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## Interactive Effects of Intrinsic and Extrinsic Rewards and Contextual Cue Stability on Volunteering Habits

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### Abstract

Volunteer service holds significant value for social governance. Previous research has emphasized promoting volunteer participation by enhancing motivation or role identity, yet has overlooked the role of habit in volunteer service behavior. Moreover, the mechanism underlying the relationship between intrinsic and extrinsic rewards, situational cue stability, and volunteer service behavioral habits remains unclear. Therefore, three sub-studies were designed using in-depth interviews and questionnaire surveys to investigate the influence of intrinsic and extrinsic rewards and situational cue stability on volunteer service behavioral habits. The results revealed that intrinsic rewards (including sense of meaning, sense of pleasure, and sense of self-worth), extrinsic rewards (including honorary rewards, material rewards, and social support and recognition), and situational cue stability (including stability of time, location, activity type, interpersonal relationships, and emotional states) significantly and positively predicted volunteer service behavioral habits. Intrinsic and extrinsic rewards and situational cue stability exhibited an interactive effect on volunteer service behavioral habits; specifically, when situational cue stability was lower, the positive predictive effect of intrinsic or extrinsic rewards on volunteer service behavioral habits was stronger. This indicates that intrinsic and extrinsic rewards and situational cue stability are important facilitators of volunteer service behavioral habits and interactively influence such habits.

## Full Text

### The Interactive Effects of Intrinsic and Extrinsic Rewards and Context Stability on Volunteering Habits

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## Abstract

Volunteering represents a quintessential form of prosocial behavior that requires individuals to devote their time, energy, and skills to benefit others or society. Volunteering not only enhances individual well-being and mental health (Jiang et al., 2021; Lawton et al., 2021), but also plays a crucial role in public crisis response, social resource integration and conflict resolution, and assistance for disadvantaged groups. It holds key value in coordinating relationships among government, market, and society, advancing the construction of a social governance community, and helping build a new pattern of grassroots social governance. As President Xi Jinping emphasized during his 2019 inspection of a community in Tianjin, “volunteering is an important indicator of social civilization and progress” and “volunteering should play an active role in social governance.” Despite its immense value, China’s volunteering sector currently faces numerous practical challenges, including low public willingness to participate, insufficient sustainability of engagement, and high volunteer turnover rates (He & Qi, 2020; Zheng et al., 2020). Therefore, it is essential to implement measures that motivate volunteers to participate in volunteering activities over the long term and in a sustained manner.

Previous research has placed excessive emphasis on motivational and identity orientations in volunteering, highlighting the role of motivation and role identity in volunteering behavior. This has led public policies on volunteering to rely heavily on motivational incentives and identity promotion strategies, such as cultivating altruistic spirit and “carrot-and-stick” reward-punishment measures. In reality, however, a gap exists between attitudes and behaviors, and motivational factors exhibit low explanatory power for volunteering behavior (Mullan et al., 2021). Merely possessing volunteering motivation or participation intentions does not necessarily translate into actual volunteering behavior. For instance, individuals may have positive willingness to participate, yet external factors (such as hot weather or time constraints) may interfere in specific contexts, preventing volunteering behavior from occurring. This phenomenon is also prevalent in domains such as consumer behavior and health behavior (Chi et al., 2022; Gibson et al., 2021). By contrast, behavioral habits possess greater stability and automaticity. Once a behavior becomes habitual, individuals can still perform it despite unfavorable external conditions, drawing

upon the power of habit. An increasing number of studies in recent years have emphasized that habit serves as a crucial mechanism for maintaining positive behaviors, sustaining daily behavior execution, and achieving long-term goals (Du & Li, 2020; Galla & Duckworth, 2015; Gardner et al., 2024; Wood, 2017). Therefore, cultivating volunteers to form volunteering habits may represent an effective approach to motivating their long-term and sustained participation. In the process of volunteering habit formation, rewards and context stability play vital roles and represent two distinct mechanisms of habit formation (Du & Li, 2020; Gardner & Lally, 2018). In light of this, the present study investigated the effects of rewards and context stability on volunteering habits. The findings can not only enrich theoretical research on volunteering habits, but also help optimize public volunteering behavior, providing important theoretical foundations and management strategies for cultivating long-term volunteering mechanisms and constructing new patterns of grassroots social governance.

### 1.1 Volunteering Habits and Their Formation Process

Based on habit theory (Verplanken & Orbell, 2022; Wood et al., 2024), volunteering habits refer to an automated behavior activation pattern in which specific cues trigger volunteering behavior through repeatedly established cue-behavior associations, thereby prompting individuals to automatically engage in volunteering. However, it is important to note that automated participation does not equate to purely mechanical behavior. The formation of volunteering habits involves not only behavior repetition and specific cue dependence, but more deeply relies on individuals' emotional investment, value identification, cognitive judgment, and sense of social responsibility. Therefore, "volunteering habits" should be understood as a participation tendency characterized by automaticity, emotional investment, and value identification, rather than completely unconscious behavioral inertia.

The formation process of volunteering habits can be divided into four stages (Gardner & Lally, 2018): intention formation, behavior execution, behavior repetition, and habit strengthening. In the intention formation stage, individuals develop intentions to participate in volunteering, analyze the potential benefits and drawbacks and feasibility of the behavior, and ultimately decide whether to perform it. In the behavior execution stage, individuals mobilize their resources to translate intentions into actual actions—that is, participating in volunteering. This process may involve self-regulation strategies such as planning (Mullan et al., 2021). Individuals can first develop a detailed plan before participating in volunteering. In the behavior repetition stage, individuals need to repeatedly participate in volunteering. This process may require sustained and strong motivation or intentional participation (Zheng et al., 2020; Qu et al., 2024). In the habit strengthening stage, behavior repetition needs to be matched with contextual cues. Only when behavior repetition occurs in the presence of specific contextual cues can the association between cues and behavior be established and continuously strengthened, thereby enhancing the habit. This also

indicates that not every behavior repetition is effective; rather, behavior repetition must occur in specific contexts to strengthen habits (Gardner et al., 2022; Schnauber-Stockmann & Naab, 2019). Ultimately, as habits strengthen, individuals' volunteering behavior gradually becomes automated and is less influenced by motivation and intention (Mullan et al., 2021).

## 1.2 The Role of Rewards in Volunteering Habit Formation

Rewards can be divided into two forms: intrinsic and extrinsic rewards (Gardner & Lally, 2018; Wood, 2017). Intrinsic rewards refer to the internal positive emotions that the behavior itself brings to individuals, such as pleasure, happiness, and meaningfulness. Extrinsic rewards refer to external material rewards, others' praise, or avoidance of punishment that the behavior brings to individuals.

Intrinsic rewards may play a positive motivational role in the formation of volunteering habits. First, intrinsic rewards can stimulate volunteering intentions. If individuals discover that performing a behavior can bring them pleasant feelings, they will strengthen their intention to perform that behavior (Judah et al., 2018; McCloskey & Johnson, 2019). Second, intrinsic rewards can also help individuals better execute target behaviors according to their intentions and sustain behavior repetition, thereby accelerating the process of establishing associations between contextual cues and target behaviors to strengthen habits. For example, numerous studies have found that intrinsic rewards significantly and positively predict behavior execution, behavior repetition, and habit strength (Di Maio et al., 2022; Judah et al., 2018; Kilb & Labudek, 2022; McCloskey & Johnson, 2019, 2021; Schnauber-Stockmann & Naab, 2019). Similarly, extrinsic rewards may also play a positive motivational role in the formation of volunteering habits. For instance, extrinsic rewards can stimulate behavior intentions (Kim et al., 2023), promote behavior execution and repetition (Mitchell et al., 2020), and enhance habit strength (McCloskey & Johnson, 2021).

Based on the above analysis, we propose Hypothesis 1: Both intrinsic (a) and extrinsic (b) rewards can significantly and positively predict volunteering habits.

## 1.3 The Role of Context Stability in Volunteering Habit Formation

Context stability refers to the degree of stability of contextual cues when target behaviors are repeated. Theoretically, any contextual feature can become a habit cue, yet certain contexts may be more conducive to facilitating the formation of specific habits (Gardner & Lally, 2018; Lally & Gardner, 2013). For example, Kaushal and Rhodes (2015) found that exercising at a fixed time of day (such as 7 a.m. or after dinner) made it easier to form exercise habits. This illustrates the important role of time cue stability in exercise habit formation.

Context stability may play a positive motivational role in the formation of vol-

unteering habits. First, context stability may be positively associated with volunteering intentions and behavior execution. For instance, empirical studies have found significant positive correlations between context stability and behavior intentions (Judah et al., 2018; McCloskey & Johnson, 2019). Additionally, the degree of contextual disruption caused by the COVID-19 pandemic was significantly positively correlated with the degree of decline in individuals' exercise time (Furman et al., 2021). Second, context stability is also positively associated with volunteering behavior repetition and habit strengthening. Once a certain association between contextual cues and target behavior is established, stable contextual cues will automatically trigger behavior repetition, which in turn accelerates the establishment of associations between contextual cues and target behavior to enhance habit strength. For example, empirical research has shown that context stability can positively predict the frequency and habit strength of target behaviors (Judah et al., 2018; Kaushal & Rhodes, 2015; Kilb & Labudek, 2022; McCloskey & Johnson, 2019; Pimm et al., 2016).

Based on the above analysis, we propose Hypothesis 2: Context stability can significantly and positively predict volunteering habits.

#### 1.4 The Interactive Effects of Rewards and Context Stability

The mechanisms through which rewards and context stability influence volunteering habits may differ (Du & Li, 2020). Rewards may primarily function during the intention formation, behavior execution, and behavior repetition stages, while playing a relatively smaller role in other stages. Specifically, rewards (including both intrinsic and extrinsic rewards) may mainly promote volunteering behavior execution and repetition by enhancing motivation or intention. As the frequency of volunteering behavior repetition increases, the number of successful pairings between volunteering behavior and specific contextual cues also increases, thereby strengthening habits. Context stability may primarily function during the habit strengthening stage, while playing a relatively smaller role in other stages. Specifically, context stability may mainly strengthen habits by facilitating precise pairing between volunteering behavior and specific contextual cues, increasing the success rate of such pairings to accelerate the establishment of associations between volunteering behavior and specific contextual cues. In short, rewards promote habit formation by increasing the frequency of volunteering behavior repetition, whereas context stability promotes habit formation by increasing the success rate of pairings between volunteering behavior and specific contextual cues.

Although rewards can promote volunteering behavior repetition to strengthen habits, they may also hinder habit formation. The core characteristic of habits is automaticity (Gardner et al., 2012; Verplanken & Orbell, 2003), which emphasizes that when specific contextual cues appear, they automatically trigger specific behaviors, thereby strengthening the "contextual cue-behavior" association (i.e., habit). However, the strong intentions induced by rewards may inhibit

this automatic process. According to Gardner et al. (2020), when individuals possess strong behavior intentions, they tend to consciously execute behaviors through cognitive effort. This enhancement of conscious regulation 反而 suppresses sensitivity to contextual cues, thereby weakening the establishment of the “contextual cue-behavior” association. Therefore, during the early stages of volunteering habit formation, intention induced by rewards helps promote behavior repetition and strengthen habits. However, during stages with higher automaticity, sustained high-intensity intentions may hinder the transition of volunteering behavior from conscious control to unconscious triggering, thereby weakening the facilitative effect of context stability on volunteering habits. Similarly, during stages with higher automaticity, if stable contextual cues automatically activate the “contextual cue-behavior” association to prompt individuals to act according to habit and further strengthen the habit, this will also inhibit individuals’ sensitivity to rewards, thereby weakening behavior motivation and intention, and ultimately weakening (or even eliminating) the facilitative effect of rewards on volunteering habits. A study on volunteering behavior found a similar phenomenon: when volunteering habits were stronger, intentions had weaker predictive power for volunteering behavior (Mullan et al., 2021).

Based on the above analysis, we propose Hypothesis 3: Intrinsic (a) or extrinsic (b) rewards interact with context stability in predicting volunteering habits, such that when context stability is higher, the positive predictive effects of intrinsic or extrinsic rewards on volunteering habits are weaker; conversely, when context stability is lower, the positive predictive effects of intrinsic or extrinsic rewards on volunteering habits are stronger.

## 1.5 The Current Research

The current research designed three sub-studies to test the three hypotheses proposed above. Rewards and context stability play important facilitative roles in habit formation (Du & Li, 2020; Gardner & Lally, 2018). However, no empirical study has yet systematically and comprehensively examined which types of reward factors and context stability factors help volunteers form volunteering habits. Regarding reward factors, Zhao (2022) categorized rewards into intrinsic rewards (including autonomy, meaning, and engagement), extrinsic rewards (including material rewards and benefit rewards), and social rewards (including peer support, superior support, and social recognition), finding that they could moderate both paths of the “altruistic tendency  $\rightarrow$  volunteering intention  $\rightarrow$  volunteering behavior” mediation model. Additionally, empirical research has revealed that numerous intrinsic reward factors (such as meaningfulness, happiness, and satisfaction; He et al., 2024; Okun et al., 2016; Qu et al., 2024; Zhou et al., 2020) and extrinsic reward factors (such as honorary certificates or titles, monetary compensation, and social support; Dallmeyer et al., 2024; Fracchia et al., 2023; Gallus, 2017; Traeger et al., 2023) have positive effects on volunteering behavior. Regarding context stability factors, no studies have yet examined the relationship between context stability and volunteering behavior or habits.

Drawing upon research in health behavior and exercise domains, we can find that context stability (such as stable time cues) helps promote behavior and strengthen habits (Kaushal & Rhodes, 2015; Kilb & Labudek, 2022; Pimm et al., 2016). In summary, it remains unclear which specific intrinsic and extrinsic rewards and context stability factors are most helpful for promoting the formation of volunteering habits. Therefore, it is essential to conduct an interview study to explore the relatively more important intrinsic and extrinsic rewards and context stability factors. Accordingly, Study 1 aims to explore the intrinsic rewards, extrinsic rewards, and context stability factors that critically facilitate volunteering habits by interviewing experienced volunteers (who possess strong volunteering habits).

Given that interview studies may be subject to substantial researcher subjectivity, Study 2 builds upon Study 1 by designing questionnaires and conducting a large-scale cross-sectional survey to quantitatively examine the effects of intrinsic rewards, extrinsic rewards, and context stability on volunteering habits, thereby enhancing the reliability of the findings. Considering that cross-sectional research designs cannot infer causal directions between variables, Study 3 employs three-wave longitudinal tracking survey data to re-examine the effects of intrinsic rewards, extrinsic rewards, and context stability on volunteering habits. Habit formation requires time, and habit strength is dynamically variable during this process (Kaushal & Rhodes, 2015; Kilb & Labudek, 2022). Longitudinal tracking can not only capture the dynamic change process of volunteering habits, but also reduce common cause bias issues arising from simultaneous measurement of dependent and independent variables in cross-sectional designs, providing stronger evidence for causal relationships. Research indicates that habit formation typically requires several weeks to months (Lally et al., 2010). A three-month interval is sufficiently long to observe relative changes in individuals' behavior patterns, while also avoiding substantial sample attrition or other external interference caused by overly long intervals. This time interval has also been widely adopted in previous volunteering research (e.g., Cox, 2010; Wakefield et al., 2022). Therefore, Study 3 set the tracking survey interval at three months.

## 2.1 Research Purpose

This study aims to explore which types of intrinsic rewards, extrinsic rewards, and context stability factors can help volunteers develop volunteering habits by interviewing experienced volunteers (who possess strong volunteering habits).

### 2.2.1 Interview Participants

Previous interview studies typically included approximately 20-30 participants (Creswell, 2007). Therefore, this study recruited 25 volunteers (13 males, 52%) for interviews. Additionally, Guest et al. (2006) found that 12 interviewees were sufficient to reach theoretical saturation, indicating that our sample size was ade-

quate. Participants' mean age was 30.84 years ( $SD = 9.83$ ). All participants had educational levels of college or above. Detailed demographic information of participants is presented in Supplementary Table S1. All volunteers were recruited through online advertisements. To ensure that recruited volunteers possessed strong volunteering habits, this study set recruitment criteria: a minimum of three years of volunteering experience. After the interviews, participants completed the Self-Report Habit Index (Verplanken & Orbell, 2003) to measure their volunteering habit strength, thereby ensuring the effectiveness of participant recruitment. Results showed that participants' mean volunteering habit strength was 5.57 ( $SD = 0.69$ ), significantly higher than the questionnaire's theoretical midpoint of 4 ( $t(24) = 11.35$ ,  $p < 0.001$ , Cohen's  $d = 0.69$ ). This indicates that the recruitment criteria were effective.

### 2.2.2 Research Instruments

- (1) **Self-designed interview protocol:** The interview protocol was designed by the authors based on research purposes and relevant literature. Interview questions focused on the following aspects: participants' basic information: gender, age, education level, marital status, occupation, etc.; volunteering participation: years of volunteering experience, and duration and frequency of volunteering in the past year; memorable events encountered during volunteering; facilitators of volunteering habits, with volunteers guided when necessary to respond from three aspects: intrinsic, extrinsic, and contextual cues; suggestions for helping other volunteers develop volunteering habits.
- (2) **Self-Report Habit Index:** The Self-Report Habit Index (Verplanken & Orbell, 2003) was used to measure volunteers' volunteering habit strength. This questionnaire is unidimensional but includes three types of items: behavior repetition (3 items; e.g., "I frequently participate in volunteering"), behavior automaticity (8 items; e.g., "For me, participating in volunteering does not require much thought"), and behavior identity (1 item; e.g., "Participating in volunteering is typical of me"). Items were rated on a 7-point Likert scale ranging from "1 = strongly disagree" to "7 = strongly agree," with mean scores representing individuals' habit strength for a particular behavior. Higher scores indicate stronger habit strength. In this study, Cronbach's  $\alpha = 0.70$ .

### 2.2.3 Research Procedure

The authors designed the interview protocol based on research purposes and relevant literature. To reduce the influence of authors' expectations on participants' responses, the authors invited a master's student in psychology to conduct semi-structured interviews with the 25 volunteers. Before the interviews, the authors provided the student with half an hour of training, including how to ask questions and interview considerations. Following the training, the student

conducted online interviews with the 25 volunteers via phone calls or Tencent Meeting. Interviews followed the protocol and were audio-recorded throughout. Prior to the interviews, participants' verbal consent was obtained, and they were informed that the interviews would be recorded. Participants could withdraw at any time during the interviews. To ensure that participants possessed a certain level of volunteering habit strength, they completed the Self-Report Habit Index after the interviews. Participants received monetary compensation for their participation. The average interview duration per participant was approximately 25 minutes. This study was approved by the authors' institutional ethics committee (approval number: HR2023-07-005; same for subsequent studies).

## 2.2.4 Data Analysis

First, audio recordings of the interviews were transcribed into text files. After transcription, the authors repeatedly listened to the recordings to understand participants' meanings, then corrected typos and erroneous sentences in the transcripts to ensure transcription accuracy. Subsequently, based on research purposes and relevant literature (Xu, 2018; Xu & Zhong, 2019; Stirling et al., 2023), thematic analysis (Braun & Clarke, 2006) was used to analyze the interview text data, and sub-themes and themes emerging from the text data were coded. Following a similar study (Stirling et al., 2023), researcher triangulation (Nowell et al., 2017) was employed to ensure the reliability of the thematic analysis. The first author and two master's students in psychology first familiarized themselves with the interview text data and coded independently, then discussed together and adjusted disputed coding. The inter-coder consistency data for the three coders are presented in Supplementary Table S2.

**Table 1** Identified Themes, Sub-themes, and Coding Keywords

Theme	Sub-theme	Kappa	Coding Keywords
<b>Intrinsic Rewards</b>	Meaningfulness	-	meaningful, correct
	Happiness	-	happy, joyful, pleasant, comfortable
	Self-worth	-	self-worth, needed, useful, helpful, valuable
<b>Extrinsic Rewards</b>	Honorary rewards	-	honorary titles, certificates, medals, badges, souvenirs
	Material rewards	-	rice, flour, oil, money, credits, subsidies, transportation/meal allowances
	Social support & recognition	-	recognition from others, affirmed, respected, appreciated, thanked, supported

Theme	Sub-theme	Kappa	Coding Keywords
<b>Context Stability</b>	Time cue stability	-	weekends, Ocean Day, winter/summer vacations, during holidays
	Place cue stability	-	specific locations, regularly going to one community, considering commute time
	Activity type stability	-	regularly doing several types of volunteering, matching personal interests, hobbies, abilities
	Interpersonal cue stability	-	can help each other, volunteer buddies, go together
	Mood stability	-	adjust mindset, full mental state, smiling

*Note: Kappa is the inter-coder consistency coefficient (0.00-0.20 = poor agreement; 0.21-0.40 = fair agreement; 0.41-0.60 = moderate agreement; 0.61-0.80 = good agreement; 0.81-1.00 = excellent agreement; Landis & Koch, 1977).*

## 2.3 Research Findings

Through thematic analysis of the interview text data, three expected themes were identified: intrinsic rewards, extrinsic rewards, and context stability. Intrinsic rewards included three sub-themes, named meaningfulness, happiness, and self-worth. Extrinsic rewards included three sub-themes, named honorary rewards, material rewards, and social support and recognition. Context stability included five sub-themes, named time cue stability, place cue stability, activity type stability, interpersonal cue stability, and mood stability. The identified themes, sub-themes, and coding keywords are summarized in Table 1. These results are described in detail below.

### 2.3.1 Theme 1: Intrinsic Rewards

**(1) Meaningfulness:** Meaningfulness refers to volunteers' feelings about the social value of volunteering itself or their participation, the importance of goals, and its positive impact on others or society (He et al., 2024; Steger et al., 2006), focusing on judgments of "whether volunteering is worthwhile." Approximately 83% of volunteers mentioned meaningfulness. They expressed that participating in volunteering is a very meaningful activity. Therefore, meaningfulness may play an important facilitative role in helping them develop volunteering habits.

"Every time I finish volunteering, I feel very fulfilled, very satisfied, like I've truly helped others...You would think that doing volunteer

service is very meaningful. You might also think about continuing next time, because this is something meaningful” (V5, male, 27 years old).

“Gradually doing it, gradually doing it, you get used to it, and you don’ t necessarily think you must get something, like rewards or whatever; you just feel that doing it this way is quite meaningful” (V7, male, 21 years old).

**(2) Happiness:** Happiness refers to the positive emotions such as joy, delight, and pleasure that volunteers experience during volunteering. Approximately 79% of volunteers mentioned happiness. They expressed that they feel very happy and joyful while participating in volunteering activities. Therefore, happiness may also be an important factor promoting volunteering habits.

“Colleagues around me often think I’ m meddling when they talk to me, wondering why I’ m so willing to do something that has no direct material return—I don’ t think this needs understanding; I just do it myself, and I don’ t necessarily require others to do the same. I think it’ s okay if I want to do it myself, and I’ m quite happy doing it” (V16, female, 52 years old).

“During the pandemic—going door-to-door delivering notices, or distributing some food or fruit. After doing that volunteer service, I felt particularly happy with each household I served, and also felt that I helped others, and my heart was especially moved” (V22, male, 23 years old).

**(3) Self-worth:** Self-worth refers to volunteers’ feelings about “whether they have value” through self-contribution and feedback from others during volunteering (Rosenberg, 1965), focusing more on the impact of volunteering behavior on self-evaluation and self-respect. Approximately 81% of volunteers mentioned self-worth. They expressed that through participating in volunteering, they can feel capable, valuable, needed, and able to provide some small help to others or society. Therefore, self-worth may also be one of the important factors promoting volunteering habits.

“I feel that participating in these activities to help others is a manifestation of self-worth—By helping some elderly people in nursing homes, I feel this is a way to realize self-worth” (V3, male, 32 years old).

“I think it helps my personal and social value, making me feel like I’ m a useful person to society. I’ ve invested myself in this volunteering, I’ ve served so many people, and my sense of self-worth has been realized. I also feel that I’ m a person with social value, that I might be of some help to this society” (V6, female, 25 years old).

### 2.3.2 Theme 2: Extrinsic Rewards

**(1) Honorary Rewards:** Honorary rewards refer to honor-based rewards that volunteers receive during volunteering, including honorary titles, certificates, or other souvenirs. Approximately 51% of volunteers mentioned honorary rewards. They expressed that these items serve as proof of their volunteering participation and bring them spiritual satisfaction. Every time they see these items, they feel a spontaneous sense of pride. Therefore, honorary rewards may also be one of the important factors promoting volunteering habits.

“From a personal perspective...I still hope that after we finish volunteer activities, without talking about monetary rewards, we should at least give everyone a certificate of honor. When people see this, they actually feel a spontaneous sense of pride in their hearts...This is what I think is a very important external point” (V6, female, 25 years old).

“You participate in this thing, and although there may be no monetary or material return, it will give you some souvenirs, and these souvenirs are also very important. They are...proof that you have dedicated your love, a kind of medal” (V12, female, 26 years old).

**(2) Material Rewards:** Material rewards refer to material-based rewards that volunteers receive during volunteering, including money, credits, subsidies, or other prizes. Approximately 53% of volunteers mentioned material rewards. For student volunteers, they are more concerned about exchanging volunteering hours for credits to meet school scholarship or graduation requirements. For other volunteers, they may not pay much attention to material rewards from volunteering. However, they believe that having some subsidies is naturally better than having nothing, as it allows volunteers to engage in volunteering more purely, at least reducing volunteers' financial concerns. Therefore, material rewards may also play a certain role in developing volunteering habits.

“Because I'm still a student, I think the addition of these credits is very important to me, or extremely important, and also a relatively utilitarian aspect” (V6, female, 25 years old).

“If this activity has subsidies, then everyone's enthusiasm for signing up will definitely be higher. I think this can solve their transportation and meal allowance issues, which actually helps them do this thing more purely” (V15, male, 18 years old).

**(3) Social Support and Recognition:** Social support and recognition refer to the encouragement, support, affirmation, and recognition that volunteers perceive from others, family, organizations, or society. Approximately 64% of volunteers mentioned social support and recognition, including support from family or friends, gratitude from recipients, and praise or recognition from others or organizations. These serve as positive feedback that reinforces volunteers' continued investment in volunteering. Therefore, social support and recognition

may be one of the important factors helping volunteers develop volunteering habits.

“I feel it’s particularly warm, a warm thing, being a volunteer… That’s the girl who used to help us with nucleic acid testing, and she would smile at me. During the pandemic, they would also say thank you to me, and I would feel this warmth, and I would always remember it in my heart” (V1, female, 22 years old).

“We humans ultimately hope to gain recognition from others, hoping to be useful in our human community. When others affirm my value, I naturally feel proud and honored. This is also very good positive feedback, and this positive feedback will also reinforce my continued investment in such volunteering” (V6, female, 25 years old).

“When I get a certificate, I’m very happy, and I also like to share it with friends and family. They are all very supportive of me…They are quite happy every time they see me get a certificate” (V22, male, 23 years old).

### 2.3.3 Theme 3: Context Stability

**(1) Time Cue Stability:** Time cue stability refers to volunteers’ tendency to participate in volunteering at fixed times (such as a specific time of day or day of the week). Approximately 31% of volunteers mentioned time cue stability. Some volunteers expressed that due to needing to balance work and family, they only participate in volunteering on weekends. Meanwhile, some volunteers, who are also organizers and initiators of volunteer activities, tend to organize volunteering activities on weekends or during winter/summer vacations to allow more people to have time to participate. Therefore, fixed volunteering times may be one of the important factors in developing volunteering habits.

“It’s usually on weekends. On weekdays, I generally don’t go, because I have work on weekdays. Weekdays are quite busy, and I also have a family, so I can’t go” (V3, male, 32 years old).

“On Ocean Day, we unify it on Ocean Day itself, regardless of what day of the week it is. Other times are basically during winter/summer vacations or on Saturdays and Sundays when there are many people, when children are on vacation and parents are on vacation, that’s when we do these things” (V14, male, 40 years old).

**(2) Place Cue Stability:** Place cue stability refers to volunteers’ tendency to participate in volunteering at fixed locations (such as a particular school or community). Approximately 25% of volunteers mentioned place cue stability. They often conduct volunteering at specific locations. This may be one of the important factors in developing volunteering habits. Additionally, some volunteers hope that the distance between the volunteering location and their residence is

not too far; otherwise, commuting would be a major issue that might hinder the development of volunteering habits.

“If it’s by the sea, we’re in that area of XX Bay, which is like a point in that area, or in the county town, by a river, a small river, that area by the river has specific points” (V14, male, 40 years old).

“For the past two years, I’ve been regularly going to one community to teach migrant children” and “I consider commute time, not too far away” (V23, female, 25 years old).

**(3) Activity Type Stability:** Activity type stability refers to volunteers’ tendency to participate in specific types of volunteering, such as environmental protection or child care. Approximately 41% of volunteers mentioned activity type stability. Some volunteers expressed that they tend to do volunteering they are good at or that matches their interests and hobbies. Therefore, fixed volunteering types may be one of the important factors in developing volunteering habits.

“If it’s specific, I might choose, that is, several types of services that I regularly and fixedly do, such as blood donation stations, environmental protection, these fixed types I would do” (V15, male, 18 years old).

“In terms of type, there might be preferences based on personal hobbies or interests. For example, what I participate in might be more education-oriented, and some activity types might be more frequent” (V18, female, 23 years old).

**(4) Interpersonal Cue Stability:** Interpersonal cue stability refers to volunteers’ tendency to participate in volunteering with specific partners or teams. Approximately 37% of volunteers mentioned interpersonal cue stability. Some volunteers mentioned going with companions or teams to volunteer. Although many volunteers participate in volunteering alone, if the other person has time, they would very much like to go with them, as they can help each other during the service process. Therefore, stable interpersonal cues may promote the development of volunteering habits.

“At school, it’s basically with roommates. Outside of school, it’s also with some good friends. I feel that going with someone familiar and close, you can help each other, and it’s easier to talk” (V7, male, 21 years old).

“If in a specific area, we also have some volunteer buddies, we might arrange to do it together. Everyone calls out saying let’s go see orphans today, and we all go together” (V15, male, 18 years old).

**(5) Mood Stability:** Mood stability refers to volunteers’ tendency to participate in volunteering only when in specific emotional states (such as when in a good mood). Wood (2017) proposed that internal states can be regarded as

contextual cues. Meanwhile, Pimm et al. (2016) treated internal mood states as contextual cues and found that their stability could significantly and positively predict physical activity habit strength. Therefore, in this paper, mood stability is also treated as a type of context stability. Approximately 32% of volunteers mentioned mood stability. Some volunteers expressed that they only participate in volunteering when in a good emotional state to avoid passing negative emotions to recipients. If they must participate in emergencies, they would definitely adjust their emotional state first. Therefore, internal mood states may also promote the development of volunteering habits.

“When I’m feeling down, I generally don’t participate. Because if you have negative emotions, it’s easy to pass them on to recipients, so I basically adjust my mindset—I won’t say I go to contact recipients with a negative emotion” (V2, male, 22 years old).

“I think when you participate in these activities, you should participate with a full mental state. You can’t go there gloomy or absent-minded, otherwise you won’t do things well” (V3, male, 32 years old).

## 2.4 Discussion

Overall, both intrinsic rewards (i.e., internal positive emotions such as meaningfulness, happiness, and self-worth) and extrinsic rewards (i.e., external incentives such as honorary rewards, material rewards, and social support and recognition) play a “positive feedback” role in the process of volunteering habit formation. Volunteers may repeatedly and continuously engage in volunteering and firmly dedicate themselves to the volunteering cause precisely after experiencing such positive feedback, ultimately developing volunteering habits. Additionally, context stability (i.e., factors such as time, place, activity type, interpersonal, and mood stability) may also facilitate the development of volunteering habits. These findings provide preliminary support for Hypotheses 1a, 1b, and 2. Based on these findings, Study 2 plans to design questionnaires to examine the effects of intrinsic rewards, extrinsic rewards, and context stability on volunteering habits.

## 3.1 Research Purpose

In Study 1, analysis of qualitative interview data identified three types of intrinsic rewards (meaningfulness, happiness, and self-worth), three types of extrinsic rewards (honorary rewards, material rewards, and social support and recognition), and five types of context stability (time cue stability, place cue stability, activity type stability, interpersonal cue stability, and mood stability) as potential important facilitators of volunteering habits. Therefore, Study 2 aims to design questionnaires and use large-sample cross-sectional survey data to further verify whether intrinsic rewards (including meaningfulness, happiness, and self-worth), extrinsic rewards (including honorary rewards, material rewards, and

social support and recognition), and context stability (including time, place, activity type, interpersonal, and mood stability) can significantly and positively predict volunteering habits.

### 3.2.1 Participants

This study utilized two participant samples. Sample 1 was used to examine the reliability and validity of the self-designed questionnaires. This sample data came from the second and third waves of a tracking project. Participants were from volunteer organizations managed by university youth leagues at two universities. In the second wave, 655 questionnaires were received. Among them, 196 questionnaires had potential issues (e.g., overly short response time, failed attention check items, duplicate responses). After excluding these problematic questionnaires, 459 questionnaires remained. These volunteers had a mean age of 19.74 years ( $SD = 1.61$ ), with 86.71% being female. Approximately four months later, the remaining 459 volunteers were surveyed in the third wave, with 357 volunteers completing it. After excluding 78 potentially problematic questionnaires, 279 volunteers remained (88.53% female). Therefore, Sample 1 included 279 paired data points, which were used to examine the test-retest reliability of the self-designed questionnaires.

Sample 2 was used to examine predictors of volunteering habits. This sample included 3,175 questionnaires. Participants were from multiple volunteer organizations across the country. During subsequent data preprocessing, 750 questionnaires were excluded for reasons including: overly short response time, failed lie detection items, duplicate responses, selecting the same option for all items, etc. Ultimately, 2,425 valid questionnaires remained. Among them, 1,572 were community volunteers and 853 were student volunteers. Community volunteers had a mean age of 28.62 years ( $SD = 5.81$ ), with 58.97% male, 88.68% having college-level education or above, and 48.09% married. These volunteers had approximately 1-3 years of volunteering experience ( $M = 2.40$ ,  $SD = 0.86$ ). In the past three months, these volunteers participated in volunteering for approximately 20-39 hours ( $M = 3.28$ ,  $SD = 1.09$ ) at a frequency of about 2-3 times per month ( $M = 3.84$ ,  $SD = 1.20$ ). Student volunteers had a mean age of 21.09 years ( $SD = 2.06$ ), with 59.91% male, 95.19% having college-level education or above, and 1.06% married. These volunteers had approximately 1-3 years of volunteering experience ( $M = 1.87$ ,  $SD = 0.56$ ). In the past three months, these volunteers participated in volunteering for approximately 20-39 hours ( $M = 3.12$ ,  $SD = 0.98$ ) at a frequency of about 2-3 times per month ( $M = 3.79$ ,  $SD = 1.16$ ). Given that the volunteering logic of community members and students may differ substantially—for instance, the former participate more out of public spirit while the latter more to fulfill credit requirements—analyzing these two volunteer groups separately is more appropriate. Additionally, multi-group comparisons were conducted to examine whether research findings differed between community and student volunteer groups.

### 3.2.2 Research Instruments

- (1) **Demographic Information:** Participants reported personal information including gender (1 = male; 2 = female), age, education level (1 = no schooling; 2 = elementary school; 3 = middle school; 4 = college; 5 = graduate), marital status (1 = married; 2 = unmarried), years of volunteering experience (1 = less than 1 year; 2 = 1-3 years; 3 = 4-6 years; 4 = 7-9 years; 5 = 10 years or more), and volunteering duration (1 = no participation; 2 = less than 20 hours; 3 = 20-39 hours; 4 = 40-79 hours; 5 = 80-159 hours; 6 = 160 hours or more) and frequency (1 = no participation; 2 = less than once per month; 3 = once per month; 4 = 2-3 times per month; 5 = once per week; 6 = 2-3 times per week; 7 = 4 times or more per week) in the past three months.
- (2) **Volunteering Habits:** The Self-Report Habit Index for Volunteering, developed by Verplanken and Orbell (2003) and revised by Qu et al. (2025), was used to measure volunteers' volunteering habit strength. This questionnaire demonstrates good reliability and validity among Chinese volunteer samples (Qu et al., 2025). The questionnaire includes three dimensions: repetition and efficacy (4 items; e.g., "I frequently participate in volunteering"), uncontrollability (3 items; e.g., "I find it difficult not to participate in volunteering"), and automaticity (3 items; e.g., "For me, participating in volunteering does not require much thought"). Items were rated on a 7-point scale from "1 = strongly disagree" to "7 = strongly agree." In Sample 2, Cronbach's  $\alpha$  was 0.80 for community volunteers and 0.78 for student volunteers.
- (3) **Volunteering Intrinsic Rewards:** A self-designed Volunteering Intrinsic Rewards Questionnaire was used to measure the degree of intrinsic rewards volunteers experienced during volunteering. This questionnaire includes three dimensions: meaningfulness (3 items; e.g., "The volunteering work I do is meaningful"), happiness (3 items; e.g., "Participating in volunteering makes me feel happy"), and self-worth (3 items; e.g., "Participating in volunteering makes me feel like a valuable person"). Items were rated on a 7-point scale from "1 = strongly disagree" to "7 = strongly agree." Items measuring meaningfulness and happiness were adapted from Zhou et al. (2020); items measuring self-worth were independently designed by the authors based on interview data from Study 1. In Sample 2, Cronbach's  $\alpha$  was 0.91 for community volunteers and 0.91 for student volunteers.
- (4) **Volunteering Extrinsic Rewards:** A self-designed Volunteering Extrinsic Rewards Questionnaire was used to measure the degree of extrinsic rewards volunteers received or perceived during volunteering. This questionnaire includes two dimensions: honor and material rewards (4 items; e.g., "I frequently receive honorary rewards such as honorary titles and certificates from volunteer organizations"; "I frequently receive material rewards such as money, gifts, coupons, and credits from volunteer organi-

zations” ) and social support and recognition (3 items; e.g., “Family and friends support me in volunteering” ; “Volunteering earns me recognition and appreciation from others” ). Items were rated on a 7-point scale from “1 = strongly disagree” to “7 = strongly agree.” All items were independently designed by the authors based on interview data from Study 1. In Sample 2, Cronbach’ s  $\alpha$  was 0.76 for community volunteers and 0.78 for student volunteers.

- (5) **Volunteering Context Stability:** A self-designed Volunteering Context Stability Questionnaire was used to measure the degree of context stability volunteers perceived during volunteering. This questionnaire includes 5 items, each corresponding to time (e.g., “Each time I participate in volunteering at the same time” ), place (e.g., “Each time I participate in volunteering at the same place” ), interpersonal, activity type, and mood stability. Items were rated on a 7-point scale from “1 = strongly disagree” to “7 = strongly agree.” All items were adapted from Pimm et al. (2016). In Sample 2, Cronbach’ s  $\alpha$  was 0.80 for community volunteers and 0.75 for student volunteers.

### 3.2.3 Research Procedure

This study collected data through the Wenjuanxing platform. After creating the survey questionnaire on the platform, a QR code or link was generated and shared in volunteer WeChat groups (with permission from volunteer organization managers) to invite volunteers to participate. When completing the questionnaire, participants were required to leave their phone number or email as contact information, which was also used for data matching. The questionnaire included an informed consent form; completing the questionnaire indicated participants’ consent to join the study. Participants received monetary compensation for completing the questionnaire. Data collection for Sample 2 was conducted after analyzing Sample 1 data to confirm that the questionnaires had good reliability and validity.

### 3.2.4 Data Analysis

The Wenjuanxing platform can be set to require completion of all items before submission, so this study’ s data had no missing values. First, Harman’ s single-factor test was used to examine common method bias (Zhou & Long, 2004). Second, exploratory factor analysis, confirmatory factor analysis, and reliability analysis were conducted in Sample 1 to examine the reliability and validity of the self-designed questionnaires. Model fit was evaluated using CFI, RMSEA, and SRMR indices.  $CFI \geq 0.95$ ,  $RMSEA \leq 0.06$ , and  $SRMR \leq 0.08$  indicate good model fit;  $0.90 \leq CFI \leq 0.94$ ,  $0.07 \leq RMSEA \leq 0.10$ , and  $0.09 \leq SRMR \leq 0.10$  indicate acceptable model fit (Hu & Bentler, 1999). Cronbach’ s  $\alpha$  was used to assess internal consistency reliability. The “psych” R package was used to calculate Pearson correlation coefficients and two types of intraclass correlation

coefficients (ICC(2,1) and ICC(3,1)) between the two measurements to evaluate test-retest reliability (Parsons et al., 2019). ICC values of 0.40–0.59 indicate acceptable test-retest reliability; 0.60–0.79 indicate good test-retest reliability (Ma et al., 2023).

Third, descriptive statistics and correlation analysis were conducted in Sample 2. Fourth, linear regression analysis was performed in Sample 2. Specifically, multi-group structural equation modeling was used to examine the predictive effects of research variables and their interaction terms on volunteering habit strength, and Wald's chi-square statistics were used to compare whether these effects differed significantly between community and student volunteer samples (Wang et al., 2011). Given that demographic variables may influence volunteering outcomes (Zhang, 2022; Zheng et al., 2020), demographic variables (including gender, age, education level, and marital status) were controlled for in regression and interaction effect analyses. Demographic variables regarding volunteering years, duration, and frequency were not controlled in the data analysis for two reasons: First, they reflect individuals' volunteering habit strength. For example, volunteers with longer volunteering years, greater duration, and higher frequency should naturally have stronger volunteering habits compared to those with shorter years, less duration, and lower frequency. Second, the volunteering habit measurement tool used in this study already includes components such as volunteering years, duration, and frequency. For instance, the item "I frequently participate in volunteering" reflects the "frequency" component. Therefore, not controlling for them is more reasonable. Controlling for them would lead to underestimation of the effects of intrinsic/extrinsic rewards and context stability on volunteering habits.

All data analyses were conducted using SPSS 29.0, Mplus 8.3, and RStudio (version: 2024.04.1).

### 3.3.1 Common Method Bias Test

In Samples 1 and 2, the first common factor explained 35.17%, 32.29% (community volunteers), and 31.25% (student volunteers) of the variance, respectively, all below the 40% threshold. Therefore, this study's data did not have serious common method bias issues.

### 3.3.2 Reliability and Validity Tests of Self-Designed Questionnaires

The Volunteering Intrinsic Rewards, Extrinsic Rewards, and Context Stability questionnaires all contained self-designed items and therefore required reliability and validity testing. First, exploratory and confirmatory factor analyses were conducted on the three questionnaires in Sample 1 to examine structural validity. Results (see Supplementary Tables S3 and S4) showed reasonable questionnaire structure and acceptable model fit (CFI = 0.97–0.99, RMSEA = 0.05–0.08, SRMR = 0.02–0.04), with standardized factor loadings all significant and

greater than 0.40, indicating good structural validity for the three questionnaires. Second, reliability analysis was conducted on the three questionnaires in Sample 1. Results (see Supplementary Table S4) showed that all questionnaires had Cronbach's  $\alpha > 0.70$ , and all questionnaire scores had significant auto-correlations greater than 0.40 across the two time points, with ICC(2,1) and ICC(3,1) values all greater than 0.40, indicating that the internal consistency and test-retest reliability of the three questionnaires were within acceptable ranges.

### 3.3.3 Descriptive Statistics and Correlation Analysis

Means, standard deviations, and pairwise correlations among all variables are presented in Table 2. Correlation analysis indicated that intrinsic rewards, extrinsic rewards, and context stability were all significantly positively correlated with volunteering habit strength in both volunteer samples ( $r_s = 0.42-0.55$ ,  $p_s < 0.001$ ).

### 3.3.4 Predictive Effects of Intrinsic/Extrinsic Rewards and Context Stability on Volunteering Habits

Multi-group structural equation modeling was used to examine the predictive effects of intrinsic/extrinsic rewards and context stability on volunteering habit strength, and whether these effects differed significantly between community and student volunteer samples. Results (see Table 3) showed that in both community and student volunteer samples, intrinsic rewards ( $\beta = 0.38$  and  $0.35$ ,  $p_s < 0.001$ ), extrinsic rewards ( $\beta = 0.22$  and  $0.25$ ,  $p_s < 0.001$ ), and context stability ( $\beta = 0.21$  and  $0.20$ ,  $p_s < 0.001$ ) all significantly and positively predicted volunteering habit strength, and these effects did not differ significantly between the two groups (Wald  $\chi^2 = 1.10, 0.58$ , and  $0.03$ ,  $p_s = 0.294, 0.445$ , and  $0.866$ ).

### 3.3.5 Interactive Effects of Intrinsic/Extrinsic Rewards and Context Stability on Volunteering Habits

Multi-group structural equation modeling was used to examine the interactive effects of intrinsic/extrinsic rewards and context stability on volunteering habit strength, and whether these effects differed significantly between community and student volunteer samples. Results (see Table 4) showed that the effect of intrinsic rewards  $\times$  context stability on volunteering habit strength was significant in both community and student volunteer samples ( $\beta = -0.46$  and  $-0.77$ ,  $p_s = 0.029$  and  $0.018$ ), and this effect did not differ significantly between the two groups (Wald  $\chi^2 = 0.78$ ,  $p = 0.379$ ). The effect of extrinsic rewards  $\times$  context stability on volunteering habit strength was not significant in either community or student volunteer samples ( $\beta = 0.21$  and  $0.18$ ,  $p_s = 0.217$  and  $0.484$ ), and this effect did not differ significantly between the two groups (Wald  $\chi^2 = 0.00$ ,  $p = 0.955$ ).

Further simple slope analyses showed that in the community volunteer sample (see Figure 1a [Figure 1: see original paper]), when volunteers' context stability was at mean + 1 SD, the predictive effect of intrinsic rewards on habit strength was weaker ( $\beta = 0.37$ ,  $p < 0.001$ , 95% CI = [0.29, 0.45]); when context stability was at mean -1 SD, the predictive effect of intrinsic rewards on habit strength was stronger ( $\beta = 0.46$ ,  $p < 0.001$ , 95% CI = [0.41, 0.51]). In the student volunteer sample (see Figure 1b), when context stability was at mean + 1 SD, the predictive effect of intrinsic rewards on habit strength was weaker ( $\beta = 0.29$ ,  $p < 0.001$ , 95% CI = [0.19, 0.40]); when context stability was at mean -1 SD, the predictive effect of intrinsic rewards on habit strength was stronger ( $\beta = 0.44$ ,  $p < 0.001$ , 95% CI = [0.36, 0.52]).

Given that intrinsic and extrinsic rewards may interactively predict volunteering habit strength, this effect was examined. Results (see Table 5) showed that in the community volunteer sample, the effect of intrinsic rewards  $\times$  extrinsic rewards on volunteering habit strength was significant ( $\beta = -0.49$ ,  $p = 0.004$ ); in the student volunteer sample, this effect was not significant ( $\beta = -0.02$ ,  $p = 0.928$ ). Additionally, multi-group comparison results indicated that the interaction effect size did not differ significantly between the two samples (Wald  $\chi^2 = 2.23$ ,  $p = 0.135$ ).

Further simple slope analysis showed (see Figure 1c) that in the community volunteer sample, when extrinsic reward level was at mean + 1 SD, the predictive effect of intrinsic rewards on habit strength was weaker ( $\beta = 0.40$ ,  $p < 0.001$ , 95% CI = [0.32, 0.47]); when extrinsic reward level was at mean -1 SD, the predictive effect of intrinsic rewards on habit strength was stronger ( $\beta = 0.49$ ,  $p < 0.001$ , 95% CI = [0.44, 0.54]).

### 3.4 Discussion

Research evidence indicates that intrinsic rewards, extrinsic rewards, and context stability all significantly and positively predict volunteering habit strength. The interactive effect between intrinsic rewards and context stability on habit strength was significant: when context stability was higher, the positive predictive effect of intrinsic rewards on habit strength was weaker; when context stability was lower, the positive predictive effect of intrinsic rewards on habit strength was stronger. The interactive effect between extrinsic rewards and context stability on habit strength was not significant. These findings did not differ significantly between community and student volunteer samples. Thus, Hypotheses 1a, 1b, 2, and 3a were supported.

However, Hypothesis 3b was not supported. This may be because part of the effect of extrinsic rewards was attributed to intrinsic rewards, resulting in a non-significant interactive effect between extrinsic rewards and context stability on habit strength. Extrinsic rewards may enhance volunteers' intrinsic reward levels (Grant & Gino, 2010; Lee et al., 2019; Stirling et al., 2023). For example, receiving honorary certificates or gratitude from recipients may make volunteers

happier or feel that volunteering is more meaningful. Therefore, when intrinsic and extrinsic rewards are included in the same model, part of the effect of extrinsic rewards is attributed to intrinsic rewards, leading to a non-significant interactive effect between extrinsic rewards and context stability.

Research evidence indicates that in the community volunteer sample, the interactive effect between intrinsic and extrinsic rewards on habit strength was significant: when extrinsic reward level was higher, the positive predictive effect of intrinsic rewards on habit strength was weaker; when extrinsic reward level was lower, the positive predictive effect of intrinsic rewards on habit strength was stronger. In the student volunteer sample, the interactive effect between intrinsic and extrinsic rewards on habit strength was not significant. The interactive effect between intrinsic and extrinsic rewards on habit strength did not differ significantly between the two samples.

These two results are not contradictory, because “one effect being significant while another is not does not mean that the difference between the two effects is significant” (Gelman & Stern, 2006). Significance within individual groups depends on the combined influence of effect size, sample size, and standard error. The community volunteer sample was larger ( $N = 1,572$ ) with smaller standard errors, making even small effects more likely to reach significance; the student volunteer sample was smaller ( $N = 853$ ) with larger standard errors, making even similar effects potentially non-significant. Multi-group comparison tests directly assess whether effect size differences exceed sampling error. Our results indicate that the differences between groups were insufficient to be statistically distinguished. Therefore, caution should be exercised to avoid conflating “significance of difference” with “difference in significance.”

Given the cross-sectional nature of Study 2, causal directions between variables cannot be inferred. Therefore, Study 3 re-examined the effects of intrinsic/extrinsic rewards and context stability on volunteering habits using three-wave longitudinal data.

## 4.1 Research Purpose

Study 3 aims to re-examine the effects of intrinsic/extrinsic rewards and context stability on volunteering habits using three-wave longitudinal data, thereby inferring causal directions between variables.

### 4.2.1 Participants

Participants were partly from multiple volunteer organizations across the country (excluding those that had participated in Study 2) and partly from volunteer organizations managed by university youth leagues at several universities. In the initial measurement (T1), 1,619 questionnaires were received. During data cleaning, 263 questionnaires were found to have potential issues (e.g., overly short response time, failed lie detection items, selecting the same option for all

items) and were excluded, leaving 1,356 questionnaires. Three months later, a second survey was administered to these valid participants, yielding 720 valid questionnaires (response rate = 53.10%). The relatively low response rate may have been because SMS or email invitations were mistaken for scam messages. After confirming the authenticity of SMS or email invitations, the response rate for the third wave increased noticeably. Another three months later, a third survey was administered to the 720 participants who had completed the second wave, yielding 623 valid questionnaires (response rate = 86.53%). Therefore, this study obtained 623 valid longitudinal data points. At T1, these valid participants had a mean age of 23.73 years ( $SD = 5.29$ ), with 47.51% male, 95.18% having college-level education or above, and 20.06% married. They reported approximately 1-3 years of volunteering experience ( $M = 2.13$ ,  $SD = 0.79$ ), and in the past three months had participated in volunteering for approximately 20-39 hours ( $M = 3.09$ ,  $SD = 1.09$ ) at a frequency of about 2-3 times per month ( $M = 3.70$ ,  $SD = 1.20$ ). Given that Study 2 did not find significant differences in results between community and student volunteer samples, Study 3 did not separate participants into community and student volunteer samples for separate analysis and multi-group comparison.

Independent samples t-tests were used to examine participant attrition. Results showed that valid participants ( $N = 623$ ) and attrited participants ( $N = 733$ ) did not differ significantly on T1 volunteering habits ( $t(1354) = 1.34$ ,  $p = 0.179$ ) or T1 context stability ( $t(1354) = -1.20$ ,  $p = 0.230$ ). However, significant differences were found on T1 intrinsic rewards ( $t(1349.30) = 2.73$ ,  $p = 0.006$ , Cohen's  $d = 0.75$ ) and T1 extrinsic rewards ( $t(1354) = 3.37$ ,  $p < 0.001$ , Cohen's  $d = 0.95$ ). Specifically, valid participants had significantly higher intrinsic reward levels ( $M = 6.14$ ,  $SD = 0.71$ ) and extrinsic reward levels ( $M = 5.23$ ,  $SD = 0.93$ ) than attrited participants (intrinsic:  $M = 6.03$ ,  $SD = 0.78$ ; extrinsic:  $M = 5.05$ ,  $SD = 0.97$ ). This suggests that volunteers who received more intrinsic and extrinsic rewards at T1 may have been more willing to participate in subsequent follow-up surveys.

#### 4.2.2 Research Instruments

Same as Study 2. The Self-Report Habit Index for Volunteering had Cronbach's  $\alpha = 0.80$ , 0.84, and 0.84 at the three time points. The Volunteering Intrinsic Rewards Questionnaire had Cronbach's  $\alpha = 0.92$ , 0.91, and 0.91. The Volunteering Extrinsic Rewards Questionnaire had Cronbach's  $\alpha = 0.79$ , 0.78, and 0.80. The Volunteering Context Stability Questionnaire had Cronbach's  $\alpha = 0.78$ , 0.81, and 0.78.

#### 4.2.3 Research Procedure

Same as Study 2.

#### 4.2.4 Data Analysis

The Wenjuanxing platform can be set to require completion of all items before submission, so this study's data had no missing values. First, Harman's single-factor test was used to examine common method bias (Zhou & Long, 2004). Second, to ensure consistent measurement of the same variables across different time points, longitudinal measurement invariance testing of the research instruments was required. The first step tested configural invariance, using this model as the baseline. The second step tested weak invariance (constraining factor loadings to be equal) and calculated the difference in CFI ( $\Delta\text{CFI}$ ) between this weak invariance model and the baseline model. The third step tested strong invariance (constraining intercepts to be equal) and calculated the difference in CFI between this strong invariance model and the weak invariance model. If  $\Delta\text{CFI} \leq 0.01$ , the questionnaire demonstrates good measurement invariance (Cheung & Rensvold, 2002). Third, descriptive statistics and correlation analysis were conducted on research variables. Cross-lagged panel models can statistically examine directional relationships between variables by controlling for temporal order and autoregressive paths, thereby providing indirect evidence of causal influence (Hamaker et al., 2015). Therefore, cross-lagged panel models were constructed to examine the cross-temporal predictive effects and interactive effects of intrinsic/extrinsic rewards and context stability on volunteering habits. Study 2 found that demographic variables were significantly correlated with this study's core variables, suggesting that demographic variables may influence the core variables. Therefore, in constructing the cross-lagged panel models, demographic variables (including gender, age, education level, and marital status) were controlled for in their effects on core variables (including habit strength, intrinsic rewards, extrinsic rewards, and context stability) at each time point.

All data analyses were conducted using SPSS 29.0 and Mplus 8.3.

#### 4.3.1 Common Method Bias Test

At T1, T2, and T3, the first common factor explained 30.13%, 32.20%, and 32.77% of the variance, respectively, all below the 40% threshold. Therefore, this study's data did not have serious common method bias issues.

#### 4.3.2 Longitudinal Measurement Invariance Test

Longitudinal measurement invariance test results (see Supplementary Table S5) showed that all measurement questionnaires in this study passed weak and strong invariance tests ( $\Delta\text{CFIs} \leq 0.01$ ), indicating good cross-time measurement invariance for these questionnaires in this study.

#### 4.3.3 Descriptive Statistics and Correlation Analysis

Means, standard deviations, and pairwise correlations among all variables are presented in Table 6. Correlation analysis indicated that intrinsic rewards,

extrinsic rewards, and context stability at T1, T2, and T3 were all significantly positively correlated with habit strength at T1, T2, and T3 ( $r_s = 0.21-0.60$ ,  $p_s < 0.001$ ).

#### 4.3.4 Cross-Temporal Predictive Effects of Intrinsic/Extrinsic Rewards and Context Stability on Volunteering Habits

Cross-lagged panel models were used to examine the cross-temporal predictive effects of intrinsic rewards, extrinsic rewards, and context stability on volunteering habits. Results (see Figure 2 [Figure 2: see original paper]) showed good model fit (CFI = 1.00, RMSEA = 0.01, SRMR = 0.06). T1 intrinsic rewards significantly and positively predicted T2 habit strength ( $\beta = 0.18$ ,  $p < 0.001$ ); T2 intrinsic rewards significantly and positively predicted T3 habit strength ( $\beta = 0.09$ ,  $p = 0.007$ ). T1 extrinsic rewards marginally and positively predicted T2 habit strength ( $\beta = 0.06$ ,  $p = 0.093$ ); T2 extrinsic rewards did not significantly predict T3 habit strength ( $\beta = 0.03$ ,  $p = 0.278$ ). T1 context stability did not significantly predict T2 habit strength ( $\beta = 0.04$ ,  $p = 0.262$ ); T2 context stability did not significantly predict T3 habit strength ( $\beta = 0.03$ ,  $p = 0.269$ ).

#### 4.3.5 Cross-Temporal Interactive Effects of Intrinsic/Extrinsic Rewards and Context Stability on Volunteering Habits

Cross-lagged panel models were used to examine the cross-temporal interactive effects of intrinsic rewards with context stability and extrinsic rewards with context stability on volunteering habit strength. Results (see Figure 3a [Figure 3: see original paper]) showed marginally acceptable model fit (CFI = 0.94, RMSEA = 0.08, SRMR = 0.16). The interactive effect of T1 context stability and T1 intrinsic rewards on T2 habit strength was not significant ( $\beta = -0.17$ ,  $p = 0.633$ ); the interactive effect of T2 context stability and T2 intrinsic rewards on T3 habit strength was significant ( $\beta = -0.69$ ,  $p = 0.025$ ). Additionally, results (see Figure 3b) showed marginally acceptable model fit (CFI = 0.93, RMSEA = 0.09, SRMR = 0.18). The interactive effect of T1 context stability and T1 extrinsic rewards on T2 habit strength was not significant ( $\beta = -0.29$ ,  $p = 0.287$ ); the interactive effect of T2 context stability and T2 extrinsic rewards on T3 habit strength was marginally significant ( $\beta = -0.45$ ,  $p = 0.058$ ).

Further simple slope analyses showed (see Figure 4a [Figure 4: see original paper]) that when volunteers' T2 context stability was at mean + 1 SD, T2 intrinsic rewards did not significantly predict T3 habit strength ( $\beta = 0.05$ ,  $p = 0.405$ , 95% CI = [-0.07, 0.16]); when T2 context stability was at mean - 1 SD, T2 intrinsic rewards significantly and more strongly predicted T3 habit strength ( $\beta = 0.19$ ,  $p < 0.001$ , 95% CI = [0.11, 0.28]). Additionally, as shown in Figure 4b, when T2 context stability was at mean + 1 SD, T2 extrinsic rewards did not significantly predict T3 habit strength ( $\beta = 0.01$ ,  $p = 0.786$ , 95% CI

= [-0.06, 0.09]); when T2 context stability was at mean -1 SD, T2 extrinsic rewards significantly and more strongly predicted T3 habit strength ( $\beta = 0.10$ ,  $p = 0.008$ , 95% CI = [0.03, 0.18]).

Given that intrinsic and extrinsic rewards may interactively predict volunteering habit strength, this effect was examined. Results (see Figure 3c) showed marginally acceptable model fit (CFI = 0.93, RMSEA = 0.09, SRMR = 0.18). The interactive effect of T1 intrinsic rewards and T1 extrinsic rewards on T2 habit strength was not significant ( $\beta = -0.004$ ,  $p = 0.992$ ); the interactive effect of T2 intrinsic rewards and T2 extrinsic rewards on T3 habit strength was not significant ( $\beta = 0.43$ ,  $p = 0.171$ ).

#### 4.4 Discussion

Research evidence indicates that T1 intrinsic rewards could significantly and positively predict T2 volunteering habit strength, T1 extrinsic rewards could marginally and positively predict T2 volunteering habit strength, while T1 context stability did not significantly predict T2 volunteering habit strength. T2 intrinsic rewards could significantly and positively predict T3 volunteering habit strength, whereas T2 extrinsic rewards and T2 context stability did not significantly predict T3 volunteering habit strength. These results support Hypotheses 1a and 1b, but not Hypothesis 2. These findings suggest that over longer time spans, intrinsic rewards are the most stable predictor of volunteering habit strength, while extrinsic rewards and context stability have weaker predictive power for volunteering habit strength.

Furthermore, the cross-temporal interactive effect of T2 intrinsic rewards and T2 context stability on T3 volunteering habit strength was significant; the cross-temporal interactive effect of T2 extrinsic rewards and T2 context stability on T3 volunteering habit strength was marginally significant. Specifically, when T2 context stability was at mean + 1 SD, T2 intrinsic rewards and T2 extrinsic rewards did not significantly predict T3 habit strength; when T2 context stability was at mean -1 SD, T2 intrinsic rewards and T2 extrinsic rewards significantly and more strongly predicted T3 habit strength. These results support Hypotheses 3a and 3b. However, the cross-temporal interactive effects of T1 intrinsic rewards and T1 context stability, and T1 extrinsic rewards and T1 context stability on T2 volunteering habit strength were not significant. This discrepancy may stem from the non-linear and stage-based characteristics of volunteering habit formation (Gardner & Lally, 2018; Lally et al., 2010). Habit formation typically requires time and accumulated repetition, and the effects of intrinsic/extrinsic rewards and context stability on volunteering habits often involve lagged effects. At T1, individuals' volunteering participation may still be in an exploratory or initial motivational stage, with behaviors not yet forming stable patterns, so the interaction between rewards and context stability had not yet jointly influenced behavior performance with sufficient frequency. By T2, individuals' volunteering participation may have become relatively stable, with increased frequency of behavior repetition, allowing the joint effect of re-

wards and context stability to more fully influence the formation of behavioral automaticity, ultimately showing significant predictive effects on volunteering habit strength at T3.

## 5 General Discussion

This research designed three sub-studies to examine the effects of intrinsic rewards, extrinsic rewards, and context stability on volunteering habits. Results revealed that intrinsic rewards (including meaningfulness, happiness, and self-worth), extrinsic rewards (including honorary rewards, material rewards, and social support and recognition), and context stability (including time, place, activity type, interpersonal, and mood stability) significantly and positively predicted volunteering habit strength. Furthermore, intrinsic rewards and context stability, and extrinsic rewards and context stability had interactive effects on volunteering habit strength: when context stability was lower, the positive predictive effects of intrinsic or extrinsic rewards on volunteering habit strength were stronger; when context stability was higher, the positive predictive effects of intrinsic or extrinsic rewards on volunteering habit strength were weaker. These findings not only offer practical implications for motivating volunteers, but also enrich theoretical research on volunteering habits.

### 5.1 The Role of Intrinsic and Extrinsic Rewards

All three sub-studies consistently demonstrated that intrinsic rewards positively facilitate volunteering habits (Hypothesis 1a). The more intrinsic rewards volunteers obtain during volunteering (i.e., the more meaningfulness, happiness, and self-worth they experience), the more likely they are to develop volunteering habits and thus engage in volunteering work more long-term and sustainably. This finding aligns with research findings from other domains. For example, individuals who report that vegetables at dinner are delicious are more likely to develop the habit of eating more vegetables at dinner (Kilb & Labudek, 2022). Therefore, to motivate volunteers to participate in volunteering long-term and sustainably, volunteer organizations or relevant institutional departments need to implement measures that help volunteers gain more positive emotions such as meaningfulness, happiness, and self-worth during volunteering. For instance, volunteer organizations or relevant institutional departments could regularly provide volunteers with feedback about the positive impacts their volunteering work has brought to recipients, communities, and society (He et al., 2024), which may enhance volunteers' sense of meaningfulness.

Consistent with previous research findings (McCloskey & Johnson, 2021), this study found that extrinsic rewards also positively facilitate volunteering habits (Hypothesis 1b). The more extrinsic rewards volunteers receive during volunteering (including honorary rewards, material rewards, and social support and recognition), the more likely they are to develop volunteering habits and thus engage in volunteering work more long-term and sustainably. Moreover, many

internal positive emotions are elicited by extrinsic rewards (such as honorary rewards, material rewards, and social support and recognition). For example, gratitude from recipients may enhance helpers' intrinsic positive emotions such as meaningfulness, happiness, and self-worth (Grant & Gino, 2010; Lee et al., 2019; Qu et al., 2024; Stirling et al., 2023). In Study 1 interviews, volunteers also mentioned things like “getting a certificate makes me very happy,” “when others affirm my value, I naturally feel proud and honored,” and “when they also say thank you to me, I feel this warmth.” Therefore, to motivate volunteers to participate in volunteering long-term and sustainably, volunteer organizations or relevant institutional departments should appropriately provide volunteers with more extrinsic rewards during volunteering, such as increasing material subsidies and offering more praise and support.

## 5.2 The Role of Context Stability

Studies 1 and 2 found that context stability positively facilitates volunteering habits (Hypothesis 2). The more stable the contextual cues (including stable time, place, volunteering activity type, partners or teams, and mood) under which volunteers engage in volunteering, the more likely they are to develop volunteering habits and thus engage in volunteering work more long-term and sustainably. This finding aligns with results from many other studies. For example, Kaushal and Rhodes (2015) found that exercising at a fixed time of day (such as 7 a.m. or after dinner) made it easier to form exercise habits; context stability is significantly positively correlated with habit strength (Judah et al., 2018; Kilb & Labudek, 2022; McCloskey & Johnson, 2019; Pimm et al., 2016). This finding can help volunteer organizations or relevant institutional departments motivate volunteers to participate in volunteering long-term and sustainably. For instance, volunteer organizations can try to conduct volunteering activities at fixed times or places, and if possible, the types of volunteering activities should also be kept stable, which may help volunteers establish habits and thus participate in volunteering long-term and sustainably. However, over-reliance on fixed contexts (such as specific service times, venues, or tasks) may limit the contextual adaptability and transferability of volunteering behavior, thereby affecting its continuation across different service environments. To address this, an “adaptive habits” perspective can be introduced, emphasizing flexibility on the basis of certain stability, enabling individuals to maintain behavioral tendencies in diverse scenarios. Therefore, volunteer organizations need to strike a balance between context stability and flexibility to achieve an optimal state that both facilitates smooth volunteering work and helps volunteers establish habits.

## 5.3 Interactive Effects of Intrinsic/Extrinsic Rewards and Context Stability

Studies 2 and 3 found that intrinsic rewards and context stability had significant interactive effects on volunteering habit strength. Study 3 found that extrin-

insic rewards and context stability had marginally significant interactive effects on volunteering habit strength. Specifically, when context stability was lower, the positive predictive effects of intrinsic or extrinsic rewards on volunteering habit strength were stronger; when context stability was higher, the positive predictive effects of intrinsic or extrinsic rewards were relatively weaker. These results support Hypotheses 3a and 3b proposed in this study. This finding can be explained through the “intention-automaticity interference effect” in habit formation mechanisms. According to Gardner et al. (2020), during early stages of habit formation, individuals often rely on strong behavior intentions and execute behaviors through conscious planning and cognitive effort. The presence of rewards can enhance individuals’ motivation and intention during this stage, thereby promoting behavior repetition and facilitating habit formation. However, as behavior gradually becomes automated, individuals’ behavior increasingly depends on contextual cue triggering rather than conscious planning and control, and overly strong intentions may 反而 weaken the “contextual cue-behavior” association. Therefore, during stages with higher automaticity, the facilitative effect of sustained rewards on habits will gradually diminish and may even interfere with the consolidation process of habits themselves. Similarly, after individuals have established strong “contextual cue-behavior” associations in highly stable contexts, their behavior is more automatically activated by contextual cues. At this point, even without rewards, individuals may continue performing the behavior due to habit inertia (Du & Li, 2020). In such situations, individuals’ sensitivity to rewards decreases, thereby weakening the motivational and intentional activation effects of rewards, ultimately weakening (or even eliminating) the positive effect of rewards on habit strength.

This finding has important implications for volunteering incentive practices. Specifically, for temporary or emergency volunteering activities (such as natural disaster relief or temporary community organization), because service times and locations are not fixed and lack stable contextual cues, it is more necessary to provide diverse forms of intrinsic or extrinsic rewards (such as honorary recognition or material subsidies) to stimulate volunteers’ participation willingness, thereby promoting their behavior repetition and habit formation. For regularly conducted, highly organized volunteering activities (such as volunteering activities regularly held at a certain location at 10 a.m. every Saturday), volunteering behavior has gradually become embedded in specific contexts and may form automated behavior patterns. In this case, the motivational effect of rewards is lower, and incentive measures can be appropriately simplified or even gradually faded to reduce resource consumption and encourage the establishment of intrinsic identification.

Additionally, Study 2 found in the community volunteer sample that intrinsic and extrinsic rewards had a significant interactive effect in predicting volunteering habit strength: when extrinsic reward level was higher, the positive predictive effect of intrinsic rewards on habit strength was weaker; when extrinsic reward level was lower, this positive predictive effect was stronger. This suggests that extrinsic rewards may weaken the facilitative effect of intrinsic

rewards on community volunteers' volunteering habit strength. One possible explanation is that community volunteers often participate more out of public spirit, and certain extrinsic rewards (such as money) may bring about stigmatization effects (Huang et al., 2024), thereby weakening their intrinsic reward experiences and their predictive power for volunteering habits. Therefore, volunteer organizations should be cautious about using direct monetary rewards in practice.

However, this interactive effect was not supported in the longitudinal study (Study 3). On one hand, using cross-lagged panel models controls for prior levels of dependent variables, which removes covariation of stable components between variables, thereby only examining predictors' independent contributions to change over time. When such change magnitude is small or heavily influenced by measurement error, effects are more likely to become non-significant. On the other hand, this effect may be temporally unstable and thus may not be captured in analyses across different time spans. Given this, interpretation of results should remain cautious to avoid over-inference. Future research could further examine the temporal stability of this interactive effect and its underlying mechanisms.

#### 5.4 Research Contributions

The main contributions of this study include the following aspects. First, it examined the facilitative effects of intrinsic/extrinsic rewards and context stability on volunteering habits. Existing habit research has primarily focused on domains such as healthy eating and physical exercise, with relevant studies showing that intrinsic/extrinsic rewards (Di Maio et al., 2022; McCloskey & Johnson, 2021) and context stability (Kaushal & Rhodes, 2015; Kilb & Labudek, 2022) play important facilitative roles in habit formation. However, systematic investigation of the mechanisms through which these factors operate in volunteering habit formation is still lacking. Compared to healthy eating and physical exercise behaviors, volunteering behavior has three distinctive features: First, volunteering behavior hardly brings direct and substantial benefits to individuals themselves and is often more altruistic in nature; second, the reward forms brought by volunteering behavior are more individuals' internal psychological experiences, lacking external material rewards; third, volunteering behavior is relatively complex, involving a series of steps such as information acquisition, activity registration, time coordination, and formal participation. Therefore, whether existing research findings on habit mechanisms apply to the volunteering domain still requires further verification. This study demonstrates that intrinsic/extrinsic rewards and context stability can effectively predict volunteering habit strength, providing preliminary empirical evidence for the cultivation and promotion of volunteering habits.

Second, it reveals the interactive influence mechanism between intrinsic/extrinsic rewards and context stability on volunteering habits. The study found that intrinsic or extrinsic rewards interact with context stability in

predicting volunteering habits. When context stability is lower, intrinsic or extrinsic rewards have stronger positive predictive effects on volunteering habit strength; when context stability is higher, intrinsic or extrinsic rewards have weaker positive predictive effects on volunteering habit strength. This finding not only enriches theoretical research on volunteering habits, but also has reference value and 启发 significance for habit research in other domains.

In addition to the above empirical contributions, this study also has theoretical contributions. First, based on the empirical findings obtained, this study summarizes a theoretical framework (see Figure 5 [Figure 5: see original paper]) to better understand the relationship between intrinsic/extrinsic rewards, context stability, and volunteering habits. This theoretical framework not only reveals the facilitative effects and interactive influence mechanisms of intrinsic/extrinsic rewards and context stability on volunteering habits, but also provides new theoretical support for motivating sustained volunteering behavior from a multi-path perspective in the future. Most importantly, this theoretical framework breaks through the conventional behaviorist “stimulus-response-reward” automatic mechanism. Although this study focused on the role of rewards and contextual stimuli, it did not neglect that the occurrence and continuation of volunteering behavior more heavily depend on emotional connection, value identification, cognitive evaluation, and social interaction. Through interviews and surveys with volunteers, this study found that internal cognitive and emotional factors such as meaningfulness, happiness, and self-worth, as well as external social factors such as honorary rewards and social support and recognition, play key facilitative roles in volunteering habit formation. This indicates that volunteering habits are nurtured in individuals’ cognition and emotion, and possess sociality and purposefulness, rather than being purely automatic or conditioned reflexes.

Second, this study provides a novel perspective (i.e., habit) to understand and analyze volunteering behavior. Traditional volunteering research has emphasized humanistic care factors such as intrinsic motivation, identity, and self-determination. However, recent studies have gradually realized that the sustainability and scale expansion of volunteering behavior depend not only on one-time motivational activation, but also on the automation and stability of behavior in daily life (Du & Li, 2020; Mullan et al., 2021). Understanding volunteering behavior as “behavioral habits” helps parse the psychological mechanisms underlying individuals’ long-term volunteering participation, thereby explaining why some people can sustain participation while others cannot, and ultimately designing more effective intervention methods for volunteering practice (such as maintaining stable contextual cues and providing appropriate material rewards). This attempt provides a new direction for future volunteering research. However, overemphasizing habituation may risk “demoralizing” or “de-emotionalizing” volunteering behavior, potentially being misunderstood as encouraging mechanical volunteering while neglecting its social value and emotional investment. Therefore, in practical promotion, it should be emphasized that “motivation-habit” is a complementary rather than substitutive relationship. Habit is not the opposite

of motivation, but rather a stable behavior pattern formed under the incentive of intrinsic and extrinsic rewards, which can compensate for behavior interruption crises caused by insufficient motivation. Specifically, volunteer organizations or relevant institutional departments need not only to stimulate volunteers' public value identification, but also to optimize participation pathways and incentive methods to help volunteers establish volunteering habits.

## 5.5 Limitations and Future Directions

Although this study has made contributions in both theory and practice, several limitations should be considered. First, this study only focused on the automatic process of volunteering behavior (i.e., habit). In fact, as a multi-step behavior, volunteering involves a series of steps such as information acquisition, advance registration, time arrangement, and formal participation, and may not achieve complete automation like simple daily behaviors (such as brushing teeth after waking up). This suggests that the occurrence and continuation of volunteering behavior are simultaneously influenced by automatic processes (i.e., habit) and conscious processes (i.e., motivation or intention) (Mullan et al., 2021; Verplanken & Orbell, 2022). Therefore, future research needs to simultaneously focus on both the automatic process of volunteering behavior (i.e., cultivating habits) and the conscious process (i.e., stimulating motivation and intention) to better motivate volunteers to participate in volunteering long-term and sustainably. Second, this study's inference of causal directions between variables is relatively weak. Although Study 3 used cross-lagged panel models to examine causal directions between variables, this testing method does not manipulate independent variables, thus the resulting findings are not highly convincing. Future research could use field experiments to manipulate independent variables, thereby testing whether intrinsic/extrinsic rewards and context stability can strengthen volunteering habit strength. Third, the proportion of invalid questionnaires was relatively high, possibly due to online sampling. Future research could reduce invalid questionnaires through offline face-to-face sampling. Fourth, in Study 3, valid samples had significantly higher intrinsic and extrinsic reward levels at T1 than attrited samples, which may reflect some selection bias. This bias may affect the representativeness and generalizability of research findings—that is, research conclusions may be more applicable to volunteers who received more positive feedback early on. Therefore, caution should be exercised in result interpretation and practical promotion. Future research should take measures (such as increasing participant compensation, using multiple channels to contact participants, etc.) to reduce participant attrition, thereby improving data completeness and representativeness and making research findings more reliable. Finally, this study's data collection and theoretical construction are based on Chinese sociocultural background. Under the influence of Confucian culture, cultural characteristics such as stronger collectivist tendencies and higher social responsibility may affect individuals' reward perception patterns for volunteering behavior. Therefore, the applicability of this study's conclusions should be limited to similar cultural backgrounds, and future research could further

validate the mechanism model proposed in this study in multi-cultural samples.

This study reached the following conclusions: (1) Intrinsic rewards (including meaningfulness, happiness, and self-worth), extrinsic rewards (including honorary rewards, material rewards, and social support and recognition), and context stability (including time, place, activity type, interpersonal, and mood stability) are important facilitators of volunteers' volunteering habits. Moreover, intrinsic rewards are the most stable facilitators. (2) Intrinsic or extrinsic rewards interact with context stability in predicting volunteers' volunteering habits. When context stability is lower, intrinsic or extrinsic rewards have stronger positive predictive effects on volunteers' volunteering habits; when context stability is higher, intrinsic or extrinsic rewards have weaker positive predictive effects on volunteers' volunteering habits.

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## Supplementary Tables

### Table S1 Basic Information of Interviewed Volunteers

[Table content would be preserved with English translations of categories]

### Table S2 Inter-coder Consistency Data

[Table content would be preserved with English translations of categories]

### Table S3 Exploratory Factor Analysis Results of Self-Designed Questionnaires

[Table content would be preserved]

### Table S4 Confirmatory Factor Analysis and Reliability Analysis Results of Self-Designed Questionnaires

[Table content would be preserved]

### Table S5 Longitudinal Measurement Invariance Test Results

[Table content would be preserved]

*Note: Figure translations are in progress. See original paper for figures.*

*Source: ChinaXiv – Machine translation. Verify with original.*