# Intention patterns predicting college students' volunteer service participation

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A B S T R A C T

Volunteer service activities of college students are crucial for universities to educate students on civic engagement. Education laws and scientific methods must be employed to enhance college students' willingness to volunteer and actively participate in volunteer service activities. Based on literature collection and collation, this study takes the theory of planned behaviour as the basic framework, includes the dimension of "cognition," designs the questionnaire, and discusses the relationship among the relevant factors that affect the volunteer service behaviour of college students. Cognition, defined as understanding volunteerism's personal and social benefits, positively predicted attitudes, norms, and control, but not directly behaviour. A sample survey of Chinese college students and a correlation analysis of effective questionnaires demonstrate that college students' volunteer service attitudes, subjective norms, and perceived behaviour control positively impact volunteer service behaviour intention, which can predict volunteer service behaviour. College students' cognition of volunteer service significantly and positively impacts their attitude toward it, subjective norms, and perceived behavioural control but does not directly impact their volunteer service behaviour. Thus, the following aspects must be improved: guiding attitude, creating atmosphere, improving mechanisms, innovating projects, strengthening cognition, and implementing practical education. The findings of this study can help colleges and universities to clarify the impact mechanism of college students' volunteer service cognition on their volunteer service behaviour. It contributes new evidence on optimising the student environment to engage youth in building community well.

## 1. Introduction

Volunteer work is essential in university education, serving as a fundamental moral practice [1,2]. According to the China Volunteer Service Development Report (2020), an estimated 210 million individuals in China engaged in volunteer services in 2019. This figure represents a notable increase of 12 million compared to the previous year, signifying a rise in participation. Furthermore, these volunteers accounted for nearly 15 % of Mainland China's overall population, indicating a continuing upward trend in volunteerism [3]. Under the supervision and support of governmental institutions, societal organisations, and academic institutions, college

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students who volunteer actively participate in various volunteer activities across many sectors of society. A sense of volunteerism and commitment drives these students, and they employ diverse methods and approaches to carry out their volunteer services. College students play an essential role in promoting the advancement of voluntary service in China through their dedicated endeavours [4].

Despite the positive impact of volunteering on the education and society of university students, there are still many challenges and problems to overcome to realise its full potential. From the student perspective, specific problems in colleges and universities are identified, such as the low enthusiasm of college students to participate in volunteer services, lack of understanding of volunteerism, utilitarianism of value orientation, imperfect organisation of volunteer activities, and poor content of activities [5]. From the perspective of colleges and universities, problems with volunteer services exist, such as imperfect organisational systems, lack of conditions for activities, and unsustainable long-term mechanisms [6]. How the government, colleges, and universities can better guide college students to actively participate in volunteer service activities, exercise their practical abilities, improve their spiritual quality, and achieve practical education in colleges and universities are critical issues to be resolved during the development process.

This study explores the behavioural patterns influencing Chinese university students' volunteer participation and proposes optimisation strategies based on empirical evidence. To accomplish this objective, we conducted a comprehensive survey encompassing 804 college students from various regions in China. This survey aimed to investigate the various aspects associated with these students' attitudes, subjective norms, perceptual behavioural control, and behavioural intention to engage in volunteering activities. The study used structural equation modelling to analyse the survey data and establish a behavioural model of students' volunteer participation. This study will comprehensively analyse the behavioural models and optimisation strategies of Chinese university students' participation in volunteering and provide valuable insights for promoting research and practice in this area.

## 2. Literature review

This study reviewed the relevant literature and researched the basis of the theory of planned behaviour (TPB) [7]. Concurrently, referring to the existing literature, it classifies each variable at a deep level suitable for this study to accurately explore college students' volunteer service behaviour mode. Based on the theory of planned behaviour proposed by Ajzen [8,9], this study makes research assumptions and proposes a model for college students' volunteer service intention and behaviour. Taking cognition (C), attitude (ATT), subjective norms (SN), and perceptual behavioural control (PBC) as independent variables that affect college students' volunteer service behavioural intention (BI) and behaviour (B), and college students volunteer service BI as variables that affect their volunteer service B, this study investigates the relationship among cognition, attitude, subjective norms, perceived behaviour control, and volunteer service intention, between volunteer service cognition and behaviour, and between volunteer service intention and behaviour. The behavioural mode of college students' participation in volunteer services is also verified.

### 2.1. Related variables

Attitudes is the overall evaluation of an individual's specific subject or behaviour based on their values, which may be positive or negative feelings that reflect their likes and dislikes toward a particular person, thing, or behaviour. Attitudes can be good internal reflections, such as approval or affection, or negative ones, such as opposition or disgust. Simultaneously, a neutral attitude is also possible.

Subjective norms are individuals' subjective pressures when deciding whether to engage in a particular behaviour. This reflects the role of essential reference objects in individual decision-making behaviour. When engaging in a specific behaviour, representative individuals are affected by important individual or group attitudes and behaviours. A positive attitude of a significant individual or group to a specific behaviour urges them to carry out that behaviour. Contrastingly, a negative attitude of a significant individual or group to a specific behaviour prevents the individual from taking action.

Perceptual behavioural control refers to the extent individuals believe they can control a particular behaviour. It is mainly affected by their past experiences and expected obstacles. The expected hindrance is minimal when people perceive they have rich experience and resources to take a particular action. Thus, they take the initiative to implement this action. Contrastingly, when individuals perceive that they have insufficient experience and resources when taking action, the expected hindrance is substantial, thereby preventing them from taking action.

Behavioural intention refers to individuals' motivation and behavioural tendency to perform a specific behaviour. It is the direct cause of a specific behaviour. However, behavioural intention does not necessarily determine whether an action exists. Intention represents the intention to take a specific action. Behavioural intention reflects the effort of individuals in terms of time, energy, and money to implement a behaviour. The stronger the behavioural intention, the greater the possibility of taking action. College students volunteer service behaviour intention refers to the specific activities or behavioural tendencies that they undertake for volunteer service activities, which directly affects whether they will engage in this behaviour.

Behaviour refers to an individual's actions due to internal or external factors.

Cognition is the understanding of things. Cognition is an information-processing activity in which individuals understand the objective world. Cognition is the process of acquiring knowledge through psychological activity. Cognition encompasses several mental processes, such as feeling, perception, and thinking. A person's knowledge of external things or behaviours, acquired through direct and indirect experiences, regulates individual cognitive activities. Individual cognition is enhanced through the dynamic interplay between an individual and their environment.

### 2.2. Research hypotheses

Strobl and Grail believe that the degree of cognition can negatively or positively affect attitudes, whereas cognition may not directly affect behaviours [10]. Zhu et al. (2015) research on college students' cognitive psychology of participating in voluntary tourism demonstrated that their cognitive level of voluntary tourism positively impacts their attitudes [11]. Huang (2019) researched the garbage treatment of rural residents using intermediary analysis, hypothesis tests, and other methods to study the relationship between cognition, attitude, and behaviour and found that the attitude of rural residents participating in garbage treatment had a significant mediating effect between cognition and behaviour [12]. Therefore, this study proposes Hypothesis 1.

**H1.** College students' cognition of volunteer services positively impacts their attitudes.

Hu (2015) used hierarchical multiple regression to test the regulatory effects of green consumption cognition. First, He took the respondents' green consumption cognition, attitude, payment intention, subjective norms, and perceived behavioural control as the independent variables. He took green consumption intention as the dependent variable for the regression analysis. The higher the level of green consumption cognition, the more significant the promotional effect of consumers' subjective norms on their purchase intentions [13]. Hu revealed that people with higher levels of education are more willing to donate organs than those with lower levels of education. Concurrently, compared to ordinary people, medical staff are more knowledgeable about organ donation, and their attitudes and behavioural intention toward organ donation are more favourable [14]. Shi and other scholars built a theoretical model of the impact of ecological cognition on farmers' behaviour of returning farmland to forests based on the theory of planned behaviour. The results show that farmers' perceptual control, attitude, and subjective norms of ecological cognition impact their behaviour of returning farmland to forests [15]. Therefore, this study proposes Hypotheses 2 and 3.

**H2.** College students' cognition of volunteer services positively impacts their subjective norms.

**H3.** College students' cognition of volunteer services positively impacts their perceptual behavioural control.

Cheng's research on the relationship between social security payment cognition and behaviour shows that payment cognition plays a positive role in payment behaviour [16]. Huang (2011) explored the path relationship between public participation cognition and behaviour through empirical research and found that public participation cognition positively affects attitude and that public participation attitude mediates cognition and behaviour [17]. Liu (2009) revealed that the most significant factor affecting citizens' participation in volunteer services is their volunteer service awareness [18]. Therefore, this study proposes Hypothesis 9.

**H9.** College students' volunteer service cognition positively impacts their behaviour.

In the behavioural attitude and intention investigation, Ajzen pointed out that attitude refers to individuals' values toward subjects. When individuals perceive that adopting a specific behaviour is beneficial, they will have a positive attitude toward it. Liu et al. (2016) found that attitude is the most critical factor influencing college students' volunteering behavioural intention, and when exploring the influencing factors of college students' participation in community volunteering, the more positive an individual's behavioural attitude is, the higher his or her behavioural intention is [19]. Therefore, this study proposes Hypothesis 4.

**H4.** College students' volunteer service attitudes positively impact their behavioural intentions.

In a study on subjective norms and behavioural intentions, Ajzen pointed out that subjective norms refer to whether important stakeholders will agree with and support an individual when performing a particular behaviour and the expected pressure when a person performs a specific behaviour. Ajzen believes that when an individual carries out a specific act, the extent to which a significant individual or group approves or opposes their carrying out the act is a significant factor. People are more likely to engage in the behaviour when the degree of approval is high. In related research on perceptual behavioural control and behavioural intention, Ajzen pointed out that perceptual behaviour control represents the ease with which individuals implement specific behaviours. The more experience and resources an individual have, the stronger the perceptual control over the behaviour and the higher the probability of implementing the behaviour. In addition to resources and opportunities, Ajzen believes that individuals should consider the past experiences of their friends and acquaintances. The smaller the expected obstacles and the stronger the control over the behaviour, the higher the probability of implementing the behaviour. When studying the relationship between college students' volunteer service attitude and behaviour, Liu et al. found that a positive attitude does not determine the generation of behaviour and that other dimensions also affect it [20]. The greater the support of significant individuals or groups, the more positive the behavioural intention. The stronger the ability to control perceptual behaviour, the more likely it is to appear. Therefore, this study proposes Hypotheses 5 and 6.

**H5.** College students' subjective norms of volunteer service positively impact their behavioural intention.

**H6.** College students' perceived behavioural control of volunteer services positively impacts their behavioural intention.

The determinants of an individual's actual behaviour are behavioural intention and perceived behavioural control. Behavioural intention refers to the possibility of an individual's willingness to perform a particular behaviour. The stronger a person's intention to perform a specific act, the higher the probability they will engage in it. Behavioural intention is a decisive factor in measuring actual behaviour. A significant correlation exists between behavioural intention and actual behaviour, and perceptual behaviour control is another variable that affects actual behaviour control [21]. Armitage showed that perceptual behavioural control could explain the significant variation between behavioural intention and actual behaviour [8]. Ajzen and Madden also confirmed that perceptual behavioural control directly impacts future actual behaviour, in addition to an indirect impact on future actual behaviour through behavioural intention [22]. Accordingly, we propose Hypotheses 7 and 8.

**H7.** College students' perceived behavioural control of volunteer service positively impacts their behaviour.

**H8.** College students' volunteer service behavioural intentions positively impact their behaviour.

Based on this theoretical analysis, we construct the model exhibited in Fig. 1.

## 3. Methodology

### 3.1. Participants

We recruited Chinese college students as research participants and employed a random sampling method. The questionnaire was administered through "Question Star" (https://www.wjx.cn), a widely used academic survey platform in China with over 50 million registered users. This platform allowed us to reach the target student sample while preventing duplicate responses through careful screening protocols. Before the study, we obtained all participants' ethical approval and informed consent. To safeguard privacy, each participant received a unique identification number, and we assured them that their responses would remain confidential and solely used for research purposes. Our participant pool encompassed junior college, undergraduate, and graduate students, representing various disciplines such as engineering, literature, law, economics, and management. Participants volunteered and remained anonymous, and we did not provide any incentives to participants.

### 3.2. Questionnaire design

We incorporated the volunteer service cognitive scale into Ajzen's theory of planned behaviour scales, including attitude, subjective norms, perceived behavioural control, and behavioural intention. We constructed the final questionnaire on the behaviour model of college students participating in volunteer service after eliminating irrelevant items and including pertinent questions influencing college students' volunteerism behaviours. This comprehensive 41-item questionnaire encompassed basic personal information and six dimensions: volunteer service cognition, attitude, subjective norms, perceived behavioural control, behavioural intention, and behaviour.

Among them, 34 questions were related to scales in the model, and another seven questions were related to participants' basic information. We designed this research questionnaire using a scale from relevant literature and tested it for reliability and validity. The specific distribution was as follows: volunteer service attitude scale (5 questions) [23], subjective norms scale (5 questions) [24], perceived behaviour control scale (6 questions) [25], volunteer service intention scale (6 questions) [26], volunteer service behaviour scale (4 questions) [27], and volunteer service cognition scale (8 questions) [28].

Measurement employed a 7-point Likert scale: 1 = strongly disagree, 2 = disagree, 3 = slightly disagree, 4 = neutral, 5 = slightly agree, 6 = agree, and 7 = strongly agree. We assessed the reliability and validity of the pre-test questionnaire, resulting in a Cronbach's α of 0.925, which met the requirements for reliability. We used SPSS 23.0 and AMOS 23.0 to test variable reliability, validity, and model construction analysis.
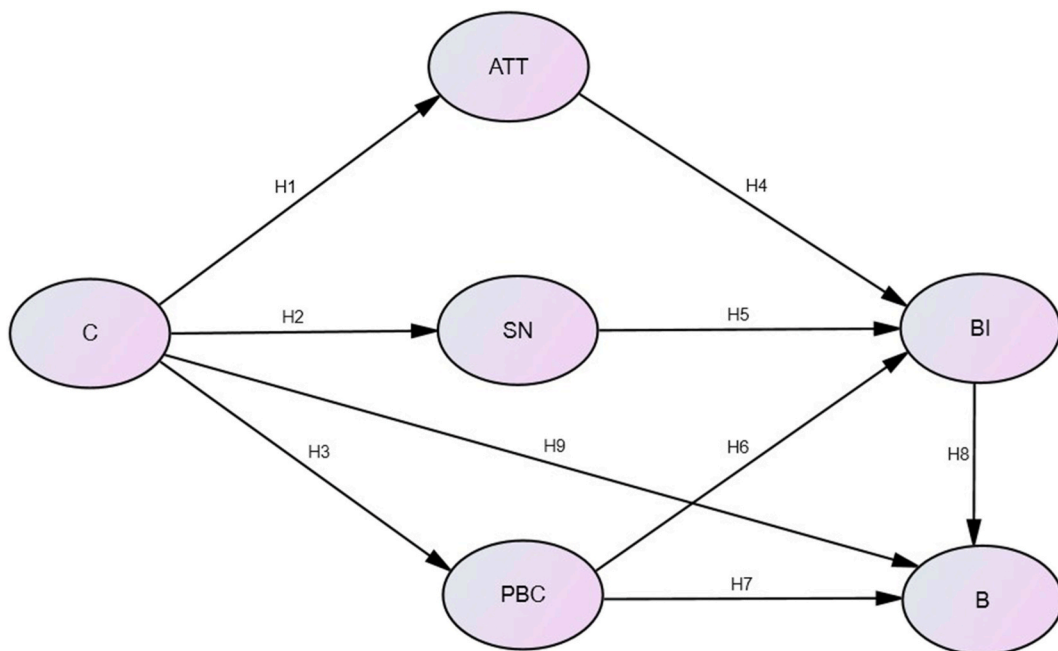


**Fig. 1.** Conceptual model.

## 4. Results

### 4.1. Data collection

We collected data from Chinese college students through an online survey using the "Question Star" platform. In total, we distributed 916 questionnaires and successfully recovered all 916 completed surveys. To ensure response quality and validity, we undertook a rigorous screening process. First, questionnaires completed in less than 100 s were excluded, as our pilot study determined this was the minimum time required for thoughtful participation. Second, any surveys with substantial missing data were omitted to preserve data integrity for analysis. Third, we evaluated response patterns and excluded questionnaires where 70 % or more answers exhibited suspicious consistency, indicative of inattentive responding. After applying these criteria, 112 questionnaires were identified as potentially invalid and removed. Our final sample consisted of the remaining 804 viable questionnaires, representing an effective recovery rate of 87.8 %. We assessed the reliability of the questionnaire using Cronbach's alpha and KMO tests and found that the scale had good internal consistency (Cronbach's alpha = 0.929, KMO = 0.942).

Table 1 shows that the sample consisted of 54.7 % male and 45.3 % female participants. Regarding grade level, the most significant proportion of participants were juniors (33.6 %), followed by sophomores (23.8 %) and seniors (18.8 %). Freshmen and graduate students represented 10.9 % and 12.9 % of the sample. In terms of academic majors, science was the most represented category (33.7 %), closely followed by engineering (22.9 %) and literature and history (25.1 %). Other majors, including finance, medical, agriculture and forestry, and others, accounted for smaller proportions of the sample. Participants in this study were from various regions across China. The most significant proportion was from Southwest China (35.7 %), while the most minor proportion was from Northeast China (3.0 %). Other regions, including East China, South China, Central China, North China, and Northwest China, were also represented in the sample. Moreover, Table 2 exhibits basic information on the sample's participation in volunteer services.

### 4.2. Model inspection

We subjected the questionnaire to exploratory factor analysis using principal component analysis, and the rotation converged after seven iterations using the Kaiser Normalised Maximum Variance method. We found several questions (Q11, Q19, Q20) had a factor load of less than 0.50. Researchers generally consider a factor loading of 0.50 a minimum acceptable value to ensure an item contributes significantly to the overall construct and meets adequate reliability and validity standards [29]. We conducted a confirmatory factor analysis (CFA) to fit and correct the measurement model for each dimension. After we revised the model, the remaining valid topics were ATT2, ATT4, SN2, PBC2, PBC3, PBC5, BI6, B1, C4, and C6. Ultimately, we included 24 valid questions in this study.

### 4.3. Reliability analysis

Table 3 presents the reliability and convergence validity analyses of the model tests. The Composite reliability (CR) value of the composition reliability of each measurement model was between 0.816 and 0.890, which was greater than 0.7, thereby meeting the requirements of the model construction.

**Table 1**
Statistical table of demographic characteristics of samples (n = 804).

| Demographic Characteristics | Variable Classification | Number of Samples (person) | Percentage (%) |
|---|---|---|---|
| Gender | Male | 440 | 54.7 |
| | Female | 364 | 45.3 |
| Grade | Freshman | 88 | 10.9 |
| | Sophomore | 191 | 23.8 |
| | Junior | 270 | 33.6 |
| | Senior | 141 | 18.8 |
| | Graduate | 104 | 12.9 |
| Major | Literature and History | 202 | 25.1 |
| | Science | 271 | 33.7 |
| | Engineering | 184 | 22.9 |
| | Finance | 82 | 10.2 |
| | Medical | 47 | 5.8 |
| | Agriculture and forestry | 13 | 1.6 |
| | Other | 5 | 0.6 |
| Region | East China | 103 | 12.8 |
| | South China | 122 | 15.2 |
| | Central China | 130 | 16.2 |
| | North China | 117 | 14.6 |
| | Northwest China | 21 | 2.6 |
| | Southwest China | 287 | 35.7 |
| | Northeast China | 24 | 3.0 |

**Table 2**
The basic situation of college students' participation in voluntary service (N = 804).

| Volunteer service | Variable classification | Number of samples (person) | Percentage % |
|---|---|---|---|
| Volunteer service classification | Donation activities | 373 | 46.4 |
| | Social cultural, and sports activities | 453 | 56.3 |
| | Community volunteer service activities | 441 | 54.9 |
| | Supporting educational activities | 185 | 23.0 |
| | Science popularisation and policy publicity activities | 140 | 17.4 |
| | Environmental protection | 119 | 14.8 |
| Activity type | Serving the elderly, children and the disabled | 122 | 15.2 |
| | Care for animals | 88 | 10.9 |
| | Technical service | 46 | 5.7 |
| | Other | 532 | 66.2 |
| | Never participated | 16 | 2.0 |
| What are the main channels for you to understand the information related to voluntary service | Social platform | 169 | 21.0 |
| | Network media | 162 | 20.1 |
| | TV media | 127 | 15.8 |
| | School and organisation notice | 322 | 40.0 |
| | Introduction of classmates and friends | 21 | 2.6 |
| | Other | 3 | 0.4 |

Note: Participants could select multiple volunteering categories, thus the total exceeds the sample size of 804.

**Table 3**
Analysis of reliability and convergence validity.

| Dimension | Measurement Topic | Parameter Estimate | | | | Std | Squared multiple correlations (SMC) | Composite reliability (CR) | Convergent validity (AVE) |
|---|---|---|---|---|---|---|---|---|---|
| | | Non-normalised Value | Normalised Value | Z Value | P Value | | | | |
| ATT | ATT1 | 1 | | | | 0.806 | 0.650 | 0.816 | 0.597 |
| | ATT2 | 1.003 | 0.047 | 21.328 | *** | 0.773 | 0.598 | | |
| | ATT3 | 1.009 | 0.049 | 20.413 | *** | 0.737 | 0.543 | | |
| SN | SN5 | 1 | | | | 0.755 | 0.570 | 0.821 | 0.535 |
| | SN4 | 0.836 | 0.047 | 17.632 | *** | 0.671 | 0.450 | | |
| | SN3 | 0.935 | 0.046 | 20.178 | *** | 0.779 | 0.607 | | |
| | SN1 | 0.912 | 0.049 | 18.775 | *** | 0.716 | 0.513 | | |
| PBC | PBC4 | 1 | | | | 0.644 | 0.415 | 0.824 | 0.614 |
| | PBC2 | 1.309 | 0.071 | 18.454 | *** | 0.835 | 0.697 | | |
| | PBC1 | 1.361 | 0.073 | 18.58 | *** | 0.854 | 0.729 | | |
| BI | BI1 | 1 | | | | 0.769 | 0.591 | 0.889 | 0.616 |
| | BI2 | 1.012 | 0.046 | 21.818 | *** | 0.748 | 0.560 | | |
| | BI3 | 1.078 | 0.044 | 24.724 | *** | 0.833 | 0.694 | | |
| | BI4 | 1.077 | 0.046 | 23.639 | *** | 0.801 | 0.642 | | |
| | BI5 | 1.093 | 0.048 | 22.582 | *** | 0.77 | 0.593 | | |
| B | B2 | 1 | | | | 0.723 | 0.523 | 0.831 | 0.622 |
| | B3 | 1.122 | 0.053 | 21.041 | *** | 0.833 | 0.694 | | |
| | B4 | 1.094 | 0.053 | 20.613 | *** | 0.806 | 0.650 | | |
| C | C8 | 1 | | | | 0.809 | 0.654 | 0.890 | 0.577 |
| | C7 | 0.957 | 0.043 | 22.443 | *** | 0.731 | 0.534 | | |
| | C5 | 0.994 | 0.042 | 23.776 | *** | 0.765 | 0.585 | | |
| | C3 | 0.875 | 0.046 | 19.119 | *** | 0.643 | 0.413 | | |
| | C2 | 1.045 | 0.042 | 25.006 | *** | 0.795 | 0.632 | | |
| | C1 | 1.074 | 0.043 | 25.207 | *** | 0.8 | 0.640 | | |

Note: ***, $P < 0.001$; Std = Standardised factor loading coefficients; ATT, attitude; SN, subjective norms; PBC, perceptual behavioural control; BI, behavioural intention; B, behaviour; C, Cognition. (The same as below).

### 4.4. Convergence validity test

To test the convergence validity of the structural equation model, researchers use the method of measuring a dimension in different ways. Generally, the standard estimate of the measured variable is more significant than 0.70, the combined reliability of the potential variable is more significant than 0.60, and the average extraction of variance (AVE) is more significant than 0.50. Researchers used the AVE test to test the convergence validity [30]. According to the standard proposed by Hair et al.(1998) [29], the average variance extraction value should be greater than 0.50. Table 3 reveals that each dimension's average variance extraction value was between 0.535 and 0.622, more significant than 0.50. The reliability of the questions in all dimensions met the requirements, and the six

subscales met the relatively ideal reliability and convergent validity standards that met the requirements of the construction model.

### 4.5. Differential validity test

The bootstrap confidence interval (CI) approach was employed to assess the differential validity of the facets. We acquired a total of 5000 iterated estimations with a confidence level of 95 %. The 95 % CI for the correlation coefficient between the aspects was determined by multiplying $\pm 2$ times the standard error of the point estimate. After testing, the CI between the facets was nearly identical and did not contain a single value, indicating that the facets have differential validity. As Table 4 indicates, the arithmetic square root of each dimension's average variance extraction value is greater than the standardised correlation coefficient with the other five dimensions in the model, and a significant difference exists between the validity of each dimension.

### 4.6. Fitting test

The test results of model fit are presented in Table 5, in which the degree of freedom of the Chi-square ratio is $\chi$. The value of 2/df is 4.730, thus indicating that the model's basic fitting is good. The root means square error of the approximation (RMSEA) is 0.068, which suggests that the theoretical and actual models are highly consistent. The absolute fitness index's goodness of fit index (GFI) was 0.889, and the adjusted goodness of fit index (AGFI) was 0.890, within the acceptable range. The value-added adaptation indicators included the comparative fit index (CFI), normed fit index, non-normed fit index (NNFI), and incremental fit index (IFI), all of which were more significant than 0.9, as recommended by experts and scholars [31–33]. Furthermore, the standardised root mean square residual (SRMR) value was below the recommended threshold of 0.08 [34], suggesting an acceptable level of discrepancy between the observed and predicted covariances in the model. It indicated that the research type had a reasonable degree of fit.

### 4.7. Analysis of the mediating effect

This study examined the mediating effect of attitudes, subjective norms, and perceptual behaviour control based on the theory of planned behaviour to determine whether mediating variables play a role in the relationship between cognition and behavioural intention. The Sobel z-test was used to test the significance of the indirect effects. Table 6 presents the results of the intermediary effect analyses.

The direct impact of cognition on behaviour is 0.115, and the upper and lower limits of the bias-corrected 95 % CI and percentile 95 % CI does not contain zero, thereby establishing the direct effect; cognition significantly and directly impacts behaviour. We conducted a mediation analysis to examine the indirect effects of cognition on behaviour through various mediating variables. The results revealed that the indirect effect of cognition on behaviour through attitude to behavioural intention was 0.122. The 95 % CI did not contain 0, providing evidence of a significant and causal intermediary effect of attitude on cognition and behaviour. Similarly, the indirect effect of cognition from subjective norms to behavioural intention on behaviour was 0.095, establishing a causal relationship between subjective norms and behavioural intention on cognition and behaviour. Additionally, the indirect effect of cognition from perceptual behaviour control to behavioural intention on behaviour was 0.086, suggesting a significant mediating effect of perceptual behaviour control on cognition and behaviour. Moreover, the indirect effect of cognition on behaviour through perceptual behaviour control was 0.102, further supporting the presence of a causal intermediary effect of perceptual behaviour control on cognition and behaviour.

Therefore, the analysis of the intermediary role discussed in this study found that the total indirect effect of cognition on behaviour through attitude, subjective norms and perceptual behaviour control was 0.404. The upper and lower limits of the 95 % CI did not contain 0, thereby establishing the total indirect effect and indicating that the study of cognition through attitude, subjective norms and perceptual behaviour control partially mediated behaviour. The total effect of cognition on behaviour is 0.519, and the upper and lower limits of the 95 % CI do not contain 0; therefore, the total effect is valid, thus indicating that the cognition of college students has significant direct and indirect effects on volunteer service behaviour.

**Table 4**
Differential validity table.

| Dimension | Average Variance Extraction Value | Pearson Correlation Coefficient and Differential Validity | | | | | |
|---|---|---|---|---|---|---|---|
| | | SN | C | B | BI | PBC | ATT |
| SN | 0.535 | **0.731** | | | | | |
| C | 0.577 | 0.417 | **0.760** | | | | |
| B | 0.622 | 0.703 | 0.514 | **0.789** | | | |
| BI | 0.616 | 0.664 | 0.620 | 0.702 | **0.785** | | |
| PBC | 0.614 | 0.605 | 0.507 | 0.619 | 0.672 | **0.784** | |
| ATT | 0.597 | 0.536 | 0.643 | 0.615 | 0.660 | 0.639 | **0.773** |

Note: The diagonal bold font value is the arithmetic square root of the average variance extraction value, and the lower triangular value is the Pearson correlation coefficient of other dimensions.

**Table 5**
Standard of the fit index.

| Model Fit Index | χ2/df | GFI | AGFI | RMSEA | NFI | NNFI | CFI | IFI | SRMR |
|---|---|---|---|---|---|---|---|---|---|
| Standard | 1–5 | >0.8 | >0.8 | <0.08 | >0.9 | >0.9 | >0.9 | >0.9 | ≤0.08 |
| Actual Model Value | 4.73 | 0.889 | 0.89 | 0.068 | 0.9 | 0.908 | 0.919 | 0.919 | 0.064 |

**Table 6**
Intermediary effect table.

| Path Relationship | Estimated Value | Relevant Indicators | | Bootstrap 5000 times 95%CI | | | |
|---|---|---|---|---|---|---|---|
| | | | | Deviation Correction Percentage | | Percentage | |
| | | Standard Error | Z Value | Lower Limit | Upper Limit | Lower Limit | Upper Limit |
| Indirect Effect (IE) | | | | | | | |
| C-ATT-BI-B | 0.122 | 0.025 | 4.880 | 0.081 | 0.179 | 0.076 | 0.174 |
| C–SN–BI-B | 0.095 | 0.024 | 3.958 | 0.056 | 0.15 | 0.055 | 0.149 |
| C-PBC-BI-B | 0.086 | 0.02 | 4.300 | 0.053 | 0.133 | 0.05 | 0.126 |
| C-PBC-B | 0.102 | 0.037 | 2.757 | 0.031 | 0.181 | 0.029 | 0.178 |
| Total IE | 0.404 | 0.041 | 9.854 | 0.329 | 0.488 | 0.327 | 0.486 |
| Direct Effect (DE) | | | | | | | |
| DE | 0.115 | 0.05 | 2.300 | 0.022 | 0.22 | 0.02 | 0.219 |
| Total Effect (TE) | | | | | | | |
| TE | 0.519 | 0.052 | 9.981 | 0.42 | 0.626 | 0.419 | 0.624 |

Note: C, Cognition; ATT, attitude; BI, behavioural intention; B, behaviour; SN, subjective norms; PBC, perceptual behavioural control.
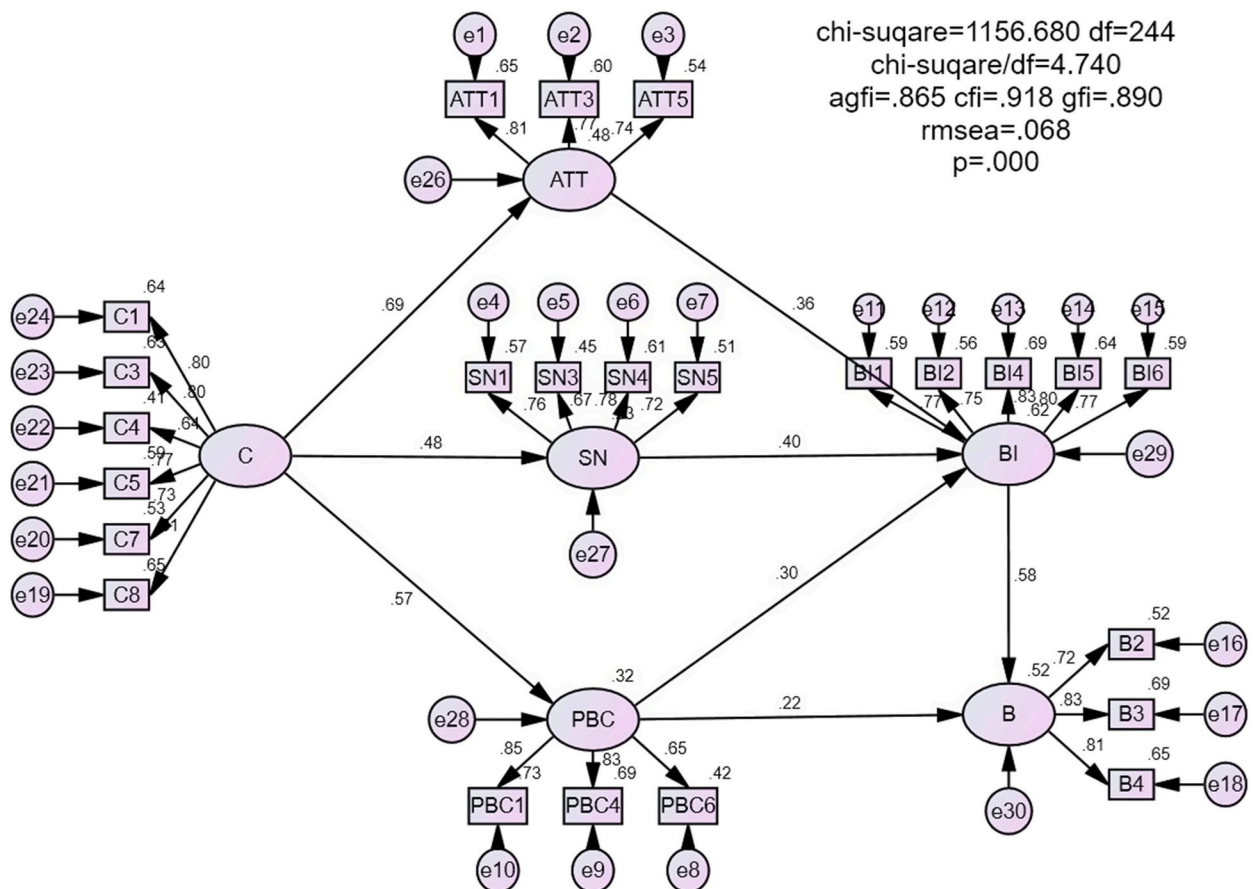


**Fig. 2.** A revised model of college students' volunteer service participation.

*4.8. Hypothesis testing*

The nine hypotheses in the presupposition model were: cognition to attitude, cognition to subjective norms, cognition to perceptual behaviour control, cognition to behaviour, attitude to behavioural intention, the subjective norm to behavioural intention, perceptual behaviour control to behavioural intention, and behavioural intention to behavioural hypothesis relationships (Fig. 2). Table 7 lists the test results. The path coefficient of H9 is 0.120, far lower than the standard value of 0.2; thus, it is not tenable. We assumed that the path coefficient of H7 is 0.188, slightly lower than the standard value of 0.2 and that its regression coefficient is greater than 0.2 after deleting the H9 path. We assumed that seven was valid and within the allowable range. All the other assumed path coefficients of H1, H2, H3, H4, H5, H6, and H8 were >0.2, and the P value was <0.001. The path coefficient is higher than 0.2 and significant; thus, all other assumptions are valid.

## 5. Discussions and suggestions

*5.1. Discussion*

This study used a structural equation model to systematically analyse the influencing factors and relationships between college students' intentions and behaviours to participate in volunteer service. The main conclusions are as follows. First, a significant positive correlation exists between college students' attitudes toward volunteer service and their intention to volunteer ($\beta = 0.353$, $p < 0.001$). This result is consistent with the TPB, which posits that attitudes are one of the main determinants of behavioural intentions [7]. The higher the students' evaluation of volunteer service behaviour, the more willing they are to participate in volunteer service. This finding implies that promoting positive attitudes toward volunteer service among college students can increase their motivation to engage in such activities.

Second, we found a significant positive correlation between college students' subjective norms of volunteer service and their intentions for volunteer service ($\beta = 0.397$, $p < 0.001$). This result also supports the TPB, which suggests that subjective norms reflect the perceived social pressure or expectations from others regarding a specific behaviour [7]. Others or public moral norms affect students' intentions toward volunteer service. The more profound the impact, the stronger the intention to participate in volunteer services. Whether it is the positive influence, the pressure of public morality, or the power to be close to others, it will guide students' willingness to volunteer. This finding indicates that enhancing social support and recognition for volunteer service among college students can foster their sense of responsibility and belonging.

Third, we observed a significant positive correlation between college students' perceived behavioural control of volunteer services and their intention to volunteer ($\beta = 0.305$, $p < 0.001$). Moreover, we found a significant positive correlation between college students' perceived behavioural control over volunteering and their volunteering behaviour ($\beta = 0.188$, $p < 0.001$). This result aligns with the TPB, which proposes that perceived behavioural control reflects the perceived ease or difficulty of performing a behaviour [7]. So, the study provides evidence that perceived behavioural control is essential to college students' volunteering intentions and behaviours. This highlights the importance of ensuring students feel capable of and in the power of volunteering to promote greater participation.

Fourth, we identified a significant positive correlation between college students' volunteer service behaviour intention and volunteer service behaviour ($\beta = 0.520$, $p < 0.001$). This result confirms the TPB, which asserts that behavioural intention is the most proximal predictor of actual behaviour [7]. It indicates that the more active college students' intention to service voluntarily, the more likely they are to engage in volunteer service.

Fifth, we found that college students' cognition of volunteer service behaviour is closely related to their attitudes, subjective norms, and perceptual behaviour control ($\beta = 0.694$, 0.483, and 0.564, respectively, all $p < 0.001$); however, we did not find an apparent direct correlation between their cognition of volunteer service behaviour and their behaviour ($\beta = 0.120$, $p > 0.008$). This study reveals that the emergence of voluntary behaviour is affected by various subjective and objective factors. College students' cognition of volunteer service cannot directly affect whether individuals know to take action. However, they must indirectly affect behaviour by influencing their attitudes, subjective norms, and perceived behavioural control about volunteer service. To explore this issue further, we tested two alternative models: one with a direct path from cognition to behaviour and one with an indirect path from cognition to behaviour through intention. We compared the fit indices of these two models using chi-square difference tests and found that the indirect model had a significantly better fit than the direct model. This result suggests that cognition does not directly impact

**Table 7**
Path analysis table.

| Hypothesis | Path | Path Coefficient | Standard Error | C.R. Value | P Value | Hypothesis Supported |
|---|---|---|---|---|---|---|
| H1 | ATT-C | 0.694 | 0.039 | 16.991 | *** | YES |
| H2 | SN-C | 0.483 | 0.046 | 11.594 | *** | YES |
| H3 | PBC-C | 0.564 | 0.037 | 12.519 | *** | YES |
| H4 | BI-ATT | 0.353 | 0.036 | 9.512 | *** | YES |
| H5 | BI-SN | 0.397 | 0.030 | 10.871 | *** | YES |
| H6 | BI-PBC | 0.305 | 0.041 | 8.368 | *** | YES |
| H7 | B-PBC | 0.188 | 0.052 | 4.217 | *** | YES |
| H8 | B-BI | 0.520 | 0.052 | 10.365 | *** | YES |
| H9 | B–C | 0.120 | 0.043 | 2.653 | .008 | NO |

behaviour but influences behaviour through intention [35]. This finding is consistent with the TPB, which posits that intention mediates the effects of attitudes, subjective norms, and perceived behavioural control on behaviour. Therefore, we favour the indirect and direct models explaining the relationship between cognition and behaviour.

Our study offers several notable strengths that contribute to the robustness and relevance of our findings. First and foremost, the comprehensive adoption of the TPB as the theoretical framework provided a solid foundation for exploring the intricate interplay of cognitive, attitudinal, and situational factors affecting college students' intentions and behaviours toward volunteer service. By grounding our analysis within a well-established framework, our study extends beyond isolated variables and provides a holistic understanding of the motivations driving volunteer engagement. Furthermore, the large and diverse sample of college students drawn from various majors and regions across China enhances the generalizability of our findings. This robust representation underscores the relevance of our conclusions for a broader student population and provides insights that can potentially guide policy and programmatic efforts on a larger scale.

In summary, this study provides empirical evidence for the applicability of the TPB in explaining college students' intentions and behaviours to participate in volunteer service. The results show that attitudes, subjective norms, and perceived behavioural control are significant predictors of intentions, while intentions and perceived behavioural control are significant predictors of behaviours. However, some discrepancies between our findings and the TPB were also observed, such as the lack of direct effect of perceived behavioural control on behaviour and cognition on behaviour. We also discussed our study's possible implications and limitations and suggested directions for future research.

### 5.2. Suggestions

#### 5.2.1. Guide college students' attitude toward volunteer service

In order to foster a positive attitude toward volunteer service among college students, it is imperative to align service opportunities with their physiological needs and self-fulfilment aspirations. When designing volunteer service projects, colleges and universities should conscientiously assess the specific needs of student volunteers, seamlessly integrating their academic knowledge with their chosen majors. By providing tailored experiences that align with their academic pursuits, students can derive a sense of achievement and satisfaction, shaping a positive attitude toward volunteer service. Moreover, universities and volunteer organisations can enhance the impact of unique projects by offering skill-based training sessions that bolster service quality and enrich the overall volunteering experience.

#### 5.2.2. Create a positive atmosphere of volunteer service

Given the profound influence of family dynamics and peer relationships on college students' decision-making, considering these social factors is paramount when promoting volunteer engagement among this population. Educational institutions must actively engage parents and relatives to ensure the familial environment supports and encourages volunteer participation. Leveraging the strong bonds among students, colleges and universities should encourage peer-led initiatives and harness the guidance of educators to promote volunteerism. Engaging social media platforms for volunteer service advocacy and fostering governmental support is pivotal in creating an enabling environment. Society can offer vital encouragement and support by generating widespread recognition of the value of college students' involvement.

#### 5.2.3. Improve volunteer service mechanisms and innovate volunteer service projects

Recognising the profound impact of relevant volunteer service systems on students' engagement, institutions must focus on creating fair and transparent evaluation mechanisms that recognise and appreciate students' contributions. Robust incentive structures encompassing material and non-material rewards are essential in sustaining enthusiasm. Personalised training programs that amalgamate academic theory with practical experience enhance students' skill sets and bolster their commitment to volunteer service. By refining these mechanisms, colleges and universities empower students to contribute while actively enjoying a comprehensive and enriching volunteering experience.

#### 5.2.4. Strengthen the awareness of volunteer service and implement practical education

Collaboration between educational institutions, families, governments, and society is crucial to elevate college students' understanding of volunteer service. Leveraging partnerships, colleges and universities can expand students' cognitive horizons by embedding volunteer service knowledge into curricula. In this digital age, utilising new media platforms can effectively disseminate stories and knowledge about volunteerism. By crafting content that resonates with students' interests, institutions can inspire active participation and broader societal awareness.

## 6. Conclusion

This study revealed that college students' volunteer service cognition significantly positively affects attitude, subjective norms, and perceived behaviour control. Attitude, subjective norms, and perceived behaviour control of volunteer service have a significant positive impact on behaviour intention, and perceived behaviour control and behavioural intention have a significant favourable influence on behaviour. This study confirmed that attitude, subjective norms, perceptual, behavioural control, and behavioural intention, as intermediary variables, have significant causal intermediary effects on cognition and behaviour. It demonstrates that the higher the cognitive level of college students, the more active they are in controlling their attitudes, subjective norms, and perceptual

behaviours toward volunteer service, the higher their behavioural intention to participate in volunteer service, and the more likely they are to engage in volunteer service behaviour. It demonstrates that the higher the cognitive level of college students, the more active they are in controlling their attitudes, subjective norms, and perceptual behaviours toward volunteer service, the higher their behavioural intention to participate in volunteer service, and the more likely they are to engage in volunteer service behaviour.

The findings of this study have important implications for promoting volunteer service among college students and enhancing their social responsibility and civic awareness. Based on the results of this study, we suggest the following aspects should be improved:

1. Guiding attitude: Educators and administrators should cultivate positive attitudes toward volunteer service among college students by emphasising its benefits for personal growth, social development, and moral values. They should also provide opportunities for students to experience volunteer service firsthand and share their stories and reflections with others.
2. Creating atmosphere: Schools and communities should create a supportive and encouraging atmosphere for volunteer service by organising various activities, events, and campaigns that showcase the achievements and contributions of volunteers. They should also recognise and reward outstanding volunteers and role models who can inspire others to join them.
3. Improving mechanisms: Governments and NGOs should improve the mechanisms for volunteer service by establishing clear standards, regulations, and procedures for recruitment, training, supervision, evaluation, and feedback. They should also provide adequate resources, facilities, and incentives for volunteers and ensure their safety and well-being.
4. Innovative projects: Volunteer organisations and agencies should design innovative projects that cater to college students' interests, needs, and abilities. They should also diversify the types, forms, and modes of volunteer service to attract more participants and enhance their satisfaction and engagement.
5. Strengthening support service awareness: Media and public opinion should strengthen the support service awareness of volunteer service by disseminating positive information, stories, and images of volunteers and their work. They should also raise public awareness of the social issues and problems that volunteers address and solicit their support and cooperation.
6. Implementing practical education mechanisms: Colleges and universities should implement practical education mechanisms that integrate volunteer service into the curriculum, teaching methods, assessment criteria, and graduation requirements. They should also provide academic credits, certificates, or scholarships for students who complete certain hours or levels of volunteer service.

This study has several limitations that should be acknowledged. First, it adopted the theory of planned behaviour as the main theoretical framework, which may not capture all the relevant factors influencing volunteer service intentions and behaviours. Future studies could incorporate other variables, such as personal values [36], social support [37], moral obligation [38], etc., to develop a more comprehensive and accurate model of volunteering. Second, it focused on Chinese college students as the sample, which may limit the generalizability and cultural sensitivity of the findings. China's specific cultural values and educational norms may shape volunteering intentions in different ways than other countries and regions. Future studies could test the universality of the intention patterns found in this study by sampling college students from diverse geographical and sociocultural backgrounds. Third, it surveyed a selection of students from Chinese universities, which may not reflect the full range of volunteering intentions and behaviours among Chinese college students. The availability and motivation of volunteer opportunities may vary depending on the local needs and values of different universities and regions in China. Future studies could examine the potential variations in volunteering intentions and behaviours across different educational institutions and geographic areas in China.

In conclusion, our study's strengths lie in its comprehensive theoretical framework, diverse and sizable sample, and meaningful implications for practice and policy. By exploring the correlations, mediating pathways, and underlying dynamics within the TPB, our research delves deep into the factors shaping college students' intentions and behaviours toward volunteer service. Including a diverse range of participants from across China enhances the transferability of our findings, thereby offering insights that resonate beyond our specific sample.

**Data availability statement**

Data will be made available on request.

**CRediT authorship contribution statement**

**Jifan Hu:** Conceptualization, Formal analysis, Writing – original draft, Writing – review & editing. **Tingting Zhang:** Data curation, Formal analysis, Methodology, Writing – original draft. **Hongshen Wang:** Investigation, Methodology, Resources, Writing – original draft. **Zichao Chen:** Conceptualization, Methodology, Project administration, Supervision, Writing – review & editing. **Li Liu:** Project administration, Supervision, Validation, Writing – review & editing.

**Declaration of competing interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2023.e21897.

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