

Chinese University Students' Perceptions of Implicit Altruism in a Time of COVID-19 Crisis

-- From the Perspective of APE Model

Xue Wen, Maonan Zhang, and Bing Li *

Jilin University, Changchun, Jilin, China

* l_bing@jlu.edu.cn

Abstract. Drawing on the Associative Propositional Evaluation Model (APE), this study examined the influencing factors of Chinese university students' altruism and voluntary behaviors against the backdrop of global pandemic. A sample of 2172 Chinese university students answered the Self-developed University Students Implicit Altruism Situational Judgment Test (USIA-SJT) and The Self-report Altruism Scale (SRAS). Results show that gender, single child, years of enrollment, political status, parental education, personal/parental experiences and parental participation have statistically significant effects on the participants' implicit and explicit altruism, which substantially impact their voluntary behaviors during the coronavirus crisis. Both EFA and CFA indicated the sound psychometric property of the Self-developed USIA-SJT, with the construction of the SIX C model, rendering it a robust measure to gauge Chinese university students' implicit altruism as well as to predict their voluntary behaviors under serious public emergencies.

Keywords: APE; SIX C Model; Implicit Altruism; Voluntary Behaviors.

1. Introduction

Human routinely behave in ways that benefit others through a range of interactions, from students explaining questions mutually to many individuals sacrificing their lives to help those in need. Such altruistic behaviors are widely occurring in everyday life of ordinary people, including the campus life of university students. However, when these behaviors happen in the midst of life-threatening crises, say, the COVID-19 crisis, they will be given more serious due consideration.

Previous research has clarified several concepts related to altruism. For example, Hamilton [1] held the idea that altruistic behavior is a common kind of pro-social behavior, which is costly to the actor yet beneficial to the recipients. Furthermore, some scholars believed that people often need to pay some prices to help others, such as sacrificing their own interests, while the recipients usually have no direct relations with the helpers [2]. Wilson [3] also defined altruistic behavior as the behavior of sacrificing oneself to provide help for others. Given the crucial role of altruism in psychological studies, the measurement and prediction of altruistic behavior have already aroused our concern.

Since the beginning of 2020, COVID-19 has been raging across the world and still spreading until today. Faced with such a severe public crisis, we surprisingly discovered that many volunteers actively took part in the combat against COVID-19 through various voluntary activities in China. According to the white paper "Fighting COVID-19: China in Action", up to 8.81 million Chinese volunteers have registered in the prevention and control of COVID-19 epidemic as of May 31, 2020, with more than 460,000 volunteer service projects, and more than 290 million hours of volunteer service recorded. Broadly speaking, the immense success of the fight against the epidemic cannot be achieved without the hard work of volunteers and their altruism.

Among volunteers from all walks of life, the group of university students was particularly appealing to us. They were willing to donate money, goods and materials for the fight against the epidemic even without mobilization. They took the initiative to stand guard and undertake risky work, including disinfection and propaganda in the community, without asking for anything in return. Through their practical actions in the front line of epidemic prevention, they fulfilled the responsibilities of excellent Chinese university students. We couldn't help but wonder the deep

reasons or factors behind their self-sacrifice and altruism as well as an effective way to recognize such altruists ahead of time.

The aim of our study was to examine the use of a new assessment as an appropriate implicit measure of altruism under such risky circumstances, as well as to find the causes of and influencing factors for university students' implicit and explicit altruism.

1.1 The APE Model

In the present study, the Associative Propositional Evaluation Model (APE) is used to illustrate the cognitive process of altruism, which mainly showed the mutual interplay between implicit and explicit evaluation, indicating precise predictions about converging versus diverging patterns of them [4]. According to the APE Model, the implicit and explicit evaluation result from two different potential mental processes. The implicit evaluation is the outcome of associative processing, which determines the activation of mental contents based on feature matching and spatiotemporal contiguity. The explicit evaluation, on the other hand, is based on the propositional processing, which identifies the activated mental content on account of cognitive consistency. Wu et al [5]. have already verified the feasibility of the APE Model in predicting individual altruistic behavior. On this basis, we made a flow chart of part of the APE Model for further research, as is shown in Figure 1.

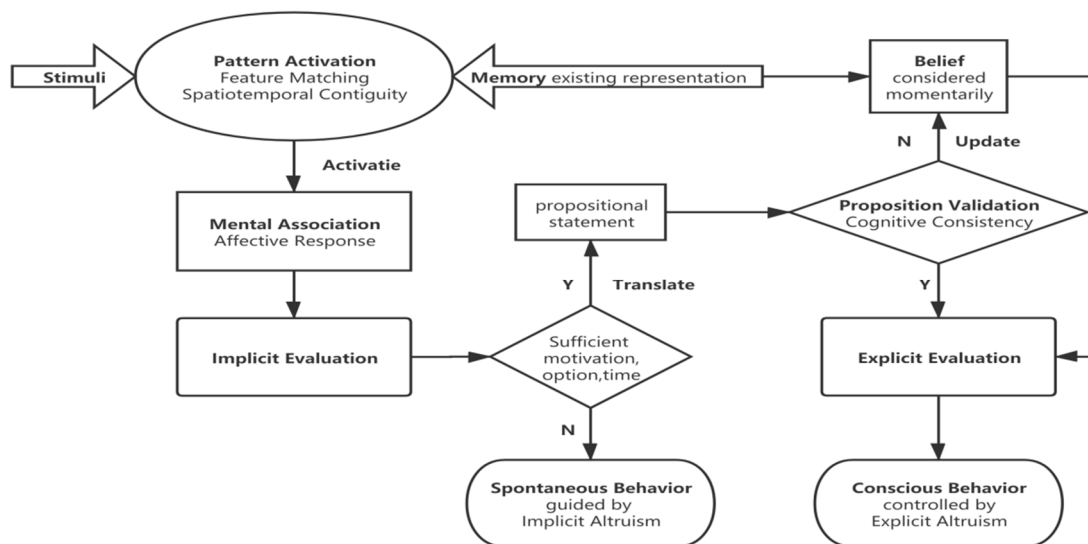


Figure 1. The APE Model

In most cases, the external stimuli act as an input. The brain will initiate Pattern Activation based on existing representation in memory, subsequently activating Mental Association accompanied with a spontaneous affective response, thus leading to implicit evaluation. If there is not enough time, motivation, or cognitive resources for propositional reasoning processing, individuals will make spontaneous altruistic behavior dominated by implicit altruism. In other circumstances, individuals could make propositional statements, thus leading to Proposition Validation, aimed at assessing whether one's evaluative proposition is consistent with beliefs and affective response. If not, individuals will update any premier ones to coordinate and construct a new explicit evaluation. Then individuals will make conscious altruistic behavior controlled by explicit altruism.

1.2 Implicit Altruism

Implicit social cognition refers to the implicit and automatic features of individual's social behavior, which is based on the unconscious level of information processing. In the process of implicit social cognition, individuals cannot recall specific experiences actively, yet these psychological processes

have a potential impact on one's judgment and behavior [6][7]. As an illustration, people's fear of suffering disasters will promote individuals' defensive avoidance, which will promote their altruistic behavior and one kind of self-protection motivation [8]. These processes take place unconsciously.

The majority of implicit measures rely on assessing computerized reaction time under or after priming (AMP) or cognitive conflict (Implicit Association Test, IAT), which measure the evaluative relation between notional words and attribute words [5] [9]. Besides, physiological assessments such as facial EMG and the startle blink response have also proven valuable [10][11]. However, under the COVID-19 epidemic, although we could benefit from utilizing implicit measures, we do not have the opportunity, resources, or expertise to use typical technologically advanced procedures. Under such exceptional circumstances, our study tried to adopt a new method to measure the individual's implicit altruism.

1.3 Situational Judgement Tests

Situational Judgment Tests (SJTs) are widely applied in personnel assessment to test the participants' working abilities. Recent studies have affirmed its application in psychological assessment, such as the feasibility in personality measurement as well as its superiority over the traditional Self-report scale [12]. In SJTs, the subject is required to make decisions based on the existing associative structure in order to solve the problems in some specific situations. This cognitive processing is consistent with the associative processing in APE Model, and the latter matches the external stimuli to memory for activating the specific association [13]. Hence, we tried to measure the implicit evaluation through SJTs based on APE Model in our study.

It is assumed that the altruistic behavior of university students during the epidemic time was different from the altruistic behavior in common situation, and the altruistic behavior under high-risk situation was guided by one's implicit altruism (IA). Thus, we used the Self-developed USIA-SJT and SRAS as well as tested individuals' voluntary behaviors in the COVID-19 epidemic simultaneously. Moreover, the demographic questionnaire was also used to explore the predictors of individual's altruistic behavior in risky situations.

2. Materials and Methods

2.1 Participants

Sample 1: In preliminary test, the analyzed sample consisted of 439 university students recruited from a national key university in China, including 181 male students and 258 female students. Participants' average age was 19.90 years (SD=1.66; ranging from 18.24 to 21.56 years).

Sample 2: In formal test, we collected data of 2405 participants. Data of 233 participants was excluded from the analyses because they showed response patterns indicative of careless responding (determined by choosing invalid options). Thus, the analyzed sample consisted of 2,172 Chinese university students from different universities around the country. The majority of participants was female (n=1240, 57.1% females; n=923, 42.5% males); nine participants (0.4%) did not provide information on their genders. The mean age of the participants was 19.91 years (SD=1.73; ranging from 18.18 to 21.64 years). Most of them (90.88%) were between 18 and 22 years old. In China, university education always lasts for 4 years: around 44.48% of the participants were freshmen and 31.35% of the participants were sophomores in universities.

2.2 Instruments

2.2.1 University Student Implicit Altruism SJT (USIA-SJT)

We designed an SJT specialized for university students, which is composed of 5 scenarios, each one involving a potential school-life dilemma. According to the APE model, we collect information related to implicit altruism under this construct. A semi-structured interview was conducted with five interviewees, collecting ten typical altruistic contexts and the corresponding altruistic behaviors.

After evaluating experts, five life situations were retained ultimately (i.e., Bus, Lecture, Metro, Paper, Shower), and each situation included four behavioral response items. Secondly, the Likert type scoring method was selected, and the subjects were asked to rate the possibility of each behavior items at seven levels, where 1=least possible (i.e., definitely won't do), 7=most possible (i.e., definitely will do). Although the traditional SJT test has a variety of scoring methods, it has not been clearly pointed out which one is the best strategy [14]. Therefore, in this study, the original scores were not converted, and data analysis was carried out directly by comparing the data processing mode of the self-presentation scale.

In the current study, participants needed to put themselves into others' shoes to make these choices rather than tackle the problems directly on their own in order to avoid further propositional validation. Thus we created a university student named "Xue Sheng(薛声)", who came to be the protagonist in all these situations. It is crucial to guarantee that all the choices are made based on one's implicit altruism.

2.2.2 The Self-report Altruism Scale (SRAS)

The most widely used instrument to measure one's altruistic behaviors internationally is The Self-report Altruism Scale (SRAS), which was originally compiled by Rushton [15] in 1983. The items were all based on general situations. In this study, the revised Chinese version was used to measure the Explicit Altruistic behaviors of university students [16]. There are 17 items in the questionnaire, and Likert 5-point scoring is adopted: 1 = Never, 2 = Once, 3 = More than once, 4 = Often, 5 = Always.

2.3 Procedure

We collected data for all questionnaires through Sojump.com (i.e., Wenjuanxing), an online data collection platform that recruits diverse samples that could satisfy multiple needs and provide psychometrically reliable responses data. In the online questionnaire, participants firstly received detailed instructions. From the instruction, they were informed that it was a short questionnaire study about social psychology during the COVID-19 epidemic, and it would last about 5 min. They were also told that an anonymized procedure was in place, that their data would be used only for research purposes, and that they could withdraw their participation at any time without any consequences. We also explicitly stated that it was a voluntary study. The consent of participants was implied by completing the questionnaire. Since all the students involved were over the age of 14 years, permission from parents or legal guardians was not needed. As an incentive, participants were offered random amounts of money after finishing the questionnaire. The preliminary tests (including USIA-SJT and SRAS) were completed in March 2020. Subsequently, the formal tests (including demography questionnaire, USIA-SJT, and SRAS) were completed half a month later (range: 15-18).

2.4 Data Analysis

All the data collected was analyzed in SPSS, Version 22.0, and AMOS, Version 26.0. To determine the formal USIA-SJT, an Exploratory Factor Analysis (EFA) approach was conducted in the preliminary tests. Based on the results, several modifications were performed on the original USIA-SJT. A three-factor model was obtained ultimately. Then in the formal tests, a Confirmatory Factor Analysis (CFA) approach was used to test for competing models that might underline the internal structure of the USIA-SJT. Besides, we also calculated the reliability and validity of the SRAS. The fit of these models was judged based on the guidelines provided by Hair et al. [17] for samples larger than 250 participants and instruments using between 12 to 30 items. Specifically, the models were considered to fit the data if showing comparative fit index (CFI)>0.92 combined with root mean square error of approximation (RMSEA)<0.07. Besides, since the goodness-of-fit index (GFI) and the adjusted goodness-of-fit index (AGFI) favor models with a minimum number of free paths, the GFI values of greater than 0.90 typically were considered acceptable [17].

3. Results

3.1 EFA of the USIA-SJT

For sample 1, an Exploratory Factor Analysis (EFA) approach was performed, and the extraction method was principal component analysis. The rotation method was orthogonal variance maximization. The results showed that the KMO=0.706, and Bartlett's test of sphericity $\chi^2=1629.871$ (df=190, $p<0.001$), indicating that the data was suitable for factor analysis, as is illustrated in Table 1. According to the low load (load less than 0.3) and the double load (the difference between two loads less than 0.2) criteria, we selected five items as independent options (PA, PC, SC, SD, MA), namely keeping them without scoring in the test. Eventually, our test contains three factors in total, composed of 15 valid items and five invalid items.

Table 1. Component Matrix

	F1	F2	F3
Lecture A	0.703		
Bus C	0.67		
Lecture D	0.572		
Metro D	0.497		
Lecture B		0.684	
Bus A		0.66	
Bus B		0.635	
Metro C		0.587	
Paper B		0.482	
Shower A		0.356	
Bus D			0.763
Lecture C			0.72
Metro B			0.667
Paper D			0.592
Shower B			0.497

3.2 CFA of the USIA-SJT

For sample 2, the Cronbach's alpha values for the Three-factors model range between 0.5 to 0.8, and the total internal consistency reliability of the SJT was 0.645. The homogeneity of the scale meets the standard. A Confirmatory Factor Analysis (CFA) was performed to test the construct validity of the three-factor model. The former indexes are shown in Table 2 and Figure 2, which indicate that the construct validity and structure of SJT are good.

Table 2. Model fitting index of the three-factor model

χ^2	df	χ^2/df	GFI	AGFI	RMSEA	IFI	CFI
878.501	87	10.098	0.95	0.931	0.065	0.842	0.841

df, degrees of freedom; GFI, goodness-of-fit; AGFI, adjusted goodness-of-fit; RMSEA, root mean square error of approximation; IFI, Incremental Fit Index; CFI, comparative fit index. All chi-square values were significant at $p<0.001$.

The "SIX C" Structure. According to the items in these three factors, we put forward the "SIX C" Structure of our USIA-SJT, including Context Continuity(F1), Context Compromise (F2), and Context Conceal (F3). Context Continuity (CC₁) means individuals' tendency to devote themselves substantially throughout the whole situation, always accompanied with necessary costs, since the stimuli are completely consistent with the existing representations in memory. Context Compromise (CC₂) indicates that individuals will be influenced by affective response or inconsistent representations, thus leading to complex implicit altruism under maximal mental activation. Context Conceal (CC₃) means the feature that individuals prefer to separate themselves from the context,

namely concealing their negative affections or incompatible representations, and this is always in the way of transferring with little mental activation.

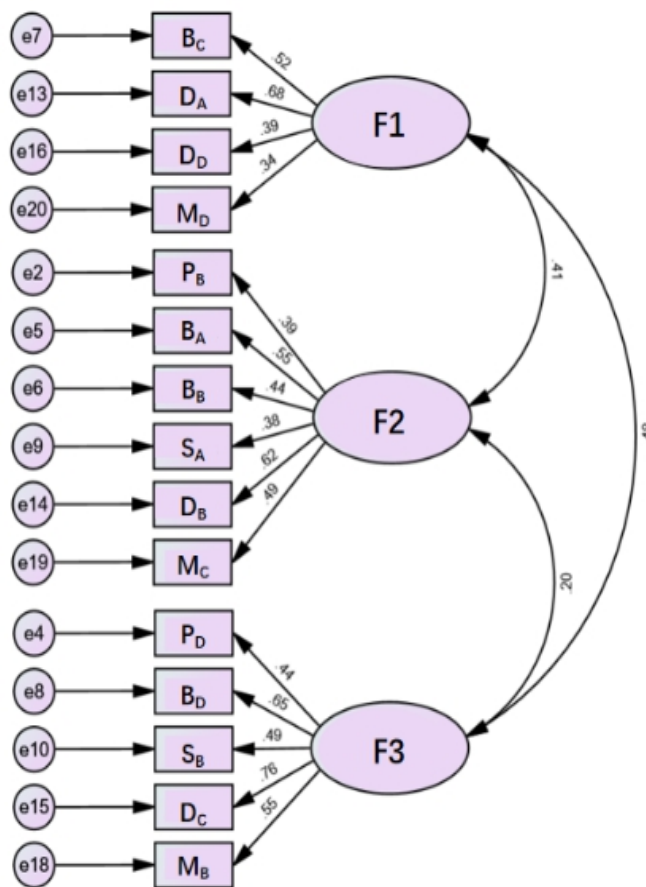


Figure 2. Confirmatory factor analysis model

3.3 CFA of the SRAS

In our study, the reliability and validity of the scale were good: the Cronbach's alpha value was 0.868. A Confirmatory Factor Analysis (CFA) was also performed to test the construct validity of the SRAS and the fitting indexes of the four-factor model were as follows.

Table 3. Model fitting index of the SRAS

χ^2/df	GFI	AGFI	RMSEA	IFI	CFI
9.131	0.938	0.916	0.061	0.903	0.903

All chi-square values were significant at $p < 0.001$.

4. Discussion

4.1 Gender

From the perspective of physiology, the fetal testosterone (fT) and testosterone (TTT) levels in the male are higher than that in the female. Research has shown that fT is negatively correlated with empathy and social behavior, while TTT will impair cognitive empathy ability [18-19]. As a result, male's cognitive empathy ability is worse than female's, which makes them less sensitive to their own spontaneous affective responses. In addition, the altruistic situations in our study always contain potential risks and losses. At the same time, women are more inclined to adopt risk avoidance strategies than men. The correlation coefficient between subjective loss and trait anxiety level of

women is significantly higher than that of men [20]. This indicates that women are more likely to avoid or transfer strategies to avoid the more robust emotional responses caused by behavior consequences, which means high scores in CC₃. Finally, for explicit altruism, since male students begin to pay more attention to their social image and realize their responsibilities for family and society, they may show more pro-social behaviors due to these needs [21].

Table 4. T test for gender differences (M±SD)

	Male(n=923)	Female(n=1240)	t
CC ₁	4.88±0.92	4.93±0.83	-1.2
CC ₂	4.04±0.91	4.22±0.83	-4.615***
CC ₃	3.85±1.10	3.97±0.10	-2.765**
EA	52.11±10.50	51.1±9.93	2.264*

CC₁=Context Continuity; CC₂=Context Compromise; CC₃=Context Conceal; EA=Explicit Altruism. *p<0.05, **p<0.01, ***p<0.001

4.2 Only Child or Not

Table 5. T test for family differences (M±SD)

	Non-only(n=860)	Only (n=1312)	t
CC ₁	5.043±0.842	4.818±0.873	5.965***
CC ₂	4.21±0.836	4.092±0.888	3.111**
CC ₃	3.894±1.029	3.938±1.051	-0.9620
EA	51.38±9.315	51.63±10.7	-0.5690

Although abundant psychological researches on the only/non-only-child have been conducted in China, there are still contradictory conclusions in many problems [22]. This may be due to the differences within era and sample groups. A recent study has shown that the anxiety and depression of only-child students are more serious than that of non-only-child students [23]. Our research suggests that a higher level of anxiety and depression may prevent the only-child students from maintaining a positive and stable mood environment, thus negatively affecting their CC₁. Moreover, the non-only-child students are significantly weaker than the only-child students in personality stubbornness, which suggests that the non-only-child students are better at adapting environment [24]. Moreover, we believe that they can deal with the inconsistent representations between their memory and the environment more flexibly. This explains their high scores in CC₂.

4.3 Years of Enrollment

The junior year is a crucial year for transition for university students [24]. Researches have shown that junior students' emotional management ability is significantly lower than that of other grades [25]. Compared with freshmen and sophomores, juniors often experience more anxiety from academic and employment, while these activate the negative self-schema of individuals, hence causing higher depression. At the same time, the depression will also continue to strengthen this schema in turn [26]. Therefore, trapped in the weak emotional management ability and deteriorative negative self-schema, juniors are exposed much more to the external and internal negative emotions, which significantly reduce their altruism [27]. As is shown in our study, it could actually damage their implicit altruism and explicit altruism, furthermore, decrease their spontaneous and conscious behaviors.

Table 6. ANOVA test for time differences (M±SD)

Grade	CC ₁	CC ₃	EA				
Freshman(n=966)	4.94±0.84	3.83±1.04	50.88±10.18				
Sophomore(n=681)	4.93±0.88	3.90±1.06	51.73±9.70				
Junior(n=239)	4.70±0.95	4.15±1.02	53.26±10.80				
Senior(n=135)	4.86±0.81	4.06±0.99	50.44±11.17				
Graduate(n=105)	4.96±0.89	4.08±0.99	53.54±9.69				
Others(n=46)	4.92±0.90	4.13±0.99	51.93±10.19				
F	3.136**	5.017***	3.399**				
Bonferroni							
			95% CI				
	(I)	(J)	MD(I-J)	SD	p	Lower Bound	Upper Bound
CC ₁	Junior	Freshman	-0.236**	0.063	0.003	-0.419	-0.052
		Sophomore	-0.220*	0.065	0.011	-0.411	-0.029
CC ₃	Junior	Freshman	0.312***	0.075	0.000	0.092	0.533
		Sophomore	0.247*	0.078	0.023	0.018	0.476
EA	Junior	Freshman	-2.386*	0.733	0.017	-4.54	-0.23

4.4 Politics Status

Table 7. ANOVA test for politic status differences (M±SD)

	Public(n=80)	CYL(n=1988)	CPC(n=103)	F		
EA	50.19±10.60	51.43±10.12	54.5±10.43	5.222**		
Bonferroni						
				95% CI		
(I)	(J)	MD(I-J)	SD	p	Lower Bound	Upper Bound
CPC	Public	4.320**	1.508	0.013	0.71	7.93
	CYL	3.071**	1.026	0.008	0.61	5.53

CYL=Communist Youth League; CPC=Communist Party of China.

A university student could finally join the CPC not only needs to stand out from the other students who are all excellent in character and learning but also needs to receive long-term training and examination. Therefore, party members tend to have higher political consciousness, moral quality, and behavioral ability. As far as the CPC's requirements are concerned, party members ought to keep the purpose "Serve the people heart and soul" and the oath "Always ready to sacrifice everything for the Party and the people" in mind all the time. In such environment, party members have a greater sense of responsibility and mission than non-party members. Therefore, party members tend to behave altruistically.

4.5 Parents' Education

On the one hand, the lower education level of parents may relate to lower social and economic class, while individuals at low social status, lacking economic and social resources, are more concerned about the well-being of others and show more trust and pro-social behaviors. Compared with the upper class, lower class are more context-dependent and other-oriented, namely more sensitive to others' emotion and stimuli in the social environment [28]. This could partly explain the families' high scores of CC₂ in the lower social class. On the other hand, parents' educational backgrounds could affect their parenting styles, further effect student's pro-social behaviors [29]. Wang's studies [30] have shown that parenting styles will affect the pro-social behaviors of undergraduates.

Table 8. ANOVA test for parents' education differences (M±SD)

		A	B	C	D	F		
Father	CC ₁	5.02±0.80	4.97±0.93	4.82±0.85	4.78±0.89	9.978***		
	CC ₃	3.90±0.99	3.83±1.07	3.94±1.04	4.01±1.08	2.715*		
Mother	CC ₁	5.03±0.80	4.96±0.87	4.87±0.89	4.69±0.90	16.705***		
Kruskal Wallis								
		(I)	(J)	MD (I-J)	SD	p		
Father-CC ₁		A	C	3.905	38.594	0.001		
			D	4.643	35.263	0.000		
		B	C	3.013	41.573	0.016		
			D	3.591	38.502	0.002		
Bonferroni								
						95% CI		
		(I)	(J)	MD(I-J)	SD	p	Lower Bound	Upper Bound
Father-CC ₃		D	B	0.179*	0.064	0.032	0.010	0.349
Mother-CC ₁		A	C	0.163**	0.050	0.007	0.030	0.296
		D	A	-0.342***	0.049	0.000	-0.472	-0.211
			B	-0.266***	0.057	0.000	-0.415	-0.116
			C	-0.179**	0.056	0.009	-0.326	-0.031

A=Junior High school and below; B=Senior High school; C=Some college; D=College and above.

Fathers with high education level may be less likely to show concern and understanding to their children by virtue of some cultural and practical reasons [31]. Some highly educated fathers might also be so strict with their children that they always take punishment and show the attitude of refuse and deny, which are all significantly positively correlated with the moral evasion of children [31]. Moral evasion could reduce the discomfort affection originated from the inconsistency between context and existing representations. This could explain why students with highly educated fathers have higher scores in CC₃.

4.6 Personal/Parental Experiences

The results show that the relationship between implicit altruism and impact perceived from direct/indirect experiences is "U" shaped. That is to say, compared with "Never experience" and "Significantly affected", those who "barely affected" perform the lowest scores in IA. For the former circumstances (compared with "Never experience"), Zhou et al. [32] have reported that some people experience emotional response numbness after trauma. After a public emergency, due to defenses against severe pressure and trauma, individuals' emotional responses to the related events will become numb potentially. Moreover, it also affects the plasticity of the nervous system. Although individuals cannot realize the impact consciously and actively (only a little impact), the results of our study suggest that one's implicit memory, as well as spontaneous affective response, may be changed. Therefore, it harms individual's IA, namely lead to low scores in CC₂. While this hypothesis still needs to be verified by further researches. Besides, we also speculated that individuals who tend to choose "barely affected" may be influenced by the social desirability effect and fear of being perceived as "vulnerable," thus suppressing their lack of internal security.

For the latter circumstances (compared with "Significantly affected"), previous research has shown that individuals' experience related to disasters and awareness of the disaster risk tends to increase their participation in voluntary groups [33]. Moreover, children's awareness of the disaster risk is always influenced strongly by their parents' practical experiences [31]. Also, Zakir [9] has also shown that people will react more strongly to disaster-related information when they realize precisely the direct threat of the disaster. Thus, they will take altruistic behaviors in response to the challenges. With the increase of influence on children, they gradually perceive the threat of the crisis deeply, thus show high-level EA. Actually, there are significant positive correlations between one's pro-social

behaviors and self-efficacy, hope, optimism, and positive emotions [34]. Based on the previous studies, we speculated that individuals could gain self-efficacy and positive affective representations through altruistic behaviors to compensate for their lack of security under risky situations.

Table 9. ANOVA test for personal/parental differences (M±SD)

	Personal		Parental	
	CC ₂	CC ₁	CC ₂	EA
0	4.16±0.89	4.95±0.89	4.18±0.88	52.15±10.84
1	3.91±0.89	4.70±0.92	3.95±0.88	49.73±9.80
2	4.17±0.80	4.91±0.81	4.15±0.80	51.27±8.98
3	4.18±0.80	4.93±0.83	4.17±0.88	51.32±9.64
4	4.19±0.89	5.00±0.86	4.20±0.87	52.82±10.21
5	3.79±0.95	5.33±0.37	4.20±1.00	59.2±12.35
F	3.439**	5.70***	4.001**	5.169***

Bonferroni(Personal)							
	(I)	(J)	MD(I-J)	SD	p	95% CI	
						Lower Bound	Upper Bound
CC ₂	1	0	-0.244**	0.066	0.003	-0.437	-0.051
		2	-0.256*	0.083	0.031	-0.500	-0.012
		3	-0.274**	0.078	0.007	-0.504	-0.044

Bonferroni(Parental)							
	(I)	(J)	MD(I-J)	SD	p	95% CI	
						Lower Bound	Upper Bound
CC ₁	1	0	-0.252***	0.054	0.000	-0.411	-0.093
		2	-0.208*	0.066	0.024	-0.401	-0.015
		3	-0.231**	0.061	0.002	-0.409	-0.052
CC ₂	1	0	-0.229***	0.054	0.000	-0.389	-0.069
		2	-0.193	0.066	0.053	-0.386	0.001
		3	-0.220**	0.061	0.005	-0.399	-0.040
		4	-0.242	0.086	0.076	-0.496	0.011

Kruskal Wallis(Parental)					
	(I)	(J)	MD (I-J)	SD	p
EA	1	0	-3.549	39.35	0.006
		4	-3.175	62.46	0.022
		5	-3.346	165.19	0.012

Q1: Have you/your parents ever experienced any of the following public emergencies? 0=Never experience; Q2: Please evaluate how much the experience has affected your life. 1=Barely; 2= Sometimes; 3=Moderately; 4=Significantly; 5=Severely.

4.7 Parental Participation

Table 10. T test for gender differences (M±SD)

	NO(n=1549)	YES(n=623)	t
EA	50.93±9.996	53.02±10.459	-4.351***

Q: Have your parents participated in the work directly related to COVID-19 epidemic?

Since parents with high altruism are more willing to be involved in epidemic related work, we speculated that individual's explicit altruism might be related to their parents' education, guidance, and their own altruistic behaviors. According to Bandura's observation learning theory, individuals acquire knowledge, skills, and behaviors by observing and imitating the behaviors of others. Moreover, the potential rewards of parents' altruistic behaviors, such as a sense of high value, sense of morality, pleasant mood, and sense of self-efficacy, will make individuals have a positive attitude towards altruistic behaviors and thus show more altruistic behaviors.

4.8 Voluntary Behaviors

Table 11. ANOVA test for volunteering differences

Form	CC ₁	CC ₂	CC ₃	EA
Online(n=309)	5.05±0.82	4.29±0.92	3.79±1.11	56.68±11.11
Offline(n=164)	4.87±0.86	4.02±0.84	3.83±1.04	53.98±10.19
Willing(n=1436)	4.96±0.83	4.16±0.85	3.9±1.02	51.12±9.58
No(n=263)	4.45±0.99	3.93±0.91	4.26±1.02	46.21±8.96
F	30.663***	9.669***	11.643***	58.703***

Bonferroni							
	(I)	(J)	MD(I-J)	SD	p	95% CI	
						Lower Bound	Upper Bound
CC ₂	Online	Offline	0.277**	0.08	0.006	0.06	0.50
		No	0.362***	0.07	0.000	0.17	0.55
	Willing	No	0.227**	0.06	0.001	0.07	0.38
CC ₃	No	Online	0.465***	0.09	0.000	0.24	0.69
		Offline	0.432***	0.10	0.000	0.16	0.70
		Willing	0.363***	0.07	0.000	0.18	0.55

Kruskal Wallis						
	(I)	(J)	MD (I-J)	SD	p	
CC ₁	No	Online	-7.87	52.39	0.000	
		Offline	-4.15	62.14	0.000	
		Willing	-7.96	41.89	0.000	
EA	No	Online	-11.73	52.59	0.000	
		Offline	-7.80	62.37	0.000	
		Willing	-7.44	42.04	0.000	
	Willing	Online	-7.73	39.31	0.000	
		Offline	-3.35	51.67	0.005	

Q: During the epidemic period, have you ever participated in any voluntary activities directly related to the epidemic of COVID-19? Willing=Not yet, but I'm willing to participate; No=Not yet, and I'm not willing to participate.

Based on IAT and BIAT (Brief Implicit Association Test) measurements, recent results indicate that implicit altruism cannot predict rapidly occurred altruistic behaviors in real situations [6]. While present study showed that the IA of university students can predict their altruistic behaviors in major emergencies.

Specifically, individuals with low scores in CC₃ and high scores in CC₁ were more likely to volunteering in risky situations. Indeed, according to the APE model, for some of them, the stimuli from the environment are completely consistent with the existing representations in their memory, which activate successfully their mental association with positive affection, thus leading to their voluntary behaviors. In addition, for other students with high scores in CC₂, the mental activation of them got larger in the service of coordinate the inconsistency between context and their intention, hence taking online volunteering ultimately. It must be noted that Eyal et al. [35] have shown that

such online contribution to society enhances self-esteem and boosts social interaction. Moreover, the higher the willingness to contribute to society, the higher the willingness to contribute online. This indicates that online arenas offer a useful environment for individual pro-social expressions. The present data could partly explain this phenomenon: since high levels of willingness facilitate one's mental activation, online community comes to be an optimum option for those individuals.

Overall, individuals who chose "No" or "Willing" had lower EA scores than those who chose "Online" or "Offline." Moreover, among those non-volunteers, individuals who chose "No" had lower EA scores than those who chose "willing." Corroborating that individual with higher levels of altruism in daily lives commonly are more likely to volunteer during serious emergencies as well, such as the COVID-19 epidemic. Obviously, our data is consistent with the common sense of the public. That is to say, an individual's explicit altruism (measured by SARS) can be used to predict individuals' voluntary behaviors under significant emergencies. It does not support our original assumptions since it indicates that an individual's altruistic behavior in non-risk situations (daily life) is closely related to that in high-risk situations, while it is not enough to show that the internal psychological process of the two is consistent. Corroborating that voluntary behaviors during the COVID-19 epidemic are not only guided by IA.

Actually, this result is consistent with the results of previous studies [5]. Interestingly, Wu et al. [5] believes that an individual's specific voluntary behavior is both spontaneous and controlled by consciousness, which could be seen as a combined behavior (as is shown in Figure3), and the combined behavior can only be predicted by EA rather than IA nor the interaction of IA and EA. In comparison, our data is inconsistent with Wu's study. We may attribute the contradiction to the differences between methods. Wu et al. [5] used traditional methods such as IAT, BIAT, SC-IAT, EAST to measure an individual's IA. The results are general and not detailed under the lack of studying the structure and factors of IA. However, in our study, a novel measuring tool (SJT) was adopted to conduct a more detailed IA study. We divided IA into three different factors. Moreover, the results have shown that all these three factors can be used to predict voluntary behavior during the epidemic (combined behavior), which could even be used to predict the form of voluntary behavior (online/offline) to some extent. Although more evidence is still needed to support our view, the advantages of the USIA-SJT have already been proved preliminarily by current results.

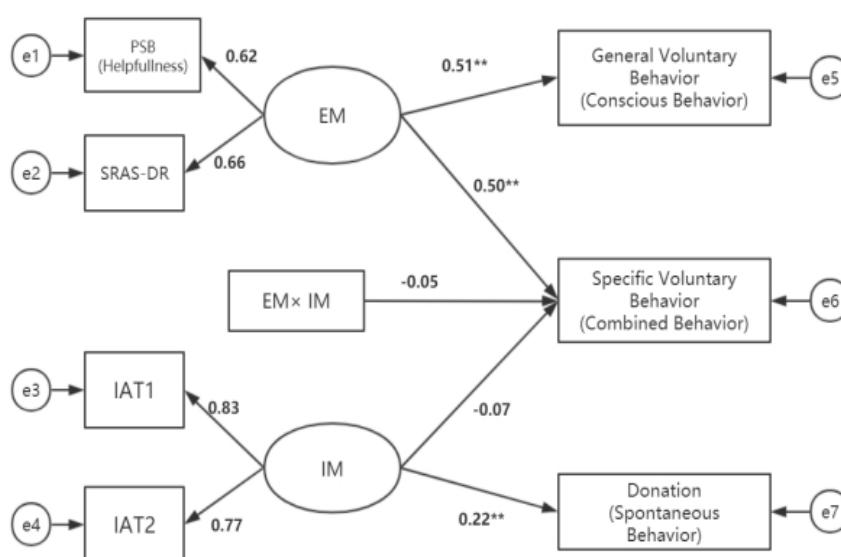


Figure 3. (Wu, 2018) PSB

Prosocial Personality Battery, while 'Helpfulness' is the subscale of PSB; SRAS-DR: Self-report Altruism Scale Distinguished by the Recipient; IAT: Implicit Association Test; EA: Explicit Measurement; IA: Implicit Measurement.

4.9 Self-developed USIA-SJT

A CFA method for the USIA-SJT showed that the structure behind fitted the 3-factor model obtained after exploratory factor analysis. While one of the indexes (CFI=0.84) is still unqualified according to Hair's standard (CFI>0.92), which means there might be another model more suitable than the present one. We may reasonably speculate that the internal correlation of the four behavioral response items in one situation may affect the fitting degree of the model. However, the results suggest that the effect of this association can be neglected.

The reliability analysis results of the USIA-SJT show that the internal consistency reliability of this study is low, which is a common problem in the SJTs. Previous researches have shown that Test-retest Reliability and Parallel-forms Reliability are considered to be the most appropriate reliability indexes for SJTs, which can better demonstrate the stability of the tests [36]. Therefore, while compiling and applying SJTs in subsequent studies, those two indexes should be given top priority.

Besides, in the USIA-SJT, the situations we have selected came from the daily life of Chinese university students, which reflect cross-cultural differences to some extent. Specifically, in the situation regard to shower, the shower house exists as one kind of public infrastructure in many Chinese universities, and students need to use a stored-value card for shower. It is noted that such differences might have an impact on the range of application of the USIA-SJT.

5. Strengths and Limitations

The present study used the SJT to measure individuals' implicit altruism innovatively and obtained inspiring results, which not only extended the range of SJTs but also provided a new method for the measurement of individual's implicit social cognition. The results have already been proved to be able to predict an individual's voluntary behaviors under serious emergencies, which reflects the effectiveness of SJTs in psychometry as well as verifies our hypothesis. We extracted three factors from the USIA-SJT, namely divided IA into three dimensions utilizing the APE model, building the SIX C model ultimately. Our study will help future researchers to have a deeper understanding of the deep cognitive structure of altruism, furthermore, having a positive influence on future psychological researches for the "black box" between an individual's implicit cognition and explicit behavior.

Otherwise, the present results also suggest that in future studies, USIA-SJT can be applied to a broader field of psychological measurement, including the measurement of personality, implicit cognition, and other aspects, instead of being limited to the assessment of personnel. In addition, this study has also conducted a relatively rich study on the influencing factors of individuals' implicit altruism, provided references for family parenting environment, University student education, party and government propaganda, and individual psychological intervention simultaneously.

However, the present results also need to be interpreted in light of several limitations. Firstly, although a large sample, as well as a wide range of subjects (over two thousand), were selected in our study, the majority of the subjects are Chinese undergraduates. Therefore, further research on other age groups and cross-cultural groups is still needed in the future for the better promotion of our results (conclusions, developed tools, etc.). Secondly, it must be noted that influenced by the COVID-19 epidemic, our questionnaire must be answered online, which could neither guarantee the reliability of the responses since whether the subjects are independent and serious-minded or not are both unknown, nor exclude the influence of factors such as the answering environment. During the application of USIA-SJT, the subject ought to give an answer within a short period of time to avoid adding propositional factors. Whereas the online questionnaire could not guarantee that the testing time is well controlled, which also needs to be improved in future studies.

Third, although we divided IA into three dimensions, the scores of these factors could not be added, and we also failed to provide a method for conversing the scores. In other words, we failed to build a comprehensive three-factor mathematical model to reflect the level of IA directly. Moreover, the lack of this specific index interferes with the prediction function of the SIX C model to a large extent, making the Self-developed USIA-SJT more complicated and difficult to use. Forth, due to the complexity of altruistic behavior, the motivation for it varies from individual to individual. The possibly influencing factors of IA obtained in our study are only qualitative results based on the statistical analysis of large samples, while the interactive relationship among the influencing factors and the effect size of each factor has not been specifically identified. Future research could group the participants according to personality characteristics, cultural background, social and economic status, etc. Then compare the effect size of each factor within different groups.

Last but not least, we have to admit that neither the theoretical basis nor the empirical conclusion of our research can fully confirm our hypothesis that SJT could be used to measure IA. There is also no evidence that it couldn't. More precisely, I believe that the Self-developed USIA-SJT could play a better role in evaluating and predicting individuals' altruistic tendency compared with the SARS, which is enough to reflect the value and development potential of this tool in psychometrics. Due to its superiority over the traditional Self-report scales, we hope it could be used more widely in psychometrics in the future.

6. Conclusion

The present results have shown that the gender, an only child, years of enrolment, political status, parental education, personal/parental experiences, and parental participation have statistically significant impacts on the participants' implicit and explicit altruism, which substantially have statistically significant impacts on students' voluntary behaviours during COVID-19 pandemic. Both EFA and CFA analyses indicated the sound psychometric property of the Self-developed USIA-SJT, with the construction of the SIX C model, rendering it as a robust measure to gauge Chinese university students' implicit altruism as well as to predict their voluntary behaviours under significant emergencies. Although traditional SRAS have the same function, the scores of USIA-SJT could virtually uncover the "black box" between an individual's implicit cognition and explicit behaviour to some extent.

References

- [1] Hamilton W D. The genetical evolution of social behavior. II[J]. *Journal of Theoretical Biology*, 1964, 7 (1): 17-52.
- [2] Roberts, G. Competitive altruism: from reciprocity to the handicap principle[J]. *Proceedings: Biological Sciences*, 1998, 265(1394):427-431.
- [3] Wilson D S. A theory of group selection [J]. *Proceedings of the National Academy of Sciences of the United States of America*, 1975, 72(1):143-146.
- [4] Gawronski B, Bodenhausen G V. Implicit and Explicit Evaluation: A Brief Review of the Associative-Propositional Evaluation Model [J]. *Social and Personality Psychology Compass*, 2014, 8(8).
- [5] Rui W, Guo Q, Fang L, et al. Implicit and Explicit Measure Predict Altruistic Behavior: Evidence from IAT and BIAT[J]. *Psychological Exploration*, 2018.
- [6] Greenwald A G, Banaji M R. Implicit social cognition: attitudes, self-esteem, and stereotypes. [J]. *Psychological Review*, 1995, 102(1):4-27.
- [7] Yang Z. Review on the Study of the Implicit Social Cognition [J]. *Psychological Exploration*, 2009.
- [8] Zsa B, Jca B, Ug C, et al. Media and altruistic behaviors: The mediating role of fear of victimization in cultivation theory perspective[J]. *International Journal of Disaster Risk Reduction*, 42.
- [9] Payne B, Cheng C, Govorun O, et al. An inkblot for attitudes: Affect misattribution as implicit measurement [J]. *Journal of Personality and Social Psychology*, 2005, 89(3):277-293.

- [10] Roddy S, Stewart I, D B arnes-Holmes. Anti-fat, pro-slim, or both? Using two reaction-time based measures to assess implicit attitudes to the slim and overweight [J]. *J Health Psychol*, 2010, 15(3):416-425.
- [11] Mahaffey A L, Bryan A D, Ito T A, et al. In Search of the Defensive Function of Sexual Prejudice: Exploring Antigay Bias Through Shorter and Longer Lead Startle Eye Blink [J]. *Journal of Applied Social Psychology*, 2011, 41(1):27-44.
- [12] Situational Judgment Tests as a method for measuring personality: Development and validity evidence for a test of Dependability[J]. *PLoS ONE*, 2019, 14(2).
- [13] Smith, Eliot R. What do connectionism and social psychology offer each other? [J]. *J Pers Soc Psychol*, 1996, 70(5):893-912.
- [14] Whetzel D L, Mc Daniel M A. Situational judgment tests: An overview of current research[J]. *Human Resource Management Review*, 2009, 19(3):188-202.
- [15] J, Philippe, Rushton, et al. The altruistic personality and the Self-report altruism scale[J]. *Personality and Individual Differences*, 1981, 2(4):293-302.
- [16] Tang S, Bo S, Zhang W, et al. Revision of Self-report Altruism Scale in Chinese College Students. *Journal of Yangtze University (Social Sciences Edition)*, 2015.
- [17] Hair J F, Tatham R L, Anderson R E, et al. Multivariate data analysis[J]. *Technometrics*, 1998, 30(1):130-131.
- [18] Chapman E, Baron-Cohen S, Auyeung B, et al. Fetal testosterone and empathy: Evidence from the Empathy Quotient (EQ) and the "Reading the Mind in the Eyes" Test[J]. *Social Neuroscience*, 2006, 1 (2): 135-148.
- [19] J, van, Honk, et al. Testosterone administration impairs cognitive empathy in women depending on second-to-fourth digit ratio[J]. *Proceedings of the National Academy of Sciences*, 2011, 108(8):3448-3452.
- [20] Zhou L P. Effect of trait anxiety and gender difference on risk-avoidant in decision-making in 316 college students [J]. *Chinese Mental Health Journal*, 2010.
- [21] Wei S G, Sun W J, Chen J, et al. Family Environment and Prosocial Behavior in College Students: A Moderated Mediation Model[J]. *Chinese Journal of Clinical Psychology*, 2017.
- [22] Xia W. Present Situation and Prospect of Mental State of One-Child in China. *Journal of Mianyang Teachers' College*, 2015.
- [23] LIU Songtao, Zhang X, Shan L U. The Mental Health Status and Personality of the Only Child and Non-only-child Students in Middle School[J]. *China Journal of Health Psychology*, 2018.
- [24] Yang P, Fan A, Wei X U. Occupation Maturity, Career Preparation and Career Choice: Key Words for College Junior Student Development[J]. *Education & Economy*, 2015.
- [25] Hu Qing. The study on the relationship between the university students' emotion management ability and subjective wellbeing[D]. West Normal University.
- [26] Wang L. A Study of the Relationship Between College Students' Cognitive Bias and Interpersonal Communication. *Journal of Yangzhou University (Higher Education Study Edition)*, 2012.
- [27] WANG Haoji. The effect of emotion, psychological distance on altruistic behavior[D]. Hunan Normal University.
- [28] Kraus M W, Piff P K, Keltner D. Social class, sense of control, and social explanation. [J]. *Journal of Personality & Social Psychology*, 2009, 97(6):992-1004.
- [29] Ding M, Fang Y, Jun N I. The Relationship Among Maternal Parenting Style, Empathy and Prosocial Behavior of University Students. *China Journal of Health Psychology*, 2017.
- [30] WANG Xusheng. Research on the Relationship among Security, Values and pro-social Behavior of University Students [D]. Hebei Normal University.
- [31] FANG Li. A Study on Relation among University Student's Parenting Style, Moral Disengagement and pro-social Behaviors[D]. Sichuan Normal University.
- [32] Zhou X, Xinchun W U, Yuanyuan A N, et al. Assessing the Latent Structure of PTSD among Chinese Adolescent after Earthquake. *Psychological Development and Education*, 2017.

- [33] Ji A, Tf B. How do natural hazards affect participation in voluntary association? The social impacts of disasters in Japanese society --ScienceDirect [J]. *International Journal of Disaster Risk Reduction*, 2019, 34: 108-115.
- [34] WANG Yan. *The Relationship of University Student among Self-supporting Personality, Psychological Capital and Pro-social Behaviors* [D]. Sichuan Normal University.
- [35] Eckhaus E, Sheaffer Z. Factors affecting willingness to contribute goods and services on social media [J]. *The Social Science Journal*, 2019, 56(3):390-400.
- [36] Ling B, Jinliang G U, Sun L. *Situational Judgment Tests in Personnel Assessment: A Research Agenda*. Psychology: Techniques and Applications, 2016.