

## ## Is Positivity Always Good? The Effect of Positive Meta-Stereotypes on Working Memory and Its Mechanisms ### Abstract Background: Positive meta-stereotypes—beliefs that outgroup members hold favorable views of one’s own group—are generally considered beneficial for social interactions and s…

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**Date:** 2023-10-09T00:00:00+00:00

### Abstract

Previous research on meta-stereotypes has predominantly focused on negative perspectives, while lacking corresponding investigation into how positive meta-stereotypes affect cognitive processing. The present study employed the N-back task with rural university students as participants and conducted three experiments to examine the effects of positive meta-stereotype activation on working memory and its underlying mechanisms. Results demonstrated that in high-difficulty working memory tasks (2-back), activation of positive meta-stereotypes led to lower accuracy rates, with approach motivation serving as a mediator and core self-evaluation as a moderator. Specifically, positive meta-stereotype activation reduced accuracy on high-difficulty tasks by increasing approach motivation, and this effect was observed only among individuals with high core self-evaluation. This study extends the choking effect of positive meta-stereotypes to the domain of cognitive processing and reveals the internal mechanisms of this choking effect.

### Full Text

**Is Positivity Always Beneficial? The Effect of Positive Meta-Stereotypes on Working Memory and Its Mechanism**

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## Abstract

Previous research on meta-stereotypes has predominantly focused on the negative perspective, while lacking corresponding exploration of how positive meta-stereotypes influence cognitive processing. This study employed the N-back task with rural college students as participants to investigate the effect of positive meta-stereotype activation on working memory and its underlying mechanism through three experiments. The results indicated that in high-difficulty working memory tasks (2-back), positive meta-stereotype activation led to lower accuracy, with approach motivation mediating this effect and core self-evaluation serving as a moderator. Specifically, positive meta-stereotype activation reduced accuracy in high-difficulty tasks by increasing approach motivation, and this effect only existed among individuals with high core self-evaluation. This study extends the choking effect of positive meta-stereotypes to the domain of cognitive processing and reveals the internal mechanism of this effect.

**Keywords:** positive meta-stereotypes, choking effect, working memory, approach motivation, core self-evaluation

Meta-stereotypes refer to stereotypes that individuals believe outgroup members hold about their ingroup (Vorauer et al., 1998), and their valence can be negative, neutral, or positive (Anseel, 2011). Meta-stereotype activation produces numerous effects (Oldenhuis, 2007; Dong et al., 2022; He et al., 2014) and significantly influences individuals' psychological and behavioral performance. Previous research has extensively investigated negative meta-stereotypes, examining not only their impact on intergroup emotions and attitudes (Kamans et al., 2009; Owuamalam, Issmer et al., 2013) but also their effects on cognitive processing such as working memory (Li et al., 2021; Sun et al., 2015). As a crucial form of cognitive processing, working memory is closely associated with individual information processing efficiency and affects learning, reasoning, problem-solving, creativity, and other aspects (Groborz & Necka, 2003; Kane & Engle, 2003; Cai et al., 2013). Existing studies have found that negative meta-stereotype activation impairs cognitive processing by occupying working memory capacity, consuming limited cognitive resources, and reducing working memory task performance (Beilock & DeCaro, 2007; Li et al., 2021; Sun et al., 2015).

Compared with negative meta-stereotypes, research on positive meta-stereotypes started later and has primarily focused on exploring their socio-psychological effects (e.g., intergroup emotions, attitudes) (Fowler & Gasiorek, 2019; Matera et al., 2015), with less investigation into how positive meta-stereotype activation affects individual cognitive processing. Previous studies have indicated that the effect of positive meta-stereotype activation

depends on the number of positive meta-stereotypes held by group members. Groups holding more positive meta-stereotypes are more likely to produce a “boost effect,” whereas those holding fewer are more likely to produce a “choking effect” (Vázquez et al., 2017; Vorauer et al., 1998; He, 2010). Research has shown that White individuals hold more positive meta-stereotypes (e.g., ambitious, wealthy) and fewer negative ones (e.g., selfish), making it easier for them to retrieve positive meta-stereotypes. They tend to believe outgroups’ positive views and respond positively to reciprocate outgroups’ positive expectations, producing a boost effect. In contrast, Black individuals hold more negative meta-stereotypes (e.g., lazy, unintelligent) and fewer positive ones (e.g., athletic ability). After positive meta-stereotype activation, they experience retrieval difficulties, feel that the positive traits contained in positive meta-stereotypes are inapplicable or uncertain, develop self-doubt, suffer damaged self-confidence, and consequently experience pressure that leads to a choking effect (Sigelman & Tuch, 1997; Vázquez et al., 2017; Vorauer et al., 1998).

In the stereotype research field, the choking effect explains why positive stereotypes cannot improve task performance (Beilock & Carr, 2001; Cheryan & Bodenhausen, 2000). Researchers believe that positive stereotype activation creates an expectation. When individuals doubt whether they can meet others’ expectations, they feel pressure (Smith & Johnson, 2006; Tagler, 2012), which causes them to monitor and control their behavioral performance, occupies cognitive resources, and disrupts cognitive task execution (Beilock & Carr, 2001, 2005; Mesagno & Beckmann, 2017; Tagler, 2012). For example, Cheryan and Bodenhausen (2000) found that when Asian American women were reminded that Asians are good at math, their performance on subsequent math tests was worse. Similar to positive stereotypes, positive meta-stereotype activation is also an expectation because it implies that individuals must be as excellent as other ingroup members. Especially when groups hold fewer positive meta-stereotypes, individuals may develop self-doubt and produce a choking effect (Vázquez et al., 2017), affecting cognitive task performance. Since this study used rural college students as participants, and rural college students hold more negative meta-stereotypes and fewer positive ones (Meng, 2013), positive meta-stereotype activation may produce a choking effect that impairs working memory task completion.

## 1.2 The Mediating Role of Approach Motivation

Although activating positive meta-stereotypes creates pressure for groups holding fewer positive meta-stereotypes, positive meta-stereotypes also represent an expectation. Positive meta-stereotypes reflect outgroups’ positive evaluations of the ingroup (e.g., being warm), and their activation makes individuals aware of outgroups’ expectations (Finkelstein et al., 2015; Fowler & Gasiorek, 2019). When individuals perceive others’ expectations, they often attempt to create a favorable image to support these expectations (Baumeister, 1982;

Mesagno & Beckmann, 2017), thereby increasing approach motivation to complete tasks (Bond, 1983). Therefore, positive meta-stereotype activation may increase individuals' approach motivation to prove outgroups' positive expectations (Finkelstein et al., 2015). Although no research has proven that positive meta-stereotype activation increases approach motivation, evidence in the stereotype domain indicates that activation of both positive self- and other-stereotypes increases individuals' approach motivation (Seibt & Förster, 2004; Feng, 2017).

Furthermore, high-intensity approach motivation caused by external expectations may further lead to the choking effect (Beilock & Gray, 2007). In Gable and Harmon-Jones' s (2010) motivational dimensional model of affect, the intensity of approach motivation differentially affects cognitive functions. Researchers found that after inducing high-intensity approach motivation, participants' attentional scope and cognitive responses were inhibited. Conversely, low-intensity approach motivation reduces individuals' attentional focus on targets, thereby broadening attention and cognitive activity and improving cognitive flexibility (Gable & Harmon-Jones, 2010; Zou et al., 2011). Higher approach motivation not only narrows the scope of early attentional processing but also reduces cognitive resources available for late attentional processing compared to low approach motivation conditions (Liu et al., 2016). Both attentional processing scope and cognitive resources are closely related to working memory (Conway et al., 2002). In working memory research, studies have found that approach motivation affects working memory. For example, compared with avoidance motivation, approach motivation increases response time on the N-back task (Yüvrük et al., 2020). Additionally, higher approach motivation reduces accuracy on high-difficulty working memory tasks (Avery & Smillie, 2013) because approach motivation is more likely to arouse physiological arousal when facing difficult tasks (Bond, 1983). Therefore, the effect of positive meta-stereotypes on working memory may be related to eliciting higher approach motivation.

### 1.3 The Moderating Role of Core Self-Evaluation

Core self-evaluation refers to individuals' most fundamental evaluation of their abilities and values. It is a central characteristic variable of self-concept, including self-efficacy, self-esteem, locus of control, and emotional stability (Chang et al., 2012; Judge & Bono, 2001; Judge et al., 1998). As a higher-order psychological trait, core self-evaluation influences important psychological and behavioral responses (Cross et al., 2021; Li & Nie, 2010). Finkelstein et al. (2015) proposed that core self-evaluation might be a potential moderating variable of meta-stereotype effects. According to the Theory of Resource Conservation, core self-evaluation serves as a resource toolbox that can alleviate the negative impact of external pressure on individuals (Alarcon et al., 2011; Finkelstein et al., 2020). For example, individuals with high core self-evaluation can generate various psychological resources at work, protecting them from stress-related problems (Bipp et al., 2019). Therefore, when facing pressure from positive

meta-stereotype activation, individuals with high core self-evaluation have more resources to resist the negative influence of meta-stereotypes. Conversely, individuals with low core self-evaluation are more vulnerable to the negative impact of meta-stereotypes (Finkelstein et al., 2015). Thus, core self-evaluation may buffer the negative effect of meta-stereotypes on working memory. Specifically, when positive meta-stereotypes are activated, individuals with low core self-evaluation will perform worse than those with high core self-evaluation.

Research has found that rural college students believe urban college students hold many negative views about them, meaning they hold more negative meta-stereotypes (e.g., indecisive, untidy) and fewer positive ones (e.g., independent) (Meng, 2013; Xie et al., 2018). Therefore, this study selected rural college students as participants to explore the effect of positive meta-stereotype activation on working memory and reveal the choking effect of positive meta-stereotype activation and its internal mechanism.

## 2 Experiment 1: The Effect of Positive Meta-Stereotype Activation on Working Memory

This experiment aimed to examine the effect of positive meta-stereotype activation on working memory.

### 2.1 Method

**2.1.1 Participants** G\*Power 3.1 was used to determine the sample size (Faul et al., 2007). For a  $2 \times 3$  experimental design with  $f = 0.25$  and  $\alpha = 0.05$ , 86 participants were needed to achieve 80% statistical power ( $1 - \beta$ ). We recruited 97 rural college students (registered household and permanent residence in rural areas; 30 males, 67 females; mean age =  $19.74 \pm 1.02$  years) through advertisements. After excluding 11 invalid datasets (incomplete questionnaires, accuracy or response times beyond 3 standard deviations), the final sample consisted of 43 participants in the positive meta-stereotype activation group and 43 in the control group. All participants were right-handed with normal or corrected-to-normal vision. Participants received 10 yuan as compensation. Independent samples t-tests and chi-square tests revealed no significant age difference between groups,  $t(84) = 1.13$ ,  $p = 0.261$ , but a significant gender difference,  $\chi^2(1) = 17.16$ ,  $p < 0.001$ . Therefore, the study treated gender as a confounding variable along with positive meta-stereotype activation as independent variables in multiple linear regression to control for confounding effects when examining the impact of positive meta-stereotypes on working memory.

**2.1.2 Experimental Design** A 2 (activation type: positive meta-stereotype activation vs. control)  $\times$  3 (task difficulty: low/medium/high) mixed design was employed. Activation type was a between-subjects variable, while task difficulty was a within-subjects variable. The dependent variables were response time and accuracy on the N-back task.

**2.1.3 Materials and Measures Meta-stereotype activation manipulation.** We adapted the meta-stereotype activation procedure from Owuamalam and Zagefka (2011). Participants in the positive meta-stereotype activation group were asked to list four positive impressions they believed urban college students hold about rural college students. Control group participants listed four developments in current science and technology.

**Manipulation check.** The effectiveness of meta-stereotype activation was assessed by asking participants about their perception of urban college students' general views toward rural college students (1 = very negative, 7 = very positive) (Matera et al., 2015).

**Working memory task.** The N-back task was used to measure working memory. The task employed three black solid shapes: triangle, circle, and square. Stimuli measured 6.5 cm × 6.5 cm (187 × 308 pixels).

**2.1.4 Procedure** After providing informed consent, participants were randomly assigned to one of two groups (positive meta-stereotype activation or control). Following the meta-stereotype activation task, participants immediately completed the manipulation check. They then performed the N-back task. The entire procedure lasted approximately 12 minutes.

The N-back program was written in E-prime 2.0. The task consisted of three parts: 0-back, 1-back, and 2-back, representing low, medium, and high difficulty, respectively. In the 0-back task, participants pressed the “A” key when a triangle appeared and the “L” key for other shapes (circle or square). In the 1-back task, participants compared the current shape with the immediately preceding shape and judged whether they were identical. In the 2-back task, participants compared the current shape with the shape presented two trials earlier (the one before the previous shape) and judged whether they were identical. Participants pressed “A” for identical shapes and “L” for non-identical shapes. Before each task, instructions appeared on the computer screen. Participants then completed practice trials and proceeded to the formal experiment only after fully understanding the requirements. During the experiment, a fixation point was presented for 500 ms, followed by a stimulus for 500 ms, and then a 2000 ms response window.

## 2.2 Results

**2.2.1 Manipulation Check** To verify the effectiveness of the meta-stereotype activation, an independent samples t-test was conducted on the manipulation check scores. The activation type difference was significant,  $t(84) = 3.04$ ,  $p = 0.003$ ,  $d = 0.66$ . The positive meta-stereotype activation group ( $M = 5.30$ ,  $SE = 0.13$ ) scored significantly higher than the control group ( $M = 4.63$ ,  $SE = 0.18$ ), 95% CI = [0.23, 1.12], indicating successful experimental manipulation.

**2.2.2 N-back Task Performance** A repeated measures ANOVA was conducted on accuracy and response time in the N-back task. For accuracy, the main effect of activation type was significant,  $F(1, 84) = 5.24$ ,  $p = 0.025$ ,  $\eta^2_p = 0.06$ , with the positive meta-stereotype activation group ( $M = 0.81$ ,  $SE = 0.01$ ) showing lower accuracy than the control group ( $M = 0.84$ ,  $SE = 0.01$ ), 95% CI = [0.01, 0.07]. The main effect of task difficulty was significant,  $F(2, 168) = 207.81$ ,  $p < 0.001$ ,  $\eta^2_p = 0.71$ . Accuracy in the medium-difficulty condition ( $M = 0.88$ ,  $SE = 0.01$ ), 95% CI = [0.06, 0.10], and the high-difficulty condition ( $M = 0.64$ ,  $SE = 0.02$ ), 95% CI = [0.27, 0.35], were both lower than in the low-difficulty condition ( $M = 0.95$ ,  $SE = 0.01$ ). Accuracy in the high-difficulty condition was also lower than in the medium-difficulty condition, 95% CI = [0.20, 0.27].

The interaction between activation type and task difficulty was significant,  $F(2, 168) = 5.60$ ,  $p = 0.004$ ,  $\eta^2_p = 0.06$ . Simple effects analysis revealed that in the high-difficulty condition, the positive meta-stereotype activation group ( $M = 0.60$ ,  $SE = 0.03$ ) had significantly lower accuracy than the control group ( $M = 0.69$ ,  $SE = 0.03$ ), 95% CI = [0.02, 0.16]. No significant differences were found in other conditions.

For response time, the main effect of activation type was not significant,  $F(1, 84) = 1.15$ ,  $p = 0.288$ . The main effect of task difficulty was significant,  $F(2, 168) = 91.58$ ,  $p < 0.001$ ,  $\eta^2_p = 0.52$ . Response times in the medium-difficulty condition ( $M = 710.54$ ,  $SE = 19.11$ ), 95% CI = [210.37, 267.85], and the high-difficulty condition ( $M = 778.97$ ,  $SE = 30.59$ ), 95% CI = [249.82, 365.25], were longer than in the low-difficulty condition ( $M = 471.43$ ,  $SE = 10.60$ ). Response time in the high-difficulty condition was also longer than in the medium-difficulty condition, 95% CI = [17.45, 119.40]. The interaction between activation type and task difficulty was not significant,  $F(2, 168) = 1.47$ ,  $p = 0.232$ .

**2.2.3 Relationship Between Positive Meta-Stereotypes and Working Memory** To further examine whether gender influenced the relationship between activation type and working memory, we conducted a linear regression analysis controlling for gender, with high-difficulty task accuracy as the outcome variable and activation type (0 = control, 1 = positive meta-stereotype activation) as the predictor. Results showed that activation type significantly predicted high-difficulty task accuracy ( $\beta = -0.27$ ,  $p = 0.025$ ), indicating that positive meta-stereotype activation negatively predicted high-difficulty task accuracy. This finding is consistent with the ANOVA results. In the model, gender did not significantly predict high-difficulty task accuracy ( $\beta = -0.001$ ,  $p = 0.996$ ).

The results of Experiment 1 supported Hypothesis 1: After activating positive meta-stereotypes, accuracy on high-difficulty tasks (2-back) was lower than in the control group. However, positive meta-stereotype activation did not affect response time, possibly due to participants' speed-accuracy trade-offs when completing working memory tasks, similar to findings in Sun et al.'s (2015)

study on negative meta-stereotype activation effects on working memory. Overall, positive meta-stereotypes negatively affected working memory task accuracy, and this effect was limited to high cognitive load working memory tasks, suggesting that positive meta-stereotype activation created additional cognitive burden that interfered with complex cognitive task execution—that is, positive meta-stereotype activation produced a choking effect. This may be because rural college students hold fewer positive meta-stereotypes and experience self-doubt when facing outgroup expectations. Groups holding fewer positive meta-stereotypes are more likely to produce choking effects (Vázquez et al., 2017). Additionally, because positive meta-stereotypes contain many positive traits, their activation makes individuals feel outgroups' expectations (Finkelstein et al., 2015). Rural college students, who hold fewer positive meta-stereotypes, may be more eager to meet outgroups' positive expectations to prove their group's competence, which may increase approach motivation to complete tasks. Approach motivation is also an important factor affecting working memory (Avery & Smillie, 2013; Yüvrük et al., 2020). Therefore, to further explore the mechanism of the choking effect of positive meta-stereotypes, Experiment 2 examined the mediating role of approach motivation.

### 3 Experiment 2: The Mediating Role of Approach Motivation

Experiment 1 explored how positive meta-stereotypes affect working memory task performance. Compared with the control group, positive meta-stereotype activation reduced accuracy on high-difficulty working memory tasks. Experiment 2 further explored the mechanism of the choking effect of positive meta-stereotypes. In this experiment, participants completed approach motivation and working memory tasks under positive meta-stereotype activation or control conditions.

#### 3.1 Method

**3.1.1 Participants** G\*Power 3.1 was used to determine the sample size (Faul et al., 2007). For a  $2 \times 3$  experimental design with  $f = 0.25$  and  $\alpha = 0.05$ , 86 participants were needed to achieve 80% statistical power ( $1 - \beta$ ). We recruited 94 rural college students (registered household and permanent residence in rural areas) through advertisements. After excluding 8 invalid datasets (incomplete questionnaires, accuracy beyond 3 standard deviations), the final sample consisted of 86 valid participants (14 males, 72 females; mean age =  $20.12 \pm 1.01$  years), with 43 in the positive meta-stereotype activation group and 43 in the control group. All participants were right-handed with normal or corrected-to-normal vision. Participants received 15 yuan as compensation. Independent samples t-tests and chi-square tests revealed no significant differences in age,  $t(84) = 0.64$ ,  $p = 0.525$ , or gender,  $\chi^2(1) = 1.37$ ,  $p = 0.243$ , between the positive meta-stereotype activation and control groups.

**3.1.2 Experimental Design** A 2 (activation type: positive meta-stereotype activation vs. control)  $\times$  3 (task difficulty: low/medium/high) mixed design was employed. Activation type was a between-subjects variable, while task difficulty was a within-subjects variable. The dependent variables were approach motivation scale scores and N-back task response time and accuracy.

**3.1.3 Materials and Measures Approach motivation.** Participants rated their approach tendency toward the current task (1 = very much want to avoid, 9 = very much want to approach) to measure approach motivation (Briggs & Martin, 2009; Feng, 2017). Other materials and measures were identical to Experiment 1.

**3.1.4 Procedure** After providing informed consent, all participants were randomly assigned to one of two groups (positive meta-stereotype activation or control). Following the meta-stereotype activation task, participants immediately completed the manipulation check. They then completed the approach motivation scale and the N-back task. The four stages lasted approximately 15 minutes.

## 3.2 Results

**3.2.1 Manipulation Check** To verify the effectiveness of meta-stereotype activation, an independent samples t-test was conducted on the manipulation check scores. The activation type difference was significant,  $t(84) = 5.17$ ,  $p < 0.001$ ,  $d = 1.13$ . The positive meta-stereotype activation group ( $M = 5.30$ ,  $SE = 0.14$ ) scored significantly higher than the control group ( $M = 4.33$ ,  $SE = 0.12$ ), 95% CI = [0.60, 1.35], indicating successful experimental manipulation.

**3.2.2 Approach Motivation** An independent samples t-test on approach motivation scores revealed a significant activation type difference,  $t(84) = 2.33$ ,  $p = 0.022$ ,  $d = 0.51$ . The positive meta-stereotype activation group ( $M = 7.19$ ,  $SE = 0.22$ ) had higher approach motivation than the control group ( $M = 6.51$ ,  $SE = 0.19$ ), 95% CI = [0.10, 1.25].

**3.2.3 N-back Task Performance** A repeated measures ANOVA was conducted on accuracy and response time in the N-back task. For accuracy, the main effect of activation type was significant,  $F(1, 84) = 9.05$ ,  $p = 0.003$ ,  $\eta^2_p = 0.10$ , with the positive meta-stereotype activation group ( $M = 0.80$ ,  $SE = 0.01$ ) showing lower accuracy than the control group ( $M = 0.84$ ,  $SE = 0.01$ ), 95% CI = [0.01, 0.07]. The main effect of task difficulty was significant,  $F(2, 168) = 255.04$ ,  $p < 0.001$ ,  $\eta^2_p = 0.75$ . Accuracy in the medium-difficulty condition ( $M = 0.88$ ,  $SE = 0.01$ ), 95% CI = [0.06, 0.10], and the high-difficulty condition ( $M = 0.63$ ,  $SE = 0.02$ ), 95% CI = [0.30, 0.37], were both lower than in the low-difficulty condition ( $M = 0.96$ ,  $SE = 0.01$ ). Accuracy in the high-difficulty

condition was also lower than in the medium-difficulty condition, 95% CI = [0.22, 0.29].

The interaction between activation type and task difficulty was significant,  $F(2, 168) = 4.61$ ,  $p = 0.011$ ,  $\eta^2_p = 0.05$ . Simple effects analysis revealed that in the high-difficulty condition, the positive meta-stereotype activation group ( $M = 0.58$ ,  $SE = 0.02$ ) had significantly lower accuracy than the control group ( $M = 0.67$ ,  $SE = 0.02$ ), 95% CI = [0.03, 0.15]. No significant differences were found in other conditions.

For response time, the main effect of activation type was not significant,  $F(1, 84) = 0.41$ ,  $p = 0.522$ . The main effect of task difficulty was significant,  $F(2, 168) = 137.34$ ,  $p < 0.001$ ,  $\eta^2_p = 0.62$ . Response times in the medium-difficulty condition ( $M = 746.58$ ,  $SE = 16.26$ ), 95% CI = [254.89, 304.98], and the high-difficulty condition ( $M = 814.74$ ,  $SE = 26.14$ ), 95% CI = [296.98, 399.22], were longer than in the low-difficulty condition ( $M = 466.64$ ,  $SE = 11.32$ ). Response time in the high-difficulty condition was also longer than in the medium-difficulty condition, 95% CI = [16.80, 119.53]. The interaction between activation type and task difficulty was not significant,  $F(2, 168) = 1.84$ ,  $p = 0.162$ .

**3.2.4 The Mediating Role of Approach Motivation** Correlations among variables are presented in Table 1. Table 1 shows that activation type was significantly correlated with approach motivation and accuracy under high-difficulty conditions.

To examine the role of approach motivation in the relationship between positive meta-stereotype activation and working memory, we used the Bootstrap method in SPSS to assess the mediating effect (Hayes, 2013). We set 5,000 resamples and calculated 95% confidence intervals. If the interval does not contain 0, the indirect effect is significant. The significance level was set at  $\alpha = 0.05$ .

The results (see Figure 2 [Figure 2: see original paper]) showed that positive meta-stereotype activation positively predicted approach motivation ( $\beta = 0.49$ ,  $p = 0.022$ , 95% CI = [0.07, 0.91]) and negatively predicted high-difficulty task accuracy ( $\beta = -0.46$ ,  $p = 0.028$ , 95% CI = [-0.88, -0.05]). Additionally, approach motivation negatively predicted high-difficulty task accuracy ( $\beta = -0.26$ ,  $p = 0.014$ , 95% CI = [-0.47, -0.05]). These results indicate that approach motivation partially mediated the effect of positive meta-stereotype activation on working memory, with the mediating effect (-0.13) accounting for 22.03% of the total effect (-0.59).

Experiment 2 verified Hypothesis 2. Consistent with Experiment 1, positive meta-stereotype activation reduced accuracy on high-difficulty tasks (2-back). Further analysis revealed that when positive meta-stereotypes were activated, participants showed stronger approach motivation, which in turn led to decreased accuracy on high-difficulty working memory tasks. This occurs because positive meta-stereotype activation creates a goal and expectation, making individuals increase approach motivation to prove themselves (Finkelstein et al.,

2015; Seibt & Förster, 2004). Excessive approach motivation reduces cognitive resources available for working memory tasks, decreasing working memory accuracy (Beilock & Gray, 2007; Gable & Harmon-Jones, 2010; Yüvrük et al., 2020; Liu et al., 2016). The results of Experiment 2 indicate that approach motivation is the mediating mechanism of the choking effect of positive meta-stereotypes. Additionally, previous research suggests that core self-evaluation can provide individuals with internal resources needed to complete tasks (Finkelstein et al., 2015) and may buffer the negative impact of meta-stereotypes on working memory. Therefore, Experiment 3 further explored the moderating role of core self-evaluation.

## 4 Experiment 3: The Moderating Role of Core Self-Evaluation

Experiment 2 further replicated and extended Experiment 1. Positive meta-stereotype activation caused performance decline on high-difficulty tasks, with approach motivation mediating this process. We then considered whether the choking effect of positive meta-stereotypes occurs under all circumstances. Therefore, Experiment 3 examined core self-evaluation (an important individual difference variable) as a moderator in positive meta-stereotype activation, aiming to provide further insight into how positive meta-stereotypes affect working memory.

### 4.1 Method

**4.1.1 Participants** G\*Power 3.1 was used to determine the sample size (Faul et al., 2007). For a  $2 \times 3$  experimental design with  $f = 0.25$  and  $\alpha = 0.05$ , 86 participants were needed to achieve 80% statistical power ( $1 - \beta$ ). We recruited 96 rural college students (registered household and permanent residence in rural areas) through advertisements. After excluding 10 invalid datasets (incomplete questionnaires, accuracy beyond 3 standard deviations), the final sample consisted of 86 valid participants (12 males, 74 females; mean age =  $19.88 \pm 1.60$  years), with 43 in the positive meta-stereotype activation group and 43 in the control group. All participants were right-handed with normal or corrected-to-normal vision. Participants received 15 yuan as compensation. Independent samples t-tests and chi-square tests revealed no significant differences in age,  $t(84) = 1.77$ ,  $p = 0.081$ , or gender,  $\chi^2(1) = 0$ ,  $p = 1$ , between the positive meta-stereotype activation and control groups.

**4.1.2 Experimental Design** A 2 (activation type: positive meta-stereotype activation vs. control)  $\times$  3 (task difficulty: low/medium/high) mixed design was employed. Activation type was a between-subjects variable, while task difficulty was a within-subjects variable. The dependent variables were approach motivation scale scores and N-back task response time and accuracy.

**4.1.3 Materials and Measures Core Self-Evaluation Scale.** We used the Core Self-Evaluation Scale developed by Judge et al. (2003), which consists of 12 items rated on a 5-point scale (1 = strongly disagree, 5 = strongly agree). Higher scores indicate higher core self-evaluation. Cronbach's  $\alpha$  in this study was 0.85. All other materials and measures were identical to Experiment 2.

**4.1.4 Procedure** After providing informed consent, participants were randomly assigned to one of two meta-stereotype activation conditions (positive meta-stereotype activation or control). They first completed the Core Self-Evaluation Scale, then the meta-stereotype activation task, followed immediately by the manipulation check and approach motivation scale, and finally the same N-back task as in Experiment 1. The entire procedure lasted approximately 15 minutes.

## 4.2 Results

**4.2.1 Manipulation Check** To verify the effectiveness of meta-stereotype activation, an independent samples t-test was conducted on the manipulation check scores. The activation type difference was significant,  $t(84) = 6.01$ ,  $p < 0.001$ ,  $d = 1.31$ . The positive meta-stereotype activation group ( $M = 5.60$ ,  $SE = 0.13$ ) scored significantly higher than the control group ( $M = 4.47$ ,  $SE = 0.14$ ), 95% CI = [0.76, 1.52], indicating successful experimental manipulation.

**4.2.2 Approach Motivation** An independent samples t-test on approach motivation scores revealed a significant activation type difference,  $t(84) = 2.25$ ,  $p = 0.027$ ,  $d = 0.49$ . The positive meta-stereotype activation group ( $M = 7.47$ ,  $SE = 0.20$ ) had higher approach motivation than the control group ( $M = 6.72$ ,  $SE = 0.26$ ), 95% CI = [0.09, 1.40].

**4.2.3 N-back Task Performance** A repeated measures ANOVA was conducted on accuracy and response time in the N-back task. For accuracy, the main effect of activation type was significant,  $F(1, 84) = 9.74$ ,  $p = 0.002$ ,  $\eta^2_p = 0.10$ , with the positive meta-stereotype activation condition ( $M = 0.82$ ,  $SE = 0.01$ ) showing lower accuracy than the control group ( $M = 0.86$ ,  $SE = 0.01$ ), 95% CI = [0.02, 0.07]. The main effect of task difficulty was significant,  $F(2, 168) = 230.33$ ,  $p < 0.001$ ,  $\eta^2_p = 0.73$ . Accuracy in the medium-difficulty condition ( $M = 0.89$ ,  $SE = 0.01$ ), 95% CI = [0.06, 0.10], and the high-difficulty condition ( $M = 0.67$ ,  $SE = 0.02$ ), 95% CI = [0.27, 0.34], were both lower than in the low-difficulty condition ( $M = 0.97$ ,  $SE = 0.01$ ). Accuracy in the high-difficulty condition was also lower than in the medium-difficulty condition, 95% CI = [0.19, 0.26].

The interaction between activation type and task difficulty was significant,  $F(2, 168) = 6.12$ ,  $p = 0.003$ ,  $\eta^2_p = 0.07$ . Simple effects analysis revealed that in the high-difficulty condition, the positive meta-stereotype activation condition ( $M = 0.61$ ,  $SE = 0.02$ ) had lower accuracy than the control group ( $M = 0.72$ ,  $SE$

= 0.02), 95% CI = [0.04, 0.17]. No significant differences were found in other conditions.

For response time, the main effect of activation type was not significant,  $F(1, 84) = 1.65$ ,  $p = 0.203$ . The main effect of task difficulty was significant,  $F(2, 168) = 95.87$ ,  $p < 0.001$ ,  $\eta^2_p = 0.53$ . Response times in the medium-difficulty condition ( $M = 700.71$ ,  $SE = 14.30$ ), 95% CI = [197.75, 252.35], and the high-difficulty condition ( $M = 811.64$ ,  $SE = 28.34$ ), 95% CI = [276.72, 395.24], were longer than in the low-difficulty condition ( $M = 475.66$ ,  $SE = 10.20$ ). Response time in the high-difficulty condition was also longer than in the medium-difficulty condition, 95% CI = [56.19, 165.66]. The interaction between activation type and task difficulty was not significant,  $F(2, 168) = 1.90$ ,  $p = 0.153$ .

**4.2.4 The Moderating Effect of Core Self-Evaluation** We used Process Model 5 to analyze the moderating effect of core self-evaluation. Positive meta-stereotype activation was entered as the independent variable, approach motivation as the mediator, high-difficulty condition accuracy as the dependent variable, and core self-evaluation was included in the model.

The results (see Table 2 ) showed that positive meta-stereotype activation positively predicted approach motivation ( $\beta = 0.47$ ,  $p = 0.027$ ) and negatively predicted high-difficulty task accuracy ( $\beta = -0.45$ ,  $p = 0.023$ ). Approach motivation negatively predicted high-difficulty task accuracy ( $\beta = -0.24$ ,  $p = 0.023$ ). The interaction term between positive meta-stereotype activation and core self-evaluation significantly predicted high-difficulty task accuracy ( $\beta = -0.52$ ,  $p = 0.008$ ). This indicates that core self-evaluation moderated the relationship between positive meta-stereotype activation and working memory.

To clarify the nature of this moderating effect, we conducted simple slope analysis by dividing core self-evaluation into high ( $M + 1$  SD) and low ( $M - 1$  SD) groups. When core self-evaluation was low ( $M - 1$  SD), there was no significant difference in high-difficulty task accuracy between the positive meta-stereotype activation and control groups ( $\beta_{\text{simple}} = 0.07$ ,  $t = 0.26$ ,  $p = 0.791$ ). When core self-evaluation was high ( $M + 1$  SD), the positive meta-stereotype activation group had significantly lower accuracy than the control group ( $\beta_{\text{simple}} = -0.96$ ,  $t = -3.55$ ,  $p < 0.001$ ). This indicates that the higher the core self-evaluation, the greater the impact of positive meta-stereotype activation on high-difficulty task accuracy (see Figure 3 [Figure 3: see original paper]).

The results of Experiment 3 replicated Experiment 2 and simultaneously revealed the moderating role of core self-evaluation. When positive meta-stereotype activation was compared with the control group, participants with high core self-evaluation showed decreased accuracy on high-difficulty working memory tasks (2-back). However, positive meta-stereotypes did not affect those with low core self-evaluation. This suggests that the choking effect of positive meta-stereotypes is more likely to occur in individuals with high core self-evaluation, which did not support Hypothesis 3. The reason for

this result may be that core self-evaluation plays a role as a vulnerability factor in positive meta-stereotype activation (Liu & Li, 2017). According to the stress vulnerability hypothesis, protective factors with positive qualities can be constrained by risk factors, causing individuals to perform well in low-pressure environments but undermining their performance in high-pressure environments (Chu et al., 2021; Li et al., 2012; Wang et al., 2010). Empirical research has also found that high core self-evaluation exacerbates the harmful effects of risk factors such as stress on learning (Gao et al., 2021). Therefore, the high-pressure environment created by positive meta-stereotype activation may cause individuals with high core self-evaluation to be more susceptible to choking effects.

## 5 General Discussion

Experiment 1 found that compared with the control group, positive meta-stereotype activation reduced accuracy on high-difficulty working memory tasks. Experiment 2 revealed that compared with the control group, positive meta-stereotype activation significantly enhanced approach motivation, which in turn reduced accuracy on high-difficulty tasks. Experiment 3 demonstrated that core self-evaluation played a moderating role, such that positive meta-stereotype activation reduced high-difficulty task accuracy by increasing approach motivation only among individuals with high core self-evaluation; this effect was not found among those with low core self-evaluation.

### 5.1 The Effect of Positive Meta-Stereotype Activation on Working Memory

Previous research has mainly examined negative meta-stereotypes and their effects (Méndez et al., 2007; Owuamalam, Issmer et al., 2013; Owuamalam & Zagefka, 2014; Van Leeuwen et al., 2014). Considering the role of meta-stereotype valence, this study built upon previous research on negative meta-stereotype activation effects on working memory (Li et al., 2021; Sun et al., 2015) to explore the effect of positive meta-stereotypes on working memory. All three experiments consistently found that the positive meta-stereotype activation group had lower accuracy than the control group in high-difficulty tasks (2-back), indicating that positive meta-stereotype activation produced a choking effect. According to the choking effect hypothesis, when positive meta-stereotypes are activated, individuals feel expectations and increased pressure, which compels them to monitor their performance to meet outgroup expectations (Beilock & Carr, 2001; Tagler, 2012) and occupies relevant cognitive resources (Belletier et al., 2015; Engle, 2002; Mesagno & Beckmann, 2017), resulting in decreased accuracy when executing difficult working memory tasks. Additionally, this study's results are consistent with related research evidence. For example, Baumeister (1984) found that when told others expected them to succeed, participants' task performance suffered. Because they felt the need to meet others' expectations, positive evaluations became not just a reference but a standard for comparison.

Failure to meet this standard meant failure, which increased their pressure and impaired task performance (Seibt & Förster, 2004).

Meanwhile, the study found that the choking effect only occurred in high-difficulty tasks with high cognitive load demands (2-back), with no significant differences between the positive meta-stereotype activation and control groups in 0-back and 1-back tasks. This indicates that when working memory demands for monitoring, updating, and storage are low, positive meta-stereotype activation (compared with the control group) does not affect working memory processing. In high-difficulty conditions, task completion places higher demands on cognitive resources (Beilock & Carr, 2005), and pressure limits the cognitive resources available for working memory, reducing accuracy. In low-difficulty conditions, task completion requires fewer cognitive resources, so working memory processing is not constrained.

Furthermore, this study's finding of a choking effect from positive meta-stereotype activation may be related to participant selection. Rural college students hold more negative meta-stereotypes and fewer positive ones when comparing themselves with urban college students (Meng, 2013). Positive meta-stereotypes are difficult for them to retrieve. When positive meta-stereotypes are difficult to retrieve, their activation represents a pressure that can easily trigger a choking effect (Vázquez et al., 2017). Future research could examine whether other groups holding more positive meta-stereotypes show the same effect.

## 5.2 The Mediating Role of Approach Motivation

Approach motivation is an important mechanism through which positive meta-stereotypes affect working memory. Experiment 2 found that positive meta-stereotype activation significantly predicted approach motivation; that is, positive meta-stereotype activation increased participants' approach motivation. Positive meta-stereotypes contain outgroups' positive evaluations (e.g., experienced, kind), making individuals want to meet external expectations and prove their abilities, which is related to approach motivation for task completion (Finkelstein et al., 2015). Previous research has found that positive stereotype activation increases individuals' approach motivation (Feng, 2017). Similarly, in this study, positive meta-stereotype activation made individuals aware of outgroups' positive evaluations, which served as a reference point or goal that guided them toward this ideal state (Finkelstein et al., 2015; Seibt & Förster, 2004). Therefore, positive meta-stereotype activation increased individuals' approach motivation.

Second, approach motivation negatively predicted accuracy on high-difficulty working memory tasks; that is, higher approach motivation intensity was associated with worse working memory task performance. This is consistent with previous research. For example, studies on the effects of different approach motivations on working memory found that high-intensity approach motivation

reduces accuracy on the N-back task (Yüvrük et al., 2020). Further mediation analysis indicated that approach motivation mediated the relationship between positive meta-stereotype activation and working memory. When positive meta-stereotypes are activated, individuals perceive that outgroups have positive expectations and have a strong desire to verify them. Individuals have strong motivation to achieve goals, but excessive approach motivation focuses individuals' attention on the goal, increasing the goal's consumption of attentional resources and thereby affecting the consumption of working memory-related cognitive resources (Gable & Harmon-Jones, 2010; Yüvrük et al., 2020). Previous researchers explaining the mechanism of the choking effect have also mentioned that individuals increase motivation to complete tasks to meet external expectations, and the relationship between motivation and task performance follows the Yerkes-Dodson law—inverted U-shaped relationship—where excessively high motivation reduces task performance, leading to the choking effect (Beilock & Gray, 2007). For rural college students, because they hold fewer positive meta-stereotypes, they are more eager to gain outgroup recognition, leading to stronger motivation that impairs task performance (Baumeister et al., 1985). In summary, this study found that positive meta-stereotype activation reduces high-difficulty task accuracy by increasing approach motivation, revealing the internal mechanism through which positive meta-stereotypes affect working memory.

### 5.3 The Moderating Role of Core Self-Evaluation

Core self-evaluation moderated the relationship between positive meta-stereotype activation and working memory. According to the Theory of Resource Conservation (Alarcon et al., 2011), core self-evaluation, as a positive psychological quality, should resist the negative impact of positive meta-stereotypes. Surprisingly, this study found that after positive meta-stereotype activation (compared with the control group), participants with high core self-evaluation had lower working memory accuracy on high-difficulty tasks (2-back). This indicates that after positive meta-stereotype activation, the protective effect of core self-evaluation disappeared. The results did not support the Resource Conservation Theory but instead supported the stress vulnerability hypothesis. In the high-pressure environment created by positive meta-stereotype activation, core self-evaluation played a destructive role, making individuals with high core self-evaluation more susceptible to choking effects (Li et al., 2012; Wang et al., 2010). The reason may be related to the rural college student group. Because this study activated rural college students' positive meta-stereotypes by asking about their perceptions of urban college students' views of rural college students, this process involved comparison between two groups. Rural college students are in a disadvantaged position compared with urban college students (Xiang & Zhao, 2012). According to social comparison theory, when disadvantaged groups compare themselves with advantaged groups, it threatens the self and reduces individuals' self-evaluation (Fu & Zhang, 2004). Activating positive meta-stereotypes may threaten rural

college students' self-evaluation, and individuals with originally high core self-evaluation experience greater conflict and are therefore more likely to produce choking effects. Individuals with lower self-evaluation may be more defensive and adopt more conservative strategies to complete tasks (Finkelstein et al., 2020). This finding also suggests that positive meta-stereotype activation is a high-pressure situation for individuals.

#### 5.4 Limitations and Future Directions

First, future research should expand the scope of choking effects and their mechanisms. This study found a choking effect of positive meta-stereotypes in the working memory domain. However, boost effect research has involved intergroup emotions, attitudes, and social behaviors (Fowler & Gasiorek, 2018, 2019; Matera et al., 2015; Lin et al., 2020). Compared with the extensive research on boost effects, choking effect research is limited. Future studies could expand to other domains such as intergroup emotions and social behaviors. Additionally, because this study used only a single item to measure approach motivation, future research could employ more multidimensional, well-established scales to measure approach motivation for deeper exploration. Future research could also examine the mediating role of approach motivation in other positive meta-stereotype domains, such as intergroup emotions and attitudes, to test whether this internal mechanism is domain-specific. Meanwhile, according to the pressure choking effect, pressure may be an important mechanism of the choking effect of positive meta-stereotypes. Future research could further examine this mechanism to compensate for current deficiencies in positive meta-stereotype choking effect research.

Second, more attention should be paid to the boundary conditions for the occurrence of choking and boost effects of positive meta-stereotypes. This study found that positive meta-stereotype activation negatively affected working memory and only among individuals with high core self-evaluation. Under what circumstances does positive meta-stereotype activation positively affect working memory? This study suggests that the reason for the choking effect may be the group selected. Future research could examine whether positive meta-stereotypes produce boost effects in groups holding more positive meta-stereotype traits. However, stereotype research indicates that both positive and negative stereotype activation can interfere with cognitive functions (Shih et al., 2015). Whether, like stereotypes, both positive and negative meta-stereotypes negatively affect working memory is a question worth exploring in the future.

Third, based on the current findings, effective methods to reduce the negative impact of positive meta-stereotypes could be further explored. Currently, meta-stereotype interventions mainly focus on negative meta-stereotypes, such as intergroup contact and cognitive reappraisal (Huang et al., 2019; Wu et al., 2019). However, research on interventions for the choking effect of positive meta-stereotypes is scarce and urgently needs further exploration.

## 6 Conclusions

- (1) Positive meta-stereotype activation produces a choking effect, reducing accuracy on high-difficulty working memory tasks.
- (2) Positive meta-stereotype activation affects working memory by increasing approach motivation.
- (3) Core self-evaluation moderates the choking effect of positive meta-stereotypes, such that positive meta-stereotype activation reduces accuracy on high-difficulty working memory tasks only among individuals with high core self-evaluation.

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