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Xinyan Liu^{1,2} Hailan Wu¹ Ju
Tu¹ Lu Wang^{1,2}

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Abstract

In the era of the mobile Internet, people are often inevitably engaged in multitasking at work. Accordingly, this study focuses on multitasking as a contextual factor and examines how its interaction with modes of attentional focus affects individuals' prosocial behavior. The results of six online experiments and one offline field experiment show that when individuals focus on the process, multitasking (vs. single-tasking) reduces their sense of self-efficacy, thereby decreasing their prosocial behavior; when individuals focus on the outcome, multitasking (vs. single-tasking) increases their sense of self-efficacy, thereby enhancing their prosocial behavior. Task completion is an important boundary condition: the above interaction effect exists when work tasks can be completed, whereas when work tasks cannot be completed, this adverse outcome directly reduces individuals' prosocial behavior, and the interaction between multitasking and modes of attentional focus disappears.

Full Text

The Double-Edged Sword Effect of Multitasking: The Impact of Multitasking on Prosocial Behavior*

Xinyan Liu^{1,2} Hailan Wu¹ Ju Tu¹ Lu Wang^{1,2}

(1 School of Business Administration, Zhongnan University of Economics and Law, Wuhan 430073)

(2 E-Commerce Research Center, Zhongnan University of Economics and Law, Wuhan 430073)

Abstract In the mobile Internet era, people are often inevitably in a multitasking state at work. Accordingly, this study focuses on multitasking as a situational factor and examines how its interaction with the mode of cognitive focus influences individuals' prosocial behavior. The results of six online experiments and one offline field experiment show that when individuals' thinking is focused on the process, multitasking (vs. single-tasking) reduces individuals' sense of self-efficacy, thereby decreasing their prosocial behavior; when individuals' thinking is focused on the outcome, multitasking (vs. single-tasking) increases individuals' sense of self-efficacy, thereby enhancing their prosocial behavior. Whether the task can be completed is an important boundary condition: the above interaction effect exists when the work task can be completed; when the work task cannot be completed, the unfavorable outcome directly reduces individuals' prosocial behavior, and the interaction effect between multitasking and the mode of cognitive focus disappears.

Keywords multitasking, mode of cognitive focus, self-efficacy, prosocial behavior, task completion

Classification numbers B849; F713.55

1 Research Question

In recent years, the dissemination and fundraising stages of an increasing number of prosocial activities have shifted to online platforms. Compared with offline contexts, the most prominent feature of online prosocial behavior is that people usually participate in it through mobile devices. At the same time, many activities such as work and entertainment can also be carried out on the same mobile device, and people switch seamlessly among various activities (Wottrich et al., 2018). This means that one may come across a donation appeal from a public-welfare organization while browsing WeChat Moments, or see a pushed invitation to an environmental-protection activity while reading Toutiao, or even have just completed several tasks on a mobile phone before that. Such behavior, in which an individual simultaneously engages in at least two tasks within a period of time or rapidly switches between two or more tasks, is referred to as multitasking (Róžańska & Gruszka, 2020). It has gradually become a normal state in people's work and life, and has become the most important contextual feature when individuals participate in online prosocial activities today—people often receive relevant invitations and decide whether to participate while in a multitasking state. Thus, will multitasking, as a potential contextual factor, affect individuals' subsequent participation in prosocial behavior

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Corresponding author: Lu Wang, E-mail: luwang@zuel.edu.cn

willingness? If so, ultimately, does (multitasking vs. single-tasking) increase or decrease their willingness to participate? What is the underlying psychological mechanism?

Although previous literature has examined factors influencing individuals' participation in prosocial activities in the context of the mobile Internet, it has mainly focused on the effects of directly related factors—such as the design of online donation content—on individuals' participation intentions (Shen Yaxuan et al., 2021). For example, the processing fluency of help-seeking information and the authenticity of information jointly influence people's willingness and behavior to donate (Zheng Xiaoying et al., 2024). However, the influence of changes in individuals' working modes in the mobile Internet environment, as a contextual factor, on their willingness to participate in prosocial behavior has not yet been addressed. Therefore, the present study and its conclusions will help deepen our understanding of the dynamic contextual factors that influence individuals' prosocial behavior in the mobile Internet environment.

1.1 Multitasking

The concept of multitasking first appeared in the field of computer science. It refers to an operating system allocating CPU processing time to different programs so that they appear to run simultaneously, giving people the impression that the operating system can execute multiple programs and process multiple tasks at the same time (Kiesel et al., 2010). This concept was later introduced into the social sciences to understand how the human brain works. Cognitive psychology defines human multitasking as a state in which a cognitive process serves more than two tasks within a given period of time (Koch et al., 2018). However, working-memory theory holds that, strictly speaking, our brain is actually unable to process two tasks simultaneously in parallel (Van der Stigchel, 2021). Accordingly, scholars have gradually defined multitasking as a state in which an individual processes multiple tasks within a period of time or rapidly switches from one task to another (Koch et al., 2018). In the present study, we restrict the nature of tasks to the work domain—that is, activities that are vital to making a living either at present (e.g., paid work) or in the future (e.g., coursework) (Kim et al., 2019). We also focus on the impact of ordinary-intensity multitasking in people's work on their subsequent prosocial behavior, and do not include within the scope of this study the high-intensity multitasking states associated with certain special positions (such as emergency-room physicians), because individuals who are forced into urgent multitasking under such circumstances already have no attention to spare for anything else.

1.2 The Mode of Thought Focus Determines the Effect of Multitasking on Prosocial Behavior via Self-Efficacy

Previous studies have shown that when individuals fall into severe multitasking states (such as mobile-phone addiction) and need to draw on the psychological resources of self-control in an attempt to escape this state, they experience a temporary decline in self-control ability and willingness—that is, ego depletion (Kong Fanchang et al., 2023; Lin et al., 2020). The present study focuses on the generally moderate-intensity multitasking state that commonly exists in daily work. We therefore infer that, although this type of multitasking may lead to a decline in individuals' cognitive executive functioning, it has not yet reached the level of ego depletion. It may affect individuals' sense of self-efficacy, thereby influencing their subsequent prosocial behavior. However, multitasking, relative to single-tasking, does not in itself have an independent main effect; its ultimate direction depends on its interaction with a variable that has a significant influence on promoting the transformation of personal ideas into behavior—the mode of thought focus. The mode of thought focus refers to the way in which individuals choose to concentrate their attention when processing information and performing tasks (Taylor & Schneider, 1989). It may be a personal trait, or it may be a temporary state triggered by contextual factors or manipulated through deliberate means (Escalas & Luce, 2003). In recent years,

A substantial body of research has shown that individuals' mode of cognitive focus has significant effects on persuasion, advertising effectiveness, and consumer attitudes and behavior, and its role has received considerable attention in psychology and marketing (Nardini & Lutz, 2018; Pan Ding et al., 2022).

Cognitive focus can be divided into two basic types: process focus and outcome focus (Taylor & Schneider, 1989). Under process focus, individuals concentrate their attention on the process of achieving a goal through a particular action, paying greater attention to how the task is completed. By contrast, under outcome focus, individuals pay greater attention to the results of the task, placing more emphasis on the final state of the action and the positive emotions it brings (Thompson et al., 2009). It should be noted that when cognition is focused on the outcome (process), this does not mean that individuals completely fail to notice information related to the process (outcome). Rather, it means that, among the two types of information, the information being focused on becomes more salient and thereby dominates subsequent psychological effects on the individual.

This article infers that differences in individuals' modes of cognitive focus will make salient the characteristics of different stages of the two types of tasks, thereby exerting diametrically opposite effects on individuals' sense of self-efficacy. When individuals focus their cognition on the process, this makes the differences between the two types of tasks during the process stand out. Previous research has confirmed that, in the process of performing multiple tasks, individuals need to switch rapidly from one task to another; this consumes a large amount of attention and working memory, causing individuals to perceive a scarcity of cognitive resources during multitasking (Koch et al., 2018; van der Schuur et al., 2015). In addition, the temporal overlap among multiple tasks likewise makes individuals feel time pressure, thereby generating a psychological perception of time scarcity (Li Aimei et al., 2016). However, this scarcity of cognitive and time resources is not an objective, absolute lack. Rather, because individuals are situated in the process of multitasking, they subjectively feel that the resources they currently "possess" are fewer than the resources they "need" —a form of relative scarcity. This perceived resource scarcity can bring about an overall change in individuals' mindset, leading them to feel not that the resources are insufficient, but that they themselves lack the ability to effectively mobilize resources to accomplish their goals, thereby weakening their sense of self-efficacy.

However, when individuals focus their cognition on the outcome, this makes the differences between the two types of tasks in terms of goal completion more salient. Previous research has shown that multitasking is generally regarded as more challenging work (Silvia et al., 2017), and individuals who lack a sense of control will proactively choose multitasking in the hope of restoring their sense of control by successfully completing multiple tasks (Han & Broniarczyk, 2021). Therefore, the most direct effect of directing individuals' attention to the outcome is that it enables those performing multiple tasks to realize that,

within a given period of time, they have completed multiple tasks rather than a single task; this is regarded as a successful work experience. Prior literature has confirmed that the accumulation of successful experiences in personal life is one of the most important antecedents of general self-efficacy (Chen et al., 2001). Therefore, this article infers that the successful experience associated with the outcomes brought about by multitasking may enhance individuals' sense of self-efficacy.

Self-efficacy is one of the most important psychological concepts in human life, influencing many decisions individuals make, including prosocial behavior (Bandura, 1977). Self-efficacy is divided into general self-efficacy (GSE) and specific self-efficacy (SSE). The two share the same connotation: in essence, both refer to individuals' belief that they can complete tasks or achieve goals (Bandura, 1977). However, GSE places greater emphasis on individuals' ability, across various different contexts, to mobilize their own motivation,

...a general belief in the abilities needed to mobilize cognitive resources and take the necessary actions to achieve goals, whereas SSE emphasizes the individual's belief in their ability to meet the demands of a particular situation within a specific domain (Wood & Bandura, 1989). The influence of SSE is not necessarily confined to that domain; it may spill over into other similar situations, or even into situations that appear not to be directly related, provided that the abilities required in these situations are essentially similar or related (Chen et al., 2001).

In the present study, multitasking and prosocial behavior are precisely two such situations that appear unrelated but are very similar in their underlying ability requirements. Broadly defined, prosocial behavior refers to behavior in which individuals incur costs for the benefit of others (Small & Cryder, 2016). Existing research shows that several specific forms of self-efficacy—for example, emotional self-efficacy (i.e., the belief that one has the ability to effectively express positive emotions and manage negative emotions), empathic self-efficacy (i.e., the belief that one can sensitively understand others' feelings and needs), and social self-efficacy (i.e., the belief that one has the ability to establish relationships with others)—are important antecedents of prosocial behavior (Caprara et al., 2010; Guo Xiaodong et al., 2023). We infer that changes in individuals' general self-efficacy caused by the work domain may spill over to affect their prosocial behavior, because emotion management, empathic ability, and social and interpersonal skills are also indispensable core skills in the work domain. In summary, this study proposes the following hypotheses:

H 1: Multitasking and mode of attentional focus interact to influence prosocial behavior. Specifically, when individuals' thinking is focused on the process, multitasking (vs. single-tasking) reduces their prosocial behavior; when individuals' thinking is focused on the outcome, multitasking (vs. single-tasking) enhances their prosocial behavior.

H 2: Self-efficacy plays a mediating role in this process. Specifically, when

individuals' thinking is focused on the process, self-efficacy negatively mediates the effect of multitasking on prosocial behavior; when individuals' thinking is focused on the outcome, self-efficacy positively mediates the effect of multitasking on prosocial behavior.

1.3 Boundary Condition: The Moderating Role of Whether the Task Can Be Completed

This study infers that whether a task can be completed is a crucial boundary condition for the interactive effect of multitasking and mode of attentional focus on intentions to engage in prosocial behavior. First, individuals' aversion to loss makes negative information more salient than positive information (Tversky & Kahneman, 1991), and individuals' attention is often attracted by important or prominent information (Eysenck & Keane, 2015). Therefore, when work tasks cannot be completed, individuals' attention will be highly concentrated on this unfavorable outcome for themselves rather than on others, making it more difficult for them to perceive others' needs (Thoits & Hewitt, 2001), thereby reducing their willingness to engage in prosocial behavior. Second, because individuals' self-concept is closely related to the goals they set, when the work tasks they set cannot be completed, individuals often begin to doubt their own abilities and believe that the failure to complete the tasks is due to their own insufficient ability (Higgins, 1987), thereby directly reducing self-efficacy. Based on this, we infer that when individuals realize that, objectively, the task cannot be completed, their attention will be highly focused on this unfavorable outcome, directly leading to a decline in self-efficacy and a reduction in willingness to participate in prosocial behavior. At this point, the effects of task type, mode of attentional focus, and their interaction on both self-efficacy and prosocial behavior will disappear. Accordingly, this article proposes the following hypothesis:

H3: Whether a task can be completed moderates the interactive effect of multitasking and the mode of cognitive focus on prosocial behavior. When the task can be completed, the theoretical mechanism proposed in this paper holds; however, when the task cannot be completed, unfavorable outcomes directly reduce individuals' willingness to engage in prosocial behavior, and the interactive effect of multitasking and the mode of cognitive focus on prosocial behavior disappears.

The theoretical framework and experimental arrangement of this study are shown in Figure 1.

Figure labels:

- Whether the task can be completed (completable vs. incompletable)
- Multitasking (single task vs. multitasking)
- Mode of cognitive focus (process vs. outcome)
- Self-efficacy
- Prosocial behavior
- Experiment 4 (H3)

- Experiments 3a-3b: moderated test of mediation (H2)
- Experiments 2-4 (H2)
- Experiments 1-4 (H1)

Figure 1. The theoretical framework and experimental arrangement of this study

2 Experiment 1: The Effects of Multitasking and Mode of Cognitive Focus on Prosocial Behavior

Experiment 1 includes three studies, which respectively use different methods for manipulating multitasking and different measures of prosocial behavior to test the interactive effect of multitasking and mode of cognitive focus on prosocial behavior, while ruling out several alternative explanations.

2.1 Experiment 1a: Using Scenario Imagination to Manipulate Multitasking and Test the Interaction Effect

Experiment 1a was a preregistered experiment (https://aspredicted.org/T1G_PVG). Its primary purpose was to use a scenario-imagination method to manipulate multitasking and preliminarily test how different modes of cognitive focus influence the effect of multitasking on intentions to engage in prosocial behavior. Its secondary purpose was to rule out alternative explanations involving sense of achievement and emotion. Prior research has shown that when people obtain positive outcomes in a task, they experience a certain sense of achievement, which in turn affects subsequent behavioral performance (Weiner et al., 1972). Other research has also shown that multitasking affects individuals' emotions (Becker et al., 2013), and emotion is also one of the possible antecedent factors of prosocial behavior; this means that both sense of achievement and emotion may serve as alternative explanatory variables in the present study.

2.1.1 Experimental Design and Participants

Experiment 1a adopted a 2 (multitasking: single task vs. multitasking) $\times$ 2 (mode of cognitive focus: process vs. outcome) between-subjects design. The 440 participants recruited on the Credamo platform were randomly assigned to one of four experimental groups. After excluding 13 responses that failed the attention check, showed identical choices across items, or had a response time of less than 60 seconds, 427 valid samples were obtained (63% female, $M_{\text{age}} = 31.05$, $SD_{\text{age}} = 10.49$). According to G*Power 3.1 (Faul et al., 2009), selecting a two-factor

variance method analysis, when the number of groups was 4, the effect size (f) was 0.4, and the significance level was 0.05, the power value for a sample size of 427 was greater than 0.99, exceeding the basic level of 0.80, indicating that the final sample had statistical power.

2.1.2 Experimental Procedure and Stimuli

Participants were asked to complete two unrelated tasks in the experiment. In the first task, we asked participants to imagine a work scenario of about 2 hours on a certain morning that they had actually experienced. In the single-task work-scenario description, the main work content was to record the core content of a live-streamed meeting; in the multitasking scenario, multiple tasks were carried out in parallel, and participants needed to check the work data from the previous day while watching the live stream and recording its content. To manipulate the process of cognitive focus, we reminded participants to focus on the process (or outcome) of the situation, and after the reading task ended, asked participants to describe in words their psychological feelings during the process of the situation (or at the time of the outcome), thereby strengthening the manipulation (Zhao et al., 2007) (see Appendix 1 for detailed experimental materials). Participants then answered two manipulation-check measurement items for multitasking ($r = 0.67$, $p < 0.001$): “In the scenario recalled above, I felt that I was handling multiple tasks at the same time” and “In the scenario recalled above, I felt that I was switching back and forth among multiple tasks” (“1” indicated strongly disagree, and “7” indicated strongly agree); as well as two manipulation-check measurement items for the mode of cognitive focus ($r = 0.62$, $p < 0.001$): “In the scenario above, what I focused on more was” (“1” indicated the process by which the work was carried out, and “7” indicated the result after the work was completed) and “In the scenario above, what I felt more was” (“1” indicated feelings during the work process, and “7” indicated feelings after the work was completed). The manipulation-check measurement items for multitasking and for the mode of cognitive focus were also used in the subsequent other experiments.

Next, participants were told that they needed to complete an unrelated behavioral-intention survey: participants were informed that they had seen on a public account a fundraising campaign to donate to libraries in poor rural areas; the funds raised would mainly be used to build libraries in rural areas and help rural children better acquire knowledge (adapted from a real project of Tencent 99 Giving Day). Participants were asked about their donation intention at that moment (“1” indicated completely unwilling to donate, and “7” indicated completely willing to donate). They then answered two measurement items for sense of accomplishment (“The scenario just now made me feel successful” and “The scenario just now made me feel a strong sense of accomplishment”; “1” indicated strongly disagree, and “7” indicated strongly agree; $r = 0.63$, $p < 0.001$); three measurement items for emotion (1 = “At this moment I feel very bad/sad/tense,” 7 = “At this moment I feel very good/happy/relaxed”; $\alpha = 0.79$; Su et al., 2017). After participants answered attention-check items and demographic questions, the experiment ended.

2.1.3 Experimental Results

Manipulation checks. The results of a 2×2 analysis of variance using the mean of the multitasking manipulation-check items as the dependent variable showed that only the main effect of multitasking was significant ($F(1, 423) = 255.54, p < 0.001, \eta_p^2 = 0.377$). Participants in the multitasking group ($M_{\text{multitasking}} = 6.14, SD_{\text{multitasking}} = 0.79$) were more likely than those in the single-task group ($M_{\text{single-task}} = 3.98, SD_{\text{single-task}} = 1.81$) to believe that they were multitasking; the other effects were not significant ($F_s < 2.45, p_s > 0.11$). Using the mean of the manipulation-check items for the mode of cognitive focus as the dependent variable, the results of a 2×2 analysis of variance showed that only the main effect of the mode of cognitive focus was significant ($F(1, 423) = 69.85, p < 0.001, \eta_p^2 = 0.142$),

Participants in the process-focus group ($M_{\text{process}} = 3.83, SD_{\text{process}} = 1.94$) felt that they paid more attention to the process, whereas participants in the outcome-focus group ($M_{\text{outcome}} = 5.33, SD_{\text{outcome}} = 1.76$) felt that they paid more attention to the outcome. All other effects were nonsignificant ($F_s < 1.14, p_s > 0.28$). These results indicate that the manipulations of multitasking and thought-focus mode in Experiment 1a were effective.

Main and interaction effects. The results of a 2×2 ANOVA with participants' donation intention as the dependent variable showed that the main effect of multitasking was nonsignificant ($F(1, 423) = 1.28, p = 0.258, \eta_p^2 = 0.003$), whereas the main effect of thought-focus mode was significant ($F(1, 423) = 17.04, p < 0.001, \eta_p^2 = 0.039$). More importantly, as predicted, the interaction between the two was significant ($F(1, 423) = 31.64, p < 0.001, \eta_p^2 = 0.070$). As shown in Figure 2, when participants' thoughts were focused on the process, multitasking—relative to single-tasking—reduced their donation intention ($M_{\text{multitasking}} = 5.21, SD_{\text{single-task}} = 1.37; M_{\text{single-task}} = 5.65, SD_{\text{multitasking}} = 1.09; F(1, 423) = 10.12, p = 0.002, \eta_p^2 = 0.023$). When participants' thoughts were focused on the outcome, this effect was reversed: multitasking increased their donation intention ($M_{\text{multitasking}} = 6.18, SD_{\text{multitasking}} = 0.75; M_{\text{single-task}} = 5.51, SD_{\text{single-task}} = 0.78; F(1, 423) = 22.78, p < 0.001, \eta_p^2 = 0.051$), providing preliminary support for H1.

Figure 2. Interaction effect of thought-focus mode and multitasking on donation intention (Experiment 1a)

Legend: single-task; multitasking.

Y-axis: Donation intention toward the village library.

X-axis: process focus; outcome focus.

Process focus: single-task 5.65, multitasking 5.21, $p = 0.002$.

Outcome focus: single-task 5.51, multitasking 6.18, $p < 0.001$.

Ruling out alternative explanations. The results of a 2×2 ANOVA with the mean score of the sense-of-achievement items as the dependent variable showed

that the main effect of multitasking, the main effect of thought-focus mode, and their interaction were all nonsignificant ($F_s < 0.87$, $p_s > 0.35$). Pairwise comparisons of group means showed no significant differences in participants' sense of achievement across groups ($M = 5.18$, $SD = 1.21$; $p_s > 0.26$), thereby ruling out sense of achievement as an alternative explanation.

The results of a 2×2 ANOVA with the mean score of the emotion items as the dependent variable showed that the main effect of multitasking, the main effect of thought-focus mode, and their interaction were all nonsignificant ($F_s < 3.29$, $p_s > 0.07$). Pairwise comparisons of group means showed that only within the multitasking group was there a near-marginally significant difference between participants' emotions when their thoughts were focused on the outcome ($M_{\text{outcome}} = 5.69$, $SD_{\text{outcome}} = 0.83$) and when their thoughts were focused on the process ($M_{\text{process}} = 5.44$, $SD_{\text{process}} = 1.08$; $F(1, 423) = 3.37$, $p = 0.067$, $\eta_p^2 = 0.008$). All other pairwise comparisons of participants' emotions across groups were nonsignificant ($p_s > 0.13$). To further rule out emo-

the mediating role of emotion, we treated willingness to participate in the rural library donation campaign as the dependent variable, multitasking (0 = single task, 1 = multitasking) as the independent variable, mode of attentional focus (0 = process, 1 = outcome) as the moderator, and emotion as the mediator, and used the bootstrapping method to test the mediation effect (Model 7, sample size = 5000; Preacher & Hayes, 2008). The results showed that, under the 95% confidence interval, the moderated mediation effect for the path multitasking $\rightarrow$ emotion $\rightarrow$ willingness to participate in the rural library donation campaign was not significant (Effect = 0.15, $SE = 0.09$, 95% $CI = [-0.0084, 0.3545]$). Whether participants focused on the process or on the outcome, the 95% confidence intervals for the indirect effects all included 0, thereby ruling out the alternative explanation of emotion.

2.1.4 Discussion

Experiment 1a manipulated multitasking through scenario imagination and used a real rural library donation project on Tencent Charity to measure participants' prosocial behavioral intentions. The results verified the interaction effect proposed in Hypothesis H1 and ruled out alternative explanations involving sense of achievement and emotion. The experimental results showed that when individuals' thinking focused on the process, multitasking significantly reduced their willingness to participate in prosocial behavior relative to single-tasking; when individuals' thinking focused on the outcome, the effect of multitasking on prosocial behavioral intention changed, such that multitasking effectively increased their willingness to participate in prosocial behavior.

2.2 Experiment 1b: Manipulating Multitasking Through Recall to Verify the Interaction Effect

Experiment 1b had two purposes: first, to manipulate multitasking through a recall method and again verify the interaction effect; second, to rule out alternative explanations involving perceived busyness, perceived self-importance, perceived effort, perceived difficulty of task completion, and construal level. Perceived busyness refers to the subjective feeling that one has many things to do or that one's time is occupied by work. It is related to a lack of time and enhances people's perceived self-importance (Kim et al., 2019), while perceived time scarcity is a typical subjective experience in multitasking (Koch et al., 2018). Perceived busyness is also associated with higher social class (Silvia et al., 2017), and people of higher social class show a stronger preference for development-oriented donations (Sun Qingzhou et al., 2023). Studies have also confirmed that multitasking may increase the perceived difficulty of task completion, leading people to perceive that they have invested more effort in multitasking (Srna et al., 2018); multitasking can increase creativity (Kapadia & Melwani, 2021), and participation in creative activities can increase willingness to engage in donation behavior by enhancing individuals' sense of autonomy (Xu et al., 2022). Related research has further found that reminding people of resource scarcity can trigger a high construal level, thereby influencing their subsequent consumption decisions, such as purchasing sustainable products (Goldsmith et al., 2020).

2.2.1 Experimental Design and Participants

Experiment 1b adopted a 3 (multitasking: single task vs. multitasking vs. control group) $\times$ 2 (mode of attentional focus: process vs. outcome) between-subjects design. A total of 650 participants recruited on the Jianshu platform were randomly assigned to one of the six experimental groups. After excluding 19 responses that failed the attention check or had response times of less than 60 seconds, 631 valid samples were obtained (62% female, $M_{\text{age}} = 29.6$, $SD_{\text{age}} = 10.13$). According to an analysis using G*Power 3.1 (Faul et al., 2009), the final sample had sufficient statistical power.

2.2.2 Experimental Procedure and Stimuli

As in Experiment 1a, participants were asked to complete two unrelated tasks. In the first task, we first introduced to participants the definition of single-tasking/multitasking, and then asked them to recall a recent instance in daily life—within the past 2–3 hours or half day—in which they had engaged in single-tasking/multitasking work. Participants were also required to carefully recall the process of carrying out the work (or the outcome of completing it) and to describe their personal feelings in detail in more than 50 Chinese characters (Zhao et al., 2007). In the control group, we directly asked participants to recall a recent instance in daily life—within the past 2–3 hours or half day—in which

they had been working. Participants then answered the same manipulation-check items for multitasking ($r = 0.83, p < 0.001$) and thinking-focus style ($r = 0.59, p < 0.001$) as in Experiment 1a.

Next, participants were told that they needed to complete an unrelated behavioral-intention survey: a donation campaign called “A Wardrobe of Love” was being conducted on the public account they were browsing, and the campaign mainly aimed to purchase new winter clothing for children in need in mountainous areas. Participants were asked about their willingness to donate at that moment (“1” indicated completely unwilling to donate, and “7” indicated completely willing to donate). Afterward, participants completed five items measuring perceived self-importance (“I feel that I am an important person,” “I feel that I am an indispensable person to others,” “I feel that my existence is important to my friends and family,” “I feel that my life has important meaning,” and “I feel that my life is valuable” ; “1” indicated completely disagree, and “7” indicated completely agree; Kim et al., 2019; $\alpha = 0.76$); three items measuring busyness (“I feel that I am occupied,” “I feel that there are many things to do,” and “I feel very busy” ; “1” indicated completely disagree, and “7” indicated completely agree; Silvia et al., 2017; $\alpha = 0.87$); perceived effort (“How much effort did you put into the recall task?” ; “1” indicated not at all, and “7” indicated very much effort; Srna et al., 2018); perceived task-completion difficulty (“How difficult do you think it was to complete the recall task?” ; “1” indicated very easy, and “7” indicated very difficult); and eight items measuring construal level (e.g., “Reading: the left side represents reading down through an article, and the right side represents acquiring knowledge; driving for travel: the left side represents following a map, and the right side represents viewing the scenery along the way,” etc.; “1” indicated strongly agreeing with the statement on the left, and “7” indicated strongly agreeing with the statement on the right; Goldsmith et al., 2020; $\alpha = 0.78$) (all scales are shown in Appendix 2). The experiment ended after participants completed the attention-check items and demographic questions.

2.2.3 Experimental Results

Manipulation checks. A 3×2 ANOVA using the mean of the multitasking manipulation-check items as the dependent variable showed a significant main effect of multitasking, $F(2, 625) = 499.06, p < 0.001, \eta_p^2 = 0.385$. Participants in the multitasking group ($M_{\text{multitasking}} = 5.98, SD_{\text{multitasking}} = 0.96$) believed to a greater extent that they were engaging in multitasking than did those in the control group ($M_{\text{control group}} = 4.00, SD_{\text{control group}} = 1.87$) and the single-tasking group ($M_{\text{single-tasking}} = 2.94, SD_{\text{single-tasking}} = 1.82$). The main effect of thinking-focus style and the interaction between the two factors were not significant ($F_s < 1.64, p_s > 0.19$). Using the mean of the thinking-focus-style manipulation-check items as the dependent variable, a 3×2 ANOVA showed a significant main effect of thinking-focus style, $F(1, 625) = 308.30, p < 0.001, \eta_p^2 = 0.330$. Participants in the

process-focus group ($M_{\text{process}} = 2.57, SD_{\text{process}} = 1.38$) felt that they focused more on the process, whereas participants in the outcome-focus group ($M_{\text{outcome}} = 4.72, SD_{\text{outcome}} = 1.68$) felt that they focused more on the outcome. No other effects were significant ($F_s < 1.81, p_s > 0.16$), indicating that the manipulations were effective.

Interaction and main effects. The results of a 3×2 ANOVA with participants' donation intention as the dependent variable showed that the main effect of multitasking was not significant ($F(2, 625) = 0.93, p = 0.394, \eta_p^2 = 0.003$), whereas the main effect of thinking-focus mode was significant ($F(1, 625) = 5.97, p = 0.015, \eta_p^2 = 0.009$). More importantly, consistent with expectations, the interaction between the two was significant ($F(2, 625) = 16.06, p < 0.001, \eta_p^2 = 0.049$). As shown in Figure 3, when participants' thinking was focused on the process, the donation intention of participants in the multitasking group ($M_{\text{multitasking}} = 5.28, SD_{\text{multitasking}} = 1.10$) was significantly lower than that of participants in the single-task group ($M_{\text{single-task}} = 5.67, SD_{\text{single-task}} = 1.05, p = 0.018$) and the control group ($M_{\text{control}} = 5.75, SD_{\text{control}} = 1.31, p = 0.002$), ($F(2, 625) = 6.48, p = 0.002, \eta_p^2 = 0.020$), whereas there was no significant difference in donation intention between participants in the single-task group and those in the control group ($p = 0.910$). However, this effect changed when participants' thinking was focused on the outcome: the donation intention of participants in the multitasking group ($M_{\text{multitasking}} = 6.13, SD_{\text{multitasking}} = 0.70$) was significantly higher than that of participants in the single-task group ($M_{\text{single-task}} = 5.50, SD_{\text{single-task}} = 0.86, p < 0.001$) and the control group ($M_{\text{control}} = 5.67, SD_{\text{control}} = 1.05, p = 0.003$), ($F(2, 625) = 10.51, p < 0.001, \eta_p^2 = 0.033$), whereas there was no significant difference in donation intention between participants in the single-task group and those in the control group ($p = 0.589$). Thus, Hypothesis H1 proposed in this paper was again supported.

Figure content: legend—single task, control group, multitasking. Y-axis—willingness to participate in the “Wardrobe of Love” donation campaign. X-axis—process focus; outcome focus. Under process focus: single task 5.67, control group 5.75, multitasking 5.28; $p = 0.910, p = 0.002, p = 0.018$. Under outcome focus: single task 5.50, control group 5.67, multitasking 6.13; $p = 0.589, p = 0.003, p < 0.001$.

Figure 3. Interactive effect of multitasking and thinking-focus mode on donation intention (Experiment 1b)

Exclusion of alternative explanations. To rule out alternative explanations involving the above variables, we used participants' intention to donate to the “Wardrobe of Love” activity as the dependent variable, multitasking (0 = multitasking, 1 = single task, 2 = control group) as the independent variable, and thinking-focus mode (0 = process, 1 = outcome) as the moderator. We simultaneously included sense of busyness, perceived effort, perceived difficulty of completing the task, and construal level as mediating variables. The results

of the bootstrapping analysis showed the following (Model 8, sample size 5000, multicategorical comparison, X_1 : single task compared with multitasking; X_2 : control group compared with multitasking; Preacher & Hayes, 2008): the moderating effect of thinking-focus mode was not significant through sense of busyness (X_1 : Effect = 0.004, SE = 0.01, 95% CI = [-0.0229, 0.0274]; X_2 : Effect = -0.002, SE = 0.01, 95% CI = [-0.0306, 0.0200]), perceived effort (X_1 : Effect = -0.03, SE = 0.03, 95% CI = [-0.0963, 0.0125]; X_2 : Effect = -0.04, SE = 0.03, 95% CI = [-0.1167, 0.0057]), or perceived difficulty of completing the task (X_1 : Effect = -0.02, SE = 0.03, 95% CI = [-0.0845, 0.0257]; X_2 : Effect = -0.03, SE = 0.03, 95% CI =

[-0.0934, 0.0114]) and construal level (X_1 : Effect = -0.06, SE = 0.04, 95% CI = [-0.1543, 0.0131]; X_2 : Effect = -0.07, SE = 0.04, 95% CI = [-0.1569, 0.0108]) were not significant when entered as mediating variables, indicating that the moderated mediation effects of these variables were not supported.

2.2.4 Discussion Experiment 1b again verified the interaction effect proposed in Hypothesis H1, and ruled out alternative explanations involving perceived self-importance, busyness, perceived effort, perceived task-completion difficulty, and construal level. Relative to Experiment 1a, Experiment 1b added a control group in which the nature of the task was not mentioned. Participants in the single-task group and the control group did not differ significantly in either the outcome variables or in several alternative explanatory variables. Therefore, in the subsequent experiments, we focus on comparisons between the multitasking and single-task groups.

2.3 Experiment 1c: Manipulating Multitasking With Actual Work Tasks to Verify the Interaction Effect

Compared with the first two experiments, Experiment 1c further tested the interaction effect of multitasking and attentional focus on prosocial behavior through three approaches: using a simulated work-task type to manipulate multitasking, replacing donation with another variable to measure prosocial behavior, and adopting an incentive-compatible experimental design (Wang et al., 2023).

2.3.1 Experimental Design and Participants Experiment 1c again adopted a 2 (multitasking: single-task vs. multitasking) $\times$ 2 (attentional focus: process vs. outcome) between-subjects design. In this experiment, 400 university students were recruited offline and randomly assigned to four experimental groups. Before the experiment, participants were informed of the instructions and again confirmed whether they were willing to participate. After the experiment, each participant received 15 yuan as compensation. After excluding 7 participants who answered the attention-check items incorrectly, the final valid sample consisted of 393 participants (70% female, M_{age} = 20.74,

$SD_{age} = 1.78$). An analysis using G*Power 3.1 (Faul et al., 2009) indicated that the final sample had adequate statistical power.

2.3.2 Experimental Procedure and Stimuli Existing studies often manipulate multitasking using decontextualized simulated cognitive tasks (Zhou Xiang et al., 2024). Considering that the present research mainly aimed to examine how people's multitasking states in everyday work influence their subsequent intentions to engage in prosocial behavior, multitasking in this experiment was manipulated by simulating actual work tasks. The research team organized the multitasking work scenarios recalled by participants in Experiment 1b and designed three task contents commonly encountered in daily work. Before the experiment began, participants were told that their current role was that of an intern at a company and that they needed to complete work tasks assigned by a supervisor. Participants in the single-task group only needed to complete one core work task: watching a video lecture on "how to efficiently prepare meeting minutes" and learning the relevant skills. The entire video lasted about 7 minutes. In the multitasking group, in addition to watching the video to learn the skills, participants were interrupted twice during the process. They were asked to pause the video learning, complete work tasks temporarily assigned by the supervisor, and then continue watching the video. The first work task was to calculate, based on an "interviewee information form," the number of interviewees in different time periods. The second work task was

The work task asked participants, in the role of a supervisor's assistant, to email the assistant of a manager who was about to visit and inquire about the manager's flight information, so that the company could arrange for a designated employee to pick the manager up at the airport. Both tasks involved relatively simple information processing. To keep the task duration roughly equivalent between the multitasking group and the single-task group, we processed the video for the multitasking group at 1.25× speed.

After entering the questionnaire stage, participants first answered a simple multiple-choice question— "Which of the following stories did the video blogger use to demonstrate the audio-positioning function?" —as an attention check. They were then asked to describe in writing their psychological feelings during the preceding process (or at the outcome) to manipulate their mode of thought focus (Zhao et al., 2007). Immediately afterward, they answered manipulation-check items for multitasking identical to those in Experiment 1a ($r = 0.74, p < 0.001$) and for mode of thought focus ($r = 0.64, p < 0.001$).

Next, participants simultaneously viewed introductions to two products and answered the question, "Which hand soap would you be more likely to choose?" (1 = Product A, 7 = Product B; the order of the two products was counterbalanced). The environmentally friendly product was described as "made from plant-based and biodegradable ingredients," whereas the ordinary product was described as "made from surface-cleaning active ingredients" (all measures are provided in Appendix 2). Before the for-

mal experiment, an independent pretest with a sample size of 70 (66% female; 61% aged 21–30) showed that the environmentally friendly product was perceived as more environmentally friendly than the ordinary product ($M_{\text{environmentally friendly product}} = 5.91, SD_{\text{environmentally friendly product}} = 0.86$; $M_{\text{ordinary product}} = 2.92, SD_{\text{ordinary product}} = 0.80$; $F(1, 68) = 223.76, p < 0.001, \eta_p^2 = 0.767$). Participants then answered demographic questions and provided their experimental ID numbers, after which the experiment ended.

In addition, we adapted a dictator game to measure participants' level of prosocial behavior. After the experiment ended, the experiment assistant paid participants the participation fee by scanning a QR code. At the same time, participants were told that, to thank everyone, a lottery would be held. All participants would be divided into two roles—allocator and recipient—and one lucky participant would be selected from each role to share a prize of 200 yuan. However, only the winner assigned to the allocator role could freely decide how to allocate the 200 yuan; the winner assigned to the recipient role could only accept the allocation plan of the other winner, and both parties' roles would remain anonymous. If participants were willing to take part (all participants chose to participate), they could first draw a role on site. If they drew the allocator role, they could write down their experimental ID number on a slip of paper, as well as the proportion of the prize they were willing to allocate to the other winner, and then place it in the corresponding box (in fact, all participants drew the allocator role). In this experiment, participants' prosocial behavior was assessed by the proportion of the lottery prize they allocated to the other person; the higher the proportion allocated to the other person, the higher the level of prosocial behavior. After the entire experiment was completed, we announced the ID numbers of the two winners in the WeChat group and contacted them privately to distribute the prize according to the allocation proportions they had submitted.

2.3.3 Experimental Results

Manipulation check. A 2×2 ANOVA using the mean of the multitasking manipulation-check items as the dependent variable showed a significant main effect of task type ($F(3, 389) = 126.75, p < 0.001, \eta_p^2 = 0.246$). Participants in the multitasking group ($M_{\text{multitasking}} = 5.32, SD_{\text{multitasking}} = 1.26$) were more likely than those in the single-task group ($M_{\text{single-task}} = 3.73, SD_{\text{single-task}} = 1.52$) to believe that they were multitasking. The main effect of mode of thought focus and the interaction between the two were not significant ($F_s < 1.30, p_s > 0.26$). Using the manipulation of mode of thought focus

With the mean score of the manipulation-check items as the dependent variable, the results of a 2×2 ANOVA showed that the main effect of mode of cognitive focus was significant ($F(3, 389) = 482.29, p < 0.001, \eta_p^2 = 0.554$). Participants in the process-focus group ($M_{\text{process}} = 2.83, SD_{\text{process}} = 1.06$) felt that they paid more attention to the process, whereas participants in the outcome-focus group ($M_{\text{outcome}} = 5.28, SD_{\text{outcome}} = 1.15$) felt that they paid more attention

to the outcome. All other effects were nonsignificant ($F_s < 1.85, p_s > 0.17$), indicating that the manipulation was effective.

Interaction effect. Taking intention to purchase environmentally friendly products as the dependent variable, the results of a 2×2 ANOVA showed that the main effect of task type was nonsignificant ($F(3, 389) = 0.03, p = 0.860, \eta_p^2 < 0.001$), and the main effect of mode of cognitive focus was also nonsignificant ($F(3, 389) = 3.48, p = 0.063, \eta_p^2 = 0.009$). As expected, the interaction between the two was significant ($F(3, 389) = 11.68, p = 0.001, \eta_p^2 = 0.029$). When participants' thinking was focused on the process, participants in the multitasking group were significantly less likely to purchase environmentally friendly products than those in the single-task group ($M_{\text{multitasking}} = 3.72, SD_{\text{multitasking}} = 1.96; M_{\text{single-task}} = 4.37, SD_{\text{single-task}} = 1.72; F(1, 389) = 6.48, p = 0.011, \eta_p^2 = 0.016$). However, this effect changed when participants' thinking was focused on the outcome: participants in the multitasking group were significantly more likely to purchase environmentally friendly products than those in the single-task group ($M_{\text{multitasking}} = 4.68, SD_{\text{multitasking}} = 1.71; M_{\text{single-task}} = 4.09, SD_{\text{single-task}} = 1.77; F(1, 389) = 5.24, p = 0.023, \eta_p^2 = 0.013$). Hypothesis H1 proposed in this paper was again supported.

Taking the proportion of lottery winnings allocated to others as the dependent variable, the results of a 2×2 ANOVA showed that the main effect of task type was nonsignificant ($F(3, 389) = 0.01, p = 0.933, \eta_p^2 < 0.001$), and the main effect of mode of cognitive focus was also nonsignificant ($F(3, 389) = 1.88, p = 0.171, \eta_p^2 = 0.005$); however, the interaction between the two was significant ($F(3, 389) = 8.93, p = 0.003, \eta_p^2 = 0.022$). When participants' thinking was focused on the process, the proportion of lottery winnings that participants in the multitasking group allocated to others was significantly lower than that in the single-task group ($M_{\text{multitasking}} = 33.94\%, SD_{\text{multitasking}} = 19.05\%; M_{\text{single-task}} = 39.40\%, SD_{\text{single-task}} = 16.74\%; F(1, 389) = 4.23, p = 0.040, \eta_p^2 = 0.011$). However, this effect changed when participants' thinking was focused on the outcome: the proportion of lottery winnings that participants in the multitasking group allocated to others was significantly higher than that in the single-task group ($M_{\text{multitasking}} = 42.13\%, SD_{\text{multitasking}} = 20.63\%; M_{\text{single-task}} = 36.36\%, SD_{\text{single-task}} = 17.90\%; F(1, 389) = 4.71, p = 0.031, \eta_p^2 = 0.012$). Hypothesis H1 proposed in this paper was again supported.

2.3.4 Discussion

Experiment 1c used simulated real work tasks to manipulate multitasking, and measured participants' prosocial intentions and actual behavior using, respectively, intention to purchase environmentally friendly products and the proportion of lottery winnings allocated to others. The results again verified the interaction effect predicted by Hypothesis H1.

It is worth noting that in Experiment 1a, the two modes of cognitive focus in the

Figure 4. Interaction effect of thinking focus and multitasking on prosocial behavior in Experiment 1c. Panel A: intention to purchase environmentally friendly products; Panel B: proportion of lottery allocation given to others.

Figure 1: Figure 4. Interaction effect of thinking focus and multitasking on prosocial behavior in Experiment 1c. Panel A: intention to purchase environmentally friendly products; Panel B: proportion of lottery allocation given to others.

single-task group did not produce a significant difference in participants' prosocial behavioral intentions ($p = 0.290$). In Experiment 1b, in both the single-task group and the control group, whether thinking was focused on the process or on the outcome, participants' donation intentions toward "Wardrobe of Love" also did not differ significantly ($ps > 0.25$). In Experiment 1c, participants in the single-task group also showed no significant differences in either intention to purchase environmentally friendly products or the proportion of lottery winnings allocated to others ($ps > 0.25$). However, across the three experiments, among participants in the multitasking group, those with different modes of cognitive focus showed significant differences in prosocial behavioral intentions or behavior (ps

< 0.002), indicating that thinking focus did not affect subsequent prosocial behavioral intentions or behavior among individuals who completed a single task; its moderating effect occurred mainly among individuals who completed multiple tasks. Next, we further examine the psychological mechanism underlying the above interaction effect.

Figure 4 Interaction effect of thinking focus and multitasking on prosocial behavior in Experiment 1c (Experiment 1c)

3 Experiment 2: The Mediating Role of Self-Efficacy

Experiment 2 aimed to test the mediating role of self-efficacy in the interaction effect of multitasking and thinking focus on prosocial behavior. It also attempted to rule out alternative explanations involving self-esteem and self-confidence. Both concepts are related to self-efficacy and may influence individuals' prosocial behavior. Specifically, self-esteem refers to an individual's affective evaluation of their own appreciation, value, and importance (Chen et al., 2001); self-confidence refers to an individual's belief that they can perform well in various situations (Gaspar & Schweitzer, 2021).

3.1 Experimental Design and Participants

Experiment 2 again adopted a 2 (multitasking: single task vs. multitasking) $\times$ 2 (thinking focus: process vs. outcome) between-subjects design. We recruited 420 participants on the Credamo platform, and they were randomly assigned to one of the four experimental groups. After excluding 8 responses that failed the

attention check and had response times of less than 60 seconds, 412 valid samples were obtained (66% female, $M_{\text{age}} = 29.6$, $SD_{\text{age}} = 8.47$). An analysis using G*Power 3.1 (Faul et al., 2009) indicated that the final sample had statistical power.

3.2 Experimental Procedure and Stimuli

Participants were asked to complete two unrelated tasks in the experiment. In the first stage, the same method as in Experiment 1a (the recall method) was used to manipulate multitasking and thinking focus. After completing the written description of their experience, participants answered the same manipulation-check items as in Experiment 1a for multitasking ($r = 0.80$, $p < 0.001$) and thinking focus ($r = 0.48$, $p < 0.001$).

In the second stage, we invited participants to complete an unrelated behavioral-intention survey. They were told that, while browsing on their mobile phones, they saw that a public welfare platform was carrying out a “Caring for Children with Autism” campaign, through which people could care by purchasing paintings by children with autism...

care for them, and raise charitable donations for them (adapted with reference to a real public-welfare project on Alipay). We asked participants about their willingness to participate in the activity at that moment (“1” = very unwilling, “7” = very willing). Next, participants answered 4 items measuring self-efficacy (“When facing a difficult task, I believe I can complete it” ; “I will be able to successfully overcome many challenges” ; “I believe I can effectively complete many different tasks” ; “Overall, I think I can obtain outcomes that are very important to me” ; where “1” = strongly disagree and “7” = strongly agree; Schwarzer & Jerusalem, 1995; $\alpha = 0.71$), 10 items measuring self-esteem (e.g., “I feel that I am a person of worth”; where “1” = strongly disagree and “7” = strongly agree; Rosenberg, 1965; $\alpha = 0.86$), and 3 items measuring self-confidence (“I will be able to achieve most of the goals I set for myself” ; “I believe I can succeed in any endeavor I am determined to undertake” ; “I am confident that I can effectively complete many different tasks” ; Jiang et al., 2021; $\alpha = 0.79$) (all scales are provided in Appendix 2). The experiment ended after participants completed the attention-check items and demographic questions.

3.3 Experimental Results

Manipulation checks. A 2×2 ANOVA using the mean score of the multitasking manipulation-check items as the dependent variable showed that only the main effect of multitasking was significant ($F(1, 408) = 477.76$, $p < 0.001$, $\eta_p^2 = 0.539$); participants in the multitasking group ($M_{\text{multitasking}} = 5.99$, $SD_{\text{multitasking}} = 0.93$) were more likely than those in the single-tasking group ($M_{\text{single-tasking}} = 3.17$, $SD_{\text{single-tasking}} = 1.59$) to believe that they themselves were multitasking, while the other effects were not significant ($F_s < 0.11$, $p_s > 0.74$). A 2×2 ANOVA using the mean score of the mindset-focus manipulation-

check items as the dependent variable showed that only the main effect of mindset focus was significant ($F(1, 408) = 236.65, p < 0.001, \eta_p^2 = 0.367$); participants in the process-focus group ($M_{\text{process}} = 2.58, SD_{\text{process}} = 1.24$) felt that they paid more attention to the process, whereas participants in the outcome-focus group ($M_{\text{outcome}} = 4.56, SD_{\text{outcome}} = 1.37$) felt that they paid more attention to the outcome. The other effects were not significant ($F_s < 0.36, p_s > 0.55$). These results indicate that the manipulations of multitasking and mindset focus in Experiment 2 were effective.

Interaction effect. A 2×2 ANOVA using participants' willingness to participate in the "Care for Children with Autism" activity as the dependent variable showed that the main effect of multitasking was not significant ($F(1, 408) = 1.34, p = 0.248, \eta_p^2 = 0.003$), whereas the main effect of mindset focus was significant ($F(1, 408) = 13.57, p < 0.001, \eta_p^2 = 0.032$). As expected, the interaction between the two was significant ($F(1, 408) = 37.37, p < 0.001, \eta_p^2 = 0.084$). As shown in Figure 5, when participants' mindset was focused on the process, multitasking (relative to single-tasking) reduced their willingness to participate in the public-welfare activity ($M_{\text{multitasking}} = 5.28, SD_{\text{multitasking}} = 1.05; M_{\text{single-tasking}} = 5.74, SD_{\text{single-tasking}} = 1.17; F(1, 408) = 12.41, p < 0.001, \eta_p^2 = 0.030$). However, when participants' mindset was focused on the outcome, the above effect reversed: multitasking increased their willingness to participate in the public-welfare activity ($M_{\text{multitasking}} = 6.19, SD_{\text{multitasking}} = 0.79; M_{\text{single-tasking}} = 5.51, SD_{\text{single-tasking}} = 0.67; F(1, 408) = 26.17, p < 0.001, \eta_p^2 = 0.060$), thereby replicating H1.

Legend: Single task Multitasking

Y-axis: Intention to participate in the "Caring for Children with Autism" activity

X-axis: Process focus; Outcome focus

Thinking focus	Single task	Multitasking	Significance
Process focus	5.74	5.28	$p < 0.001$
Outcome focus	5.51	6.19	$p < 0.001$

Figure 5. Interaction effect of thinking focus and multitasking on intention to participate in public-benefit activities (Experiment 2)

Mediation analysis and exclusion of alternative explanations. The results of a 2×2 ANOVA using the mean score of the self-efficacy items as the dependent variable showed that the main effect of multitasking ($F(1, 408) = 0.08, p = 0.778, \eta_p^2 < 0.001$) was not significant, whereas the main effect of thinking focus ($F(1, 408) = 16.20, p < 0.001, \eta_p^2 = 0.038$) was significant and consistent with expectations. The interaction effect between the two was also significant ($F(1, 408) = 46.57, p < 0.001, \eta_p^2 = 0.102$). When participants' thinking was focused on the process, multitasking, compared with single-tasking, reduced their self-efficacy ($M_{\text{multitasking}} =$

5.19, $SD_{\text{multitasking}} = 0.78$; $M_{\text{single-task}} = 5.61$, $SD_{\text{single-task}} = 0.67$; $F(1, 408) = 21.61$, $p < 0.001$, $\eta_p^2 = 0.050$). However, when participants' thinking was focused on the outcome, multitasking instead increased their self-efficacy ($M_{\text{multitasking}} = 5.88$, $SD_{\text{multitasking}} = 0.54$; $M_{\text{single-task}} = 5.43$, $SD_{\text{single-task}} = 0.59$; $F(1, 408) = 25.01$, $p < 0.001$, $\eta_p^2 = 0.058$).

Taking intention to participate in the activity as the dependent variable, multitasking (0 = single-task, 1 = multitasking) as the independent variable, thinking focus (0 = process focus, 1 = outcome focus) as the moderator, and self-efficacy, self-esteem, and self-confidence simultaneously as mediators, the mediation mechanism was tested using the bootstrapping method (Model 7, sample size 5000; Preacher & Hayes, 2008). The results showed that, under the 95% confidence interval, the moderating effect of thinking focus was significant when self-efficacy served as the mediating variable (Effect = 0.60, $SE = 0.13$, 95% $CI = [0.3736, 0.8662]$). Specifically, when thinking was focused on the process, the negative mediating effect of self-efficacy was significant (Effect = -0.29 , $SE = 0.08$, 95% $CI = [-0.4612, -0.1464]$); when thinking was focused on the outcome, the positive mediating effect of self-efficacy was significant (Effect = 0.31, $SE = 0.07$, 95% $CI = [0.1802, 0.4675]$) (the full model is shown in Figure 6). The data results supported Hypothesis H2. However, when self-esteem (Effect = -0.03 , $SE = 0.03$, 95% $CI = [-0.0949, 0.0233]$) and self-confidence (Effect = 0.05, $SE = 0.05$, 95% $CI = [-0.0300, 0.1570]$) served as mediating variables, the moderating effect of thinking focus was not significant; whether focusing on the process or focusing on the outcome, the mediating effects of these two variables were both nonsignificant.

Text in Figure 6

- Thinking focus mode (0 = process, 1 = outcome)
- Self-efficacy
- Multitasking (0 = single task, 1 = multitasking)
- Intention to participate in the "Care for Children with Autism" activity

Path coefficients and indices:

- Interaction = 0.88***
- $a = -0.42^{***}$
- $b = 0.68^{***}$
- $c = 0.07^{NS}$
- Moderated mediation: index = 0.60, 95% $CI = 0.3736 \sim 0.8662$
- Process focus: index = -0.29 , 95% $CI = -0.4612 \sim -0.1464$
- Outcome focus: index = 0.31, 95% $CI = 0.1802 \sim 0.4675$

Figure 6. Full model of the moderated mediating effect of self-efficacy (Experiment 2)

3.4 Discussion

Experiment 2 once again verified the interaction effect of multitasking and thinking focus mode on prosocial behavior, and also verified the mediating role of self-efficacy. When individuals' thinking focused on the process, multitasking—as compared with single-tasking—damaged their perceived self-efficacy, thereby reducing their intention to participate in prosocial activities. However, when individuals' thinking focused on the outcome, multitasking enhanced their perceived self-efficacy, thereby increasing their intention to participate in prosocial activities. The experimental results also found that, when self-esteem, self-confidence, and self-efficacy were simultaneously included as mediating variables, only the moderated mediating effect of self-efficacy was significant, thereby ruling out alternative explanations based on self-esteem and self-confidence. We believe this may be because, compared with self-efficacy, self-esteem and self-confidence are more stable personality traits and are less susceptible to the influence of a multitasking state.

4 Experiment 3: Revalidating the Mediating Role of Self-Efficacy by Testing Moderation of the Mediation

Experiment 3 aimed to reexamine the mediating role of self-efficacy by testing moderation of the mediation. In addition, under different thinking focus modes, the direction of multitasking's effect on individuals' self-efficacy and subsequent prosocial behavior is opposite. Testing the mediating role of self-efficacy under the two thinking focus modes within a single experiment may therefore not be sufficiently clear. Accordingly, Experiments 3a (preregistered) and 3b (preregistered) will separately test the mediating role of self-efficacy when thinking is focused on outcomes and when it is focused on processes.

4.1 Experiment 3a: Breaking Ability Continuity to Verify the Mediating Role of Self-Efficacy When Thinking Is Focused on Outcomes

Self-efficacy is an individual's judgment of their overall ability and confidence to effectively complete a task in the future. The preceding analysis suggests that, when individuals focus on outcomes, multitasking makes them feel that they have completed more tasks within the same amount of time and that their own ability is stronger, thereby enhancing their self-efficacy and ultimately increasing their intention to participate in prosocial activities. Therefore, if participants' perception of ability continuity is manipulated—that is, if the connection between past ability and the individual's future cross-domain ability is broken—then even if multitasking makes individuals feel that their own ability is stronger, their self-efficacy will not increase. On this basis, we infer that if self-efficacy indeed plays a mediating role in the overall mechanism, then in the control group, when thinking is focused on outcomes, the effect whereby multitasking increases prosocial behavior will appear again; however, in the group in which ability continuity is broken, the positive effect of multitasking on prosocial be-

havior

would be weakened or disappear. This experiment was preregistered (https://aspredicted.org/C2S_TTF), and an incentive-compatible design was used to measure prosocial behavior (Wang et al., 2023).

4.1.1 Experimental Design and Participants Experiment 3a adopted a 2 (multitasking: single task vs. multitasking) $\times$ 2 (continuity of ability: negation vs. control) between-subjects design. A total of 420 participants were recruited on the Jianshu platform and were randomly assigned to one of the four experimental groups. After excluding 12 responses that failed the attention check and had a response time of less than 60 seconds, 408 valid samples were obtained (67.9% female, $M_{\text{age}} = 28.6$, $SD_{\text{age}} = 7.32$). An analysis using G*Power 3.1 (Faul et al., 2009) indicated that the final sample had sufficient statistical power.

4.1.2 Experimental Procedure and Stimuli Participants were required to complete two unrelated tasks in the experiment. In the first stage, the scenario-imagination method was again used to manipulate multitasking, but the work content was changed: participants were told that they needed to go to a supermarket to purchase supplies for a company weekend event. In the multitasking group, participants needed to simultaneously complete multiple tasks within a certain period of time, including asking everyone for opinions and selecting materials, answering phone calls from clients, and replying to work messages from colleagues. In the single-task group, participants only needed to complete the task of selecting materials. To strengthen the multitasking manipulation and to guide the thought focus of participants in all groups entirely toward outcomes (Srna et al., 2018), after reading the scenario description materials, participants needed to choose which tasks they would complete in the above scenario. Specifically, participants in the multitasking group were told that they had to choose at least two or more work items, whereas participants in the single-task group could choose only one work item. Participants then answered the same multitasking manipulation-check items as in Experiment 2 ($r = 0.61$, $p < 0.001$).

Next, participants in the control group answered the same self-efficacy scale items as in Experiment 2 (Schwarzer & Jerusalem, 1995; $\alpha = 0.83$), attention-check items, and demographic questions. To disrupt participants' perceived association between past ability and future ability, participants in the continuity-of-ability negation group were required to read a WeChat public-account article titled "Present Ability Does Not Determine the Future" and summarize its core viewpoint in more than 15 Chinese characters. The core content of the article included: "People overestimate the influence of present ability on the future... Performance in certain work domains cannot explain your performance in other domains... Current ability also cannot guarantee your future ability to effectively complete a certain task; therefore, you cannot predict your future ability to

perform another job based on your current performance in a certain domain.” Then, participants in this group again answered the same self-efficacy scale items as in Experiment 2 (Schwarzer & Jerusalem, 1995; $\alpha = 0.83$), attention-check items, and demographic questions.

In this experiment, the measurement of prosocial behavioral intention adopted an incentive-compatible design (Wang et al., 2023). After completing the first-stage task, participants were told that the survey had ended. Because the research team was participating in the “Settle a Home for You” public-welfare activity to help empty-nest older adults (see Figure 7, simplified based on real project information from Tencent’s 99 Giving Day), in addition to the normal payment of the response fee, 10 lucky participants would also receive an extra reward of 20 yuan (a real lottery). After being clearly informed that this donation was voluntary and would not affect any evaluation of them in the experiment, we invited participants to use a slider (0%-100%)

to indicate the percentage of the prize money they would be willing to donate if they won (Goenka & van Osselaer, 2019), and this was used as the measure of prosocial behavioral intention in the present experiment.

A Home for You

Provide improvements to the living environment and regular visits and companionship for elderly people in difficult circumstances who live alone.

Implementing and receiving organization: Zhejiang Anfulisheng Charity Foundation

Project Introduction

What, after all, does it mean to grow old?

Aging, illness, and loneliness refer to ordinary older adults; if hardship, living alone, disability, or even partial loss of self-care ability are added, they more vividly describe the older adults we aim to help.

The “A Home for You” project is a public-welfare charity project initiated in 2018 by the Zhejiang Anfulisheng Charity Foundation (abbreviated as An Foundation). It aims to help these older adults who are in difficult circumstances, live alone, or even have disabilities by improving their living environment and providing assistance in daily life as well as emotional care, so that they may have a secure place to live and peace of mind.

Donate

Figure 7. Example of prosocial-behavior activity materials (Experiment 3a)

4.1.3 Experimental Results

Manipulation check. A 2×2 ANOVA using the mean of the multitasking manipulation-check items as the dependent variable showed that only the main effect of multitasking was significant ($F(1,404) = 205.32, p < 0.001, \eta_p^2 = 0.337$). Participants in the multitasking group ($M_{\text{multitasking}} = 6.06, SD_{\text{multitasking}} = 0.72$) were more likely than those in the single-task group ($M_{\text{single-task}} = 4.59, SD_{\text{single-task}} = 1.27$) to perceive themselves as multitasking. The main effect of the ability-continuity manipulation and its interaction with multitasking were not significant ($F_s < 2.61, p_s > 0.11$). These results indicate that the multitasking manipulation in Experiment 3a was effective.

Main effects. A 2×2 ANOVA using the intended donation percentage as the dependent variable showed that the main effect of multitasking was significant ($F(1,404) = 18.51, p < 0.001, \eta_p^2 < 0.044$). Participants in the multitasking condition intended to donate a higher percentage of the prize money ($M_{\text{multitasking}} = 61.01\%, SD_{\text{multitasking}} = 25.39\%$ vs. $M_{\text{single-task}} = 51.20\%, SD_{\text{single-task}} = 21.92\%$). The main effect of the ability-continuity manipulation was significant ($F(1,404) = 8.38, p = 0.004, \eta_p^2 < 0.020$): participants in the condition negating ability continuity intended to donate a lower percentage of the prize money ($M_{\text{negation}} = 52.82\%, SD_{\text{negation}} = 24.15\%$ vs. $M_{\text{control}} = 59.27\%, SD_{\text{control}} = 23.84\%$). More importantly, the interaction between the two was significant ($F(1,404) = 24.59, p < 0.001, \eta_p^2 = 0.057$). As shown in Figure 8, multitasking significantly increased the intended donation percentage among participants in the control group ($M_{\text{multitasking}} = 69.85\%, SD_{\text{multitasking}} = 21.13\%$ vs. $M_{\text{single-task}} = 48.89\%, SD_{\text{single-task}} = 21.77\%$; $F(1,404) = 43.31, p < 0.001, \eta_p^2 = 0.097$). Because, in the present experiment, participants' thinking focus was entirely adjusted to an outcome focus, the results for the control group once again partially verified the hypoth-

Hypothesis H1. However, among participants in the ability-continuity denial group, there was no significant difference in the intended donation percentage between the multitasking and single-task perception groups ($M_{\text{multitasking}} = 52.08\%, SD_{\text{multitasking}} = 26.28\%$ vs. $M_{\text{single-task}} = 53.56\%, SD_{\text{single-task}} = 21.93\%$; $F(1,404) = 0.21, p = 0.644, \eta_p^2 = 0.001$).

Figure 8. Intended donation percentage of prize amount (Experiment 3a)

- Legend: Single task; Multitasking
- Y-axis: Intended donation percentage of prize amount (%)
- Control group: single task = 48.89; multitasking = 69.85; $p < 0.001$
- Denial group: single task = 53.56; multitasking = 52.08; $p = 0.644$

Moderated mediation test. Taking the intended donation percentage of the prize amount as the dependent variable, multitasking (0 = single task, 1 =

multitasking) as the independent variable, ability continuity (0 = control, 1 = denial) as the moderator, and self-efficacy as the mediator, the mediation mechanism was tested using the bootstrapping method (Model 7, sample size = 5000; Preacher & Hayes, 2008). The results showed that, at the 95% confidence interval, the moderating effect of ability continuity was significant (Effect = -3.46 , $SE = 1.50$, $95\%CI = [-6.8279, -0.8999]$). Specifically, in the control group, the positive mediating effect of self-efficacy was significant (Effect = 4.29 , $SE = 1.25$, $95\%CI = [2.0478, 7.0207]$), partially replicating the results of Experiment 2; however, when the continuity between present ability and future ability was denied, the mediating effect of self-efficacy was not established (Effect = 0.83 , $SE = 0.95$, $95\%CI = [-1.0235, 2.7622]$) (the full model is shown in Figure 9). The data once again supported Hypothesis H2.

Figure 9. Full model of the moderated mediation effect of ability continuity (Experiment 3a)

- Ability continuity (0 = control, 1 = denial)
- Multitasking (0 = single task, 1 = multitasking)
- Self-efficacy
- Intended donation percentage of prize amount
- Interaction = -0.45^{**}
- $a = 0.56^{***}$
- $b = 7.63^{***}$
- $c = 7.25^{**}$

Moderated mediation: index = -3.46 , $95\%CI = -6.8279 \sim -0.8999$

Control group: index = 4.29 , $95\%CI = 2.0478 \sim 7.0207$

Denial group: index = 0.83 , $95\%CI = -1.0235 \sim 2.7622$

4.1.4 Discussion Experiment 3a again verified the mediating role of self-efficacy through moderated mediation. Consistent with expectations, in the control group, because participants' thinking had already been focused on outcomes, multitasking significantly enhanced their self-efficacy, thereby increasing the proportion who were willing to donate. However, after the continuation of the ability-negation task, the increase in self-efficacy produced by multitasking relative to single-tasking disappeared, resulting in no significant difference between the two groups in the proportion willing to donate. This experiment not only replicated part of the main effect of this article in the control group, partially supporting Hypothesis H1, but also verified in another way that self-efficacy indeed plays a key mediating role in the interactive effect of multitasking and thinking focus on prosocial behavior, thereby again supporting Hypothesis H2.

4.2 Experiment 3b: Using an External Means to Enhance Self-Efficacy to Verify the Mediating Role of Self-Efficacy When Thinking Is Focused on the Process

The preceding analysis showed that when individuals focus on the process, multitasking reduces their self-efficacy, thereby reducing their willingness to engage in prosocial behavior. Experiment 3b (preregistered: https://aspredicted.org/KJP_QK6) attempted to use an external means to enhance some participants' self-efficacy. If self-efficacy indeed plays a mediating role in the entire mechanism, then the results and mechanism of the present study should be replicated in the control group; however, in the self-efficacy enhancement group, the negative effect of multitasking on prosocial behavior should be weakened or disappear.

4.2.1 Pretest Procedure and Results Previous literature has enhanced participants' self-efficacy through situational writing tasks (Sharma & Morwitz, 2016). Drawing on this approach, we conducted an independent pretest experiment ($N = 117$; women = 64.1%; $M_{\text{age}} = 28.62$, $SD_{\text{age}} = 9.18$) to verify the effectiveness of this manipulation. Participants were randomly assigned to one of two conditions (self-efficacy: enhancement vs. control). In the enhancement group, participants were asked to recall an extremely important task they had successfully completed and to describe the steps by which they completed it; in the control group, participants were asked to recall and describe details from an ordinary day in their life during the past week. After completing the situational writing task, participants answered the same manipulation-check items for perceived self-efficacy as in Experiment 2 ($\alpha = 0.76$), as well as basic demographic questions such as gender and age. The results of a one-way ANOVA showed that, compared with the control group ($M_{\text{control}} = 5.29$, $SD_{\text{control}} = 0.64$), participants in the self-efficacy enhancement group perceived higher self-efficacy ($M_{\text{enhancement}} = 5.89$, $SD_{\text{enhancement}} = 0.61$; $F(1, 115) = 26.07$, $p < 0.001$, $\eta_p^2 = 0.185$), indicating that the manipulation was effective.

4.2.2 Formal Experimental Design and Participants Experiment 3b adopted a 2 (task condition: single-tasking vs. multitasking) $\times$ 2 (self-efficacy: enhancement vs. control) between-subjects design. A total of 420 participants recruited on the Jianshu platform were randomly assigned to one of the four experimental groups. After excluding 14 responses that failed the attention check and had response times of less than 60 seconds, 406 valid samples remained (women = 64.3%; $M_{\text{age}} = 28.73$, $SD_{\text{age}} = 8.64$). An analysis using G*Power 3.1 (Faul et al., 2009) indicated that the final sample had sufficient statistical power.

4.2.3 Formal Experimental Procedure and Stimuli

Participants were required to complete two unrelated tasks in the experiment. In the first stage, the same scenario-description materials as in Experiment 3a

were used to manipulate multitasking. The difference was that, before reading the scenario materials, participants were reminded to “focus on the process of experiencing this scenario” ; after reading the scenario-imagery materials, they were asked to “recall this work process and describe how you felt while experiencing the work process described above.” In this way, all participants’ mindset was directed toward a process focus (Zhao et al., 2007). Participants then answered the same multitasking manipulation-check items as in the preceding series of experiments ($r = 0.55, p < 0.001$).

Next, the writing task from the pretest was used to manipulate participants’ self-efficacy. Participants in the enhancement group were asked to describe “a very important task that you successfully completed,” whereas participants in the control group were asked to describe “an ordinary day you experienced during the past week.”

In the second stage, participants needed to complete an unrelated behavioral-intention survey. They were told that a relief foundation was calling on people to participate in the “Caring Meal Plan” (adapted from a real charitable activity on Alipay) to deliver caring meals to sanitation workers who leave early and return late. They then indicated the extent to which they were willing to participate in this charitable activity (1 = “*veryunwilling*”; 7 = “*verywilling*”). Finally, they answered attention-check items and provided basic demographic information.

4.2.4 Experimental Results

Manipulation check. A 2×2 ANOVA using the mean score of the multitasking manipulation-check items as the dependent variable showed that only the main effect of multitasking was significant ($F(1, 402) = 143.54, p < 0.001, \eta_p^2 = 0.263$). Participants in the multitasking condition ($M_{\text{multitasking}} = 6.17, SD_{\text{multitasking}} = 0.65$) were more likely than those in the single-task condition ($M_{\text{single-task}} = 4.97, SD_{\text{single-task}} = 1.26$) to believe that they were multitasking. The main effect of the self-efficacy manipulation and its interaction with multitasking were both nonsignificant ($F_s < 3.20, p_s > 0.07$), indicating that the manipulation was effective.

Main effects. A 2×2 ANOVA with willingness to participate in the Caring Meal Plan as the dependent variable showed a significant main effect of multitasking ($F(1, 402) = 7.33, p = 0.007, \eta_p^2 = 0.018$). Because all participants in this experiment had their mindset focused on the process, participants in the multitasking condition reported significantly lower willingness to participate in the Caring Meal Plan than did those in the single-task condition ($M_{\text{multitasking}} = 5.73, SD_{\text{multitasking}} = 0.99$ vs. $M_{\text{single-task}} = 5.98, SD_{\text{single-task}} = 0.89$). The main effect of perceived self-efficacy manipulation was significant ($F(1, 402) = 18.82, p < 0.001, \eta_p^2 = 0.045$): participants in the self-efficacy enhancement group reported higher willingness to participate in the Caring Meal Plan ($M_{\text{enhancement}} = 6.05, SD_{\text{enhancement}} = 0.91$ vs. $M_{\text{control}} = 5.66, SD_{\text{control}} = 0.95$). The interaction between the

two was also significant ($F(1, 402) = 8.56, p = 0.004, \eta_p^2 = 0.021$). As shown in Figure 10, multitasking significantly reduced willingness to participate in the Caring Meal Plan among participants in the control group ($M_{\text{multitasking}} = 5.40, SD_{\text{multitasking}} = 0.96; M_{\text{single-task}} = 5.91, SD_{\text{single-task}} = 0.87; F(1, 402) = 15.94, p < 0.001, \eta_p^2 = 0.038$). Under the condition in which participants' mindset was entirely adjusted to a process focus, the results of this experiment again partially verified Hypothesis H1. However, among participants in the self-efficacy enhancement group, there was no significant difference in willingness to participate in the Caring Meal Plan between the multitasking and single-task conditions ($M_{\text{multitasking}} = 6.06, SD_{\text{multitasking}} = 0.91; M_{\text{single-task}} = 6.04, SD_{\text{single-task}} = 0.90; F(1, 402) = 0.024, p = 0.877, \eta_p^2 < 0.001$).

Legend: Single task Multitask

Y-axis: Intention to participate in the "Love Meal Program"

Group	Single task	Multitask	Comparison
Control group	5.91	5.40	$p < 0.001$
Enhancement group	6.04	6.06	$p = 0.877$

Figure 10. Intention to participate in the Love Meal Program (Experiment 3b)

4.2.5 Discussion

Experiment 3b changed the method for validating the mediating mechanism through moderation. After all participants' thinking was guided to focus on the process by having them recall their psychological feelings during a work process in a scenario, some participants' self-efficacy was then externally enhanced through scenario-based writing. Consistent with expectations, in the control group, multitasking significantly reduced participants' intention to participate in the Love Meal Program, again partially replicating the main effect of this research and partially supporting Hypothesis H1. After self-efficacy was enhanced, however, participants in the multitasking and single-tasking conditions showed no significant difference in their intention to participate in the Love Meal Program. This again verifies that self-efficacy played a mediating role in the interactive effect of multitasking and attentional focus on prosocial behavior.

5 Experiment 4: The Boundary Role of Whether the Task Can Be Completed

The main purpose of Experiment 4 was to verify the boundary condition under which the theoretical model of this research holds—that is, to examine the moderating role of whether the task can be completed (completable vs. incompletable)

in the interactive effect of multitasking and attentional focus on prosocial behavior. Based on the preceding reasoning, the effects and mechanisms proposed in this paper should hold only when the task is completable; when the task cannot be completed, the interaction effect proposed in this paper should be weakened or disappear.

5.1 Experimental Design and Participants

Experiment 4 adopted a 2 (multitasking: single task vs. multitasking) $\times$ 2 (attentional focus: process vs. outcome) $\times$ 2 (whether the task could be completed: completable vs. incompletable) between-subjects design. A total of 840 participants recruited on the Jianshu platform were randomly assigned to one of the eight experimental groups. After excluding 20 responses that failed the attention check or had response times of less than 60 seconds, 820 valid samples were obtained (66.1% female, $M_{\text{age}} = 28.79$, $SD_{\text{age}} = 8.61$). An analysis using G*Power 3.1 (Faul et al., 2009) showed that the final sample had statistical power.

5.3 Experimental Procedure and Stimuli

Participants were required to complete two unrelated tasks in the experiment. In the first task, we asked participants to imagine that they had actually experienced a work scenario on the morning of a workday. In the multitasking group, he/she interrupted the task of “preparing review materials” in order to “reply to customer WeChat messages while organizing a document temporarily needed by the boss,” and after finishing, “return to the previous

the interrupted postmortem materials work” ; whereas in the single-task condition, he/she carried out the various tasks sequentially throughout the morning and focused on only one work task during each period of time. In the task-completable condition, the reading materials naturally indicated, in accordance with the progress of the tasks, that all tasks had been completed; however, in the task-incompletable condition, we stated at the end of the reading materials that “when lunchtime arrived, you found that the work at hand had not yet been completed.” Meanwhile, following the same method as in the preceding series of experiments, before reading the materials we reminded participants to attend to the process (outcome) of the situation, and after the reading task we asked them to describe in writing their psychological feelings during the process of the situation (at the time of the outcome), in order to strengthen the manipulation of thinking focus mode (Zhao et al., 2007). Participants then completed the same multitasking manipulation check as in Experiments 1-3 ($r = 0.56$, $p < 0.001$), the thinking focus mode check ($r = 0.67$, $p < 0.001$), and the manipulation-check item for whether the task could be completed: “How would you rate the extent to which the tasks in the recollection were completed?” (“1” indicated completely incompletable, and “7” indicated completely completable).

In the second stage, participants were invited to complete an unrelated be-

behavioral intention survey. Participants saw that “during your leisure time, a message pops up on your phone. It is a donation request from a public-interest platform seeking donations of ‘learning kits for left-behind children,’ under the appeal ‘Donate learning kits to left-behind children in remote areas, help support the learning, healthy growth, and care of left-behind children.’ ” Participants reported their willingness to participate in the activity at that moment (“How willing would you be to donate at this time?” , where “1” indicated very unwilling and “7” indicated very willing). Next, participants completed the same self-efficacy measure as in Experiment 2 (Schwarzer & Jerusalem, 1995; $\alpha = 0.87$). Finally, participants completed the same attention test as in Experiment 1a and reported demographic information such as gender and age.

5.4 Results of the Formal Experiment

Manipulation checks. A $2 \times 2 \times 2$ ANOVA using the mean score of the multitasking manipulation-check items as the dependent variable showed that only the main effect of multitasking was significant ($F(1, 812) = 387.24, p < 0.001, \eta_p^2 = 0.323$). Participants in the multitasking condition ($M_{\text{multitasking}} = 6.12, SD_{\text{multitasking}} = 0.84$) were more likely than those in the single-task condition ($M_{\text{single-task}} = 4.61, SD_{\text{single-task}} = 1.31$) to think that they were multitasking. The main effects of thinking focus mode and task completable versus incompletable, as well as all two-way and three-way interaction effects, were not significant ($F_s < 1.16, p_s > 0.28$), indicating that the multitasking manipulation in Experiment 4 was effective. A $2 \times 2 \times 2$ ANOVA using the mean score of the thinking-focus-mode manipulation-check items as the dependent variable showed that only the main effect of thinking focus mode was significant ($F(1, 812) = 352.13, p < 0.001, \eta_p^2 = 0.302$). Participants in the process-focus condition ($M_{\text{process}} = 2.73, SD_{\text{process}} = 1.37$) felt that they paid more attention to the process, whereas participants in the outcome-focus condition ($M_{\text{outcome}} = 4.79, SD_{\text{outcome}} = 1.74$) believed that they paid more attention to the outcome. The main effects of multitasking and task completable versus incompletable, as well as all two-way and three-way interaction effects, were not significant ($F_s < 1.60, p_s > 0.20$), indicating that the manipulation of thinking focus mode in Experiment 4 was effective. A $2 \times 2 \times 2$ ANOVA using the manipulation-check item for whether the task could be completed as the dependent variable showed that only the main effect of task completable versus incompletable was significant ($F(1, 812) = 1540.42, p < 0.001, \eta_p^2 = 0.655$). Participants in the task-completable condition ($M_{\text{completable}} = 6.22, SD_{\text{completable}} = 0.78$) felt more strongly that the task could be completed than did participants in the task-incompletable condition ($M_{\text{incompletable}} = 3.16, SD_{\text{incompletable}} = 1.37$). The main effects of multitasking and thinking focus mode, as well as all two-way and three-way interaction effects, were not significant ($F_s < 1.91, p_s > 0.16$), indicating that the manipulation of task completable versus incompletable in Experiment 4 was effective.

Main effects. Taking donation participation intention for the “left-behind chil-

dren' s learning package" as the dependent variable, a 2 (multitasking: single task vs. multitasking) $\times$ 2 (thinking focus: process vs. outcome) $\times$ 2 (whether the task could be completed: completable vs. incompletable) analysis of variance was conducted. The results showed that the main effect of multitasking was not significant ($F(1, 812) = 1.13, p = 0.289, \eta_p^2 = 0.001$), whereas the main effects of thinking focus ($F(1, 812) = 8.25, p = 0.004, \eta_p^2 = 0.010$) and whether the task could be completed ($F(1, 812) = 28.12, p < 0.001, \eta_p^2 = 0.033$) were significant. The two-way interactions of thinking focus with multitasking ($F(1, 812) = 12.21, p < 0.001, \eta_p^2 = 0.015$) and with whether the task could be completed ($F(1, 812) = 5.64, p = 0.018, \eta_p^2 = 0.007$) were significant. More importantly, consistent with expectations, the three-way interaction among the three variables was significant ($F(1, 812) = 12.25, p < 0.001, \eta_p^2 = 0.015$). The remaining main effects and two-way interactions were not significant ($F_s < 1.71, p_s > 0.19$).

The results of the simple-effects analyses showed (see Table 1 and Figure 11) that when the task was completable, among participants whose thinking focused on the process, multitasking reduced their donation participation intention for the left-behind children' s learning package ($M_{\text{multitasking}} = 5.04, SD_{\text{multitasking}} = 0.97; M_{\text{single task}} = 5.40, SD_{\text{single task}} = 1.03; F(1, 812) = 5.35, p = 0.021, \eta_p^2 = 0.007$). Among participants whose thinking focused on the outcome, this effect was reversed: multitasking instead increased their donation participation intention for the left-behind children' s learning package ($M_{\text{multitasking}} = 6.00, SD_{\text{multitasking}} = 0.70; M_{\text{single task}} = 5.26, SD_{\text{single task}} = 0.80; F(1, 812) = 22.04, p < 0.001, \eta_p^2 = 0.026$). This result again fully verified Hypothesis H1 of the present study. However, when the task was incompletable, regardless of whether participants' thinking focused on the process ($M_{\text{multitasking}} = 4.98, SD_{\text{multitasking}} = 1.34; M_{\text{single task}} = 5.00, SD_{\text{single task}} = 1.30; F(1, 812) = 0.02, p = 0.903, \eta_p^2 < 0.001$) or on the outcome ($M_{\text{multitasking}} = 5.02, SD_{\text{multitasking}} = 1.34; M_{\text{single task}} = 5.04, SD_{\text{single task}} = 1.33; F(1, 812) = 0.02, p = 0.899, \eta_p^2 < 0.001$), there was no significant difference in donation participation intention for the left-behind children' s learning package between the multitasking and single-task groups. However, whether the task could be completed had a main effect: donation participation intention for the left-behind children' s learning package was significantly lower in the incompletable-task group than in the completable-task group ($M_{\text{incompletable}} = 5.01, SD_{\text{incompletable}} = 1.32; M_{\text{completable}} = 5.43, SD_{\text{completable}} = 0.95; F(1, 812) = 28.12, p < 0.001, \eta_p^2 = 0.033$).

Table 1. Self-efficacy and donation participation intention for the left-behind children' s learning package under different experimental conditions (N = 820)

Whether the task could be com- pleted	Thinking fo- cus	Self- efficacy	Self- efficacy	Self- efficacy	Self- efficacy	Donation	Donation	Donation	Donation
						par- tici- pa- tion in- ten- tion:	par- tici- pa- tion in- ten- tion:	par- tici- pa- tion in- ten- tion:	par- tici- pa- tion in- ten- tion:
						M	SD	p	η^2
Completed	Single	5.52	0.69	<	0.016	5.40	1.03	0.021*	0.007
Completed	Multitask	5.00	1.01			5.04	0.97		
Completed	Single	5.37	0.67	0.003**	0.011	5.26	0.80	<	0.026
Completed	Multitask	5.79	0.69			6.00	0.70	0.001***	
Incompleted	Single	4.81	1.26	0.610	0.000	5.00	1.30	0.903	0.000
Incompleted	Multitask	4.88	1.06			4.98	1.34		
Outcome	Single	4.87	1.32		0.609	5.04	1.33	0.899	0.000
Outcome	Multitask	4.80	1.10			5.02	1.33		

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Figure content: Legend: Single task Multitask. Y-axis: “Left-behind children learning kit” donation participation and intention. Bars, from left to right: Process focus / task completable, 5.40 vs. 5.04, $p = 0.021$; Outcome focus / task completable, 5.26 vs. 6.00, $p < 0.001$; Process focus / task not completable, 5.00 vs. 4.98, $p = 0.903$; Outcome focus / task not completable, 5.04 vs. 5.02, $p = 0.899$.

Figure 11. The moderating effect of whether the task could be completed on donation participation and intention for the left-behind children learning kit (Experiment 4)

The moderating effect of whether the task could be completed. Taking donation participation and intention for the left-behind children learning kit as the dependent variable, multitasking (0 = single task, 1 = multitask) as the independent variable, sense of self-efficacy as the mediator, thinking focus (0 = process, 1 = outcome) as the first-stage moderator, and whether the task could be completed (0 = not completable, 1 = completable) as the second-stage moderator, the full model was tested using the bootstrapping method (Model 11, sample size = 5000; Preacher & Hayes, 2008). The results showed that,

within the 95% confidence interval, the overall moderated mediation effect of the model was significant (Effect = 0.70, SE = 0.19, 95% CI = [0.3363, 1.0955]). Specifically, when the task was completable, the moderating effect of thinking focus was significant (Effect = 0.61, SE = 0.11, 95% CI = [0.4028, 0.8359]). Further analysis showed that when thinking focused on the process, the negative mediating effect of sense of self-efficacy was significant (Effect = -0.33, SE = 0.08, 95% CI = [-0.5098, -0.1806]); however, when thinking focused on the outcome, the positive mediating effect of sense of self-efficacy was significant (Effect = 0.27, SE = 0.06, 95% CI = [0.1507, 0.4004]). When the task was not completable, the moderating effect of thinking focus was not significant (Effect = -0.09, SE = 0.15, 95% CI = [-0.3934, 0.2026]); at this point, regardless of whether participants' thinking focused on the process (Effect = 0.05, SE = 0.11, 95% CI = [-0.1601, 0.2561]) or on the outcome (Effect = -0.05, SE = 0.11, 95% CI = [-0.2600, 0.1742]), the mediating effect of sense of self-efficacy was not significant (the full model is shown in Figure 12). Hypothesis 3 of this paper was supported.

Thinking focus

(0 = process, 1 = outcome)

Task completion

(0 = incomplete, 1 = completable)

Interaction = 1.08***

Multitasking

(0 = single task, 1 = multitasking)

$a = 0.07^{NS}$

Self-efficacy

$b = 0.65^{***}$

Willingness to donate learning kits to left-behind children

Moderated moderated mediation effect: index = 0.70, 95% CI = 0.3363-1.0955

Moderated mediation under the task-completable condition: index = 0.61, 95% CI = 0.4028-0.8359

Mediating effect under process focus: index = -0.33, 95% CI = -0.5098-0.1806

Mediating effect under outcome focus: index = 0.27, 95% CI = 0.1507-0.4004

Moderated mediation under the task-incomplete condition: index = -0.09, 95% CI = -0.3934-0.2026

Mediating effect under process focus: index = 0.05, 95% CI = -0.1601-0.2561

Mediating effect under outcome focus: index = -0.05, 95% CI = -0.2600-0.1742

$c = -0.10^{NS}$

Figure 12. Full model of the moderated moderated mediation effect (Experiment 4)

5.5 Discussion

Experiment 4 verified an important boundary condition under which thinking focus determines the effect of multitasking on prosocial behavioral participation intentions—namely, whether the task can be completed. The results of Experiment 4 show that the theoretical mechanism proposed in this paper holds only when the task can ultimately be completed. In this case, thinking focus moderates the effect of multitasking on prosocial behavioral participation intentions. When thinking is focused on the process, multitasking reduces people's intentions to engage in prosocial behavior; however, when thinking is focused on the outcome, the direction of the overall effect changes, and multitasking can increase people's intentions to engage in prosocial behavior. Once the work task cannot be completed, however, the interaction between thinking focus and multitasking disappears; that is, regardless of which type of thinking focus individuals adopt, multitasking (vs. single-tasking) has no significant difference in its effect on their intentions to engage in prosocial behavior. At this point, the negative consequences of an uncompleted work task directly reduce individuals' intentions to engage in prosocial behavior, thereby verifying Hypothesis 3.

6 Discussion

6.1 Research Conclusions

Through four sets comprising seven experiments, this paper examined the internal psychological mechanisms and boundary conditions by which thinking focus and multitasking interact to influence prosocial behavior. The findings show that when individuals' thinking is focused on the process, perceived multitasking (vs. single-tasking) reduces their prosocial behavior (Experiments 1a, 1b, 1c, 2, 3b, and 4); however, when individuals' thinking is focused on the outcome, perceived multitasking (vs. single-tasking) instead increases their prosocial behavior (Experiments 1a, 1b, 1c, 2, 3a, and 4). Meanwhile, this paper verified the mediating role of self-efficacy in two ways: by measuring the mediator (Experiment 2) and by testing mediation through moderation (Experiments 3a and 3b). This study further indicates that whether a task can be completed is an important boundary condition. Only when the task can ultimately be completed do the effects proposed in this paper hold; once the work task cannot be completed, the interaction between thinking focus and multitasking disappears, and the negative consequences of an uncompleted work task directly reduce individuals' prosocial behavior.

6.2 Theoretical Contributions

This study makes theoretical innovations in the following respects:

The influence of multitasking on subsequent decisions beyond the cognitive domain and its boundary conditions. This study expands the rel

related research. Specifically: (1) This study extends the scope of multitasking research from the traditional focus on antecedents and task performance to its influence on decisions outside the task domain. At present, research on multitasking has mainly concentrated on its antecedents and on the performance of the task itself (Madore et al., 2020; Srna et al., 2018). Today, with the popularization of smart terminals, people's various behavioral transitions have become more seamless. Accordingly, the fields of psychology and marketing have begun to attach importance to the effects of incidental contextual factors on subsequent, unrelated decisions. For example, the suspenseful ending of a drama at a critical moment can arouse viewers' curiosity, thereby leading them to prefer indulgent products in subsequent consumption (Wang & Huang, 2018). The conclusions of the present study indicate that the downstream effects of multitasking go far beyond domains related to the task itself; rather, multitasking may become an incidental contextual factor whose influence spills over into decisions outside the task domain. Given that multitasking has gradually permeated all aspects of people's work and life, and has even evolved into a common contextual factor in individual decision-making, exploring its influence on extra-domain decisions is both timely and increasingly important. The exploratory study in this article is only a starting point for extending the field of multitasking research in this new direction. (2) This study extends the downstream effects of multitasking to domains beyond cognition. A small number of existing studies have examined individuals' subsequent performance after experiencing multitasking, but they remain limited to the effects of multitasking on individuals' cognitive executive functioning. For example, media multitasking improves working-memory capacity and creativity (Zhou Xiang et al., 2024), and multitasking enhances individuals' cognitive flexibility, thereby making them more creative in subsequent tasks (Kapadia & Melwan, 2021). This study shows that multitasking not only affects individuals' cognitive resources, but also induces changes in psychological concepts that are more general and important to individuals, such as self-efficacy, and may consequently exert broad influence on subsequent decisions beyond the cognitive domain. (3) This study further explores the roles of multiple moderating variables—such as mindset and whether the task is completed—in the above mechanism, effectively integrating conclusions in the multitasking literature that previously appeared scattered and contradictory. Prior research has found that multitasking has both negative and positive effects (Kapadia & Melwan, 2021), and even the effects of this characteristic of multitasking on the performance of the task itself have varied (Madore et al., 2020; Srna et al., 2018). The present study finds that these divergences exist because prior studies overlooked the roles of certain key moderating variables. This study shows that mindset is the first-level boundary condition, and that whether the work task can be completed plays a second-level moderating role in the interaction between mindset and multitasking. By sort-

ing out these two boundary conditions, the present study can integrate existing multitasking-related research into a relatively systematic framework, reconcile many existing debates, and make the theoretical mechanism clearer.

The influence of unrelated dynamic contextual factors in the mobile Internet environment on prosociality. Existing research on prosociality has two characteristics: (1) when examining the influence of decision makers themselves, it pays more attention to the effects of static personal traits, such as gender and social class; (2) when examining influences on the decision-making process, it has mostly focused on contextual factors that are highly related to the fundraising matter itself. For example, whether a fundraising event is sudden (Zheng et al., 2019) or the number of recipients (Friedrich & McGuire, 2010). After the rise of Internet philanthropy, many scholars began to explore changes in individuals' prosocial behavior in this new environment, but they have still focused on how elements directly related to the project interaction interface design affect individuals' willingness to participate. For example, overly high default donation amounts (Fan Yafeng et al., 2019) and multiple payment channels (Ran Yaxuan et al., 2021) can both lead individuals to question the organizer' s [[unclear: word beginning with “道” continues on next page]]

morality, worrying that their donation behavior may ultimately fail to produce positive effects, thereby weakening their willingness to donate and their donation behavior. Few scholars have attended to the effects on individuals' donation behavior of contextual factors that are not directly related to the fundraising event itself. Only Zhang et al. (2021) have noted the finding that occasional major online promotions, such as Double Eleven, increase consumers' donation behavior. Today, as “fingertip philanthropy” flourishes, more prosocial behavior is carried out via smart terminals, and multitasking has become the most salient contextual factor when individuals participate in prosocial behavior in the mobile Internet environment. From different perspectives, the present study and the study by Zhang et al. (2021) both show that, in the mobile Internet environment, dynamic contextual factors unrelated to prosocial behavior itself—whether external environmental factors or the decision maker' s own dynamic behavioral characteristics—can trigger an important dimension of individuals' prosocial-behavior-related decisions: judgments of efficacy, which in turn influence consumers' prosocial behavioral decisions.

Extending research related to modes of thought focus. This study also extends research on modes of thought focus in the following three respects. (1) This study demonstrates that different modes of thought focus may also influence individuals' prosocial behavior. Existing research on modes of thought focus has mostly examined domains such as advertising persuasion (Cian et al., 2020), consumers' self-control behavioral tendencies (Pan Ding et al., 2022), and perceived product innovation (Zeng Fu' e et al., 2023), whereas the present study expands the domains of their downstream effects. (2) This study focuses on the replay of past experiences, whereas the vast majority of existing research has examined how individuals' mental simulation of events that have not yet

occurred or of consumption processes affects their subsequent behavior (Cian et al., 2020). Different modes of thought focus activate different forms of mental simulation in individuals; the content may involve replaying past experiences, rehearsing future events, or even fantasies that mix real and imagined elements (Pham & Taylor, 1999). The study by Xie et al. (2016) shows that past experiences influence individuals' mental simulation of future events, but the present study shows that different modes of thought focus based on the replay of prior work experiences can also directly produce different effects on individuals' subsequent behavior. This provides a new perspective for understanding how modes of thought focus influence individual behavior. (3) This study identifies a new factor influencing the different effects of different modes of thought focus. Early literature in this field mainly focused on the beneficial effects of process focus for taking action, because process focus provides guidance for concrete action (Thompson et al., 2009). Subsequent research has successively shown that no particular mode of thought focus or mental simulation is necessarily better; many factors—including temporal distance (Zhao et al., 2007), cognitive versus affective thinking modes (Zhao et al., 2011), additive versus subtractive thinking frames (Lu & Jen, 2016), and even whether one is making a decision in isolation or choosing among multiple options (Thompson et al., 2009)—may make a certain mode of thought focus lead to more favorable outcomes. The present study finds that, when reviewing past work experiences, the differing characteristics of task type (multitasking vs. single-tasking) can also interact with modes of thought focus, causing the latter to produce different downstream effects and thereby clarifying the boundary conditions under which different modes of thought focus exert positive effects.

6.3 Practical Implications

The findings of this article can provide useful

effective guidance. First, when charitable organizations or online public-welfare platforms present donation campaigns and public-welfare information, they should fully take into account that people are constantly engaged in multitasking. In describing activities, they can use certain cue stimuli to guide people to focus their thinking on outcomes. This form of guidance can be as simple as a pop-up text prompt when a page is opened, such as “You’ ve been working for so long—you must have completed so many tasks!! Great job!!” Yet it can effectively influence the prosocial behavioral outcomes of individuals in this state.

Second, when platforms send invitations for public-welfare projects to individuals who are immersed in a multitasking state, they should consider that the process of multitasking may reduce individuals' sense of self-efficacy. Therefore, the pushed information can appropriately include relevant content that boosts individuals' sense of self-efficacy as a way of compensating. In practice, possible suggestions include appropriately lowering the cost of participating in prosocial projects and informing people of the clear effects of such behavior. For example,

adding guiding phrases such as “Even your smallest act of kindness can help them” may also have a strong facilitative effect in this state.

6.4 Limitations and Future Research Directions

This paper has the following limitations, which are worthy of further exploration in future research:

First, this study examined only the different effects of multitasking in the work domain (vs. single-tasking) on individuals’ subsequent prosocial behavior under the moderation of thinking focus. Future research could attempt to examine the possible effects of hedonic multitasking or mixed multitasking (simultaneously involving leisure and work, such as listening to music while working) on subsequent prosocial behavior.

Second, this study explored the boundary role of whether tasks can be completed. In the future, other variables such as individual differences can be considered to examine their moderating effects on the theoretical mechanisms in this study. For example, the possible influence of a polychronic time perspective could be explored. A polychronic time perspective is a continuous and stable individual trait; individuals with high scores in polychronicity believe that engaging in two or more activities at the same time is the best way to do things and hold a positive attitude toward simultaneously engaging in two or more activities (Mattarelli et al., 2015). Thus, when thinking is focused on outcomes, they may gain a greater sense of achievement and enhanced self-efficacy; when thinking is focused on process, the sense of resource scarcity brought about by multitasking may be weakened, thereby weakening or eliminating the negative effects of multitasking in this situation.

Third, this study examined the influence of multitasking on out-domain prosocial behavior via self-efficacy. Future research could further examine the influence of other psychological mechanisms brought about by multitasking, as well as possible downstream consequences. For example, this study shows that when focusing on process, multitasking may lead to a perceived scarcity of cognitive resources. However, some scholars have analyzed that precisely this feeling of being “constrained” may stimulate individuals’ cognitive flexibility (Kapadia & Melwan, 2021). Future research could attempt to explore the influence of this possible mechanism on individuals’ other subsequent consumption decisions.

References

- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84, 191–215.
- Becker, M. W., Alzahabi, R., & Hopwood, C. J. (2013). Media multitasking is associated with symptoms of

depression and social anxiety. *Cyberpsychology Behavior and Social Networking*, 16(2), 132-135.

Caprara, G. V., Alessandri, G., Di Giunta, L., Panerai, L., & Eisenberg, N. (2010). The contribution of agreeableness and self-efficacy beliefs to prosociality. *European Journal of Personality*, 24, 36-55.

Chen, G., Gully, S. M., & Eden, D. (2001). Validation of a new general self-efficacy scale. *Organizational Research Methods*, 4, 62-83.

Cian, L., Longoni, C., & Krishna, A. (2020). Advertising a desired change: When process simulation fosters (vs. hinders) credibility and persuasion. *Journal of Marketing Research*, 57(3), 489-508.

Escalas, J. E., & Luce, M. F. (2003). Process versus outcome thought focus and advertising. *Journal of Consumer Psychology*, 13(3), 246-254.

Eysenck, M. W., & Keane, M. T. (Eds). (2015). *Cognitive psychology: A student's handbook*. Psychology Press.

Fan, Y., Jiang, J., & Cui, W. (2019). The backfire effect of default amounts on donation behavior in online donation platform. *Acta Psychologica Sinica*, 51(04), 415-427.

[Fan Yafeng, Jiang Jing, Cui Wenquan. (2019). The influence of default option settings on individuals' willingness to donate on online public-welfare platforms and its mechanism. *Acta Psychologica Sinica*, 51(04), 415-427.]

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Methods*, 41(4), 1149-1160.

Friedrich, J., & McGuire, A. (2010). Individual differences in reasoning style as a moderator of the identifiable victim effect. *Social Influence*, 5(3), 182-201.

Gaspar, J. P., & Schweitzer, M. E. (2021). Confident and cunning: Negotiator self-efficacy promotes deception in negotiations. *Journal of Business Ethics*, 171(1), 139-155.

Goenka, S., & Van Osselaer, S. M. J. (2019). Charities can increase the effectiveness of donation appeals by using a morally congruent positive emotion. *Journal of Consumer Research*, 46(4), 774-790.

Goldsmith, K., Roux, C., & Wilson, A. V. (2020). Can thoughts of having less ever promote prosocial preferences? The relationship between scarcity, construal level, and sustainable product adoption. *Journal of the Association for Consumer Research*, 5(1), 70-82.

Guo, X., Zheng, H., Ruan, D., Hu, D., Wang, Y., Wang, Y., & Chen, C. (2023). Associations between empathy and negative affect: Effect of emotion regulation. *Acta Psychologica Sinica*, 55(06), 892-904.

- [Guo Xiaodong, Zheng Hong, Ruan Dun, Hu Dingding, Wang Yi, Wang Yanyu, Chen Chuqiao. (2023). Cognitive and affective empathy and negative affect: The mechanism of emotion regulation. *Acta Psychologica Sinica*, 55(06), 892–904.]
- Han, J. J., & Broniarczyk, S. M. (2021). Multitasking as consumer compensatory control. *Journal of Consumer Research*, 48(3), 456–473.
- Higgins, E. T. (1987). Self discrepancy: A theory relating self and affect. *Psychological Review*, 94, 319–340.
- Jiang, Z. X., Xu, J., Gorlin, M., & Dhar, R. (2021). Beautiful and confident: How boosting self-perceived attractiveness reduces preference uncertainty in context-dependent choices. *Journal of Marketing Research*, 58(5), 908–924.
- Kapadia, C., & Melwani, S. (2021). More tasks, more ideas: The positive spillover effects of multitasking on subsequent creativity. *Journal of Applied Psychology*, 106(4), 542–559.
- Kiesel, A., Steinhauser, M., Wendt, M., Falkenstein, M., Jost, K., Philipp, A. M., & Koch, I. (2010). Control and interference in task switching—A review. *Psychological Bulletin*, 136, 849–874.
- Kim, J. C., Wadhwa, M., & Chattopadhyay, A. (2019). When busy is less indulging: Impact of busy mindset on self-control behaviors. *Journal of consumer research*, 45(5), 933–952.
- Koch, I., Poljac, E., Müller, H., & Kiesel, A. (2018). Cognitive structure, flexibility, and plasticity in human multitasking—An integrative review of dual-task and task-switching research. *Psychological Bulletin*, 144(6), 557–583.
- Kong, F., Xia, Y., Liu, Z., Wang, M., & Li, X. (2023). Media multitasking affects cognitive control: Evidences for scattered attention hypothesis. *Journal of Psychological Science*, 46(04), 865–872.
- [Kong Fanchang, Xia Yujuan, Liu Zhaojun, Wang Meiru, & Li Xiaoyao. (2023). Media multitasking affects cognitive control: Evidence for the scattered-attention hypothesis. *Journal of Psychological Science*, 46(04), 865–872.]
- Li, A., Sun, H., Xiong, G., Wang, X., & Li, B. (2016). The effect and cognitive mechanism of “time poverty” on intertemporal choice and proactive behavior. *Advances in Psychological Science*, 24(06), 874–884.
- [Li Aimei, Sun Hailong, Xiong Guanxing, Wang Xiaotian, & Li Bin. (2016). The effect of “time poverty” on intertemporal decision-making and proactive behavior and its cognitive mechanisms. *Advances in Psychological Science*, 24(06), 874–884.]

- Lin, T. T. C., Kononova, A., & Chiang, Y. H. (2020). Screen Addiction and Media Multitasking among American and Taiwanese Users. *Journal of Computer Information System*, 60(6), 583–592.
- Lu, M. Y., & Jen, W. (2016). Effects of product option framing and temporal distance on consumer choice: The moderating role of process versus outcome mental simulations. *Psychology & Marketing*, 33(10), 856–863.
- Madore, K. P., Khazenzon, A. M., Backes, C. W., Jiang, J. F., Uncapher, M. R., Norcia, A. M., & Wagner, A. D. (2020). Memory failure predicted by attention lapsing and media multitasking. *Nature*, 587, 87.
- Mattarelli, E., Bertolotti, F., & Incerti, V. (2015). The interplay between organizational polychronicity, multitasking behaviors and organizational identification: A mixed-methods study in knowledge intensive organizations. *International Journal of Human-Computer Studies*, 79, 6–19.
- Nardini, G., & Lutz, R. J. (2018). How mental simulation evokes negative affective misforecasting of hedonic experiences. *Journal of Consumer Marketing*, 35(6), 633–643.
- Pan, D., Liu, Z., & Yang, D. (2022). Self-control or indulgence? The impact of upward comparison on consumer behavior. *Nankai Business Review*, 25(01), 63–75.
- [Pan Ding, Liu Ziqi, Yang Defeng. (2022). Self-control or indulgence? The impact of upward comparison on consumer behavior. *Nankai Business Review*, 25(01), 63–75.]
- Pham, L. B., & Taylor, S. E. (1999). From thought to action: Effects of process-versus outcome-based mental simulations on performance. *Personality and Social Psychology Bulletin*, 25(2), 250–260.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40(3), 879–891.
- Ran, Y., Niu, Y., & Chen, S. (2021). “More” is less: Why multiple payment mechanism impairs individual donation. *Acta Psychologica Sinica*, 53(4), 413–430.
- [Ran Yaxuan, Niu Yuxin, Chen Siyun. (2021). “More” is less: The influence of the number of payment channels on individual donation from the perspective of metacognitive inference. *Acta Psychologica Sinica*, 53(4), 413–430.]
- Rosenberg, M. (Ed). (1965). *The measurement of self-esteem, society and the adolescent self-image*. Princeton University Press.
- Róžańska, A., & Gruszka, A. (2020). Current research trends in multitasking: A bibliometric mapping approach. *Journal of Cognitive Psychology*, 32(3), 278–286.

- Schwarzer, R., & Jerusalem, M. (1995). General Self-Efficacy Scale. In J. Weinman, S. Wright, & M. Johnson (Eds.), *Measures in health psychology: A user's portfolio: Causal and control beliefs* (pp. 35–37). Windsor: NFER-Nelson.
- Sharma, E., & Morwitz, V. G. (2016). Saving the masses: The impact of perceived efficacy on charitable giving to single vs. multiple beneficiaries. *Organizational Behavior and Human Decision Processes*, 135(77), 45–54.
- Silvia, B., Paharia, N., & Keinan, A. (2017). Conspicuous consumption of time: When busyness and lack of leisure time become a status symbol. *Journal of Consumer Research*, 44(1), 118–138.
- Small, D. A., & Cryder, C. (2016). Prosocial consumer behavior. *Current Opinion in Psychology*, 10(8), 107–111.
- Srna, S., Schrifft, R. Y., & Zauberman, G. (2018). The illusion of multitasking and its positive effect on performance. *Psychological Science*, 29(12), 1942–1955.
- Su, L., Jiang, Y., Chen, Z., & DeWall, C. N. (2017). Social exclusion and consumer switching behavior: A control restoration mechanism. *Journal of Consumer Research*, 44(1), 99–117.
- Sun, Q., Huang, J., Yu, X., & Gao, Q. (2023). Give a man a fish or teach him to fish? Differences in donor behavior between high and low social classes. *Acta Psychologica Sinica*, 55(10), 1677–1699.
- [Sun Qingzhou, Huang Jingru, Yu Xiaofen, & Gao Qingde. (2023). Give a man a fish or teach him to fish? Differences in helping behavior between high and low social classes. *Acta Psychologica Sinica*, 55(10), 1677–1699.]
- Taylor, S. E., & Schneider, S. K. (1989). Coping and the simulation of events. *Social Cognition*, 7(2), 174–194.
- Thoits, P. A., & Hewitt, L. N. (2001). Volunteer work and well-being. *Journal of Health and Social Behavior*, 42(4), 115–131.
- Thompson, D., Hamilton, R., & Petrova, P. (2009). When mental simulation hinders behavior: The effects of process-oriented thinking on decision difficulty and performance. *Journal of Consumer Research*, 36(4), 562–574.
- Tversky, A., & Kahneman, D. (1991). Loss aversion in riskless choice: A reference-dependent model. *The Quarterly Journal of Economics*, 106(4), 1039–1061.
- van der Schuur, W. A., Baumgartner, S. E., Sumter, S. R., & Valkenburg, P. M. (2015). The consequences of media multitasking for youth: A review. *Computers In Human Behavior*, 53, 204–215.
- Van der Stigchel, S. (2021). Dangers of divided attention. *American Scientist*, 109(1), 46–53.

- Wang, C., & Huang, Y. (2018). "I want to know the answer! Give me fish 'n' chips!" : The impact of curiosity on indulgent choice. *Journal of consumer research*, 44(5), 1052-1067.
- Wang, P. X., Wang, Y. J., & Jiang, Y. W. (2023). Gift or donation? Increase the effectiveness of charitable solicitation through framing charitable giving as a gift. *Journal of Marketing*, 87(1), 133-147.
- Weiner, B., Heckhausen, H., & Meyer, W. U. (1972). Causal ascriptions and achievement behavior: A conceptual analysis of effort and reanalysis of locus of control. *Journal of Personality and Social Psychology*, 21(2), 239-248.
- Wood, R., & Bandura, A. (1989). Impact of conceptions of ability on self-regulatory mechanisms and complex decision making. *Journal of Personality and Social Psychology*, 56, 407-415.
- Wottrich, V. M., van Reijmersdal, E. A., & Smit, E. G. (2018). The privacy trade-off for mobile app downloads: The roles of app value, intrusiveness, and privacy concerns. *Decision support systems*, 106, 44-52.
- Xie, H., Minton, E. A., & Kahle, L. R. (2016). Cake or fruit? Influencing healthy food choice through the interaction of automatic and instructed mental simulation. *Marketing Letters*, 27(4), 627-644.
- Xu, L. D., Mehta, R., & Dahl, D. W. (2022). Leveraging creativity in charity marketing: The impact of engaging in creative activities on subsequent donation behavior. *Journal of Marketing*, 86(5), 79-94.
- Zeng, F., Jin, Q., Chi, Y., & Zhou, H. (2023). Process or outcome? The impact of psychological simulation on perceived product innovation. *Nankai Business Review*, 26(02), 154-165.
- [Zeng, F., Jin, Q., Chi, Y., & Zhou, H. (2023). Process or outcome? A study of the impact of psychological simulation on perceived product innovation. *Nankai Business Review*, 26(02), 154-165.]
- Zhao, M., Hoeffler, S., & Zauberan, G. (2007). Mental simulation and preference consistency over time: The role of process-versus outcome-focused thoughts. *Journal of Marketing Research*, 44(3), 379-388.
- Zhao, M., Hoeffler, S., & Zauberan, G. (2011). Mental simulation and product evaluation: The affective and cognitive dimensions of process versus outcome simulation. *Journal of Marketing Research*, 48(5), 827-839.
- Zhang, K. J., Cai, F. Y., & Shi, Z. Y. (2021). Do promotions make consumers more generous? The impact of price promotions on consumers' donation behavior. *Journal of Marketing*, 85(3), 240-255.
- Zheng, L., Zhu, Y., & Jiang, R. (2019). The mediating role of moral elevation in cause-related marketing: A moral psychological perspective. *Journal of*

Business Ethics, 156(2), 439–454.

Zheng, X., Han, R., Liu, R., & Xu, J. (2024). The interactive effect of processing fluency and information credibility on donation in the digital philanthropy context. *Acta Psychologica Sinica*, 56(02), 226–238.

[Zheng, X., Han, R., Liu, R., & Xu, J. (2024). The effects of information-processing fluency and authenticity on online public-welfare donations. *Acta Psychologica Sinica*, 56(02), 226–238.]

Zhou, X., Zhang, J., Bai, B., Zhai, H., Cui, Y., & Zu, C. (2024). Half-hearted is better than one-heart: Media multitasking promotes creativity in people with low working memory capacity. *Acta Psychologica Sinica*, 56(08), 1031–1046.

[Zhou, Y., Zhang, J., Bai, B., Zhai, H., Cui, Q., & Zu, C. (2024). “Being of two minds” is better than “single-mindedness”: Media multitasking enhances creativity among individuals with low working-memory capacity. *Acta Psychologica Sinica*, 56(08), 1031–1046.]

Double-edged sword effect of multitasking on prosocial behavior

LIU Xinyan^{1, 2}, WU Hailan¹, TU Ju¹, WANG Lu^{1, 2}

(1 *School of Business Administration, Zhongnan University of Economics and Law, Wuhan 430073, China*)

(2 *E-Commerce Research Center, Zhongnan University of Economics and Law, Wuhan 430073, China*)

Abstract

Background In the era of mobile internet, people inevitably find themselves frequently in a multitasking state and are likely to receive online invitations to participate in social projects, such as charity or environmental initiatives. This study examines the effect, mechanism, and boundary conditions of multitasking as a situational factor on the subsequent prosocial behaviors of individuals. This study proposes the following hypotheses: 1: The thinking focus reverses the effect of multitasking on prosocial behavior. When individuals focus on processes, multitasking reduces their engagement in prosocial behaviors. When individuals focus on outcomes, multitasking increases their engagement in prosocial behaviors. 2: Self-efficacy plays a mediating role in the interaction between multitasking and thinking focus on prosocial behavior. 3: Task feasibility moderates the interaction between multitasking and thinking focus on prosocial behavior intentions. When tasks are feasible, the aforementioned interaction effect remains valid. However, when tasks become infeasible, adverse outcomes directly reduce individuals' intentions to engage in prosocial behavior, resulting in the loss of the interactive effect of multitasking and thinking focus on prosocial behavior.

Method This research conducted a series of experiments to validate its hypotheses. Study 1a (preregistered) and 1b manipulated independent variables by using the situational imagination and recall method. Study 1c applied simulated real-world tasks to manipulate multitasking to verify the main interaction effect of multitasking and thinking focus on prosocial behavior participation. Study 2 measured the intermediate variable to validate the full model of the mechanism underlying the above interaction effect. Studies 3a and 3b (both preregistered) once again confirmed the mediating role of self-efficacy by using a process-by-moderation approach. Study 4 tested the boundary conditions of the theoretical model: the moderating effect of task feasibility (feasible vs. infeasible).

Results Research results indicate that when individuals focus on processes, multitasking (vs. single-tasking) reduces their willingness to participate in prosocial behavior (studies 1a, 1b, 1c, 2, 3b, and 4). However, when individuals focus on outcomes, multitasking (vs. single-tasking) actually increases their willingness to engage in prosocial behavior (studies 1a, 1b, 1c, 2, 3a, and 4). Additionally, this study verified the mediating role of self-efficacy in the above interaction effect through two methods: measurement of mediation (study 2) and process-by-moderation approach (studies 3a and 3b). That is, when individuals focus on processes, multitasking lowers their self-efficacy, subsequently reducing their engagement in prosocial behaviors. On the other hand, when individuals focus on outcomes, multitasking enhances their self-efficacy, subsequently increasing their engagement in prosocial behaviors. This study also indicates that task feasibility is an important boundary condition. When tasks are feasible, the effects proposed in this work are valid. However, when tasks become infeasible, adverse outcomes directly reduce individuals' intentions to engage in prosocial behavior, and the interactive effect of thinking focus and multitasking on prosocial behavior disappears.

Conclusion This study makes several theoretical contributions. First, this study, for the first time, demonstrates that multitasking, as a situational factor, influences individuals' subsequent prosocial behaviors. This work thereby expands the domain of research on multitasking to its effect on a domain-unrelated decision for the first time. This study also investigated the role of multiple moderating variables, such as thinking focus and task feasibility, effectively integrating seemingly disparate and contradictory findings in the field of multitasking. Second, this study further enriches the research on the effect of unrelated dynamic situational factors on prosocial behavior in the era of mobile internet. Third, this study expands the existing research related to thinking focus. The findings of this project can offer valuable guidance for designing activities that promote prosocial behavior among the public while considering the dynamics of multitasking states.

Keywords multitasking, thinking focus, self-efficacy, prosocial behavior, task feasibility

Appendix

Appendix 1: Materials for Experiment 1a

[Manipulation of Multitasking and Attentional Focus]

(a) Single-Task-Process Group

When you read the following description, please imagine that you have genuinely experienced this work scenario, and focus in particular on **the process of experiencing this scenario**.

You are an employee at a technology company, and you have some fixed tasks to do every day. This morning, you are doing your routine daily work. After working for a short while, your supervisor assigns you a task: to take notes on the content of a recorded livestream of a meeting. You therefore **put aside the routine work at hand and begin watching the livestream recording and taking notes on its content**. About two hours later, you finish watching the livestream. You then return to your own work……

Please recall this work process and describe how you would feel if you **experienced the work process described above**. [Fill in the blank]

(b) Multitasking-Process Group

When you read the following description, please imagine that you have genuinely experienced this work scenario, and focus in particular on **the process of experiencing this scenario**.

You are an employee at a technology company, and you have some fixed tasks to do every day. This morning, you need to develop a new event plan. After working for a short while, your supervisor assigns you a task: to watch a recorded livestream and take notes on it. You therefore **watch the recorded livestream while taking notes on the key points**. Halfway through, you realize that you have not yet checked yesterday's data, and the daily checking report must be submitted before noon. Therefore, you **check the data while watching the recorded livestream**. About two hours later, you finish watching the livestream, and the daily checking report has also been submitted. You then return to the work of developing the event plan……

Please recall this work process and describe how you would feel if you **experienced these work processes**. [Fill in the blank]

(c) Single-Task-Outcome Group

When you read the following description, please imagine that you have genuinely experienced this work scenario, and focus in particular on **the outcome of experiencing this scenario**.

You are an employee at a technology company, and you have some fixed tasks to do every day. This morning, you are doing your routine daily work. After working for a short while, your supervisor assigns you a task: to take notes on the content of a recorded livestream of a meeting. You therefore **put aside the routine work at hand and begin watching the livestream recording and taking notes on its content**. About two hours later, you finish watching the livestream. Thereupon

then you returned to your own work again……

Please recall the work outcome and describe how you would feel **after completing the work described above**. [blank]

(d) Multitasking-Outcome Group

When you read the following textual description, please imagine that you have truly experienced this work scenario, and focus on **the outcome of experiencing this scenario**.

You are an employee at a technology company and have some fixed work every day. This morning, you need to **develop a new activity plan**. Shortly after you begin work, your supervisor assigns you a task: you are asked to watch a livestream replay and take notes. Thus, you **watch the livestream replay while recording key points**. Halfway through, you realize that today you have not yet checked yesterday's data. The daily checking report must be submitted before noon. Thus, you **watch the livestream replay while checking the data**. About two hours later, you have finished watching the livestream, and the daily checking report has also been submitted. Then you return again to the work of developing the activity plan……

Please recall the work outcome and describe how you would feel **after completing the work described above**. [blank]

[Prosocial Behavior Materials]

While browsing on your phone, you unintentionally see on a public account an activity **to donate to libraries in impoverished rural areas**. The activity mainly involves raising funds to build libraries in rural areas, helping rural children gain better access to knowledge. The way to participate is to **click the link at the end of the article after reading the full article, fill in the relevant information, and complete the donation**.

Appendix 2: Scales Used in the Experiments

	Experiment 1a	Experiment 1b	Experiment 1c	Experiment 2	Experiment 3a	Experiment 3b	Experiment 4
	Experiment 1a	Experiment 1b	Experiment 1c	Experiment 2	Experiment 3a	Experiment 3b	Experiment 4
Multitasking=	r =	r =	r =	r =	r =	r =	r =
manipulation check	0.67	0.83	0.76	0.80	0.61	0.55	0.56

In the re-called scenario described above, I felt that I was handling multiple tasks at the same time. In the re-called scenario described above, I felt that I was

switching back and forth among multiple tasks. (1 = completely disagree.)

	Experiment 1a	Experiment 1b	Experiment 1c	Experiment 2	Experiment 3a	Experiment 3b	Experiment 4
Manipulation- check of mode of at- ten- tional fo- cus	0.62	r = 0.59	r = 0.65	r = 0.48			r = 0.67
In the situation described above, what I focused on more was (1 = the process of carrying out the work, 7 = the outcome after completing the work)							
In the situation described above, what I felt more was (1 =							

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Self-efficacy	$\alpha =$	$\alpha =$	$\alpha =$	$\alpha =$
(Schwarzer, 1995) When facing difficult tasks, I believe I will complete them I will be able to successfully overcome many challenges I believe I can effectively complete many different tasks Overall, I think I can	0.71	0.83	0.76	0.87
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Measure	Items / Anchors	Reliability
Emotion (Su et al., 2017)	(1) Bad-good(2) Sad-happy(3) Tense-relaxed	$\alpha = 0.79$

Measure	Items / Anchors	Reliability
Perceived Self-Importance (Kim et al., 2019)	I feel that I am an important person.I feel that I am indispensable to others.I feel that my existence is important to my friends and family.I feel that my life has important meaning.I feel that my life is valuable.(1 = completely disagree, 7 = completely agree)	$\alpha = 0.76$
Sense of Busyness (Bellezza et al., 2016)	I feel occupied.I feel that there are many things to do.I feel extremely busy.(1 = completely disagree, 7 = completely agree)	$\alpha = 0.87$
Perceived Effort (Srna et al., 2018)	How much effort did you put into the recalled task?	
Perceived Task-Completion Difficulty (Scasserra, 2008)	How difficult do you think it was to complete the recalled task?	

Measure	Items / Anchors	Reliability
Level of Construal (Vallacher & Wegner, 1989)	(1) Making a list [recording things item by item—improving work efficiency](2) Reading [reading downward through an article—acquiring knowledge](3) Doing laundry [putting clothes into the washing machine—removing stains from clothes](4) Greeting someone [saying “hello” when meeting—expressing friendliness](5) Growing flowers [watering and fertilizing regularly— beautifying the living environment](6) Locking the door [inserting the key into the lock and turning it— ensuring safety](7) Brushing teeth [cleaning teeth with a toothbrush and toothpaste— preventing cavities](8) Driving somewhere [following the map— viewing the scenery along the way]	$\alpha = 0.78$

Self-esteem (Rosenberg, 1965)

I feel that I am a person of considerable worth.

I feel that I have many good qualities.

I feel that I am a failure.

I feel that I can do things as well as most other people.

I feel that I do not have much to be proud of.

I take a positive attitude toward myself.

I am satisfied with myself.

I can win more respect for myself.

At times I do feel that I am useless.

I feel that I am good for nothing.

$\alpha = 0.86$

Self-confidence (Jiang et al., 2021)

I will be able to achieve most of the goals I set for myself.

I believe I can succeed in any endeavor to which I set my mind.

I am confident that I can effectively complete many different tasks.

$\alpha = 0.79$

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

Source: ChinaXiv. Machine translation. Verify with the original.