ORIGINAL RESEARCH

Does the Power of Social Example Fade? Nudge Effect of Social Information on Individual's Donation Behaviors During the COVID-19 Pandemic: A Moderated Mediation Model with Three-Wave Cross-Sectional Data

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Purpose: This study assesses how various social information influence individuals' money donation behaviors towards charitable funds against the COVID-19 pandemic at different stages of the pandemic. It also explores the mediating role of social anxiety and the moderating role of self-control.

Materials and Methods: This three-wave study was conducted with online survey experiments using convenience sampling at the pandemic's outbreak stage (April–June 2020), trough stage (February–March 2021), and resurgence stage (May 2022) in China. The nudge power of social information was measured by whether participants changed their initial money donation decisions after informed positive or negative social information. Self-report scales were used to measure levels of social anxiety (Social Interaction Anxiety Scale) and self-control (Self-Control Scale). The final data set included 1371 participants from 26 provinces of mainland China. Stata medeff package and SPSS PROCESS were used to analyze the data.

Results: Individuals' initial donation behaviors did not fluctuate along with the pandemic status, but the nudge effect of social information did. From outbreak stage to trough stage, the nudge power of positive social information significantly declined, but did not significantly change again at the resurgence stage. By contrast, the nudge power of negative social information did not significantly differ between outbreak and trough stage but did significantly increase at the resurgence stage. Social anxiety played a significant mediating role in the relationship between COVID-19 status and power of social information. Moreover, self-control moderated the direct effect of COVID-19 status on power of social information and the indirect effect via social anxiety.

Conclusion: Our findings enrich research on the nudge power variation of social information on individuals' donation behaviors along with the pandemic status and its potential psychological influence factors. This study also helps guide organizations to better design and carry out social information nudge mechanism.

Keywords: COVID-19, nudge, social information, donation, social anxiety, self-control

Introduction

Since late 2019, the COVID-19 pandemic has devastated lives and livelihoods all over the world.[1] The high infection rate of COVID-19 created a new fear in society. Governments worldwide were compelled to implement containment measures in many spheres of life, causing many industries to experience unprecedented economic crises and inevitably exacerbating socio-economic inequalities.[2,3] Because COVID-19 has persisted for so long, people have had to rebuild economic and social order while still dealing with the pandemic. This requires solidarity and cooperation, with crucial roles for fairness, generosity, and other kinds of prosociality.

Charitable donation is among the economic activities that best reflect individuals' prosociality. Amid the pandemic, donations can provide logistical support for the government, health centers, and individuals affected by COVID-19.[4] More specifically, pandemic prevention departments and medical units can use donations to implement better prevention and treatment measures. Thus, charitable donations and assistance can strengthen cooperation between government and citizens toward combating COVID-19.

During the unprecedented quarantine of the epidemic, online donation platforms have become one of the most effective ways to make charitable donations.[5–7] Online donation platforms often use social example, a kind of social information, as a nudge mechanism to promote citizens' donation behaviors.[8] Few studies have explored whether and how the nudge power of social information changed during the COVID-19 pandemic. Previous studies indicate that the same social information shows different power in different contexts.[9,10] Though the outbreak was effectively controlled in mainland China during 2020 to 2021, the rise of the gamma, delta, and other variants have brought a COVID-19 resurgence in 2022. Further, the COVID-19 pandemic has severely impacted the social context in which the social information works. Thus, the different stages of the COVID-19 pandemic may cause changes in the nudge power of social information on individuals' donation behaviors.

Social Information and Charitable Donation Behavior

Most of previous studies show that social information regarding others' donations can effectively change an individual's donation behavior.[11–16] However, some studies contend that social information has no impact on the amount of individual donations,[17] or even has a negative impact.[18,19] The source of social information has been identified as a crucial determinant of its nudge power.[12,20,21] In particular, Tian and Konrath[22] show that social information has a larger influence on receivers with similar attributes to the information source, which is called the "peer effect".[13] Another main determinant of the power of social information is its content.[21] Studies have found that social information conveying appropriate donation behaviors by others has the most positive effect on an individual's donation decision.[11] Social information conveying an excessive or low donation amount has been found to have lower nudge power or even lead to donors making smaller donations.[12,13,15]

The above studies mainly concentrated on showing donors positive social information about others' donations. However, negative social information also shows a powerful influence. For example, Dimant[23] found that anti-social behavior significantly triggers behavioral contagion as well as pro-social behavior. During the COVID-19 pandemic, citizens have been even more sensitive to negative than to positive social information.[24] Thus, it is important to explore the effects of both positive and negative social information.

Social Context and the Nudge Power of Social Information

Previous studies show that social contextual factors may influence the nudge power of social information.[10] Thus, the effects of the social information can vary across time and context.[25] For example, in their study of the factors influencing consumers' prosocial behaviors, Goldstein et al[26] found that the message "The majority (75%) of guests reuse their towels" increased reuse. However, providing hotel guests with the same social information in Germany did not change their prosocial behaviors.[27] These conflicting results derived from the general difference in environment-related attitudes and behaviors between the two countries. Thus, the social information of 75% simply is not high enough for the Germans with high environmental awareness to change their behaviors which is different from the Americans.[26] These studies indicate that identical social information may take on different meanings for people in different cultures or social contexts,[28] resulting in different effects on individual behavior.[9]

The COVID-19 pandemic has severely impacted the social context, with varying impacts on people's mental states, beliefs, or behavior motivations at different stages of the crisis.[29] Amid such changes in the social context, individual perceptions of identical social information may have also changed. Thus, the nudge power of identical social information may differ in line with the severity of the disasters. For instance, Wang et al[30] found that the nudging effect of blood users' demand information was enhanced as the COVID-19 pandemic processes to its peak. However, to our knowledge, no study has explored how the nudge power of identical social information on individuals' donation behaviors varied with the status of the COVID-19.

Social Anxiety as a Mediator

Individual processing of social information is affected by contextual factors such as emotion.[31–33] Studies have found that citizens' emotions changed according to the status of the COVID-19 pandemic,[34,35] resulting in different perceptions of identical social information. While quarantine is considered especially effective for reducing infections and mortality, and has been implemented in most countries during the pandemic,[36,37] this policy diminishes social opportunities and aggravates loneliness and feelings of uncertainty, leading to higher levels of social anxiety.[38,39] With elevated social anxiety, an individual's information-processing ability tends to be distorted.[40,41] Individuals with high social anxiety expect to be more negatively evaluated by others and are more fearful of negative evaluations compared to individuals with low social anxiety. Consequently, they tend to be more influenced by social information.[35] Therefore, people with different levels of social anxiety will process the same social information differently. This suggests that with changes over time in the severity of the pandemic, and thus of the quarantine policy, resulting changes in the levels of social anxiety may have altered the power of social information. For instance, as individuals' social anxiety reduced when the pandemic abated, the nudge power of social information may have declined.

Self-Control as a Moderator

It is speculated in this study that self-control may significantly moderate the relationship between the COVID-19 pandemic stage and the nudge power of social information. Self-control is the ability to pursue overarching goals despite short-term temptations, distractions, or aversive states.[42–44] When facing external environment changes, individuals with higher self-control ability are more likely to suppress the influence of those changes on their perceptions.[45,46] The weaker one's self-control, the greater the likelihood of being influenced by external factors without thinking.[47] As discussed above, individuals' perceptions of identical social information may differ according to the social context, in turn affecting their donation decision. Therefore, for individuals with high self-control ability, changes in the status of the COVID-19 pandemic likely have less influence on the power of social information.

Besides, self-control may also moderate the relationship between COVID-19 pandemic status and individuals' social anxiety levels. Previous studies suggest that self-control is associated with greater emotional stability[48] and that emotional stability can even be increased after self-control training.[49] Thus, when facing changes in the COVID-19 pandemic status, individuals with high self-control ability are more likely to tune out the effects of environmental change and to maintain emotional stability, meaning that their social anxiety levels are less likely to be affected.

The Present Study

This study employs three-wave cross-sectional surveys to examine changes in individuals' donation behaviors and the power of social information to nudge individuals' donation behaviors during the COVID-19 pandemic. This study also proposes a moderated mediation model with social anxiety as a potential mediator and self-control as a potential moderator (Figure 1). Based on the reviewed literature, we hypothesize that (1) the severity of the COVID-19 pandemic status can significantly influence both the power of positive and negative social information on individuals' donation behaviors; (2) that relationship is mediated by social anxiety; and (3) self-control moderates the effect of COVID-19 status on power of social information and the indirect effect via social anxiety.
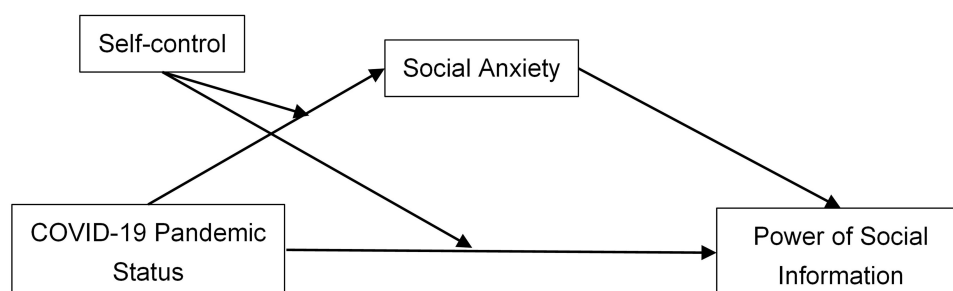

Figure 1 Hypothesized moderated mediation model.

Materials and Methods

Participants

Three samples of Chinese participants were recruited during April–June 2020 (T1, the outbreak stage of the COVID-19 pandemic in China), February–March 2021 (T2, the trough stage), and May 2022 (T3, the resurgence stage). A total of 1450 participants were initially recruited via the online crowdsourcing platform Sojump (www.wjx.cn) in mainland China by use of its random questionnaire delivery service. The platform Sojump provides functions equivalent to Amazon Mechanical Turk. We excluded 79 participants who did not meet the following criteria: aged 18 years or older, able to understand Chinese, and understood the purpose and process of the study and agreed to participate. The final data set thus included 1371 participants from 26 provinces of mainland China. The sizes of the three samples were n = 700, n = 322, and n = 349. Our study was approved by the Ethics Committees of Shandong University and Shandong University of Finance and Economics (SDU-SE-IRB 2020-010).

Measures

Demographics

Background questions covered participants' gender, age, number of siblings, average monthly household income, average monthly personal expenditure, and political affiliation.

We used a dummy variable Gender (0 = male, 1 = female) to represent participants' gender. Participants' age (18–20, 21–30, 31–40, >40) was represented by the variable Age. The number of siblings (0, 1, 2, ≥3) was represented by the variable Sibling. Political affiliation was represented by the dummy variable Polity, coded 1 if the participant was a member of the Communist Party, and 0 otherwise. The average monthly income (in RMB) of the participant's household (0–3000, 3001–6000, 6001–9000, >9000) was represented by the variable Fam-income. Finally, the average monthly personal expenditure (in RMB) of the participant (0–1000, 1001–2000, 2001–3000, >3000) was represented by the variable Ind-expenditure.

Measurement of the Nudge Power of Social Information on Participant's Donation Behaviors

We employed an online experiment to measure the nudge power of social information. The experiment was designed as a two-stage give-or-take donation game, adapted from Dimant.[30] We conducted the same experiment with the three respective samples in April–June 2020, February–March 2021, and May 2022.

Before the experiment began, all participants gave written informed consent to participate. The research background, study purpose, response anonymity, and experiment procedure were also explained to participants. Participants were told that they would make a series of decisions on charitable donations to the China Charity Federation's fund "Against COVID-19, The China Charity Federation is on the Move". For simplicity, our study was designed for a single charitable foundation. We also informed participants that we will donate real money (RMB) to the China Charity Federation's fund, the amount depends on the decisions of 10 participants chosen at random. The 10 chosen participants are also to be paid real money (RMB) based on their behaviors in the experiment. That is, if a participant is chosen randomly, her/his decisions would be implemented and would count toward the charity's funds (ie, that decision would influence the payoffs). The experimenter would then double the value of all Experimental Currency Units (ECUs) remaining in her/his charitable account at the end of the experiment and convert them into RMB (at an exchange rate of ECU 10 = RMB 1) for donation to the charitable fund. Meanwhile, this participant would receive RMB 3 plus the money converted from ECUs in their private account (using the above exchange rate). All other participants who are not selected would receive RMB 3.

At the beginning of the experiment, each participant was assigned two accounts, one private and one charitable, each containing ECU 100. Participants could choose to transfer money from the charitable account to the private account, or from the private account to the charitable account, or to keep the original sums in both accounts.

After a participant made their initial decision, they were informed of the decisions made by two other participants with similar demographic information to their own. They then had the opportunity to modify their initial decision, having been exposed to the social information. Here we design participants to receive information only from their peers to avoid the influence of different information sources.

We measured the nudge power of social information using the variable Power, coded 1 if the participant modified their donation decision, and 0 otherwise.

Measurement of the Type of Social Information

During the experiment, participants were randomly assigned to one of three experimental conditions, categorized according to peers' donation behavior as reported in the social information. The three conditions were Baseline, Positive, and Negative. In the Baseline condition, participants were informed that two peer participants had chosen to keep both accounts unchanged. In the Positive condition, participants were informed that two peer participants transferred ECU 81 and ECU 78, respectively, from their private accounts to their charitable accounts. In the Negative condition, participants were informed that two peer participants transferred ECU 80 and ECU 79, respectively, from their charitable accounts to their private accounts.

We created the variable Type to represent the type of social information. Type was coded 0 for participants in the Baseline condition, 1 for participants in the Negative condition, and 2 for participants in the Positive condition.

Measurement of Pandemic Status

Pandemic status was measured by the time period in which we conducted online experiments. We used the variable Time, coded 0 for data collected at T1, 1 for data collected at T2, and 2 for data collected at T3. We also generated two variables to represent the status change of the COVID-19 pandemic: Pandemic Status T1–T2 (coded 0 for the T1 pandemic stage and 1 for the T2 pandemic stage) and Pandemic Status T2–T3 (coded 0 for the T2 pandemic stage and 1 for the T3 pandemic stage).

Measurement of Social Anxiety

The degree of individual social anxiety (Socialanx) was measured by the Chinese version of the Social Interaction Anxiety Scale.[50] The questionnaire includes 19 items, each answered on a five-point Likert scale (1 = not at all, 5 = extremely). Higher scores indicate more severe social anxiety. The Cronbach's alpha reliability estimate in this study was 0.912.

Measurement of Self-Control

The degree of individual self-control (Selfcontrol) was measured by the Chinese version of the Self-Control Scale.[51] The questionnaire includes 19 items, each answered on a five-point Likert scale (1 = not at all, 5 = extremely). As higher scores indicate less self-control, we reverse-scored the items. The Cronbach's alpha reliability estimate in this study was 0.904.

Statistical Methods

Data were analyzed using SPSS-19.0 and Stata-17.0. The Chi-square test was used to compare the power of social information in different stages of the pandemic. We specified logit regression models to account for the dichotomous dependent variable (Power) and dichotomous independent variable (Pandemic Status T1–T2 or Pandemic Status T2–T3, in separate models) in different conditions (Baseline, Negative, Positive) separately. Thus, a total of six logit regressions were run in our analyses. Causal mediation analysis was conducted using the Stata medeff package to test whether social anxiety mediated the relationship between pandemic status and the nudge power of different types of social information. Finally, we employed a bootstrapping approach using the PROCESS macro for SPSS (Hayes, 2018) to test the significance of the moderating effect of self-control. In all these analyses, the demographics (Gender, Age, Sibling, Polity, Fam-income, Ind-expenditure) were treated as the control variables.

Results

Characteristics of Participants

The descriptive statistics in Table 1 show that 58.1% of participants were female (n = 796) and 41.9% were male (n = 575). The largest age group was 21–25 (41.9%), followed by 18–20 (27.2%), 26–30 (16.6%), and >30 (14.3%). Only 20.1% were members of the Communist Party. Regarding Fam-income, the largest group earned RMB 3001–6000 annually (36.0%), followed by > RMB 9000 (26.0%), RMB 0–3000 (25.5%), and RMB 6001–9000 (12.4%). Finally, for Ind-expenditure, the largest group spent RMB 1001–2000 per year (41.3%), followed by RMB 0–1000 (30.3%), > RMB

3000 (15.9%), and RMB 2001–3000 (12.5%). We also gave the descriptive statistics of the demographic variables at each pandemic status in Table 1. The results of the Kruskal–Wallis test show that there were no significant differences in the variables between samples in each period unless the sex of the participants with marginal significant difference.

The descriptive statistics in Table 2 indicate that the mean level of social anxiety among participants was 47.999. Looking at the changes over time, the level of social anxiety among participants tended to decrease as the pandemic eased and increase as the pandemic resurged. The mean level of self-control among participants was 51.600, and there was a tendency for self-control to decrease as the pandemic shifted from easing to resurging.

Participants' Donation Behaviors at Different Pandemic Stages

We conducted Chi-square tests to examine whether pandemic status significantly influenced participants' initial donation decisions. The results showed that participants' donation behaviors did not significantly differ between the three pandemic stages (see Figure 2). At the outbreak stage (T1), 22.3% of participants chose to transfer money to the charitable account, 27.9% chose to transfer money out of the charitable account, and 49.8% chose not to adjust the balances of their personal and charitable accounts. During the trough stage (T2), 24.2% of participants transferred money to the charitable account, 27.6% transferred money out of the charitable account, and 48.1% made no transfer. Finally, at

Table 1 Descriptive Statistics of the Demographic Variables

Variable	Categorization	Frequency (Percentage)				K-W
		All	**T1**	**T2**	**T3**	**Sig.**
Gender	Male	575 (41.9%)	273 (39.0%)	136 (42.2%)	166 (47.6%)	0.030
	Female	796 (58.1%)	427 (61.0%)	186 (57.8%)	183 (52.4%)	
Age	18–20	373 (27.2%)	204 (29.1%)	91 (28.2%)	88 (25.2%)	0.123
	21–25	574 (41.9%)	291 (41.6%)	136 (42.2%)	138 (39.5%)	
	26–30	228 (16.6%)	113 (16.1%)	49 (15.2%)	65 (18.6%)	
	>30	196 (14.3%)	92 (13.1%)	46 (14.3%)	58 (16.6%)	
Polity	Communist Party	275 (20.1%)	130 (18.6%)	64 (19.9%)	81 (23.1%)	0.209
	Otherwise	1096 (79.9%)	570 (81.4%)	258 (80.1%)	268 (76.8%)	
Sibling	0	534 (39.0%)	262 (37.4%)	130 (40.4%)	142 (40.7%)	0.103
	1	348 (25.4%)	175 (25.0%)	79 (24.5%)	94 (26.9%)	
	2	331 (24.1%)	166 (23.7%)	71 (22.1%)	94 (26.9%)	
	≥3	158 (11.5%)	97 (13.9%)	42 (13.0%)	19 (5.4%)	
Fam-income	RMB 0–3000	350 (25.5%)	189 (27.0%)	84 (26.1%)	77 (22.1%)	0.193
	RMB 3001–6000	494 (36.0%)	254 (36.3%)	115 (35.7%)	125 (35.8%)	
	RMB 6001–9000	170 (12.4%)	77 (11.0%)	43 (13.4%)	50 (14.3%)	
	> RMB 9000	357 (26.0%)	180 (25.7%)	80 (24.8%)	97 (27.8%)	
Ind-expenditure	RMB 0–1000	416 (30.3%)	217 (31.0%)	101 (31.4%)	98 (28.1%)	0.536
	RMB 1001–2000	566 (41.3%)	290 (41.4%)	131 (40.7%)	145 (41.6%)	
	RMB 2001–3000	171 (12.5%)	85 (12.1%)	37 (11.5%)	49 (14.0%)	
	> RMB 3000	218 (15.9%)	108 (15.4%)	53 (16.5%)	57 (16.3%)	

Table 2 Descriptive Statistics of Social-Anxiety and Self-Control

Variables	Pandemic Status	MEAN	SD	MAX	MIN
Socialanx	*T1*	50.256	12.728	89	18
	T2	43.475	13.787	88	15
	T3	47.648	14.611	86	19
	Total	47.999	13.743	89	15
Selfcontrol	*T1*	52.3857	13.814	95	19
	T2	53.037	11.377	81	22
	T3	48.699	12.848	88	21
	Total	51.600	13.137	95	19

the resurgence stage (T3), 26.1% of participants increased the charitable account balance, 29.8% reduced its balance, and 44.1% left both account balances unchanged.

The Impact of Pandemic Status on the Nudge Power of Social Information

We first conducted Chi-square tests to examine whether the nudge power of different types of social information significantly differed between pandemic stages. As reported in Table 3, the results show that the effect of social information in the Baseline condition stays low (T1: 10.1%; T2: 8.5%; T3: 9.5%) and does not significantly change with pandemic status (Fisher's Exact Test, $p = 1.000$). The effect of negative social information (Negative condition) varies significantly with pandemic status ($p = 0.019$), as does the effect of positive social information (Positive condition) ($p = 0.009$).

To explore the trajectories of the nudge power of social information, we compared nudge power between T1 and T2 and between T2 and T3. The pairwise comparisons with Bonferroni adjustment show that nudge power in the Negative condition did not significantly differ between T1 and T2 (18.3% vs 14.4%, $p>0.05$) but did significantly differ between T2 and T3 (14.4% vs 27.6%, $p < 0.05$). Meanwhile, nudge power in the Positive condition differed significantly between T1 and T2 (31.8% vs 19.5%, $p < 0.05$) but remained stable from T2 to T3 (19.5% vs 22.8%, p >0.05; see Figure 3).
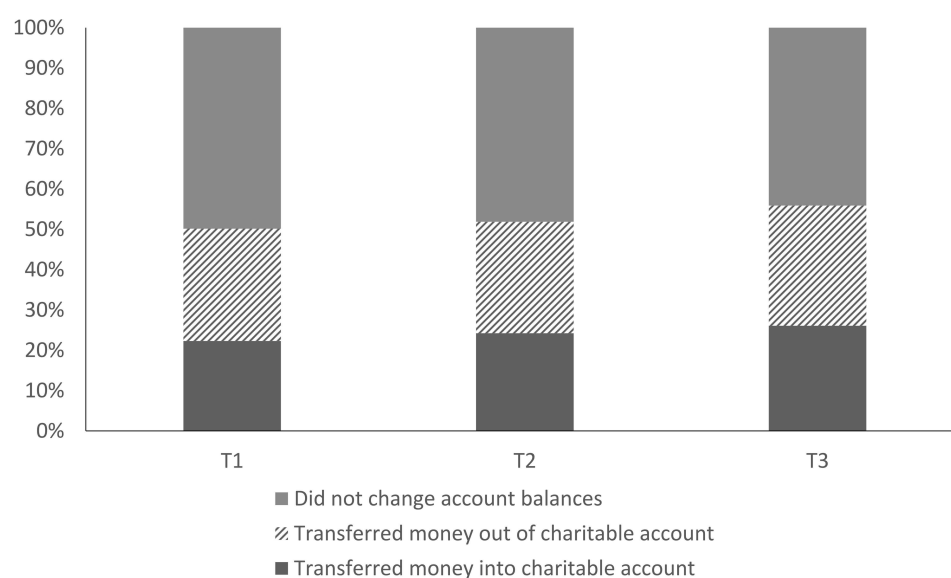

Figure 2 Participants' donation behaviors at different pandemic stages.

Table 3 Test of the Nudge Power of Social Information Along with the Pandemic Status

Type of Social Information	Power of Social Information	Time (Frequency/Percentage)		
		T1	**T2**	**T3**
Type = 0 (Baseline condition)	Power = 0	124/89.9%[a]	43/91.5%[a]	38/90.5%[a]
	Power = 1	14/10.1%[a]	4/8.5%[a]	4/9.5%[a]
	Total	138/100%	47/100%	42/100%
	Fisher's Exact Test, p = 1.000			
Type = 1 (Negative condition)	Power = 0	228/81.5%[a,b]	95/85.6%[a]	105/72.4%[b]
	Power = 1	51/18.3%[a,b]	16/14.4%[a]	40/27.6%[b]
	Total	279/100%	111/100%	145/100%
	χ^2 = 7.896, p = 0.019			
Type = 2 (Positive condition)	Power = 0	193/68.2%[a]	132/80.5%[b]	125/77.2%[a,b]
	Power = 1	90/31.8%[a]	32/19.5%[b]	37/22.8%[a,b]
	Total	283/100%	164/100%	162/100%
	χ^2 = 9.352, p = 0.009			

Notes: We conducted Fisher's Exact Test in the *Baseline* condition because two expected frequencies were below 5 in this condition. All the expected frequencies in other conditions were above 5. Superscripts indicate the results of pairwise comparisons with Bonferroni adjustment. The different superscript letters, for example [a,b]Indicated that there was significant difference between the two frequencies (p<0.05).

We conducted six logit regressions (two in each of the three conditions) to further examine the above results. As reported in Table 4, the regression results show that the nudge power of baseline social information does not vary with pandemic status (all p>0.1). The nudge power of negative social information remained stable from T1 to T2 (p>0.1) but significantly increased from T2 to T3 (p = 0.001). By contrast, the nudge power of positive social information significantly decreased fromT1 to T2 (p = 0.007) but then remained stable from T2 to T3 (p>0.1).
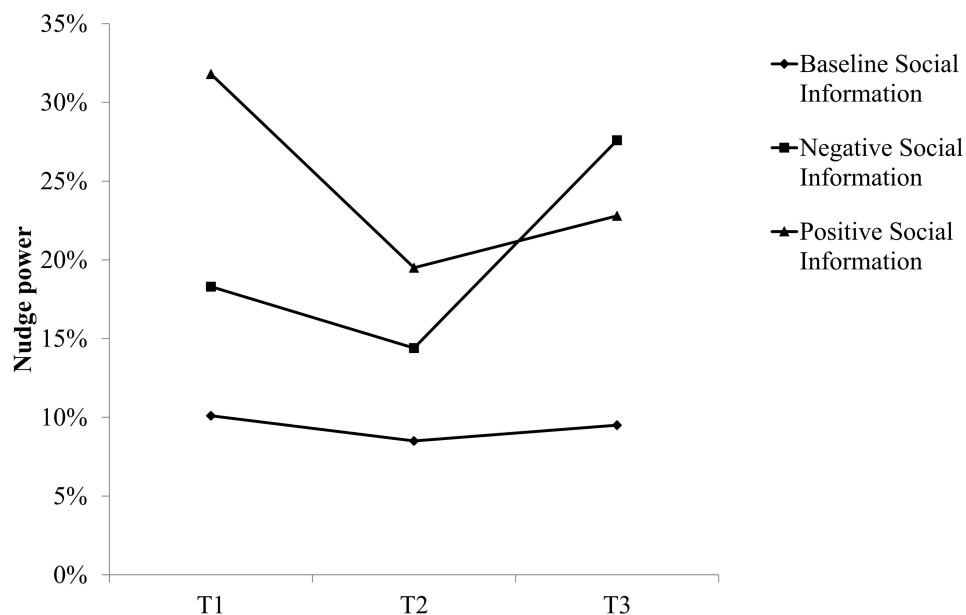

Figure 3 Effects of social information.

Table 4 Logit Regression Results

Condition	Path	Coefficient	*p*-value	95% CI
Type = 0 (*Baseline*)	*Pandemic Status T1–T2→Power*	−0.115	0.848	[−1.295, 1.065]
	Pandemic Status T2–T3→Power	−0.076	0.934	[−1.874, 1.722]
Type = 1 (*Negative*)	*Pandemic Status T1–T2→Power*	−0.310	0.349	[−0.957, 0.338]
	Pandemic Status T2–T3→Power	1.745	0.001	[0.752, 2.738]
Type = 2 (*Positive*)	*Pandemic Status T1–T2→Power*	−0.670	0.007	[−1.154, −0.186]
	Pandemic Status T2–T3→Power	−0.214	0.643	[−1.120, 0.691]

Notes: CI, confidence interval. The demographic variables Gender, Age, Sibling, Polity, Fam-income, and Ind-expenditure were included as control variables in the regressions.

The Mediating Role of Social Anxiety

Causal mediation analyses were conducted to test whether social anxiety mediated between pandemic status and the nudge power of social information. The results in Table 4 show that pandemic status was only significantly related to the power of social information in two situations: the status change from trough to resurgence in the Negative condition and the status change from outbreak to trough in the Positive condition. Thus, we mainly investigated the mediating role of social anxiety in these two situations. Table 5 reports the causal mediation analyses results. The average causal mediation effect of social anxiety under the Negative condition was significant ($b = 0.150$, 95% CI = [0.075, 0.228]) and accounted for 62.2% of the total effect. Social anxiety also significantly mediated the relationship between pandemic status change from T1 to T2 and the nudge power of positive social information: the average causal mediation effect was significant ($b = −0.074$, 95% CI = [−0.107, −0.043]) and accounted for 55.4% of the total effect.

Moderated Mediation Effect Test

We used Model 8 in the PROCESS macro for SPSS to examine the moderated mediation effect. The macro also generated a 5000-bootstrap confidence interval (without zero) for the significance test. We tested the moderated mediation effect in two situations: pandemic status change from T2 to T3 in the Negative condition (see Table 6) and pandemic status change from T1 to T2 in the Positive condition (see Table 7).

The results in Table 6 indicate that the interaction term of pandemic status change from T2 to T3 and self-control showed significant effects on social anxiety ($B = −0.675$, $p < 0.001$, 95% CI = [−0.948, −0.402]) and the nudge power of

Table 5 Results for the Mediating Role of Social Anxiety

Condition	Path	Effect	95% CI
Type = 1 (Negative)	X (*Pandemic Status T2–T3*)→M (*Socialanx*)→Y (*Power*)		
	Total effect of X on Y	0.238	[0.102, 0.351]
	Average direct effect of X on Y	0.088	[−0.030, 0.192]
	Average causal mediation effect of M	0.150	[0.075, 0.228]
Type = 2 (Positive)	X (*Pandemic Status T1–T2*)→M (*Socialanx*)→Y (*Power*)		
	Total effect of X on Y	−0.132	[−0.216, −0.046]
	Average direct effect of X on Y	−0.058	[−0.135, 0.026]
	Average causal mediation effect of M	−0.074	[−0.107, −0.043]

Notes: The demographic variables Gender, Age, Sibling, Polity, Fam-income, and Ind-expenditure were included as control variables in the regressions.
Abbreviation: CI, confidence interval.

Table 6 Results for the Moderated Mediation Effect of Self-Control in the Negative Condition

Variable	*B*	SE	*p*-value	95% CI
Outcome variable: *Socialanx*				
Pandemic Status T2–T3	51.478	8.730	< 0.001	[34.283, 68.673]
Selfcontrol	−0.076	0.113	0.501	[−0.298, 0.146]
Pandemic Status T2–T3 × Selfcontrol	−0.675	0.139	< 0.001	[−0.948, −0.402]
Gender	1.322	1.627	0.417	[−1.883, 4.527]
Age	−0.192	0.166	0.247	[−0.518, 0.134]
Polity	1.817	2.058	0.378	[−2.237, 5.871]
Sibling	0.687	0.763	0.369	[−0.816, 2.190]
Fam-income	−0.020	0.062	0.744	[−0.143, 0.102]
Ind-expenditure	−0.026	0.168	0.879	[−0.356, 0.305]
Outcome variable: *Power*				
Pandemic Status T2–T3	11.673	3.190	< 0.001	[5.420, 17.926]
Selfcontrol	0.181	0.029	< 0.001	[0.124, 0.237]
Socialanx	0.175	0.046	< 0.001	[0.085, 0.264]
Pandemic Status T2–T3 × Selfcontrol	−0.174	0.050	0.001	[−0.271, −0.076]
Gender	0.065	0.485	0.893	[−0.885, 1.016]
Age	0.47	0.246	0.056	[−0.012, 0.951]
Polity	−0.105	0.047	0.024	[−0.196, −0.014]
Sibling	0.983	0.543	0.071	[−0.082, 2.048]
Fam-income	−0.062	0.032	0.054	[−0.125, 0.001]
Ind-expenditure	0.083	0.052	0.109	[−0.019, 0.185]
Conditional indirect effect: *Pandemic Status T2–T3→Socialanx→Power*				
Selfcontrol	B	BootSE	BootLLCI	BootULCI
M-1SD	3.171	1.185	2.097	6.322
M	1.621	0.749	0.807	3.565
M+1SD	0.071	0.726	−1.273	1.612
Conditional direct effect: *Pandemic Status T2–T3→Power*				
Selfcontrol	B	SE	LLCI	ULCI
M-1SD	2.953	0.907	1.175	4.730
M	0.744	0.667	−0.563	2.050
M+1SD	−1.465	0.933	−3.295	0.364
Index of moderated mediation				
	Index	BootSE	BootLLCI	BootULCI
Selfcontrol	−0.122	0.050	−0.250	−0.066

Abbreviations: *B*, unstandardized coefficient; SE, standard error; CI, confidence interval; LL, lower limit; UL, upper limit.

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Table 7 Results for the Moderated Mediation Effect of Self-Control in the Positive Condition

Variable	*B*	SE	*p*-value	95% CI
Outcome variable: *Socialanx*				
Pandemic Status T1–T2	−39.636	6.15	< 0.001	[−51.723, −27.549]
Selfcontrol	−0.491	0.052	< 0.001	[−0.594, −0.389]
Pandemic Status T1–T2 × Selfcontrol	0.543	0.099	< 0.001	[0.349, 0.738]
Gender	3.071	1.185	0.010	[0.743, 5.400]
Age	−0.099	0.127	0.434	[−0.349, 0.150]
Polity	1.36	1.646	0.409	[−1.875, 4.595]
Sibling	0.627	0.453	0.167	[−0.264, 1.517]
Fam-income	−0.038	0.105	0.722	[−0.245, 0.170]
Ind-expenditure	−0.176	0.584	0.763	[−1.324, 0.972]
Outcome variable: *Power*				
Pandemic Status T1–T2	−6.687	1.636	< 0.001	[−9.893, −3.481]
Selfcontrol	0.071	0.012	< 0.001	[0.048, 0.095]
Socialanx	−0.009	0.012	0.464	[−0.032, 0.015]
Pandemic Status T1–T2 × Selfcontrol	0.101	0.025	< 0.001	[0.051, 0.150]
Gender	−0.178	0.251	0.479	[−0.670, 0.315]
Age	0	0.026	0.998	[−0.052, 0.052]
Polity	0.097	0.327	0.767	[−0.544, 0.738]
Sibling	−0.073	0.094	0.441	[−0.257, 0.112]
Fam-income	0.024	0.021	0.250	[−0.017, 0.064]
Ind-expenditure	0.066	0.116	0.567	[−0.161, 0.294]
Conditional indirect effect: *Pandemic Status T1–T2→Socialanx→Power*				
Selfcontrol	*B*	BootSE	BootLLCI	BootULCI
M-1SD	−0.950	0.213	−1.436	−0.622
M	−0.451	0.120	−0.725	−0.264
M+1SD	0.049	0.152	−0.245	0.369
Conditional direct effect: *Pandemic Status T1–T2→Power*				
Selfcontrol	*B*	SE	LLCI	ULCI
M-1SD	−1.815	0.483	−2.762	−0.868
M	−0.519	0.289	−1.086	0.047
M+1SD	0.776	0.379	0.034	1.518
Index of moderated mediation				
	Index	BootSE	BootLLCI	BootULCI
Selfcontrol	0.039	0.011	0.021	0.065

Note: Bootstrap sample size = 5000.
Abbreviations: SE, standard error; *B*, unstandardized coefficient; CI, confidence interval; LL, lower limit; UL, upper limit.

negative social information ($B = -0.174$, $p = 0.001$, 95% CI = [−0.271, −0.076]). These results demonstrate that, in the Negative condition, both the association between Pandemic Status T2–T3 and Socialanx and the association between Pandemic Status T2–T3 and Power were moderated by self-control.

To further understand the moderating role of self-control, we tested the conditional direct effect and conditional indirect effect of self-control at the mean level, one standard deviation below the mean, and one standard deviation above the mean. For individuals with low self-control ability, Pandemic Status T2–T3 had a significant direct effect on the power of negative social information. However, for those with median and high self-control ability, the direct association between Pandemic Status T2–T3 and the power of negative social information disappeared. Conversely, for individuals with low and median self-control ability, Pandemic Status T2–T3 was significantly related to the power of negative social information through the mediator social anxiety. For those with high self-control ability, however, the indirect effect Pandemic Status T2–T3→Socialanx→Power disappeared. The index of moderated mediation indicated that self-control played a significant role (Index = −0.122, [BootLLCI, BootULCI] = [−0.250, −0.066]).

The results in Table 7 indicate that the interaction term of pandemic status change from T1 to T2 and self-control showed significant effects on social anxiety ($B = -0.543$, $p < 0.001$, 95% CI = [0.349, 0.738]) and the nudge power of positive social information ($B = -0.101$, $p = 0.001$, 95% CI = [0.051, 0.150]). These results demonstrate that, in the Positive condition, both the association between Pandemic Status T1–T2 and Socialanx and the association between Pandemic Status T1–T2 and Power were moderated by self-control.

The conditional direct effect and conditional indirect effect of self-control were tested at the mean level, one standard deviation below the mean, and one standard deviation above the mean. The results indicate that the direct effect of Pandemic Status T1–T2 on the nudge power of positive social information was significantly negative for low self-control ($B = -1.815$, [LLCI, ULCI] = [0.051, 0.150]), non-significant for median self-control ($B = -0.519$, [LLCI, ULCI] = [−1.086, 0.047]), and significantly positive for high self-control ($B = 0.776$, [LLCI, ULCI] = [0.034, 1.518]). Meanwhile, the indirect effect Pandemic Status T1–T2→Socialanx→Power changed from significant to non-significant with the advancement of self-control ability. That is, the indirect effect Pandemic Status T1–T2→Socialanx→Power was significantly negative for low self-control ($B = -0.950$, [LLCI, ULCI] = [−1.436, −0.622]) and median self-control ($B = -0.451$, [LLCI, ULCI] = [−0.725, −0.264]), and non-significant for high self-control ($B = 0.049$, [LLCI, ULCI] = [−0.245, 0.369]). Overall, we found that self-control moderated both paths between Pandemic Status T1–T2 and the nudge power of positive social information: the indirect effect via social anxiety and the direct effect.

Discussion

Since the emergence of the COVID-19 pandemic in late 2019, the world has experienced its impact for three years, with significant economic consequences. Charitable donations have become a crucial aspect of managing the pandemic and rebuilding the economy. As a result, it is essential to understand the factors that influence people's donation decisions during sudden and chronic emergencies. Given that individuals are sensitive to positive and negative social information, we used an adapted give-or-take donation game to investigate how information about peers' positive and negative donation behaviors affects an individual's donation decisions. We were particularly interested in how the power of social information changed at various stages of the COVID-19 pandemic. Thus, we conducted cross-sectional surveys at three different time points: April-June 2020, February-March 2021, and May 2022.

The findings indicate that people's initial donation behavior did not vary with the pandemic situation. Two potential reasons may explain this outcome. First, factors such as personal beliefs, values, and education level may impact an individual's donation behavior more than external events such as disasters. Elliott and Pais[52] found that charitable giving is a relatively stable behavior rather than a response to external stimuli. The second reason may be that while disasters can increase people's willingness to donate, they can also worsen their economic situation and decrease their willingness to donate.[53] These two factors may offset each other, resulting in no significant change in people's donation behaviors.

Our study found that the effectiveness of social information in nudging individuals' donation behaviors changed according to the pandemic stage. During the outbreak stage (T1), 31.8% of individuals increased their initial donations when presented with positive social information, while during the trough stage (T2), only 19.5% did so. This difference was statistically significant. However, during the resurgence stage (T3), 22.8% increased their initial donations, with no

significant change from the trough stage. On the other hand, negative social information prompted individuals to lower their initial donations, with 18.3% and 14.4% doing so during the outbreak and trough stages, respectively. In the resurgence stage, there was a significant increase in the proportion of individuals (27.6%) reducing their initial donations. These findings are consistent with previous research that positive crowd behaviors can increase prosociality, while negative behaviors can decrease it.[54]

Our study revealed that the effectiveness of social information as a nudge mechanism is situation dependent and linked to the social context of individuals.[55] Previous research has shown that nudge mechanisms can have unintended consequences if not appropriately situated in people's social contexts.[56,57] To address this challenge, Hauser et al[9] proposed the Beliefs-Barriers-Context (BBC) model, which explains why replicating the effects of many nudge mechanisms is difficult and offers guidance on their design. The BBC model emphasizes the importance of context, encompassing both physical and social settings, in determining the effectiveness of a nudge mechanism. Similarly, Ewert et al[58] developed a behaviourally-informed, integrated conceptual model of the policy process that takes into account individual attitudes and behaviors in various contexts at the meso and macro levels. This model highlights how institutional, socio-economic, cultural, and environmental contexts can shape cognitive processing and ultimately influence the effectiveness of a nudge mechanism.[55]

The COVID-19 pandemic has drastically altered the socio-economic landscape and continues to impact people's behavior and psychological well-being.[59–61] Changes in the social context affect how individuals perceive the same social information. This study revealed different trends in the nudge power of positive and negative social information as the status of the pandemic changed over time. Compared to the outbreak stage, the trough stage brought a significant decline in the power of positive social information but no significant change in the power of negative social information. However, during the resurgence phase, the influence of negative social information significantly increased, while there was no change in the power of positive social information. These results suggest that changes in the pandemic situation have had a dissimilar impact on the power of positive and negative social information.

When the pandemic initially broke out, people came together to help prevent and control its spread. Disasters have been found to change individuals' prosocial preferences and increase their sensitivity to positive social information.[15,62] For example, after the 2011 earthquake and tsunami in Japan, individuals showed a greater willingness to help others and became more responsive to positive social information.[63] Therefore, during the outbreak stage of the COVID-19 pandemic, people were more likely to be influenced by positive social information and examples, leading to an increase in their charitable behavior.[54] Lotti and Pethiyagoda[64] argue that during a negative socio-economic shock such as COVID-19, moral motives are more influential, which could lead to an increase in charitable behavior. However, as the pandemic subsided, the power of positive social information decreased.[35]

Studies have also shown that people's economic situation gradually worsens, negative psychological pressure likely accumulates, and selfishness and anti-social behavior increase as the COVID-19 pandemic lasts long or gets serious.[65] These negative effects might eventually outweigh the positive effect of pandemic on prosociality.[66] As resources become scarcer due to the pandemic's persistence and resurgences, competition between individuals can increase, leading to a decrease in prosocial behavior.[67,68] Consequently, people become more concerned about and susceptible to negative social information.[25] Although people's initial donation behavior did not change in line with the pandemic situation which is consistent with the findings of Grimalda et al,[69] those receiving negative information at the resurgence stage were more likely to be influenced by peers' negative donation behavior.

We found that social anxiety played a mediating role between COVID-19 pandemic status and the nudge power of social information. It is undeniable that the pandemic has had a dramatic impact on people's mental state,[70–72] including levels of social anxiety.[35] While quarantine policies have been effective in reducing infections,[36,37] social isolation resulting from them has likely worsened social anxiety.[73] The mediating effects of social anxiety were not symmetrical for positive and negative social information. For the change from outbreak to trough stage, social anxiety only significantly mediated the effect of positive social information. Conversely, for the change in COVID-19 status from trough to resurgence stage, only the effect on negative social information was significantly mediated. Social anxiety affects people's behavior mainly by generating expected external evaluation pressure.[74,75] At the outbreak stage, prosocial behaviors and preferences were prevalent,[15,54,62] so actions contrary to positive social information were

expected to receive stronger negative external evaluation. When the pandemic abated, however, the balance was restored. Therefore, from outbreak to trough stage, social anxiety only mediated the relationship between pandemic status and the power of positive social information. As the pandemic persisted, however, individuals suffering negative impacts on their financial situation or physical and/or mental health behaved less prosocially.[66] From trough to resurgence stage, individuals might thus have expected to receive a stronger negative external evaluation when behaving contrary to negative social information. On this basis, social anxiety mediated the relationship between pandemic status and the nudge power of negative social information.

This study also indicated that self-control moderated the direct effect of COVID-19 status on the power of social information and the indirect effect via social anxiety. Individuals with high self-control are more resistant to external temptations, distractions, and pressures,[47,51] and have higher emotional stability.[48] Therefore, those with high self-control are more capable of maintaining their behaviors and mental states when facing changes in the severity of the COVID-19 pandemic, making self-control a significant negative moderator.

Limitations and Future Directions

This research has several limitations. First, previous studies have found that the influence of social information depends on the source. Abel and Brown[54] found that information on the same behaviors by private and public role models had opposite effects. This study focused only on social information from peers. Therefore, future studies should consider other social information sources, such as representatives of government or non-profit organizations and strangers. Second, people's donation behaviors have been found to differ for different charitable funds, including during the COVID-19 pandemic.[64] This study only set one charitable fund that the participants can donate to. This design cannot eliminate the impact of the participants' natural preferences to the given fund and investigate the different donation behaviors to different funds. These research directions should also be expanded. Third, although we collected three sets of data at different stages of the pandemic, the research design was cross-sectional, with three different samples. A longitudinal approach should be used in future studies to enable causal inferences and gain a more fruitful overview of how the power of social information changes at different stages of the COVID-19 pandemic. Finally, all our study participants were drawn from a Chinese cultural background, which limits the generalizability of the findings.[7] Future research should test whether the findings hold for other cultural groups.

Conclusion

Our research provides new insight into the research on the nudge power of social information on individuals' donation behaviors by investigating their situation dependence and the underlying psychological mechanism. The findings suggest that the nudge power of positive social information about peer examples' prosocial behaviors decreased, whereas the nudge power of negative social information increased in line with the status of the pandemic. The results also indicated that social anxiety played a significant mediating role in the relationship between COVID-19 status and nudge power of social information. Moreover, self-control moderated the direct effect of COVID-19 status on power of social information and the indirect effect of this relation through social anxiety. These findings have important implications for understanding the situational factors that influence individuals' prosocial behaviors and how social information can be used to nudge them towards more desirable outcomes. Specifically, the results suggest that during a pandemic, positive social information about prosocial behaviors may be less effective, while negative social information may be more effective in motivating individuals to behave in a certain way. Thus, during disasters, negative social information should be suppressed and positive social information should be highlighted. Furthermore, policy makers should consider using negative social information to nudge individuals towards prosocial behavior during the disasters. The situational factors and the psychological factors, such as social anxiety and self-control, should also be taken into account in designing nudge policies aimed at promoting prosocial behavior.

Data Sharing Statement

Data supporting the findings presented in the current study will be available from the corresponding author (Kehan Li, email: kehanlee@126.com) upon request.

Ethical Approval

This study was performed according to the Declaration of Helsinki for Medical Research involving Human Subjects. All participants gave their informed consent for inclusion before they participated in the study. On the title page of the survey, all participants were told anonymity was assured, why the research was being conducted, and how the data they were providing were being stored and used. Those who are worried about the use of the data or the purpose of this study could refuse to participate in the study or withdraw from the study at any time to ensure their right to confidentiality. All the procedures were approved by the Ethics Committees of Shandong University and Shandong University of Finance and Economics (SDU-SE-IRB 2020-010).

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