



Ego depletion and prosocial behavior: The chain mediating effects of subjective vitality and empathy

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This study investigated the effect of ego depletion on prosocial behavior and the chain mediating role of subjective vitality and empathy in this relationship. We conducted a survey of 381 college students using standardized scales. The results showed that there were significant correlations among ego depletion, subjective vitality, empathy, and prosocial behavior. Further regression analysis and mediation effects tests revealed that the direct effect of ego depletion on prosocial behavior was significant, and the single mediation and chain mediation effects of subjective vitality and empathy in this relationship were also significant. The findings indicate that increasing subjective vitality helps to improve empathy and, thus, prosocial behavior.

Keywords

ego depletion, prosocial behavior, subjective vitality, empathy, chain mediation effect

Article Highlights

- We used the chain mediation approach to explore the mechanisms between ego depletion, subjective vitality, empathy, and prosocial behavior.
- Results demonstrated that ego depletion negatively predicted prosocial behavior in college students through the chain mediating effects of subjective vitality and empathy.
- Our findings support self-determination theory and the resource model of self-control, and provide a new perspective for further in-depth research on subjective vitality.

Prosocial behavior refers to positive social actions that are beneficial to others, groups, and society; it is prevalent in daily life (Eisenberg & Miller, 1987) and contributes to the harmonious development of society and to individuals' physical and mental health (Kou & Zhang, 2006). *Ego depletion* refers to a psychological state of weakened control that an individual experiences after their self-control resources have been consumed (Fei et al., 2016; Muraven et al., 1988; Ren et al., 2014). According to the resource model of self-control (Baumeister et al., 1994), people need to control their irrational thoughts, emotions, and behaviors to support the achievement of long-term goals when engaging in conscious, purposeful activities. Self-control resources are limited in the short term, and when the consumption of these resources reaches a critical level, the individual enters a state of resource scarcity (i.e., ego depletion), leading to a failure of self-control required for subsequent tasks, thereby affecting the individual's subsequent emotional and behavioral performance (Baumeister et al., 1994). Many studies have found that once an individual enters a state of ego depletion, impairments in social behaviors will result, such as a reduction in prosociality and altruism, an increase in negative emotional responses, a temporary decrease in intellectual achievement levels, and an increase in smoking behavior (Gailliot & Baumeister, 2007; Ren et al., 2014). In summary, the literature indicates that ego depletion influences prosocial behavior (Tang et al., 2022). So, what is the mechanism of this influence?

Subjective vitality refers to the energetic, positive, and motivated characteristics of an individual based on their physical or psychological energy (Lavrusheva, 2020; Ryan & Frederick, 1997). According to self-determination theory (Ryan & Deci, 2008), controlled and involuntary behaviors consume an individual's subjective vitality (Song et al., 2015). Individuals experiencing ego depletion often have low vitality. The process of self-control in restraining instinctive or impulsive behaviors to successfully accomplish goals in the workplace may lead to energy deprivation and trigger ego depletion, which results in low vitality accompanied by negative emotions, thus affecting the completion of subsequent work (Gombert et al., 2020; Muraven et al., 2008; Zheng & Xu, 2011). The negative emotions associated with low subjective vitality limit the energy individuals have available to mobilize goal-directed actions, thus affecting their subsequent interpersonal behaviors (Zheng & Xu, 2011). As such, we inferred that subjective vitality would mediate the impact of ego depletion on prosocial behavior.

Empathy, which is a process in which an individual understands and infers the emotions of others and generates similar emotional responses (Guo et al., 2023), is the foundation and direct motivation for the generation of prosocial behavior. According to the empathy–altruism hypothesis (Batson et al., 2002), individuals with high empathy tend to pay attention to and feel sympathy for others in difficulty. As this emotional orientation intensifies, the individual's altruistic motivation also increases, and they may subsequently engage in helping actions. In other words, empathy leads to altruistic motivation, which, in turn, leads to prosocial behavior (Kamas & Preston, 2021). Ding and Lu (2016) used meta-analysis techniques to find a close relationship between empathy and prosocial behavior. Similarly, An et al. (2018) found that the level of empathy of college students can significantly predict prosocial behavior. W. Wang and Wu (2020) examined the relationship between empathy and prosocial behavior among adolescents who had experienced earthquake disasters, and found that when individuals have strong empathy, they are more likely to understand the feelings of others and to behave in ways that consider others. Almost all human activities are affected by ego depletion, and empathy is no exception. According to Tangney et al. (2004), ego depletion weakens self-control abilities, such as emotion regulation and impulse control, which affects individual perspective-taking abilities (i.e., an important factor of empathy), thus negatively affecting individual empathy. Other studies have found that long-term self-depletion can reduce the empathy ability of psychological counselors (Wolk, 2015). In addition, a study involving medical and nursing groups found a negative relationship between the two variables (Cui et al., 2023). Thus, it can be inferred that ego depletion affects prosocial behavior by influencing individuals' empathy ability.

Subjective vitality, as a characteristic state influenced by physical or psychological energy, is easily affected by the degree of ego depletion. Those with low subjective vitality not only lack behavioral motivation but also have a relatively negative emotional state. Research has found that employees who are full of subjective vitality at work often know how to care for others, can view problems from the perspective of others and think empathetically when facing various situations, and have stable emotions and interpersonal relationships (Zhang, 2006). It can be inferred that the level of vitality will affect the ability to empathize. In summary, we formed the following hypotheses:

Hypothesis 1: Ego depletion will have a negative predictive effect on prosocial behavior.

Hypothesis 2: Subjective vitality will play a mediating role between ego depletion and prosocial behavior.

Hypothesis 3: Empathy will play a mediating role between ego depletion and prosocial behavior.

Hypothesis 4: Subjective vitality and empathy will play a chain mediating role between ego depletion and prosocial behavior.

Method

Participants and Procedure

After receiving approval from our school ethics committee and informed consent from the participants, we used an online crowdsourcing platform in Mainland China to recruit college students from 11 provinces: Shanxi, Hunan, Shandong, Jiangsu, Beijing, Guangdong, Guangxi, Heilongjiang, Hubei, Liaoning, and Jilin. We distributed 508 questionnaires that included attention-check questions. After excluding participants who completed the questionnaire



too quickly and those who answered the attention-check questions incorrectly, 381 valid responses were collected, for a valid recovery rate of 75%. Among the participants, there were 109 men and 272 women, with a mean age of 20.25 ± 2.84 years.

Measures

Self-Regulation Fatigue Scale

We measured ego depletion with the Chinese version of the Self-Regulation Fatigue Scale (L. Wang et al., 2015), which was used in the study of L. Li et al. (2022). This scale has good reliability and validity and is suitable for assessing the ego depletion status of young people in China (L. Li et al., 2022; L. Wang et al., 2015). The scale consists of 16 items (e.g., “I’ve had the urge to break something,” “I feel energetic,” and “I have trouble remembering some things”). Items are scored on a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*), with some being reverse scored. Higher scores indicate more severe ego depletion. In this study Cronbach’s alpha was .81.

Subjective Vitality Scale

The Subjective Vitality Scale developed by Ryan et al. (1997) was used to assess subjective vitality. We translated this scale into Chinese by following a standard back-translation procedure. The scale consists of seven items (e.g., “Sometimes I feel so alive that I want to explode,” “I look forward to a new day,” and “I feel full of life and vitality”). Items are rated on a 7-point Likert scale ranging from 1 = *strongly disagree* to 7 = *strongly agree*, with some being reverse scored. Higher scores indicate higher levels of subjective vitality. In this study Cronbach’s alpha was .83.

Interpersonal Reactivity Index

We used the Chinese version (W. Wang & Wu, 2020) of the Interpersonal Reactivity Index developed by Davis (1980) to measure empathy. There are 28 items (e.g., “When I hear stories, I often imagine what could have happened to me,” “When someone is getting on my nerves, I often try to put myself in their shoes,” and “I stay cool when I see someone get hurt”). Items are rated on a 5-point Likert scale (1 = *completely disagree*, 5 = *completely agree*), with some being reverse scored. Higher scores indicate a better empathy ability. In this study Cronbach’s alpha was .81.

Prosocial Tendency Scale

Prosocial behavior was measured with The Prosocial Tendency Scale (Carlo & Randall, 2002), which was revised into Chinese by Kou et al. (2007). There are 26 items (e.g., “I don’t hesitate when others ask me for help,” “I tend to help people, especially when they are in a lot of emotional pain,” and “I think if I help others, they should help me in the future”). Items are scored on a 5-point Likert scale ranging from 1 = *strongly disagree* to 5 = *strongly agree*, with some being reverse scored. Higher scores indicate a stronger tendency toward prosocial behavior. In this study Cronbach’s alpha was .90.

Data Analysis

SPSS 25.0 was used for data entry and descriptive analysis, and Model 6 of the PROCESS macro for SPSS was used to test the chain mediation effect.

Results

Common Method Bias Test

The results of Harman’s single-factor test showed that there were 16 factors with eigenvalues greater than 1, and the first factor explained 15.39% of the variance, which is less than the standard cut-off of 40%. This indicates that there was no serious common method bias in this study.

Descriptive Statistics and Correlation Analysis

We used SPSS 25.0 for calculating descriptive statistics and conducting a Pearson correlation analysis, with $p < .05$ considered statistically significant. The results are shown in Table 1.

Table 1. *Descriptive Statistics and Correlation Analysis of Variables*

	<i>M ± SD</i>	1	2	3	4	5
1. Gender	0.71 ± 0.45	1				
2. Ego depletion	2.90 ± 0.56	.024	1			
3. Subjective vitality	4.43 ± 1.08	.041	-.571**	1		
4. Empathy	3.56 ± 0.39	.167**	.117*	.147**	1	
5. Prosocial behavior	3.38 ± 0.48	.019	-.202**	.314**	.374**	1

Note. Gender: male = 0, female = 1.

* $p < .05$. ** $p < .01$.

According to Table 1, ego depletion was significantly and negatively correlated with subjective vitality and prosocial behavior, and significantly and positively correlated with empathy. Subjective vitality was significantly and positively correlated with empathy and prosocial behavior. Empathy was significantly and positively correlated with prosocial behavior. In addition, there were significant gender differences in empathy scores, with women having higher empathy than men did.

Chain Mediation Effects Test

All variables (excluding demographic variables) were standardized, with ego depletion as the independent variable, prosocial behavior as the dependent variable, and subjective vitality and empathy as chain mediating variables. Gender was used as a control variable. Model 6 of the PROCESS macro developed by Hayes (2013) was used for the chain mediation effects test. The regression analysis results showed that the entire regression equation was significant, $R^2 = .04$, $F(2, 378) = 8.18$, $p < .001$. See Table 2 for details.

Table 2. *Regression Analysis of Ego Depletion, Subjective Vitality, Empathy, and Prosocial Behavior*

Variable	Subjective vitality			Empathy			Prosocial behavior		
	β	<i>SE</i>	<i>t</i>	β	<i>SE</i>	<i>t</i>	β	<i>SE</i>	<i>t</i>
Ego depletion	-.34	0.03	-13.57***	.35	0.07	4.84***	-.20	0.08	-2.48*
Subjective vitality				.62	0.12	5.13***	.42	0.13	3.15**
Empathy							.42	0.05	7.74***
R^2	.33			.10			.22		
<i>F</i>	92.56***			14.46***			27.03***		

Note. $N = 381$.

* $p < .05$. ** $p < .01$. *** $p < .001$.

The results of the mediation effects test for each variable are shown in Table 3. The bootstrapping method with 5,000 repeated samples was used to test the mediation effect. The resulting 95% confidence intervals for the mediation effects of subjective vitality and empathy did not include zero, indicating that these two variables were significant mediators of the link between ego depletion and prosocial behavior. The specific effects manifested in the following three paths: (1) The indirect effect generated by ego depletion → subjective vitality → prosocial behavior, with an effect size of -0.143 ; (2) the indirect effect generated by ego depletion → empathy → prosocial behavior, with an effect size of 0.148 ; and (3) the indirect effect generated by ego depletion → subjective vitality → empathy → prosocial behavior, with an effect size of -0.090 . The proportions of the total effect that were explained by the three mediation effects were 51.07%, 52.86%, and 32.14%, respectively. The chain mediating model results are shown in Figure 1.

Table 3. The Mediating Role of Subjective Vitality and Empathy in the Relationship Between Ego Depletion and Prosocial Behavior

Effect	Path	Effect	Effect ratio	95% CI	
				LL	UL
Direct effect	Ego depletion → Prosocial behavior	-0.195	69.64%	-0.351	-0.040
Indirect effect	Ego depletion → Subjective vitality → Prosocial behavior	-0.143	51.07%	-0.278	-0.023
	Ego depletion → Empathy → Prosocial behavior	0.148	52.86%	0.072	0.231
	Ego depletion → Subjective vitality → Empathy → Prosocial behavior	-0.090	32.14%	-0.144	-0.044
Total indirect effect		-0.085	30.36%	-0.240	0.059
Total effect		-0.280			

Note. CI = confidence interval; LL = lower limit; UL = upper limit.

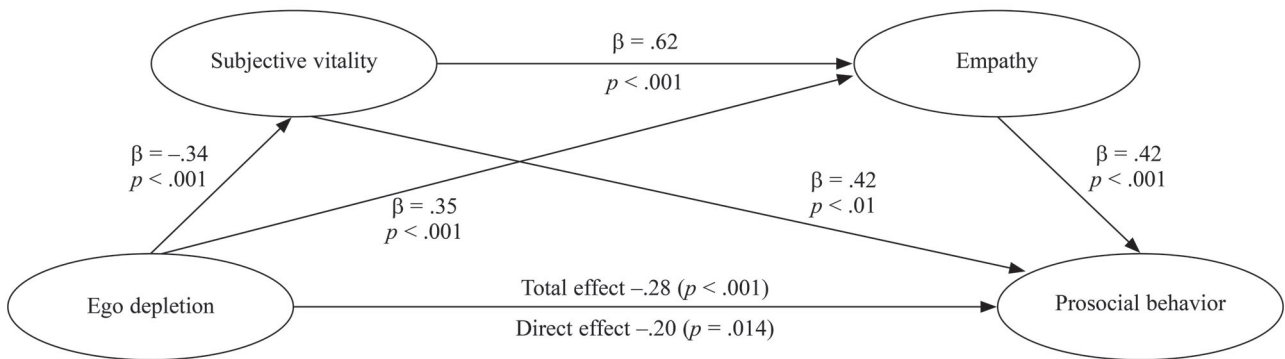


Figure 1. Chain Mediation Model

Discussion

This study examined the relationships between ego depletion, subjective vitality, empathy, and prosocial behavior. The results show that subjective vitality and empathy play a chain mediating role in the influence of ego depletion on prosocial behavior, supporting the theoretical viewpoint of self-determination theory and the resource model of self-control, and providing a new perspective for further in-depth research. Improving the vitality level of individuals will be conducive to the occurrence of prosocial behavior.

Negative Predictive Effect of Ego Depletion on Prosocial Behavior

This study found that the higher the degree of ego depletion, the less prosocial behavior people exhibit. This is consistent with Hypothesis 1 and previous research showing that ego depletion reduces the level and overall generation of individual prosocial behavior (L. Li et al., 2022; Ma & Mo, 2022). The reason for this outcome is that when an individual engages in prosocial behavior, they weigh their own and others' interests. This process requires a lot of cognitive and emotional participation, and requires sufficient self-control resources to evaluate and analyze their own and others' interests. Because individuals in a state of ego depletion reduce their attention to the interests of others, they find it more difficult to control their own impulses and exhibit more intense selfish behavior (Achtziger et al., 2015; Jin et al., 2021). Therefore, individuals experiencing ego depletion often exhibit less prosocial behavior.

Mediating Effect of Subjective Vitality in the Link Between Ego Depletion and Prosocial Behavior

We found that subjective vitality plays a mediating role in the impact of ego depletion on prosocial behavior, supporting Hypothesis 2; that is, the higher the ego depletion of an individual, the lower their subjective vitality level, and the less prosocial behavior they exhibit. Self-control consumes one's own control resources, because individuals need to expend more psychological resources when resisting instincts, habits, and other responses. As energy is the foundation of subjective vitality, it is a driving force for action and the generation of positive emotions. In other words, a low level of subjective vitality means a negative emotional state. Existing research has found that negative emotions reduce prosocial behavior (B. Li, 2020). Therefore, once an individual experiences ego depletion, their subjective vitality level will decrease, thereby reducing the possibility of the individual exhibiting prosocial behavior.

Mediating Effect of Empathy in the Link Between Ego Depletion and Prosocial Behavior

We found that empathy plays a mediating role in the impact of ego depletion on prosocial behavior, supporting Hypothesis 3. However, the direction of this path is inconsistent with the direction of the direct effect, that is, the direct effect of ego depletion on prosocial behavior is negative, but its relationship with empathy is positive. This is not consistent with previous results, and we speculate that the reason may be related to the study sample. In previous studies the participants were mainly psychological counselors and medical staff, who are prone to empathic fatigue (Cui et al., 2023; Wolk, 2015). The depletion caused by fatigue weakens the ability to empathize, resulting in a negative relationship. However, for participants such as the college students in our study, this fatigue may be less common. Generally speaking, the high ego depletion of individuals is caused by negative events or emotions occurring in the past and in daily life. On the one hand, these events consume one's energy and resources; on the other hand, they enable the individual to empathize with the misfortunes of others. In short, ego depletion can promote individuals' empathy ability to some extent. Xu et al. (2022) found that the fear of missing out, which is a kind of anxiety, is positively correlated with ego depletion in college students. Other studies have found a positive relationship between state anxiety and empathy among novice counselors (Yue, 2023). In addition, it has been found that individuals with certain personality traits, such as shyness and sensitivity, are particularly prone to internal friction and have a high level of empathy (Xu et al., 2022). In conclusion, our result suggests that there may be some moderating variables or other mediating variables between ego depletion and empathy, and that the relationship needs to be further explored.

Chain Mediation Effect of Subjective Vitality and Empathy in the Relationship Between Ego Depletion and Prosocial Behavior

This study found there is a chain mediation effect of subjective vitality and empathy in the impact of ego depletion on prosocial behavior, supporting Hypothesis 4. This indicates that a high degree of ego depletion will lead to a decrease in subjective vitality level, and individuals with less subjective vitality will have lower empathy ability, thereby reducing their prosocial behavior. Among the examined variables, ego depletion negatively predicts prosocial behavior; subjective vitality plays a mediating role in the impact of ego depletion on prosocial behavior; empathy plays a mediating role in the impact of ego depletion on prosocial behavior; and ego depletion affects subjective vitality, which further affects empathy to influence prosocial behavior, forming a chain mediation model of ego depletion → subjective vitality → empathy.

Limitations and Directions for Future Research

This study has some limitations. First, the sample comprised only college students. In the future, we hope to sample more participants from different social groups and adopt a cross-lagged model to conduct longitudinal tracking research to increase the generalizability of the results. Second, to increase the reliability of the research results, many kinds of research methods should be adopted in the future, especially the experimental method, which can be used to examine the hypotheses through manipulating the variables. Third, we recommend using electroencephalogram technology to further reveal the internal influence mechanism of ego depletion on prosocial behavior.



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The data that support the findings of this study are available on request from the corresponding author.

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