

# Well-being in highly sensitive populations under negative life events: a regulatory analysis of cognitive coping

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**Abstract:** Sensory processing sensitivity is closely related to well-being, and negative life events have a greater indirect impact on it. However, most studies have failed to determine the moderating effect of cognitive coping. This study aims to explore the regulatory effects of cognitive coping on sensory processing-sensitive individuals' well-being under negative life events, and the combination of individual life satisfaction and positive and negative emotions represents an indicator of well-being. 394 college students aged 18-22 participated in the self-reported study (54.57% male and 45.43% female). The results showed that under the influence of negative life events, cognitive coping could regulate the level of individual sensory processing sensitivity, but the cognitive coping had no obvious effect on the adjustment of well-being of individuals with sensory processing sensitivity. This study suggests that negative life events have a strong impact on sensitivity in college students and that cognitive coping can be used to modulate sensitivity levels in future interventions.

**Keywords:** Sensory processing sensitivity, Negative life events, Well-being, Cognitive coping

## 1. Introduction

In psychology, the degree of individual "sensitivity" can be measured, such as sensory processing sensitivity, external stimulus sensitivity, rejection sensitivity, interpersonal sensitivity and so on. Sensory-processing sensory (SPS) was first proposed by Aron in 1997<sup>[1]</sup>. It belongs to personality trait and refers to the Sensitivity difference of Sensory responses to internal and external environmental information based on specific physiological basis<sup>[2]</sup>. Although sensory processing sensitivity is associated with a variety of personality traits, such as neuroticism and extraversion, it is found through analysis that sensory processing sensitivity does not belong to any type of personality trait, but is composed of specific aspects of different personality domains, reflecting the uniqueness of sensory processing sensitivity<sup>[3]</sup>. People with high sensitivity are called highly sensitive people, and the characteristics of high sensitivity are as follows: deep processing of information, stronger emotional response and empathy, easier to pay attention to changes in the surrounding environment, and easier to receive overstimulation<sup>[4,5]</sup>.

Sensory processing sensitivity is closely related to well-being, and the overall sensitivity of sensory processing will reflect the sensitivity level of an individual, but its sub-dimension will more specifically reflect the sensitivity of different aspects. For example, Sobocko and Zelenski distinguished the relationship between the sub-dimension of sensory processing sensitivity and well-being through experimental research<sup>[6]</sup>. In 1984, Diener put forward the concept of subjective well-being, which comes from individuals' overall judgment and evaluation criteria for quality of life and is also formulated by themselves, that is, well-being represents individual perception, cognition and satisfaction, including the values and subjective evaluation of individual performance<sup>[7]</sup>. After reading a lot of literature, it is found that the relevant studies on sensory processing sensitivity do not directly focus on negative events, but there are studies that indicate that negative events indirectly affect sensory processing sensitivity. For example, Hammen and Constance pointed out that negative events can cause individuals to have psychological problems, such as anxiety, depression and other negative emotional problems<sup>[8]</sup>. Further, individuals will feel a gradual decrease in well-being; Some relevant studies also found that sensory processing sensitivity was significantly correlated with emotional attitude<sup>[5]</sup>. Therefore, it is necessary to understand individual subjective well-being under the influence of negative life events and the fractal dimension of sensory processing sensitivity.

"Coping" is the process of dynamic change in order to achieve a goal, and individuals deal with stressful situations by changing their own cognition and behavior<sup>[9]</sup>. According to relevant studies, Garnefski believes that all coping measures of individuals belong to emotional regulation, that is, coping is a way of emotional regulation<sup>[10]</sup>. In the face of life events, emotional regulation is an important factor in determining individual well-being<sup>[11]</sup>. In 2006, Garnefski and Kraaij studied the relationship between cognitive coping styles and depression in adolescents, adults, the elderly and clinical patients<sup>[12]</sup>. Many studies have shown a stable and significant correlation between subjective well-being and cognitive coping. For example, Li Fenghua et al., by measuring the subjective well-being of college students, found that it is easier for students to effectively solve problems by using positive coping styles, thus improving their well-being<sup>[13]</sup>. Similarly, most studies have failed to determine the regulating effect of cognitive coping on sensory processing sensitivity, including whether the impact of negative events and individual well-being are reduced under the regulation of cognitive coping.

Therefore, Figure 1 of the model is constructed based on the above brief description, and the following objective hypotheses are proposed in this study: (1) Under the influence of negative life events, the sub-dimension of sensory processing sensitivity is correlated to individual subjective well-being to varying degrees; (2) Cognitive coping can regulate the level of sensory processing sensitivity and well-being.

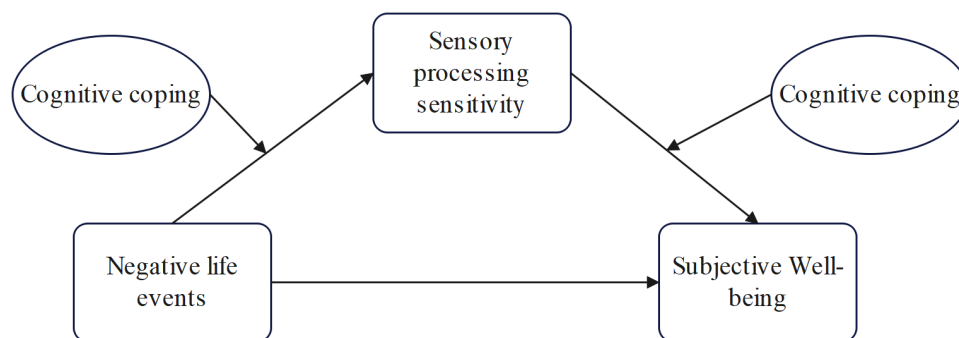


Figure 1: Variable relationship model

## 2. Research Object and Method

### 2.1 Research Object

Using cluster sampling, 425 online questionnaires were distributed to universities in Changchun, Jilin Province, China, and 394 valid questionnaires were obtained, including 215 male students (54.57%) and 179 female students (45.43%). The average age was 20.21 years. The average age was between 18 and 22 years. 98 (24.87 percent) were in the first grade, 95 (24.11 percent) in the second grade, 108 (27.41 percent) in the third grade, and 93 (23.60 percent) in the fourth grade. The researcher is approved by the Academic Ethics Committee of the City University of Macau. The research follows the principle of voluntariness and can be terminated at any time. The whole research process is strictly confidential.

### 2.2 Tools

(1) Chinese version of the highly Sensitive Population Scale: Based on the scale prepared by Smolewska et al. , the revised version of Dai Xin , the Chinese version of the Highly Sensitive Population Scale (C-HSPS), was adopted<sup>[3,14]</sup>. The revision of the scale accords with the Chinese cultural background, and has good reliability and validity for the revision of the items in the original scale in both positive and negative situations. There are 29 items in C-HSPS, with 5 sub-dimensions: irritability, stress susceptibility, positive susceptibility, social avoidance, and stimulation susceptibility. The higher the score, the higher the sensitivity of the individual. In this study, the Cronbach's  $\alpha$  coefficient of this scale was 0.96.

(2) Life satisfaction scale and positive emotion and negative emotion scale: The life satisfaction scale and the positive and negative emotion scale were selected to measure the level of individual well-being. The life satisfaction scale compiled by Diener et al. mainly evaluated the degree of subjective well-being from the cognitive component<sup>[15]</sup>. The scale consisted of 5 items and the higher the score, the more satisfied the individual was with life. On the basis of the scale compiled by Watson et al. , the Positive and Negative Emotion Scale (PANAS) revised by Huang Li et al. was adopted, which required the

adjective frequency of each emotional state to be judged according to the state in recent weeks or months<sup>[16,17]</sup>. In this study, the Cronbach's  $\alpha$  coefficient of this scale was 0.84.

(3) Cognitive Emotion Regulation Scale: Garnefski's Cognitive Emotional Regulation Scale (CERQ) was used to evaluate individuals' emotional coping styles in the face of negative life events, with a total of 36 questions and 9 dimensions: self-blame, ruminative, acceptance, concern planning, positive reappraisal, positive concern, rational analysis, catastrophization and blaming others<sup>[10]</sup>. The Cronbach's  $\alpha$  coefficient of this scale in this study was 0.97.

(4) Adolescent self-rating Life Scale: The revised self-rated Life Scale for adolescents compiled by Xin Xiuhong and Yao Shuqiao was used to measure the negative life events that affect adolescents' psychology and physiology and their degree of influence (within 3 months), including five dimensions: punishment, learning pressure, interpersonal pressure, loss of relatives and property, and adaptability problems<sup>[18]</sup>. In this study, the Cronbach's  $\alpha$  coefficient of this scale was 0.96.

### 2.3 Data analysis

SPSS 25 software was used for data analysis, and Harman single factor method was used to test whether there was a common method bias. Then the correlation analysis of sensory processing sensitivity, well-being, cognitive coping and negative life events was carried out. The significance of interaction effects Int\_1(negative life events  $\times$  cognitive coping) and Int\_2(sensory processing sensitivity  $\times$  cognitive coping) were detected for sensory processing sensitivity, negative life events, and cognitive coping centralized processing. Simple slope analysis was used to further analyze the regulatory effects, and whether the cognitive coping effect of the high or low group was significant.

## 3. Results

### 3.1 Harman Single-Factor Test

The questionnaire data in this study were self-reported, so Harman single factor method was adopted to test whether there was common method bias. The results showed that the explanation rate of variance of the first factor was 26.98%, far below the critical value of 40%, indicating that there was no serious common method bias in this study<sup>[19]</sup>.

### 3.2 Correlation Analysis

As shown in Table 1, gender and grade were significantly correlated with sensory processing sensitivity ( $p < 0.01$ ), and sensory processing sensitivity, irritability, positive susceptibility and stimulus susceptibility were significantly correlated with subjective well-being, cognitive coping and negative life events ( $p < 0.01$ ). Stress susceptibility, social avoidance cognitive coping and negative life events were significantly correlated ( $p < 0.01$ ), stress susceptibility was correlated with subjective well-being ( $p < 0.05$ ), and social avoidance was not correlated with subjective well-being ( $p > 0.05$ ).

Table 1: Correlation Analysis of Sensory Processing Sensitivity and Its Variables

	1	2	3	4	5	6	7	8	9	10	11
1Gender	1										
2Grade	0.078	1									
3SPS	0.15**	0.47**	1								
4 EOE	0.13*	0.41**	0.90**	1							
5 PS	0.07	0.43**	0.91**	0.83**	1						
6 VS	0.16**	0.44**	0.87**	0.67**	0.70**	1					
7 SA	0.06	0.39**	0.82**	0.74**	0.75**	0.61**	1				
8 SS	0.22**	0.34**	0.79**	0.61**	0.58**	0.69**	0.55**	1			
9 NLE	-0.10	0.11*	0.30**	0.30**	0.36**	0.15**	0.26**	0.30**	1		
10 CC	-0.02	0.23**	0.46**	0.40**	0.48**	0.30**	0.43**	0.36**	0.65**	1	
11 SW	0.16**	0.04	0.19**	0.13**	0.12*	0.17**	0.07	0.35**	0.33**	0.39**	1

1.Gender 2.Grade 3.Sensory Processing Sensitivity (SPS) 4.Ease of Excitation (EOE) 5.Pressure Susceptibility (PS) 6.Vigorous Susceptibility (VS) 7.Social Avoidance (SA) 8.Stimulate Susceptibility (SS) 9.Negative Life Events (NLE) 10.Cognitive Coping (CC) 11.Subjective Well-being (SW)

Note: \* $p < 0.05$ , \*\* $p < 0.01$ .

### 3.3 Modulating Effects of Cognitive Coping

For the centralized processing of sensory processing sensitivity, negative life events and cognitive coping, interactive effects Int\_1(negative life events ×cognitive coping) and Int\_2(sensory processing sensitivity × cognitive coping), as shown in the table 2, gender and grade are used as the first level of predictive variables, and negative life events, cognitive coping and subjective well-being are the second level. The third layer is two interaction effects. The results show that the interaction effect Int\_1 is significant, while the interaction effect Int\_2 is not. Simple slope analysis was used to further explain the moderating effect, as shown in the figure 2, grouping cognitive coping with plus or minus one standard deviation, and low grouping cognitive coping had a significant moderating effect between negative life events and sensory processing sensitivity  $B=0.29, t=2.51, p<0.05, 95\%CI [0.06,0.52]$ . High group cognitive coping did not significantly regulate the relationship between negative life events and sensory processing sensitivity  $B=-0.10, t=-1.09, p=0.28, 95\%CI [-0.29, 0.08]$ .

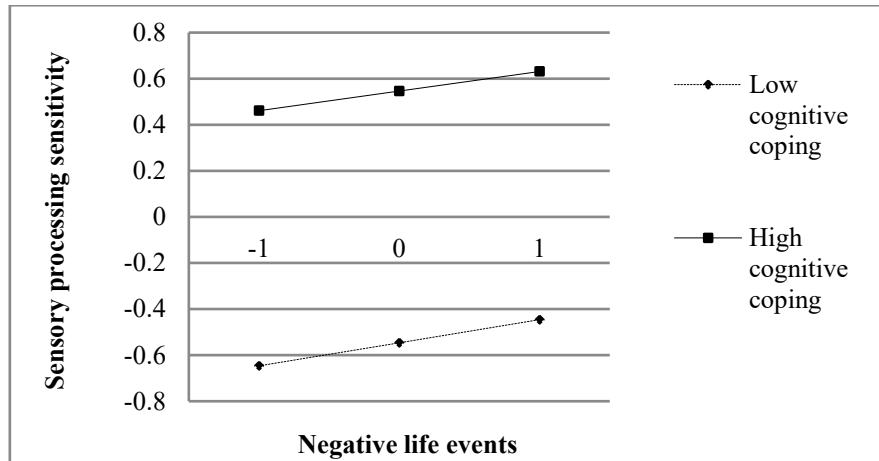


Figure 2: Moderating effects of cognitive coping

Table 2: Regression Analysis of Sensory Processing Sensitivity and Its Variables

	First-level		Second-level		Third-level	
	$\beta$	$t$	$\beta$	$t$	$\beta$	$t$
Gender	0.11	2.55**	0.13	3.18**	0.13	3.04**
Grade	0.46	10.37**	0.37	8.95**	0.36	8.45**
Negative life event			0.16	2.06*	0.18	2.49*
Cognitive coping			0.33	5.95**	0.30	5.14**
Subjective Well-being			0.01	0.20	0.03	0.75
Int 1					-0.11	-2.20*
Int 2					-0.00	-0.06
$R^2$	0.23		0.37		0.38	
$\Delta R^2$	0.22		0.36		0.37	
$F$	59.42**		45.00**		33.50**	

Note:\* $p<0.05$ , \*\* $p<0.01$ .

### 4. Discuss

Through the analysis of the influence of total and sub-dimensions of sensory processing sensitivity on well-being, it is found that total sensory processing sensitivity, irritability, positive susceptibility and stimulation susceptibility are significantly correlated with well-being. Similarly, Sobocko and Zelenski also confirmed the fractal role of sensory processing sensitivity through the dimensional classification proposed by Smolewska, Evans and Rothbart's [6,14,20]. It was found that irritability (EOE), aesthetic sensitivity (AES) and low sensory threshold (LST) were negatively correlated with well-being, while aesthetic sensitivity and orientation sensitivity were less correlated with well-being. In this study, the irritability dimension of highly sensitive people reflects the emotions generated by external negative environmental stimuli, so this dimension is significantly correlated with well-being. Individuals with significant positive susceptibility can easily feel and find positive events around them, and individuals with high stimulus susceptibility can be keenly aware of small stimulus changes in the environment, so

they are significantly correlated with well-being. However, the social avoidance dimension mainly reflects the avoidance of social situations due to physical discomfort and depression, and the stress susceptibility reflects the emotional imbalance caused by excessive stimulus information. These two dimensions may be uncontrollable and unstable, so the relationship with well-being may not be significant. In addition, Toru et al. also took highly sensitive people as research objects and found that the degree of individual sensitivity would affect the level of well-being<sup>[21]</sup>. Thus, the hypothesis of this study has been verified that sensory processing sensitivity affects the subjective well-being of individuals both globally and in sub-dimensions.

This study supports the theory of Biological sensitivity to context Model, which emphasizes individual susceptibility to environment. Boyce and Ellis proposed that stress and support in children's growth and development<sup>[22]</sup>. Although it appears earlier, it is not all harmful, it is double-sided, for example, in a negative and unfavorable environment, it may hinder its own development, and it is possible to make better use of resources for development. Therefore, through the study of negative life events, this study found that individuals' sensory processing sensitivity, well-being and cognitive coping would be affected, and the well-being of sensory processing sensitive groups would develop positively. Although contrary to the research results of Victor, Victor et al., if students experience multiple negative life events, their mental health development will be affected, and their individual well-being level will be reduced<sup>[23]</sup>. Relevant studies have found that sensory processing sensitivity is significantly related to emotional attitude<sup>[5,24]</sup>, and well-being assessment is an individual's assessment of the current life state, including the assessment of positive and negative emotions. Therefore, sensory processing sensitivity is significantly correlated with well-being. The acute observation of environmental changes is enhanced, the body responds to the state, and the emotional response increases with the sensitivity, while the information is processed many times. In view of the positive development of subjective well-being of highly sensitive individuals under the influence of negative events in this study, on the one hand, it may be that highly sensitive groups are easy to capture small well-being events, making negative events double-sided; On the other hand, it may be affected by the current environment, especially with the popularization of scientific and technological data, the highly sensitive group will have more angles to analyze negative events, and then the emotional stability and positive feedback will increase.

Among the regulating effects of cognitive coping, cognitive coping has a significant regulating effect between negative life events and sensory processing sensitivity, but not between sensory processing sensitivity and subjective well-being. In other words, this study found that in negative life events, cognitive coping can regulate the sensitivity of highly sensitive groups, but cannot regulate the well-being of highly sensitive groups. Although many studies have shown a stable and significant correlation between well-being and coping styles, for example, Li Fenghua et al. found that it is easier for college students to deal with stress and frustration events by using positive coping styles, so as to effectively solve problems and thus enhance individual subjective well-being<sup>[13]</sup>. However, other researchers have confirmed that the adjustment mode of cognitive coping is not universally applicable. Wu Lu confirmed that college students' positive coping is significantly positively correlated with their subjective well-being, while their negative coping is not<sup>[25]</sup>. In particular, the population in this study is highly sensitive. In the face of negative stress events, cognitive coping prompts the highly sensitive group to make appropriate cognitive evaluation, so as to restore psychological stability according to the results of cognitive evaluation, but it is not necessarily positive evaluation and stable effect. For example, Cabras and Mondo found that individuals with emotion-oriented coping styles had lower life satisfaction, that is, their cognitive coping styles were negatively correlated with life satisfaction, which on the other hand confirmed the possibility that one of the interaction effects of this study was not significant<sup>[26]</sup>. In a word, Cognitive coping still plays a regulating role in sensory processing sensitivity.

## 5. Conclusion

(1) The dimensions of irritability, positive susceptibility and stimulation susceptibility of sensory processing sensitivity were significantly correlated with subjective well-being and negative life events ( $p < 0.01$ ), stress susceptibility and social avoidance negative life events were significantly correlated with each other ( $p < 0.01$ ), and stress susceptibility was correlated with happiness ( $p < 0.05$ ). Social avoidance was not correlated with happiness ( $p > 0.05$ );

(2) Sensory processing sensitivity plays a partial mediating role between negative life events and subjective well-being. Under the influence of negative life events, cognitive coping can regulate sensory processing sensitivity ( $B = 0.29$ ,  $t = 2.51$ ,  $p < 0.05$ ).

## 6. Shortcomings and Prospects

The current limitations and suggestions can be further refined in future studies. This study is a cross-sectional study, which only measures the sensitivity level at a certain moment, and can observe whether the sensitivity level of college students changes with the increase of age. The data in this study are self-reported by students, which can increase changes in sensitivity induced by experimental situations in future studies

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