time pressure^{5,6} to minimize the effects of decision conflict, and showed that time pressure promoted prosocial behavior.¹³ Based on these findings of manipulated decision time, they suggested that human adults have a default prosocial nature. Since the present study only examined the relationship between self-paced decision time and prosocial behavior, we could not deny the possibility that the observed association between prosocial behavior and decision time would have been largely affected by decision conflict. However, given that general decision time (decision time on control trials in the social mindfulness task) was controlled in the regression models, which should reflect the amount of decision conflict, the influence of decision conflict should have been minimized in the present study. Although the current approach, focusing on children, provides novel insight into the prosocial behavior in human beings, further well-designed studies, such as using manipulation of decision time, are needed to conclusively determine whether human beings have an intrinsically selfish nature.

Conclusions

Collectively, contrary to previous findings in the adult population, the intuitive cooperation model of prosocial behavior may be not supported in children. The present study suggests that human beings are naturally disposed to selfishness, and a prosocial disposition is acquired through life in society. Also, even children with poor cognitive control can control the natural selfishness when they are given sufficient decision time.

Method

Participants

A total of 297 children aged 8 to 11 years in 3rd to 5th grades were recruited from two primary schools in Hokkaido, Japan. The participation rate was 76% ($N = 226$) among those recruited. This study was approved by the institutional review board of Hokkaido University of Education (# 2017055002) and the principals of the children's schools. All procedures performed in studies involving human participants were in accordance with the ethical standards of the local ethics committees of the Hokkaido University of Education and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed assent and consent were obtained from all individual participants and their legal guardians.

Cognitive control

Cognitive control was evaluated using the modified flanker task, which has been widely used for this purpose¹⁴. The distance between the participants' eyes and the display was approximately 50 cm. In the flanker task, the participants were instructed to press either the right or left button as quickly and accurately as possible corresponding to the direction in which the middle fish was facing. This task consisted of two conditions: the target was flanked by a non-target stimuli, which corresponded either to the same directional response as the target (congruent condition) or to the opposite direction (incongruent condition). All stimuli were presented in yellow against a blue background on the monitor for 200 ms each, and the stimulus-onset asynchrony was set at 1400–1800 ms. The stimulus configurations subtended the horizontal visual angle between the two outside positions of 19.3° and a vertical visual angle of 4.6°. The participants were instructed to push the z key with their left index finger if the direction of the middle arrow was facing left, or to push the m key with their right index finger if the direction of the middle arrow was facing right. The participants performed 40 practice trials and then completed two blocks of 120 trials each. The main dependent variable was the interference score calculated as subtracting the mean reaction time for the congruent condition from the mean reaction time for the incongruent condition. Lower interference score indicates better cognitive control. The reaction time on the congruent condition was used as a confounder to control children's general reaction time.

Prosocial behavior and decision time

Prosocial behavior and its decision time were evaluated using the social mindfulness task¹⁵. In this task, the participants were instructed to choose one among four objects in a series of different categories, for example, pens, baseball caps, flowers, wrapped gifts, or watches. Children were instructed to keep in mind that they were playing this task together with one other person in a dyadic interaction and to imagine that they both would get to take home one of the four objects. This task consisted of two conditions: two sets of the objects were identical (e.g., two green watches and two blue ones; control trials) or three of the objects were identical, and the fourth only differed in a single aspect (e.g., one green watch and three blue ones; experimental trials). The participants were instructed to choose object using 1 to 4 keys. The majority choice in the experimental trials reflects the socially mindful choice, while the minority choice in the experimental trials reflects the socially hostile choice. This task consisted of 39 trials in total, divided between 26 experimental and 13 control trials, using 13 separate categories of products. Each category of products was used three times, i.e., in one control trial and two experimental trials. The number of socially mindful choices and the response time in the experimental trials were used as indices of prosocial behavior and decision time. The decision time on the control trials was used as a confounder to control children's general decision time.

Socioeconomic status

To assess their socioeconomic status, we asked the participants' parents or guardians about their household income (four-point questionnaire ranging from "< 3 million yen" to "> 9 million yen"), and maternal and paternal educational attainments (five-point questionnaire ranging from "completed junior high school" to "entered a graduate school"). Socioeconomic status measures were collected from only 217 participants for household income, 222 participants for maternal education, and 221 participants for paternal education, as there were some non-respondents.

Statistical analysis

Three participants were excluded from the data set because their task accuracy was lower than chance (50%) on the flanker tasks. To evaluate the relationship between cognitive control and decision time, and prosocial behavior, multiple regression analyses predicting the number of socially mindful choices were conducted. The interference score on the reaction time in the flanker task and the decision time on the experimental trials in the social mindfulness task were entered as independent variables. The school, sex, grade, household income, maternal and paternal education, reaction time on the congruent trials, and decision time on the control trials in the social mindfulness task were entered as the confounders. To evaluate the difference in the length of decision time between prosocial and selfish behaviors at the intra-individual level, a paired t-test was performed to compare the decision time in socially mindful and hostile choices. Then, to test the relationship between cognitive control and decision time in prosocial and selfish behaviors, multiple regression analyses were carried out to predict the decision times in socially mindful and hostile choices. The interference score on the reaction time in the flanker task was entered as an independent variable. The sex, grade, household income, maternal and paternal education, and reaction time on the congruent trials in the flanker task, and decision time on the control and experimental trials in the social mindfulness task were entered as the confounders. Six participants were excluded from this intra-individual level analyses because they had no socially hostile choices. Multiple regression analyses were performed with full-information maximum likelihood estimation using the lavaan package in the R Studio software, version 1.1.463. All statistical analyses were conducted with $\alpha = 0.05$.

Declarations

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Authors' contributions

All authors developed the study concept and contributed to the study design. T.I. performed the data analysis and interpretation under the supervision of N.M, H.T., & K.K. All authors drafted the manuscript. All authors approved the final version of the manuscript for submission.

Competing interests

The author(s) declared that there were no conflicts of interest with respect to the authorship or the publication of this article.

Availability of Data and Material

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

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