

# Does Work Stressors Lead to Abusive Supervision? A Study of Differentiated Effects of Challenge and Hindrance Stressors

This article was published in the following Dove Press journal:  
*Psychology Research and Behavior Management*

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**Purpose:** From the perspective of affective events theory, the present study examines whether two distinct categories stressors (challenge-hindrance stressors) have different effects (hindrance or promotion) on abusive supervision.

**Materials and Methods:** The data of 203 pairs of supervisor-subordinate have been collected from 12 different Chinese enterprises. We first conducted confirmatory factor analyses (CFA) in Lisrel software to test the model's validity. And then, we used the descriptive statistics to example the correlations of variables. Finally, we conducted hierarchical regression analysis and bootstrap methods to test hypotheses.

**Results:** The finding shows that two distinct categories stressors have different indirect effects (hindrance or promotion) on abusive supervision. Specifically, challenge stressors reduce abusive supervision through positive affective experience, while hindrance stressors increase abusive supervision through negative affective experience. In addition, locus of control plays a first-stage moderated-mediation role in the indirect effect of challenge stressors on abusive supervision and in the indirect effect of hindrance stressors on abusive supervision.

**Conclusion:** This study offers some comprehensive insights for why and when challenge stressors and hindrance stressors have different effects on abusive supervision. This study extends the current literature by directly testing two different underlying psychological mechanisms (resource acquisition and resource depletion), which are responsible for the different effects of challenge stressors and hindrance stressors. Also, individuals' cognitive attribution tendency is confirmed as boundary conditions of the direct effect of work stressors on affective experience and indirect effects of work stressors on abusive supervision.

**Keywords:** challenge-hindrance stressors, affective experience, locus of control, abusive supervision, affective events theory

## Introduction

Work-related stressors are always important issues for organizational behavior researchers. Given the prevalence of stressors in the workplace, stress researchers have devoted great effort to probe its outcomes, to effectively coping with stressors in the workplace. Some scholars hold that stressors are always positively associated with negative outcomes, such as strain, health, turnover intention, burnout, emotional exhaustion and negative behavior,<sup>1-5</sup> or negatively associated with job performance.<sup>3,6</sup> However, some other scholars suggested that stressors are not always deleterious and confirmed that some stressors are not associated with negative outcomes even are positively associated with positive outcomes, such as

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work engagement, well-being, job performance.<sup>7-10</sup> Having noticed these seemingly inconsistent results, Cavanaugh, Boswell, Roehling, and Boudreau (2000) decided to split stressors into two distinct categories: challenge stressors and hindrance stressors.<sup>11</sup> Challenge stressors refer to some stressors which are related to positive work outcomes, while hindrance stressors refer to some stressors which are related to negative work outcomes.<sup>11,12</sup> Based on the challenge-hindrance stressors framework, many studies have been conducted to confirm the different effects of challenge and hindrance stressors on employees' work attitudes (such as engagement or turnover intentions),<sup>13,14,17</sup> employees' work performance (such as creativity),<sup>14,15</sup> employees' work behaviors (such as counterproductive behaviors or organizational citizenship behaviors),<sup>16,17</sup> and so on. Among the work on this stream of studies, scholars pay more focus on the effects of challenge and hindrance stressors on common employees, rather than on supervisors who play a supervisory role. Given the complexity inherent in supervisory roles, supervisors may face higher job demands, more complex decision making and more difficult problems. That is, supervisors may face more challenge and hindrance stressors. Yet, the findings of previous studies cannot well address the questions of why and when challenge and hindrance stressors have different effects on supervisors' behavior, especially for negative behavior.

Abusive supervision, as a special form of supervisors' negative behavior, refers to persistent hostile verbal and non-verbal behaviors of supervisors perceived by subordinates, excluding physical contact.<sup>18</sup> Typical behaviors include humiliating and ridiculing subordinates, putting subordinates down in front of others, rude to subordinates, and so on.<sup>19</sup> Many studies confirmed that abusive supervision has a host of deleterious effects on employees' psychology, behavior, performance even that the sustainable development of organizations.<sup>20-26</sup> Therefore, researchers have devoted great effort to probe why and when supervisors are engaging in such behaviors.<sup>19</sup> Empirical evidence has identified some work stressors (ie role overload, exceedingly difficult job goals) are antecedents of abusive supervision behavior from the perspectives of resource depletion.<sup>27,28</sup> In the workplace, work stressors often cause the depletion of individual self-regulation resources, leading to self-regulation failure and negative leadership behaviors. This makes the resource depletion mechanism in the logic of "work stressor-resource depletion-negative leadership behavior" have a good explanation for the emergence of abusive supervision.<sup>29</sup> However, it's worth noting that

work stressors do not always lead to the depletion of psychological resources, especially that the positive affective experience brought by challenge stressors may lead to the increase of psychological resources. Therefore, between the work stressors and the abusive supervision, there are probably two parallel mechanisms: resource acquisition and resource depletion. Nevertheless, as we discussed above, most studies are now merely focusing on the resource depletion mechanism, but fail to incorporate the resource acquisition mechanism and to explain the complex psychological process under the different effects of two distinct categories stressors (challenge and hindrance) on abusive supervision. Given that, the current study attempts to explain from a new perspective of affective events theory (AET) that why two distinct categories stressors have different effects on abusive supervision.

AET has long been an important theoretical foundation for understanding the different affective response to different categories of work events, which describes a logic that work events will first elicit individual's affective reaction and further lead to individual's behavior.<sup>30-34</sup> Therefore, AET provides a theoretical basis for understanding why and when different work stressors have different effects on abusive supervision. In line with AET, as a kind of positive and uplifting work events, challenge stressors will activate the supervisors' positive affective experience, and positive psychological resources gained from positive affective experience<sup>35</sup> will in turn decrease abusive supervision behavior. On the contrary, hindrance stressors, as a kind of negative and hassling work events, will activate the supervisors' negative affective experience such as anxiety and dissatisfaction, and the negative affective experience will induce more abusive supervision behavior.<sup>27,28</sup> Given the above, the current study constructs a parallel model to test the resource acquisition mechanism of the relationship between challenge stressors and abusive supervision, and the resource depletion mechanism of the relationship between hindrance stressors and abusive supervision.

One should not assume, however, that all individuals respond to the same work stressors in the same way. Faced with the same stressor, individuals may generate varied affective experience, which predicts possible boundary conditions for the indirect effects of two distinct categories stressors on the abusive supervision through two different affective experiences. Previous studies have found that individual differences such as Big Five Personality and emotional intelligence play a moderating role between stressors and emotional responses,<sup>27,36</sup> but few have explored how the tendency of individual cognitive attribution moderate the stressors and emotional responses. From the perspective of AET, the process

of emotional activation is a process of cognitive evaluation. Therefore, locus of control, as the cognitive attribution tendency of individuals,<sup>37–39</sup> may play a moderating role between stressors and affective experience, which further render individualized indirect effects of the two distinct categories stressors on the abusive supervision through different affective experiences. Specifically, supervisors with high locus of control believe their capability of controlling and overcoming challenge stressors, and transforms them into favorable factors that promote self-growth, bringing him more enthusiasm, attention and pride, thus leading to less abusive supervision. In sum, this paper finds the boundary effect of two different resource mechanisms, which are responsible for why challenge-hindrance stressors have different effects on individuals' affective experience. It provides an insightful understanding of when two distinct categories stressors have different effects on abusive supervision.

Our research provides several primary theoretical contributions to the existing literature. First, this study contribute to the enrichment on the relationship between challenge-hindrance stressors and abusive supervision. Our examination is essential, given that the recent studies explored the relationship between work stressors and abusive supervision behavior based on considering stressors as single-dimensional variable.<sup>5,27,28</sup> According to the framework of stressors proposed by (Cavanaugh et al, 2000),<sup>11</sup> the current study considers work stressors as two-dimensional variables. It confirms that challenge stressors and hindrance stressors have different effects on abusive supervision behavior. Our findings can offer useful insights to understand the complex relationship between challenge-hindrance stressors and abusive supervision, and initially answer the key question of “does work stressors lead to abusive supervision?”

Second, we contribute to the research of why two distinct categories stressors have different effects on abusive supervision behavior from the lens of AET. Previous researches on stressors and negative leadership behaviors mainly focused on the resource depletion mechanism,<sup>27–29</sup> but neglected the role of the resource acquisition mechanisms in the relationship between stressors and negative leadership behaviors. In the current study, AET provides a well foundation to address such a problem through two different psychological mechanisms: resource acquisition and resource depletion. We empirically examined that supervisors' challenge stressors were positively related to positive affective experience, which promotes the acquisition of psychological resource. Conversely, supervisors' hindrance stressors were positively related to negative affective experience, which promotes the depletion of the

psychological resource. In a word, this study takes a resource acquisition mechanism and resource depletion mechanism into a parallel model, to explore why and how these two distinct categories stressors hinder/promote abusive supervision.

Finally, we contribute to the research of when two distinct categories stressors have different effects on abusive supervision behavior from the lens of AET. AET hold that there is a significant difference in the intensity of affective experience between individuals activated by affective events. Previous studies have mainly focused on the role of individual variables such as Big Five Personality and emotional intelligence in moderating stressors and affective experience levels,<sup>27,36</sup> while few studies expounded how cognitive attribution tendency affects the impact of stressors on affective experience levels. Affective experience is generally produced after the individual's cognitive evaluation of the affective events. Thus, locus of control can perfectly serve as an individual's cognitive attribution tendency to illustrate the boundary conditions of work stressors and abusive supervision. Our finding provides a basis for the boundary conditions in the indirect effects of two distinct categories stressors on abusive supervision in the parallel model and deepen the understanding of the individualized differential relationship between these categories and abusive supervision.

## Theoretical Framework and Hypotheses Development

### Affective Events Theory

Emotions and affection are important antecedents influencing individual behaviors in organizations. AET is the first theory that Weiss and Cropanzano formally put forward in 1996 to focus on individual affect and the process of affective experience in work,<sup>30</sup> including the structure, antecedents, results, and boundary conditions of affective experience.<sup>32</sup> AET believes that the characteristics of the work environment will lead to the occurrence of work events that in turn, trigger an individual's affective experience, thus further affect the individual's work attitude and behavior.<sup>31,32</sup> Meanwhile, the level of affective experience is affected by individual characteristics, showing individual differences.<sup>32</sup> Additionally, AET also believes that the affective experience is generated by the cognitive evaluation mechanism but not directly by the event itself. That is, affective experience only occurs after the individual's cognitive evaluation of the event.<sup>30,32</sup>

## Challenge-Hindrance Stressors and Abusive Supervision

According to AET, the characteristics of the work environment often lead to positive or negative work events.<sup>31–33</sup> In general, positive events or uplifts will trigger individuals' positive affective experience, while negative events or hassles will activate individuals' negative affective experience.<sup>31,33</sup> Challenge stressors are viewed by an individual as surmountable work-related demands that prone to assistance with achievements at work. They are likely to be associated with personal potential gains and growth.<sup>11,12,14</sup> In contrast, hindrance stressors are viewed by an individual as insurmountable work-related demands that interfere with achievements at work and are often viewed as constrain or obstacles to personal potential gains, growth or achievements.<sup>11,12,14</sup> In the workplace, challenge stressors such as workload, time urgency, job responsibility, and job complexity,<sup>16</sup> and hindrance stressors like red tape, role ambiguity, role conflict, and hassles<sup>16</sup> are all work events that frequently occur at work. According to the AET, the internal mechanism of events triggering affect is the cognitive evaluation mechanism, and individuals will generate positive or negative affective experience by evaluating the event's value or harm to their targets. Challenge stressors are evaluated as favourable work events by individuals for they are beneficial to work performance goals and career growth.<sup>12</sup> In this sense, positive cognitive evaluation triggered by challenge stressors will activate individuals' positive affective experience. On the contrary, hindrance stressors are detrimental to job performance goals and career growth and are thus perceived by individuals as unfavourable work events.<sup>12</sup> Therefore, negative cognitive evaluation triggered by hindrance stressors will activate individuals' affective experience. As such, we propose the following:

**Hypothesis 1a:** Challenge stressors are positively related to positive affective experience.

**Hypothesis 1b:** Hindrance stressors are positively related to negative affective experience.

Base on AET, positive or negative emotional reactions caused by work events will further affect the attitude and behavior of individuals in work.<sup>32,33</sup> Abusive supervision is a negative leadership behavior that abuses and humiliates subordinates and supervisors should avoid it. According to the principle of the AET that affection is consistent with

behavioral valence,<sup>30</sup> the positive affective experienced at work can help supervisors reduce their abusive supervision. Specifically, on the one hand, positive affection guide supervisors to evaluate and construct the surrounding work environment and subordinates in a positive way, and to incorporate these positive evaluations into behavioral decisions. Positive evaluations and cognition of subordinates will reduce supervisors' negative behaviors, such as abuse and humiliation. On the other hand, Fredrickson (2001) holds that positive affection as a positive psychological resource can expand and supplement the psychological resources for individual self-regulation.<sup>35</sup> When individuals are experiencing positive affection, they have abundant psychological resources to regulate and control the display of negative behaviors. Therefore, the positive psychological resources gained by positive affective experience at work will reduce the display of supervisors' abusive supervision. In contrast, the negative affection experienced at work can induce supervisors to display more abusive supervision. Specifically, negative affection guide supervisors to evaluate and construct the surrounding work environment and subordinates in a negative way, and to incorporate these negative evaluations into behavioural decisions. Negative evaluations and cognition of subordinates will increase supervisors' negative behaviors, such as abuse and humiliation. On the other hand, negative affection, unlike positive affection, require the consumption of limited psychological resources such as time, energy, and attention for self-regulation.<sup>29</sup> While the depletion of psychological resources will lower individuals' ability to regulate and control their negative behaviors,<sup>40</sup> thereby increasing the likelihood of abusive supervision.

**Hypothesis 2a:** Positive affective experience is negatively related to abusive supervision.

**Hypothesis 2b:** Negative affective experience is positively related to abusive supervision.

In accordance with the logic that work events will first elicit individual's affective reaction and further lead to individual's behavior of AET, challenge-hindrance stressors may have different effects on abusive supervision through different mediating mechanisms of affective experience. Specifically, as positive affective work events, challenge stressors induce the positive affective experience of the supervisor that guides the supervisor to proactively treat subordinates and control negative behaviors, thereby reducing abusive supervision. In contrast, hindrance stressors, as negative affective work events, trigger the negative affective experience of supervisors. The



negative affective experience at work, on one hand, pushes supervisors to cognize and evaluate their subordinates negatively. On the other hand, the negative affective experience at work consumes effective self-regulation resources of supervisors and weaken their self-control of negative behaviors, thereby increasing the likelihood of engaging in abusive supervision.

Hypothesis 3a: Challenge stressors have a negative, indirect effect on abusive supervision via positive affective experience.

Hypothesis 3b: Hindrance stressors have a positive, indirect effect on abusive supervision via negative affective experience.

## Moderating Role of Locus of Control

AET states that there is a significant difference in the intensity of affective experience between individuals activated by affective events.<sup>30,32</sup> As the affective activation embodies a process of cognitive evaluation, the locus of control representing the individual's cognitive attribution tendency will play a moderating role between work stressors and affective experience.<sup>37</sup> Specifically, individuals with a high locus of control tend to attribute the development and results of events to internal factors such as their abilities and behaviors and believe that they can control the events.<sup>37,38</sup> They generally have a higher sense of responsibility and adaptability,<sup>41</sup> and are more willing to invest more effort and attention to get better results. Therefore, in the face of affective events with high work demands such as challenge stressors (difficult work, heavy workload, etc.), individuals with a high locus of control tend to believe that they can control and manipulate challenge stressors, and turn the stressors into factors favourable to self-growth, bringing them more positive affection, such as enthusiasm, attention and pride.<sup>42-44</sup> That is, for supervisors with a high locus of control, challenge stressors have a stronger positive effect on positive affection. Conversely, supervisors with a low locus of control tend to take lower confidence in the control and manipulation of challenge stressors, with a much lower possibility of transforming them into self-growth drivers so that they can experience less positive affective experience. In other words, for supervisors with a low locus of control, the positive relationship between challenge stressors and the positive affective experience was weaker. In terms of negative emotional events like hindrance stressors, supervisors with a high locus of control think of hindrance stressors solvable. They can effectively control their detriments despite obstacles

to goal achievement and career development, thus suffering less negative affective experience. That is, for supervisors with a high locus of control, the positive relationship between hindrance stressors and the negative affective experience was weaker. On the contrary, supervisors with a low locus of control believe that hindrance stressors undermine the goal achievement and career development, and are out of their ability to control and cope with, which leads to more negative affective experience. In short, for supervisors with a low locus of control, the positive relationship between hindrance stressors and the negative affective experience was stronger.

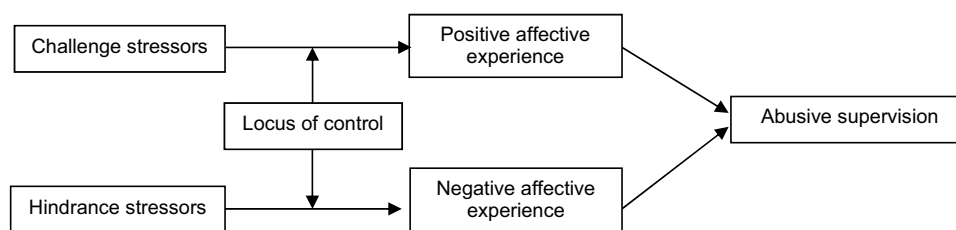
Hypothesis 4a: Locus of control moderates the relationship between challenge stressors and positive affective experience such that the relationship is stronger for supervisors with a high locus of control than for those with a low locus of control.

Hypothesis 4b: Locus of control moderates the relationship between hindrance stressors and negative affective experience such that the relationship is weaker for supervisors with a high locus of control than for those with a low locus of control.

Based on the hypotheses of the mediation mechanism and moderation mechanism, we proposed a first-stage moderated-mediation hypothesis, namely that locus of control positively moderate the indirect effect of challenge stressors on abusive supervision via positive affective experience. Specifically, supervisors with a high locus of control have a stronger indirect effect of challenge stressors on abusive supervision via positive affective experience. In comparison, those with a low locus of control have a weaker indirect effect of challenge stressors on abusive supervision via positive affective experience. Additionally, it is assumed that locus of control negatively moderates the indirect effect of hindrance stressors on abusive supervision via negative affective experience. Specifically, supervisors with a high locus of control have a weaker indirect effect of hindrance stressors on abusive supervision via negative affective experience. In comparison, those with a low locus of control have a stronger indirect effect of hindrance stressors on abusive supervision via negative affective experience.

H5a: The indirect effect of challenge stressors on abusive supervision via positive affective experience will be stronger when supervisors with a high locus of control rather than low locus of control.

H5b: The indirect effect of hindrance stressors on abusive supervision via negative affective experience will



**Figure 1** The Theoretical Model.

be weaker when supervisors with a high locus of control rather than low locus of control.

In conclusion, the theoretical model of this study is shown in [Figure 1](#).

## Materials and Methods

### Sample

To obtain multi-regional and multi-industry survey data, 12 enterprises, which distributed in many provinces and industries in China were selected to collecting data. Among them, three enterprises were manufacturing industry, four enterprises were IT industry, three enterprises were service industry, one enterprise was banking, and the other one was the real estate industry. In this survey, respondents were departmental supervisors and their subordinates from the above 12 enterprises that were one-to-one matched (by coding) for data collection. To reduce common method bias (CMB), we conducted a two-wave survey with the gap of four weeks according to Dawson, O'Brien, and Beehr (2016),<sup>45</sup> and collected dyads data from the supervisor and subordinate. The questionnaires were delivered with the help of staffs in the human resources department of each enterprise.

The supervisors were asked to fulfil two surveys (at T1 and T2, respectively) and his or her direct subordinate was asked to fulfil a survey (at T2). At Time1, the supervisors were asked to report their challenge stressors, hindrance stressors, and level of locus of control. At Time2 (four weeks after T1), the supervisors were asked to report their states of emotions and the subordinates were asked to report their perception of abusive supervision from their direct supervisor. In total, 350 supervisor questionnaires were distributed with 322 returned, and 276 valid surveys at T1. At T2, we distributed 276 questionnaires those who replied effectively at T1 and their direct subordinates and got 241 supervisor questionnaires and 236 subordinate questionnaires. Among them, 213 supervisor questionnaires and 203 subordinate questionnaires were valid surveys at T2. Finally, there were 203 valid matching samples.

Among the 203 supervisor samples, males accounted for 53.69% and females for 43.31%; their average age was 34.84; in terms of educational background, supervisors with a junior college diploma and below accounted for 6.90%, bachelors for 77.34%, and masters and above for 15.76%. Of the 203 subordinate questionnaires, males accounted for 43.35% and females for 56.65%; their average age was 29.70; in terms of educational background, subordinates with junior college diploma accounted for 38.42%, bachelors for 60.59%, and masters and above accounted for 0.99%. Moreover, the average subordinate's tenure with his direct supervisor was 2.21 years. [Table 1](#) presents the demographic characteristics of the supervisor and subordinate samples in more detail.

### Procedure

This study was conducted between June 2019 and September 2019. First, we stated the purpose of the questionnaire and assured the participants that the survey would be conducted confidentially and anonymously. Second, supervisors were asked to fulfil survey one, which includes challenge stressors, hindrance stressors, and level of locus of control. After four weeks, the supervisors were asked to fulfil survey two, which include supervisors' states of emotions and demographic characteristics, such as gender, age, education. Meanwhile, the subordinates were asked to report their perception of abusive supervision from their direct supervisor, and their demographic characteristics, such as gender, age, education, tenure with his direct supervisor. At the end, participants were compensated for completing the survey, and the written informed consent was inferred through the completion of the survey.

### Measures

The measures used were identical to which have been widely used in previous studies and were translated into

**Table 1** Sample Characteristics

Criterion	Characteristics	Supervisor Sample			Subordinate Sample		
		Frequency	Percent	Cumulative Percentage	Frequency	Percent	Cumulative Percentage
Gender	Male	109	53.69%	100%	88	43.35%	100%
	Female	94	46.31%	46.31%	115	56.65%	56.65%
Age	M	34.84			29.70		
	SD	6.91			5.84		
Education	Junior college diploma and below	14	6.90%	6.90%	78	38.42%	38.42%
	Bachelors Masters and above	157 32	77.34% 15.76%	84.24% 100%	123 2	60.59% 0.99%	99.01% 100%
Tenure	M	2.21					
	SD	1.44					

**Notes:** N=203. M, mean; SD, standard deviation. Tenure, subordinate's tenure with the supervisor. Tenure was completed only by subordinates (in yearly units).

Chinese using a double-blind back-translation procedure. Most items were rated on a 5-point scale.

### Challenge-Hindrance Stressors (T1)

In order to assess challenge-hindrance stressors, we used the 11-item measure developed by Cavanaugh et al<sup>8</sup> to test challenge stressors (1–6 items,  $\alpha=0.88$ ) and hindrance stressors (7–11 items,  $\alpha=0.90$ ). The statement of Items was the same as Rodell, and Judge (2009).<sup>16</sup> Supervisors reported to what extent they agree with each statement during the past four weeks and rated on a scale ranging from 1 (strongly disagree) to 5 (strongly agree). A sample item for challenge stressors was “The amount of time I spend at work is a lot”, and a sample item for hindrance stressors was “The amount of red tape I need to go through to get my job done is a lot”.

### Locus of Control (T1)

Consist of Judge et al (1998),<sup>42</sup> locus of control was measured with the Internality subscale (8-item) of the IPC Scale (Levenson, 1981).<sup>46</sup> Sample items are “When I get what I want, it's usually because I'm lucky” (reverse scored) and “My life is determined by my actions”. Supervisors reported to what extent they agree with each statement on a scale ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores representing more internal than external locus. Item 3 and 4 were reverse scored. The Cronbach's alpha for this scale was 0.905.

### Positive and Negative Affective Experience (T2)

Watson (1988)'s PANAS scale with two ten-item scales was adopted to measure positive and negative affective experience.<sup>47</sup> The 20 mood adjectives were rated ranging from 1 (very slightly or not at all) to 5 (extremely). In this study, supervisors were asked to report the frequency of their mood during the past four weeks. Sample positive affection adjectives are “interested” “enthusiastic” “inspired”. Sample negative affection adjectives are “upset” “irritable” “hostile”. The Cronbach's alpha was 0.933 for positive affection scale, and 0.903 for negative affection scale.

### Abusive Supervision (T2)

In our study, subordinates rated their direct supervisor on abusive supervision during the past four weeks by using the 5-item short scale ( $\alpha=0.885$ ) of Mitchell and Ambrose (2007).<sup>23</sup> Sample items included “My supervisor ridicules me” and, “My supervisor tells me I'm incompetent” on a 5-point scale, from 1 (never) to 5 (very often).

Finally, as the results from prior studies suggest that supervisors' gender (0=female, 1=male), age, and education (0=college degree or below, 1=university degree, 2=master's degree or above), as well as subordinates' gender, age, education and their tenure with the supervisor, are related to abusive supervision.<sup>48,49</sup> We control these variables.

### Data Analysis

All the data were analyzed with SPSS 26.0 and Lisrel 8.7. The conducted confirmatory factor analyses were used to

examine the validity of key variables. The descriptive statistics showed the participants' statistical characteristics. The hierarchical regression analysis and the bootstrap methods (PROCESS)<sup>50</sup> was also used to examine the mediating and moderating hypotheses.

## Results

### Measurement Model

Before hypothesis testing, we first conducted confirmatory factor analyses (CFA) to examine the validity of six key variables. As shown in Table 2, the proposed six-factor model (ie, challenge stressors, hindrance stressors, positive affective experience, negative affective experience, locus of control, and abusive supervision) revealed an acceptable fit (Model 1): ( $\chi^2/df=1.16$ , IFI=0.97, CFI=0.97, RMSEA=0.029) and fit better than alternative models (eg Models 2 to 10). The test showed that the discriminant validity of our focal variables was significant. Moreover, we examined the Average Variance Extracted (AVE) and Composite Reliability (CR) of each variable: challenge stressors (AVE=0.55, CR=0.88), hindrance stressors (AVE=0.64, CR=0.90), positive affective experience (AVE=0.59, CR=0.93), negative affective experience (AVE=0.49, CR=0.91), locus of control (AVE=0.55, CR=0.91) and abusive supervision (AVE=0.61, CR=0.89). The AVE of variables except negative affect is bigger than 0.5, and the CR of all variables are over 0.8. Fornell and Larcker (1981) suggested that a construct have an adequate

convergent validity if its AVE less than 0.5, but CR higher than 0.6.<sup>51</sup> Therefore, it can be inferred that the constructs in this study all have good convergent validity. Additionally, the square root of the AVE of each variable is bigger than the pairwise correlation coefficient between the variable and other variables, which indicates that the scale used in this paper has sound discriminative validity.

### Correlations and Descriptive Statistics

Table 3 presents the descriptive statistics and correlations among the study variables. The results indicated that challenge stressors ( $r=0.28$ ,  $p<0.01$ ) are positively correlated with positive affective experience and hindrance stressors ( $r=0.43$ ,  $p<0.01$ ) are positively correlated with negative affective experience. The results also indicated that positive affective experience is negatively correlated with abusive supervision ( $r=-0.35$ ,  $p<0.01$ ), while the negative affective experience is positively correlated with abusive supervision ( $r=0.32$ ,  $p<0.01$ ).

### Hypothesis Testing

We conducted a hierarchical regression analysis to test hypotheses 1–4 (including a and b), control variables were entered before other variables. The mediating effect (hypothesis 3a,3b), moderating effect (hypothesis 4a,4b) and bootstrap methods further tested the moderating mediating effect (hypothesis 5a,5b).

**Table 2** Comparison of Measurement Models

Models	Descriptions	$\chi^2$	df	$\chi^2/df$	$\Delta\chi^2$	RMSEA	IFI	CFI
Model 1	Six factors: CS,HS,PA,NA,LOC,AS	1032.85	887	1.16		0.029	0.97	0.97
Model 2	Five factors: CS,HS,PA,NA,LOC+AS	1823.71	892	2.04	790.86**	0.072	0.94	0.94
Model 3	Five factors: CS+HS,PA,NA,LOC,AS	1975.66	892	2.21	942.81**	0.078	0.93	0.93
Model 4	Four factors: CS+HS,PA,NA,LOC+AS	2838.29	896	3.17	1805.44**	0.104	0.89	0.89
Model 5	Four factors: CS+HS,PA+NA,LOC,AS	4586.44	896	5.12	3553.59**	0.142	0.86	0.86
Model 6	Three factors:CS+HS+PA,NA,LOC+AS	3662.97	899	4.07	2630.12**	0.122	0.85	0.85
Model 7	Three factors:CS+HS,PA+NA,LOC+AS	5431.76	899	6.04	4398.91**	0.158	0.83	0.83
Model 8	Two factors: CS+HS+PA,NA+LOC+AS	5347.60	901	5.94	4314.75**	0.156	0.8	0.8
Model 9	Two factors: CS+HS+PA+NA,LOC+AS	6243.63	901	6.93	5210.78**	0.171	0.79	0.79
Model 10	One factor: CS+HS+PA+NA+LOC+AS	8163.25	902	9.05	7130.40**	0.2	0.74	0.73

**Notes:** N=203. \*\* $p<0.01$ .

**Abbreviations:** CS, challenge stressors; HS, hindrance stressors; PA, positive affective experience; NA, negative affective experience; LOC, locus of control; AS, abusive supervision; RMSEA, root-mean-square error of approximation; CFI, comparative fit index; IFI, incremental fit index.



**Table 3** Descriptive Statistics and Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Gender <sub>sp</sub> <sup>a</sup>													
2. Age <sub>sp</sub>	-0.04												
3. EDU <sub>sp</sub> <sup>b</sup>	0.13	-0.50**											
4. Gender <sub>sb</sub> <sup>a</sup>	0.10	-0.06	-0.12										
5. Age <sub>sb</sub>	0.08	0.05	0.01	0.06									
6. EDU <sub>sb</sub> <sup>b</sup>	0.11	-0.02	0.16*	0.02	-0.11								
7. Tenure <sup>c</sup>	-0.04	0.15*	0.03	-0.07	0.24**	-0.08							
8. CS	-0.07	-0.04	-0.08	0.06	0.01	0.05	-0.01						
9. HS	0.01	0.01	-0.02	-0.04	0.05	-0.17*	-0.03	0.03					
10. PA	-0.06	0.01	-0.09	0.16*	0.12	0.07	0.02	0.28**	-0.02				
11. NA	-0.04	-0.08	0.05	-0.06	-0.04	-0.04	-0.05	0.03	0.43**	-0.22**			
12. LOC	0.00	-0.02	-0.03	0.02	-0.08	-0.05	-0.04	0.14*	-0.08	0.24**	-0.26**		
13. AS	-0.03	0.04	-0.05	0.01	-0.03	-0.21**	-0.07	0.01	0.26**	-0.35**	0.32**	-0.30**	
M	0.54	34.84	2.09	0.43	29.70	1.63	2.21	3.81	2.90	3.16	2.86	3.62	2.47
SD	0.50	6.91	0.47	0.50	5.48	0.51	1.44	0.52	0.77	0.79	0.72	0.47	0.73

**Notes:** N=203. <sup>a</sup>0, female; 1, male. <sup>b</sup>0, College degree or below; 1, university degree; 2, master's degree or above. <sup>c</sup>This was completed only by subordinates (in yearly units). \*p<0.05, \*\*p<0.01.

**Abbreviations:** CS, challenge stressors; HS, hindrance stressors; Tenure, subordinate's tenure with the supervisor; PA, positive affective experience; NA, negative affective experience; LOC, locus of control; AS, abusive supervision; Gender<sub>sp</sub>, supervisor's gender; Age<sub>sp</sub>, supervisor's age; EDU<sub>sp</sub>, supervisor's education; Gender<sub>sb</sub>, subordinate's gender; Age<sub>sb</sub>, subordinate's age; EDU<sub>sb</sub>, subordinate's education.

**Table 4** Results of Hierarchical Regression Analysis for Mediating Effects

Variables	PA		NA		AS			
	M1	M2	M3	M4	M5	M6	M7	M8
	B	B	B	B	B	B	B	B
Constant	3.39***	1.75*	3.44***	2.25***	2.92***	2.15**	2.79	2.14**
Gender <sub>sp</sub> <sup>a</sup>	-0.16	-0.13	-0.07	-0.08	-0.01	-0.02	-0.03	-0.04
Age <sub>sp</sub>	-0.01	0.00	-0.01	-0.01	0.01	0.01	0.01	0.01
EDU <sub>sp</sub> <sup>b</sup>	-0.15	-0.09	0.02	0.01	0.05	0.05	0.00	0.01
Gender <sub>sb</sub> <sup>a</sup>	0.21	0.20	-0.04	-0.01	0.02	0.04	0.11	0.11
Age <sub>sb</sub>	0.02	0.02	0.00	0.00	-0.01	-0.01	0.00	0.00
EDU <sub>sb</sub> <sup>b</sup>	0.17	0.13	-0.05	0.06	-0.33**	-0.27**	-0.26**	-0.24*
Tenure <sup>c</sup>	0.00	0.00	-0.02	-0.01	-0.04	-0.04	-0.04	-0.03
CS		0.40***	0.13	0.10		0.02		0.14
HS	0.11	0.10		0.41***		0.22**		0.13 <sup>+</sup>
PA			-0.22**	-0.21***			-0.27***	-0.30***
NA	-0.28**	-0.28**					0.26***	0.19*
F	2.58**	4.04***	1.57	6.35***	1.64	2.53**	6.40***	5.89***
R <sup>2</sup>	0.11	0.17	0.07	0.25	0.06	0.11	0.23	0.25

**Notes:** N=203. <sup>a</sup>0, female; 1, male. <sup>b</sup>0, college degree or below; 1, university degree; 2, master's degree or above. <sup>c</sup>This was completed only by subordinates (in yearly units). \*p<0.05, \*\*p<0.01, \*\*\*p<0.001.

**Abbreviations:** CS, challenge stressors; HS, hindrance stressors; Tenure, subordinate's tenure with the supervisor; Gender<sub>sp</sub>, supervisor's gender; Age<sub>sp</sub>, supervisor's age; EDU<sub>sp</sub>, supervisor's education; Gender<sub>sb</sub>, subordinate's gender; Age<sub>sb</sub>, subordinate's age; EDU<sub>sb</sub>, subordinate's education; PA, positive affective experience; NA, negative affective experience; LOC, locus of control; AS, abusive supervision.

Mediating effects testing. First, as presented in Table 4, Hypothesis 1a, which predicates a positive relationship between challenge stressors and positive affective experience is supported ( $\beta=0.40$ ,  $p<0.001$ , M2), and Hypothesis 1b, which predicates a positive relationship between hindrance stressors and negative affective experience are also supported ( $\beta=0.41$ ,  $p<0.001$ , M4). Second, Hypothesis 2a, which predicates a negative relationship between positive affective experience and abusive supervision is supported ( $\beta=-0.27$ ,  $p<0.001$ , M7), and Hypothesis 2b, which predicates a positive relationship between negative affective experience and abusive supervision is also supported ( $\beta=0.26$ ,  $p<0.001$ , M7). Third, when positive affective experience as the mediator variable is added into the model, the positive affective experience is significantly and negatively correlated with abusive supervision ( $\beta=-0.30$ ,  $p<0.001$ , M8), and when negative affective experience as the mediator variable is added into the model, the negative affective experience is significantly and positively correlated with abusive supervision ( $\beta=0.19$ ,  $p<0.05$ , M8). But the effects of challenge stressors on abusive supervision behavior are insignificant ( $\beta=0.14$ , n.s., M8), and the effects of hindrance stressors on abusive supervision behavior are weakened ( $\beta=0.13$ ,  $p<0.1$ , M8). Therefore, hypotheses 3a and 3b are supported.

To further verify these two mediating effects, we used Model 4 of the PROCESS macro with 5000 resamples to test the indirect effect of challenge stressors on abusive supervision via positive affective experience, and the indirect effects of hindrance stressors on abusive supervision via negative affective experience. Results suggested that the indirect effect of challenge stressors on abusive supervision through positive affective experience is significant ( $b=-0.12$ , boot SE=0.05, 95% CI=[-0.24, -0.04], excludes zero), and the indirect effect of hindrance stressors on abusive supervision through negative affective experience is also significant ( $b=0.08$ , boot SE=0.03, 95% CI=[0.02, 0.15], excludes zero). These findings together provided statistical evidence for two parallel mediating effects. Overall, Hypotheses 3a and 3b are supported.

Moderating effects testing. Hypotheses 4a posited that locus of control would moderate the relationship between challenge stressors and positive affective experience such that the connection would be more reliable (weaker) for supervisors high (low) in the locus of control. In contrast, Hypotheses 4b posited

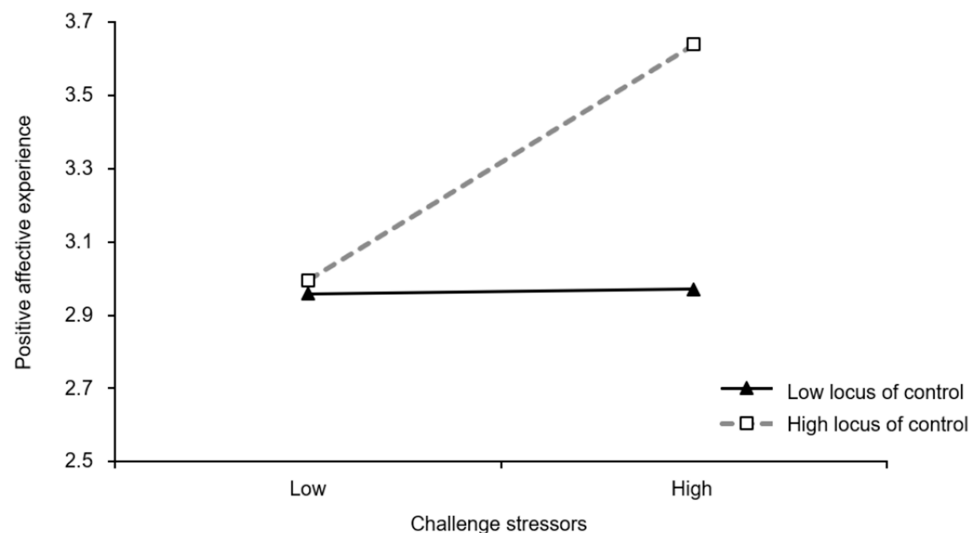
**Table 5** Results of Hierarchical Regression Analysis for Moderating Effects

Variables	PA		NA	
	M1	M2	M3	M4
	B	B	B	B
Constant	3.39***	0.27	3.44***	3.57***
Gender <sub>sp</sub> <sup>a</sup>	-0.16	-0.12	-0.07	-0.06
Age <sub>sp</sub>	-0.01	0.00	-0.01	-0.01
EDU <sub>sp</sub> <sup>b</sup>	-0.15	-0.10	0.02	0.01
Gender <sub>sb</sub> <sup>a</sup>	0.21	0.14	-0.04	-0.04
Age <sub>sb</sub>	0.02	0.02	0.00	-0.01
EDU <sub>sb</sub> <sup>b</sup>	0.17	0.17	-0.05	0.05
Tenure <sup>c</sup>	0.00	-0.02	-0.02	0.00
CS		0.32**	0.13	0.07
HS	0.11	0.11		0.36***
PA			-0.22**	-0.11 <sup>+</sup>
NA	-0.28**	-0.20*		
LOC		0.38**		-0.32***
CS*LOC		0.65***		
HS*LOC				-0.43***
F	2.58**	5.16***	1.57	7.88***
R <sup>2</sup>	0.11	0.25	0.07	0.33

**Notes:** N=203. <sup>a</sup> 0, female; 1, male. <sup>b</sup> 0, college degree or below; 1, university degree; 2, master's degree or above. <sup>c</sup> This was completed only by subordinates (in yearly units). <sup>+</sup>  $p<0.1$ , \* $p<0.05$ , \*\* $p<0.01$ , \*\*\* $p<0.001$ .

**Abbreviations:** CS, challenge stressors; HS, hindrance stressors; Tenure, subordinate's tenure with the supervisor; Gender<sub>sp</sub>, supervisor's gender; Age<sub>sp</sub>, supervisor's age; EDU<sub>sp</sub>, supervisor's education; Gender<sub>sb</sub>, subordinate's gender; Age<sub>sb</sub>, subordinate's age; EDU<sub>sb</sub>, subordinate's education; PA, positive affective experience; NA, negative affective experience; LOC, locus of control; AS, abusive supervision.

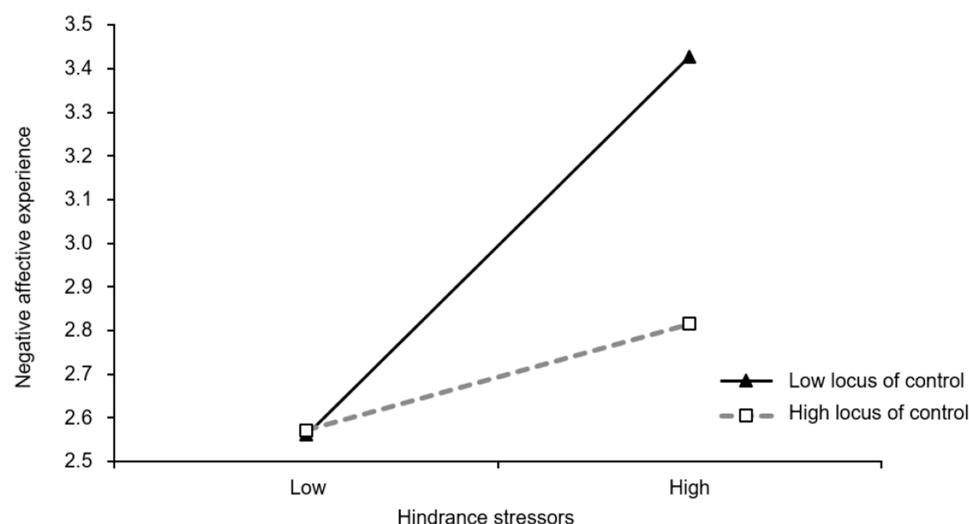
that locus of control would moderate the relationship between hindrance stressors and negative affective experience such that the relationship would be weaker (stronger) for supervisors high (low) in the locus of control. Table 5 shows the results of hierarchical regression analyses for moderating effects (the variables were mean centred before analysis). As shown in M2, the interaction of challenge stressors and locus of control is positively and significantly related to positive affective experience ( $\beta=0.65$ ,  $p<0.001$ , M2). To interpret these moderating effects, interaction effects are plotted.



**Figure 2** Interactive effect of challenge stressors and locus of control on positive affective experience.

As shown in Figure 2, the positive relationship between challenge stressors and locus of control is much more distinct in the high locus of control rather than in low locus of control. Besides, the result of bootstrap through PROCESS macro indicates that when supervisors' locus of control is high, challenge stressors have a stronger and positive effect on positive affective experience ( $\beta=0.56$ , boot SE=0.12, 95% CI= [0.333, 0.792], excludes zero). However, it turned into insignificant ( $\beta=0.05$ , boot SE=0.14, 95% CI= [-0.219, 0.315], includes zero) while supervisors' locus of control is low. Thus, Hypothesis 4a is supported.

And results also suggest that the interaction of hindrance stressors and locus of control is negatively and significantly related to negative affective experience ( $\beta=-0.43$ ,  $p<0.001$ , M4). The interaction effects are plotted to interpret these moderating effects. As shown in Figure 3, the positive relationship between hindrance stressors and negative affective experience is much more distinct in the low locus of control rather than in high locus of control. Besides, the result of bootstrap through PROCESS macro indicates that when supervisors' locus of control is low, hindrance stressors have a stronger and positive effect on negative affective experience ( $\beta=0.54$ , boot SE=0.07, 95%



**Figure 3** Interactive effect of hindrance stressors and locus of control on negative affective experience.

**Table 6** Indirect Effect Estimates with 95% Confidence Intervals

Predictor variable		Estimate	Boot SE	LLCI	ULCI
CS→PA→AS	Low LOC (Effect1)	-0.004	0.06	-0.17	0.08
	High LOC (Effect2)	-0.190	0.06	-0.30	-0.09
	Pairwise contrasts (Effect1 - Effect2)	-0.186	0.07	-0.30	-0.01
HS→NA→AS	Low LOC (Effect1)	0.106	0.04	0.02	0.20
	High LOC (Effect2)	0.030	0.02	-0.01	0.08
	Pairwise contrasts (Effect1 - Effect2)	-0.077	0.04	-0.16	-0.01

Note: N=203.

**Abbreviations:** CS, challenge stressors; HS, hindrance stressors; PA, positive affective experience; NA, negative affective experience; LOC, locus of control; AS, abusive supervision; LLCI, lower limit of confidence interval; ULCL, upper limit of confidence interval.

CI= [0.403, 0.681], excludes zero). However, it turned into weaker ( $\beta=0.20$ , boot SE=0.08, 95% CI= [0.045, 0.351], excludes zero) while supervisors' locus of control was high. Thus, Hypothesis 4b is supported.

Finally, we used Model 7 of the PROCESS macro with 5000 resamples to generate bootstrap confidence intervals for the conditional indirect effect of the challenge stressors on abusive supervision via positive affective experience at different levels of supervisors' locus of control, and the conditional indirect effect of the hindrance stressors on abusive supervision via negative affective experience at different levels of supervisors' locus of control (see Table 6). When supervisors with a high level of locus of control (+1SD), challenge stressors have a significant indirect effect on abusive supervision behavior through positive affective experience ( $b=-0.190$ , boot SE=0.06, 95% CI= [-0.30, -0.09], excludes zero), however, it turned into insignificant ( $b=-0.004$ , boot SE=0.06, 95% CI= [-0.17, 0.08], contains zero) while supervisors' locus of control was low (-1SD). And the pairwise contrasts between these conditional indirect effects was significant ( $b=-0.186$ , boot SE=0.07, 95% CI= [-0.30, -0.01], excludes zero). Consequently, Hypothesis 5a is supported. Similarly,

when supervisors with a low level of locus of control (-1SD), hindrance stressors have a significant indirect effect on abusive supervision through negative affective experience ( $b=0.106$ , boot SE=0.04, 95% CI= [0.02, 0.20], excludes zero), however, it turned into insignificant ( $b=0.030$ , boot SE=0.02, 95% CI= [-0.01, 0.08], contains zero) while supervisors' locus of control was high (+1SD). And the pairwise contrasts between these conditional indirect effects was significant ( $b=-0.077$ , boot SE=0.04, 95% CI= [-0.16, -0.01], excludes zero). Consequently, Hypothesis 5b is also supported.

## Discussion

In our study, we develop and test a parallel model based on AET that attempt to probe why and when challenge and hindrance stressors have different effects (hindrance or promotion) on abusive supervision. As predicted, our findings first suggest that different categories of stressors induce different affective experiences, and different affective experiences have different effects on abusive supervision. More specifically, challenge stressors, as a kind of positive and uplifting work events, will activate supervisors' positive affective experiences such as attentiveness, and positive affective experiences will decrease abusive supervision because they provide the supervisors with positive psychological resources to control their negative behaviors. On the contrary, as a kind of negative and hassling work events, hindrance stressors will activate supervisors' negative affective experiences such as anxiety and dissatisfaction, and the negative affective experiences will induce more abusive supervision because they consume psychological resources of supervisors. Second, positive affective experience plays a mediating role between challenge stressors and abusive supervision, and negative affective experience plays a mediating role between hindrance stressors and abusive supervision. These findings reveal that challenge stressors hinder the display of abusive supervision through positive affective experience, while hindrance stressors promote the display of abusive supervision through negative affective experience. Third, the present study also examines supervisors' locus of control moderated the relationship between work stressors and affective experience. Specifically, we find that the effect of challenge stressors on positive affective experience is strengthened when supervisors have a high level of locus of control, while the effect of hindrance stressors on negative affective experience is weakened when supervisors have a high level of locus of control. These results may be due to they tend to attribute the development and results of events to internal factors such as their

abilities and behaviors, and believe that they can control the events. Finally, supervisors' locus of control plays a first-stage moderated-mediation role in the indirect effect of challenge stressors on abusive supervision and hindrance stressors on abusive supervision. Specifically, at a high level of locus of control, the indirect effect of challenge stressors on abusive supervision through positive affective experience is stronger, but that of hindrance stressors on abusive supervision through negative affective experience is weaker; at a low level of locus of control, challenge stressors impose weaker indirect effect on abusive supervision through positive affective experience, while hindrance stressors impose stronger indirect effect on abusive supervision through negative affective experience. These findings provide a new insight for understanding two underlying mechanism and boundary conditions of two distinct categories stressors on abusive supervision. We discuss the implications of these findings, as well as the limitations and future research directions of the current study, below.

## Conclusion

Drawing on AET theory and the challenge-hindrance stressors framework, the current study developed and tested a parallel model to probe the complicated relationship between two distinct categories stressors and abusive supervision with mediating role of affective experience and the moderating role of locus of control. Results reveal that challenge stressors induce positive affective experience, while hindrance stressors cause negative affective experience. Further, challenge stressors reduce abusive supervision through positive affective experience, while hindrance stressors increase abusive supervision through negative affective experience. Besides, when the level of locus of control is high, the indirect effect of challenge stressors on abusive supervision through positive affective experience is stronger. In comparison, the indirect effect of hindrance stressors on abusive supervision through negative affective experience is weaker. When the level of locus of control is low, the indirect effect of challenge stressors on abusive supervision through positive affective experience is weaker. In comparison, the indirect effect of hindrance stressors on abusive supervision through negative affective experience is stronger.

## Theoretical Implications

The current study makes several contributions. First, this study contributes to the enrichment on the relationship research about challenge-hindrance stressors and abusive supervision by differentiating the different effects of different categories of stressors on abusive supervision. This study

expands the research on the outcomes of challenge-hindrance stressors by paying more attention to supervisors' negative behavior, such as abusive supervision. Although supervisors are also members of the employees, they may deal with more challenge-hindrance stressors for their complexity requirement in supervisory roles. Therefore, it is necessary to explore the outcomes (ie, psychology or behavior) of these two distinct categories stressors from the perspective of supervisors. This study also contributes the enrichment on the antecedents of abusive supervision by focusing on whether these two categories have different effects on such behavior. Our findings can offer useful insights to understand the complicated relationship between challenge-hindrance stressors and abusive supervision.

Second, we contribute to the research by revealing two different mechanisms of challenge-hindrance stressors on abusive supervision from the perspective of AET. Our findings verify that the difference of resource acquisition and resource depletion mechanism is responsible for the differentiated effect of challenge and hindrance stressors on abusive supervision, providing an insightful understanding of the different mechanisms of different categories of stressors on abusive supervision.

Finally, we enrich the existing research by considering variables that reflect individual differences in cognitive attribution tendency as the boundary conditions of the indirect relationship between work stressors and abusive supervision. Previous studies have mainly focused on the role of individual variables such as Big Five Personality and emotional intelligence in moderating stressors and state of affective experience.<sup>27,36</sup> In contrast, few expounded how cognitive attribution tendencies as an individual trait affects the impact of stressors on the state of affective experience. Our results shed light on how an individual's cognitive attribution tendency moderates two resource mechanism of stressors affecting abusive supervision, deepening the boundary role of an individual's cognitive attribution tendency. Furthermore, our findings can well answer the question of "when do two distinct categories stressors hinder/promote abusive supervision?".

## Practical Implications

Our research also provides some guidance for managerial practice. First, as a negative leadership behavior destructive to both organizations and subordinates, abusive supervision is being reduced by organizations and supervisors. This study validates that challenge stressors reduce abusive supervision through positive affective experiences, and hindrance stressors



promote abusive supervision through negative affective experiences. Therefore, it is essential to distinguish between stressors in the organization and avoid different confusing categories of stressors (challenge-hindrance stressors).

Second, this paper has found the two resources mechanism of challenge-hindrance stressors on abusive supervision. In view of the resources gain role of positive affection, organizational decision-makers need to pay attention to what measures can help supervisors to stimulate more positive affection. For instance, they can render timely recognition, affirmation, praise or reward for supervisors who actively and diligently complete various challenging tasks, which can inspire supervisors' positive emotions, such as enthusiasm, pride, etc.

## Limitations and Future Directions

Our study also has a few limitations that provide directions for future research. In this study, 203 paired data of supervisor-subordinate were collected by convenient samples instead of random samples, which may cause errors in the research results. In this respect, future research can further expand the sample size and adopt random samples. Secondly, this paper explored how different categories of stressors have positive and negative effects on abusive supervision through affective experience merely based on the logic of the affective events theory. This research was conducted from only one perspective and ignored the potential roles of other theories. Future research can explore that under which conditions and when challenge stressors and hindrance stressors will affect abusive supervision in the same way based on the COR theory. Multi-theoretical and multi-path discussions are beneficiary to a thorough understanding of the impact of the two distinct categories stressors on abusive supervision. Lastly, this study measured the affective state of supervisors only once time, which ignores the dynamic variability of emotions. Future research can include experimental methods to explore the relationship among various variables further.

## Data Sharing Statement

The datasets generated for this study are available on request to the corresponding author.

## Ethics Statement

All study procedures were approved by the Internal Review Board of School of Management, Guangdong

University of Technology, and informed consent of the participation was implied through survey completion.

## Acknowledgments

This study was supported by the Philosophy and Social Science Foundation of Guangdong Province supported by Guangdong Social Science Planning office [GD15CGL03, GD15XGL37], Guangdong Natural Science Foundation [2017A030310059], Humanities and Social Science Foundation of Ministry of Education of China [Grant No.16YJAZH014, 16YJC190018], and partly supported by Grant No.2013S03, Grant No.2014KQNCX192 and No.2014KQNCX195.

## Author Contributions

All authors contributed to data analysis, drafting or revising the article, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

## Disclosure

The authors report no conflicts of interest in this work.

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