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CLINICAL RESEARCH ARTICLE

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# Combined effect of compassionate and uncompassionate self-responding on Chinese college students' mental health during the initial wave of the COVID-19 pandemic: a response surface analysis

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## ABSTRACT

**Background:** The initial wave of the COVID-19 pandemic significantly deteriorated mental health, especially among college students. Self-compassion has demonstrated benefits for psychological outcomes such as depressive symptoms, life satisfaction, posttraumatic stress symptoms (PTSS), and posttraumatic growth (PTG). Notably, existing literature suggests that the protective and vulnerable aspects within the Self-Compassion Scale, namely, compassionate and uncompassionate self-responding (CSR and USR), can coexist within individuals and influence their mental health through various coexisting patterns. However, this process has not been sufficiently explored.

**Objective:** This study aimed to explore the combined effects of CSR and USR on college students' depressive symptoms, life satisfaction, PTSS, and PTG during the initial wave of the pandemic.

**Method:** In this cross-sectional study, 4450 Chinese college students (51.9% females, $M_{age}$ = 20.58 years, $SD$ = 1.49) completed self-report measures amid the COVID-19 pandemic's initial wave in 2020. Response surface analyses were utilised to investigate the combined effects of CSR and USR.

**Results:** Simultaneously increased CSR and USR were associated with a slight increase in depressive symptoms, PTSS, and life satisfaction, but a substantial increase in PTG. Conversely, increased CSR and decreased USR were associated with a considerable decrease in depressive symptoms and PTSS, a significant increase in life satisfaction, and a moderate increase in PTG.

**Conclusions:** CSR and USR demonstrated protective and vulnerable impacts, respectively. It is imperative to analyse their combined effects as an interactive system and consider the specific characteristics of different psychological responses.

## Efecto combinado de la auto-respuesta compasiva y no compasiva en la salud mental de los estudiantes universitarios chinos durante la ola inicial de la pandemia de COVID-19: un análisis de superficie de respuesta

**Antecedentes:** La ola inicial de la pandemia de COVID-19 deterioró significativamente la salud mental, especialmente entre los estudiantes universitarios. La autocompasión ha demostrado beneficios para desenlaces psicológicos como los síntomas depresivos, satisfacción con la vida, síntomas de estrés postraumático (SEPT) y crecimiento postraumático (CPT). En particular, la literatura existente sugiere que los aspectos protectores y vulnerables dentro de la Escala de Autocompasión, es decir, la auto-respuesta compasiva y no compasiva (ARC y ARNC), pueden coexistir dentro de los individuos e influir en su salud mental a través de varios patrones coexistentes. Sin embargo, este proceso no ha sido suficientemente explorado.

**Objetivo:** Este estudio tuvo como objetivo explorar los efectos combinados de la ARC y la ARNC sobre los síntomas depresivos, la satisfacción con la vida, SEPT y CPT de los estudiantes universitarios durante la ola inicial de la pandemia.

**Método:** En este estudio transversal, 4.450 estudiantes universitarios chinos (51,9% mujeres, edad $M$ = 20,58 años, $DE$ = 1,49) completaron medidas de autoinforme en medio de la ola inicial de la pandemia de COVID-19 en 2020. Se utilizaron análisis de superficie de respuesta para investigar los efectos combinados de la ARC y la ARNC.

**Resultados:** el aumento simultáneo de ARC y ARNC se asoció con un ligero aumento de los síntomas depresivos, SEPT y satisfacción con la vida, pero un aumento sustancial en CPT. Por el contrario, el aumento de la ARC y la disminución de la ARNC se asociaron con una

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## PALABRAS CLAVE

Autocompasión; síntomas depresivos; satisfacción con la vida; síntomas de estrés postraumático; crecimiento postraumático; análisis de superficie de respuesta; COVID-19

## HIGHLIGHTS

- Increased CSR and decreased USR were associated with less depressive symptoms and PTSS as well as more life satisfaction.
- CSR mitigated the negative effects of USR on depressive symptoms, life satisfaction, and PTSS.
- Simultaneously increased CSR and USR were associated with a substantial increase in PTG.

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disminución considerable de los síntomas depresivos y SEPT, un aumento significativo de la satisfacción con la vida y un aumento moderado del CPT.
**Conclusiones:** ARC y ARNC demostraron impactos protectores y vulnerables, respectivamente. Es imperativo analizar sus efectos combinados como un sistema interactivo y considerar las características específicas de las diferentes respuestas psicológicas.

## 1. Introduction

The initial outbreak of the COVID-19 pandemic had a significant and detrimental impact on public mental health in China and globally (Brooks et al., 2020). The pandemic's high transmission rate and fatality, along with the initial uncertainty surrounding the virus, led to a range of negative mental health outcomes, including depression, anxiety, and posttraumatic stress symptoms (PTSS) (Ahmed et al., 2020; Rossi et al., 2020; Tang et al., 2020). Notably, college students exhibited more severe psychological symptoms during the early stages of the pandemic (Fu et al., 2021; Romeo et al., 2021). The college years represent a critical period of emerging adulthood, crucial for cognitive and emotional development (Hochberg & Konner, 2020). College students also face various stressors, such as academic demands, social interactions, and uncertainties about the future (Wang et al., 2020). Moreover, the shift to online learning to prevent viral transmission decreased learning efficiency and heightened social isolation among this group (Fu et al., 2021). These elements combined increased the vulnerability of college students to mental health issues during the pandemic (Ahmed et al., 2020; Cao et al., 2020; Fu et al., 2021). However, the existing literature has primarily focused on the risk factors for mental health. There has been less emphasis on the protective roles of positive psychological resources. Consequently, this hinders a comprehensive understanding of individual differences in mental health resilience during significant public health events.

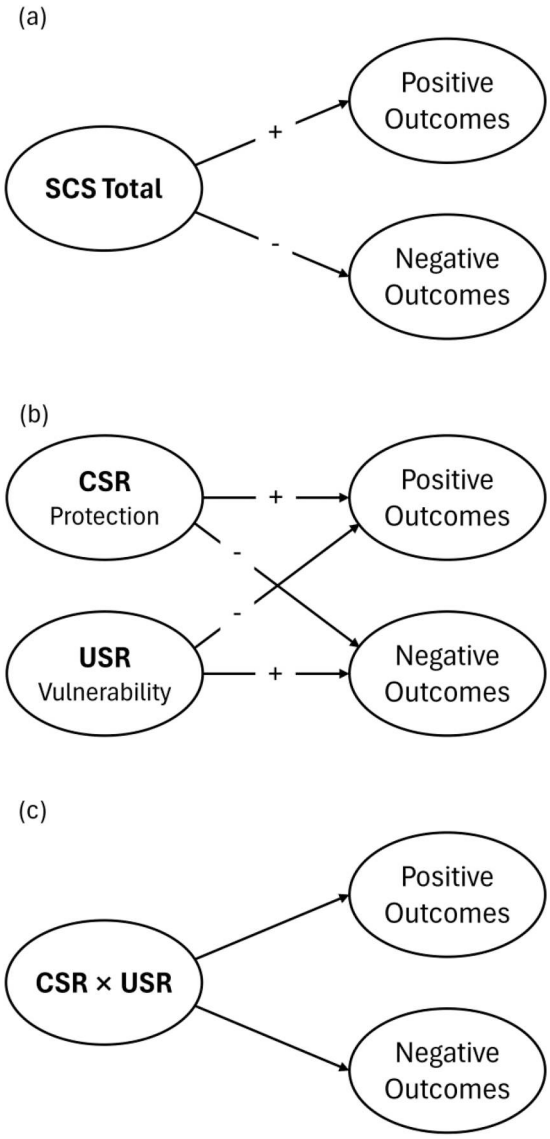


**Figure 1.** Theoretical designs of the Self-Compassion Scale for research.

Note. (a) The basic one-factor view proposed by Neff (2003b). (b) The bi-factor view proposed by Muris and Otgaar (2022). (c) The potential combined effects of CSR and USR discussed in some studies (e.g. Li et al., 2023, etc.). SCS = the Self-Compassion Scale, CSR = compassionate self-responding, USR = uncompassionate self-responding.

### 1.1. Self-compassion and mental health

Previous studies highlighted the importance of positive psychological resources for overcoming adversity (Sin & Lyubomirsky, 2009). Self-compassion, in particular, has shown a strong association with decreased psychopathological symptoms and enhanced well-being (MacBeth & Gumley, 2012; Zessin et al., 2015). Introduced by Neff (2003a), self-compassion comprises three pairs of contrasting components: self-kindness versus self-judgment, common humanity versus isolation, and mindfulness versus overidentification. Self-kindness refers to displaying a kind and accepting attitude toward ourselves instead of being harsh and critical. Common humanity involves recognising that flaws and imperfections are part of the human experience and not exclusive to oneself. Mindfulness entails observing and acknowledging our current emotions in an impartial and balanced manner rather than disregarding or fixating on them. Moreover, studies have illustrated that self-compassion can reduce depressive symptoms and PTSS while fostering life satisfaction and posttraumatic growth (PTG) among Chinese college students during the pandemic (Liang et al., 2022; Zhang & Shen, 2023; Zhen et al., 2022).

However, recent debate has focused on the specific theoretical constructs of self-compassion and the correct application of the Self-Compassion Scale (SCS; Neff, 2003a) in research. Originally, Neff (2003b) suggested that the negative components of the SCS (i.e. self-judgment, isolation, and overidentification) are reverse-scored, with the total SCS score representing one's self-compassion (see Figure 1a). However, many researchers have argued that using the SCS's total score may inadequately capture the nuanced protective effects of self-compassion (e.g. Muris & Otgaar, 2022). They propose that self-compassion consists of two separate factors: compassionate self-responding (CSR) and uncompassionate self-responding (USR). CSR, which includes self-kindness, common humanity, and mindfulness, embodies the protective factors against psychopathology. In contrast, USR, comprising self-judgment, isolation, and overidentification, is considered indicative of a vulnerability to psychopathology (Muris & Otgaar, 2022). Dissecting CSR and USR allows for a more precise and valuable examination of how self-compassion affects the protective and vulnerable aspects of positive and negative psychological outcomes (see Figure 1b). Some recent studies have supported the protective effect of CSR and the adverse impact of USR on psychopathology among Chinese college students (e.g. Fung et al., 2021). Nevertheless, over 60% of studies from 2003 to 2021 have still used the total SCS score, thus constraining an accurate understanding of self-compassion's effects (Muris & Otgaar, 2022). Additionally, previous research has only analysed the respective effects of CSR and USR without investigating their potential interplay.

### 1.2. Combined effects of compassionate and uncompassionate self-responding

Muris and Otgaar (2022) contend that CSR and USR are not mutually exclusive but coexist within individuals, as supported by factor analysis (Muris et al., 2019). This suggests that CSR and USR combine in different patterns within individuals (Ullrich-French & Cox, 2020). Recent studies utilising latent profile analysis (LPA) have explored how self-compassion clusters. They found that CSR and USR can be both high or low in the same individuals (Li et al., 2023; Liu et al., 2023; Wei et al., 2023; Wu et al., 2021). Furthermore, these studies indicate that CSR and USR interact to influence psychological outcomes (see Figure 1c). Specifically, findings consistently show that individuals with high CSR and low USR tend to demonstrate better mental health, while those with high USR and low CSR often report worse mental health (Li et al., 2023; Wei et al., 2023). Specifically, a study among Chinese college students during the COVID-19 pandemic corroborated these results. Its results showed that students with high CSR and low USR experienced lower levels of depressive symptoms and PTSS and higher levels of PTG, whereas students with high USR and low CSR displayed the converse pattern (Chi et al., 2022).

However, the consistency of mental health outcomes for individuals with similar levels of CSR and USR across studies remains uncertain. Certain research implies that USR is a primary determinant of individuals' mental health. For instance, Wei et al. (2023) observed that cancer patients with low levels of both CSR and USR experienced milder depressive and anxiety symptoms, akin to those in the high-CSR-only group. Similarly, patients with moderate levels of both exhibited more pronounced but still less severe symptoms than in the high-USR-only group. Besides, Ullrich-French and Cox (2020) found in three emerging adult samples that increased levels of CSR and USR were associated with higher depression, anxiety, and perceived stress, yet these were lower than in the high-USR-only group. Also, Wu et al. (2021) showed that college students with high levels of both CSR and USR had depressive symptoms comparable to the high-USR-only group. Oppositely, some studies indicated the dominant role of CSR. For example, Liu et al. (2023) noted that increased CSR and USR were associated with more prosocial behaviour, though to a lesser extent than the high-CSR-only group. In addition to the scenarios above, research demonstrated that CSR and USR could work together synergistically. Li et al. (2023) reported no significant differences in well-being between individuals with low and moderate levels of CSR and USR. These inconsistent findings suggest that while LPA can capture the joint effects of CSR and USR, it may not fully clarify their interactions.

### 1.3. Response surface analysis as a possible method for studying self-compassion

One of the goals of previous studies employing LPA on self-compassion was to explore the differences in psychological or behavioural outcomes among various profiles representing the combinations of self-compassion components. Notably, most studies suggest that components within CSR and USR tend to change concurrently and can generally be classified into two main types (e.g. Li et al., 2023; Liu et al., 2023; Wei et al., 2023; Wu et al., 2021). The first type demonstrates congruency between CSR and USR, where both dimensions exhibit similar levels (i.e. both high or low). The second type displays incongruency, where the two dimensions are at opposing levels (i.e. high CSR with low USR or vice versa). In other words, CSR and USR can coexist in both congruent and incongruent arrangements. Therefore, the research question can be reframed as: How do

psychological or behavioural outcomes vary depending on the congruence or incongruence between CSR and USR? However, a primary limitation of LPA lies in its categorisation of the coexistence patterns of CSR and USR, and further exploration of the association between self-compassion and one's mental health is based on these categories, which may lead to the loss of information. In this regard, Response Surface Analysis (RSA) appears to be a promising method for addressing this gap.

RSA is a technique based on polynomial regression with three-dimensional visualisations and interpretations (Edwards & Parry, 1993), aiming to investigate how the congruence and incongruence of two psychological constructs are associated with the value of an outcome (Humberg et al., 2019). More generally, this approach can be used for any situation in which researchers are interested in how combinations of two predictor variables relate to an outcome (Shanock et al., 2010). For example, Breetzke and Wild (2022) adopted RSA to investigate how the discrepancy in the need and supply of social connection at work was associated with employees' mental health during the first wave of the COVID-19 pandemic. According to Edwards (2002), RSA requires fulfilling two assumptions for valid results. Firstly, both predictors must represent the same conceptual domain to ensure meaningful results. Secondly, the predictors must be measured on a compatible numeric scale to assess their correspondence accurately. It can be seen that CSR and USR satisfy the above assumptions. Thus, RSA is a proper way to investigate the associations between the congruence or incongruence of CSR and USR and one's psychological and behavioural manifestations. Moreover, compared to LPA, RSA allows for examining the continuous combined effects (i.e. congruence and incongruence) of CSR and USR on outcome variables, which offers more significant explanatory potential due to its richer information content. Thus, this approach can provide a more comprehensive theoretical and practical understanding of self-compassion.

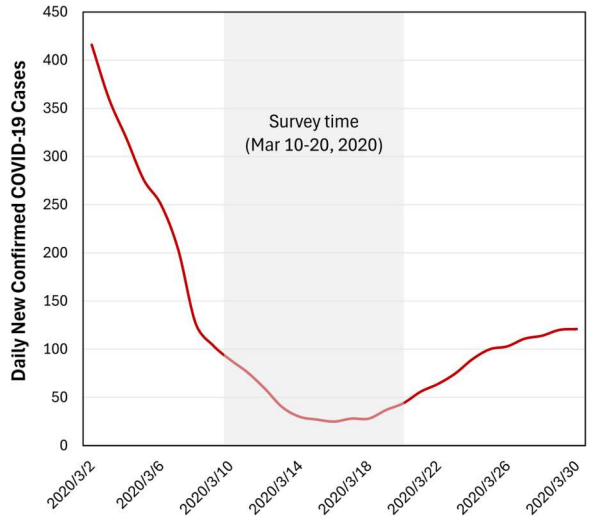


**Figure 2.** Illustration of the progress of the COVID-19 pandemic in China and the survey time.

Note. Data retrieved from https://ourworldindata.org/coronavirus.

### 1.4. The present study

The current study aimed to explore the relationship between self-compassion and the mental well-being of Chinese college students during the initial wave of the COVID-19 pandemic. Specifically, the study utilised RSA to examine the combined effects of CSR and USR on both negative psychological responses (depressive symptoms and PTSS) and positive psychological responses (life satisfaction and PTG) in response to the pandemic. Depressive symptoms and life satisfaction are primary indicators of psychological adjustment, while PTSS and PTG represent key markers of posttraumatic psychological responses. Given that prior research has seldom used RSA to explore the dynamics between CSR and USR, we cautiously hypothesised that an increase in both CSR and USR (i.e. the congruence of CSR and USR) might be linked to deteriorating mental health, while an increase in CSR coupled with a decrease in USR (i.e. the incongruence of CSR and USR) might be associated with improved mental well-being.

## 2. Methods

### 2.1. Participants and procedures

Participants were recruited from five universities with different majors and education levels located in the northern and central provinces of China (i.e. Hebei University of Economics and Business, Hebei Normal University, Hebei Jiaotong Vocational and Technical College, Hebei Vocational College of Rail Transportation, and Jingchu University of Technology). Before the survey, the researchers contacted each university's school authorities and teaching staff, seeking their cooperation in data collection. The survey was administered using the online survey platform Questionnaire Star during the later stages of the initial wave of the COVID-19 pandemic in China, specifically from 10 to 20 March 2020 (see Figure 2). A web link and relevant information about the survey were shared within WeChat groups of various classes. Students who expressed interest in participating could anonymously access the questionnaire by clicking on the link, which typically took around 30 min to complete. The initial page of the survey presented the study's objective and highlighted that students could withdraw from the survey at any time. Additionally, participants were informed that the school's mental health services centre was available to offer telephone

**Table 1.** Demographic characteristics of the sample.

| Characteristics | *n* | % |
|---|---|---|
| Sex | | |
| Male | 2140 | 48.1 |
| Female | 2310 | 51.9 |
| Age | | |
| *M* (*SD*) | 20.58 (1.49) | |
| Range | 16–36 | |
| Current location | | |
| Hubei Province | 1354 | 30.4 |
| Other provinces | 3096 | 69.6 |
| Paternal education level | | |
| Primary school or below | 865 | 19.4 |
| Middle school | 2126 | 47.8 |
| High school | 979 | 22.0 |
| Bachelor's degree | 469 | 10.5 |
| Master's degree or above | 11 | 0.2 |
| Maternal education level | | |
| Primary school or below | 1359 | 30.5 |
| Middle school | 1894 | 42.6 |
| High school | 868 | 19.5 |
| Bachelor's degree | 320 | 7.2 |
| Master's degree or above | 9 | 0.2 |
| Current family monthly income | | |
| Less than 1000 RMB | 277 | 6.2 |
| 1000–3000 RMB | 1446 | 32.5 |
| 3000–6000 RMB | 1571 | 35.3 |
| 6000–10,000 RMB | 842 | 18.9 |
| 10,000–15,000 RMB | 199 | 4.5 |
| 15,000–20,000 RMB | 60 | 1.3 |
| More than 20,000 RMB | 55 | 1.2 |

or online counselling if needed. The survey was part of a larger longitudinal investigation examining the mental health of college students. Data collection methods received approval from all relevant local education authorities and Institutional Review Boards (IRB) of the first author's institution (protocol number: 12220085; study name: Structure and Mechanism of Posttraumatic Stress and Growth). In total, 4450 students completed the survey. As the online survey platform automatically identified incomplete responses, the final dataset had no missing values for the main variables. Demographic characteristics of the participants are shown in Table 1.

## 2.2. Measures

### 2.2.1. Self-compassion

Self-compassion was assessed using the Self-compassion Scale (SCS; Neff, 2003a), which has shown an acceptable model fit of confirmatory factor analysis (CFA) in Chinese populations (the comparative fit index [CFI] = .91, the Tucker-Lewis Index [TLI] = .90, and the root mean square error of approximation [RMSEA] = .07; Chen et al., 2011). The 26-item scale encompasses six dimensions. CSR includes common humanity (four items), self-kindness (five items), and mindfulness (four items); USR includes isolation (four items), self-judgment (five items), and over-identification (four items). Each item was rated on a five-point scale (1 = *strongly disagree* to 5 = *strongly agree*). The sum of corresponding dimensions obtains the total score of CSR and USR. In the current study, the internal consistency was good for common humanity ($\alpha$ = .92), self-kindness ($\alpha$ = .94), mindfulness ($\alpha$ = .96), isolation ($\alpha$ = .90), self-judgment ($\alpha$ = .89), and over-identification ($\alpha$ = .88).

### 2.2.2. Depressive symptoms

Depressive symptoms were measured by the Center for Epidemiological-Studies Depression Scale (CES-D; Radloff, 1977), which has shown an acceptable model fit of CFA in Chinese populations (CFI = .98, TLI = .97, RMSEA = .06, the standardised root mean residual [SRMR] = .04; Zhang et al., 2010). All 20 items were on a 4-point scale (0 = *never* to 3 = *always*), with a higher total score indicating more severe depressive symptoms. In this study, the CES-D exhibited good internal consistency ($\alpha$ = .92).

### 2.2.3. Life satisfaction

Life satisfaction was assessed by the Satisfaction with Life Scale (SLS, Diener et al., 1985), which has shown an acceptable model fit of CFA in Chinese populations (CFI = .96, the goodness of fit index [GFI] = .97, RMSEA = .07; Xiong & Xu, 2009). All five items were rated on a 7-point scale (1 = *completely disagree* to 7 = *completely agree*). A higher total score indicated more life satisfaction. In this study, the SLS showed good internal consistency ($\alpha$ = .92).

### 2.2.4. Posttraumatic stress symptoms

PTSS were assessed by the PTSD checklist for DSM-5 (PCL-5; Weathers et al., 2013), which has shown an acceptable model fit of CFA in Chinese populations (CFI = .96, TLI = .95, RMSEA = .05, SRMR = .05; Cheng et al., 2020). The 20-item scale has four subscales: intrusions (five items), negative alterations in cognition and mood (seven items), avoidance (two items), and hyperarousal (six items). Each item was scored on a 5-point scale (0 = *not at all* to 4 = *extremely*), with a higher sum score indicating more severe PTSS. In this study, the internal consistency was good for intrusions ($\alpha$ = .94), negative alterations in cognition and mood ($\alpha$ = .94), avoidance ($\alpha$ = .82), and hyperarousal ($\alpha$ = .94).

### 2.2.5. Posttraumatic growth

PTG was evaluated by the revised version of the Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996; Zhou et al., 2015), which has shown an acceptable model fit of CFA in Chinese populations (CFI = .90, TLI = .88, RMSEA = .07, SRMR = .05; Zhou et al., 2015). The 22-item instrument includes three subscales: self-perception (nine items), interpersonal relationships (seven items), and philosophy of life (six items). Items are rated on a 6-point Likert scale (0 = *not at all* to 5 = *extremely*). A higher sum score indicated more positive changes. In the current

study, the internal consistency was good for self-perception ($\alpha = .97$), interpersonal relationships ($\alpha = .97$), and philosophy of life ($\alpha = .90$).

#### 2.2.6. Covariates

According to previous studies, sex, age, and family socioeconomic status (SES) had impacts on college students' mental health during the COVID-19 pandemic (Fu et al., 2021; Tang et al., 2020). Thus, we took those variables as covariates. Specifically, the family SES composite score was comprised by standardising and averaging parental educational level (1 = *primary school or below* to 5 = *master's degree or above*) and current family monthly income (1 = *less than 1000 RMB* to 7 = *more than 20,000 RMB*). Besides, considering that the epidemic was concentrated in Hubei Province during the initial phase of the COVID-19 pandemic, we also investigated whether participants were in Hubei Province at the time of the survey.

### 2.3. Data analyses

We performed descriptive statistics and correlational analyses for all variables using SPSS Version 26.0 (SPSS Inc., Chicago, 2016). Then, following the guidance proposed by Shanock et al. (2010), we utilised polynomial regression with RSA in M*plus* Version 8.3 (Muthén & Muthén, 1998–2017) to examine the combined effects of CSR and USR on participants' depressive symptoms, life satisfaction, PTSS, and PTG.

In detail, we preliminarily tested the presence of discrepancies between CSR and USR. Participants' CSR and USR were standardised. If one's CSR is half a standard deviation above or below USR, their CSR and USR were considered to exhibit discrepancies (Fleenor et al., 1996). Subsequently, we conducted polynomial regression for response surface analyses. First, CSR and USR were mean-centred before establishing the second-order terms to reduce multicollinearity (Hayes, 2013). Then, dependent variables (*DV*; i.e. depressive symptoms, life satisfaction, PTSS, and PTG) were regressed on covariates, primary term of CSR ($C$) and USR ($U$), quadratic term of CSR ($C^2$) and USR ($U^2$), and the interaction term between CSR and USR ($C \times U$). The formulaic description is illustrated in Equation (1) (covariates were not shown in the equation for simplicity):

$$DV = b_0 + b_1C + b_2U + b_3C^2 + b_4(C \times U) + b_5U^2 + e \quad (1)$$

The significance and the value of $R^2$ in each polynomial regression model reflect whether and the extent to which the equation can significantly explain the variation in dependent variables, respectively. In particular, two conceptual lines were presented for clear interpretation while visualising the response surface. The congruence line can capture the trends of dependent variables when CSR and USR change synergistically. Its characteristics, $a_1$ ($a_1 = b_1 + b_2$) and $a_2$ ($a_2 = b_3 + b_4 + b_5$), represent the linear slope and curvature of the congruence line, respectively. If $a_1$ is positive/negative, the dependent variables increase/decrease with the increase/decrease of CSR and USR. If $a_2$ is positive/negative, the surface of the dependent variable curves upward/downward along with the congruence line. At the same time, the incongruence line can capture the trends of dependent variables when CSR and USR change divergently. Its characteristics, $a_3$ ($a_1 = b_1 - b_2$) and $a_4$ ($a_4 = b_3 - b_4 + b_5$) represent the linear slope and curvature of the incongruence line, respectively. If $a_3$ is positive/negative, the dependent variables increase/decrease with the increase/decrease of CSR and decrease/increase of USR. If $a_4$ is positive/negative, the surface of the dependent variable curves upward/downward along with the incongruence line. The meaning of the four coefficients describing the response surface is summarised in Table 2. To assess the effect sizes of the results from polynomial regression and response surface analyses, we employed standardised regression coefficients ($\beta$), with $\beta = .10$, $\beta = .30$, and $\beta = .50$ indicative of small, medium, and large effect sizes, respectively (Cohen, 1988). The present study was not preregistered, yet the M*plus* code and the dataset can be accessed at https://osf.io/9ujw4/.

**Table 2.** Meaning of the coefficients describing the response surface.

| Coefficients | Original meaning | Specific meaning in the present study |
|---|---|---|
| $a_1$ | The slope of the congruence line. | $a_1 > 0$: DV increases when both CSR and USR increase.<br>$a_1 < 0$: DV decreases when both CSR and USR increase. |
| $a_2$ | The curvature of the congruence line. | $a_2 > 0$: The surface is upward curving along the congruence line.<br>$a_2 < 0$: The surface is downward curving along the congruence line. |
| $a_3$ | The slope of the incongruence line. | $a_3 > 0$: DV increases when CSR increases and USR decreases.<br>$a_3 < 0$: DV decreases when CSR increases and USR decreases. |
| $a_4$ | The curvature of the incongruence line. | $a_4 > 0$: The surface is upward curving along the incongruence line.<br>$a_4 < 0$: The surface is downward curving along the incongruence line. |

Note. CSR = compassionate self-responding, USR = uncompassionate self-responding, DV = dependent variables (i.e. depressive symptoms, life satisfaction, PTSS, and PTG).

**Table 3.** Descriptive statistics and correlational analyses.

| Variables | *M* | *SD* | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Sex[a] | – | – | – | | | | | | | | |
| 2. Age | 20.58 | 1.41 | .05** | – | | | | | | | |
| 3. Family SES | 0.00 | 0.78 | −.06*** | −.12*** | – | | | | | | |
| 4. Current location[b] | – | – | .04** | −.07*** | −.02 | – | | | | | |
| 5. Compassionate self-responding | 44.14 | 11.73 | .16*** | .06*** | .01 | .00 | – | | | | |
| 6. Uncompassionate self-responding | 35.05 | 11.73 | .06*** | −.06*** | −.02 | −.02 | .37*** | – | | | |
| 7. Depressive symptoms | 13.62 | 9.13 | −.11*** | −.04* | −.07*** | .03* | −.20*** | .32*** | – | | |
| 8. Life satisfaction | 20.52 | 6.26 | .06*** | .04* | .11*** | .02 | .41*** | .06*** | −.19*** | – | |
| 9. PTSS | 13.48 | 17.48 | −.08*** | −.03 | −.07*** | .01 | −.10*** | .31*** | .76*** | −.09*** | – |
| 10. PTG | 51.20 | 29.21 | .12*** | .02 | −.02 | −.02 | .47*** | .28*** | .02 | .23*** | .11*** |

Note. [a]female = 1, male = 0; [b]Hubei Province = 1, other provinces = 0. CSR = compassionate self-responding, USR = uncompassionate self-responding.

## 3. Results

### 3.1. Descriptive statistics and correlational analyses

Descriptive statistics and correlation analyses are shown in Table 3. Compassionate self-responding was negatively correlated with depressive symptoms and PTSS, while positively correlated with life satisfaction and PTG. Besides, uncompassionate self-responding was positively correlated with all dependent variables. In addition, demographical covariates showed correlations with main study variables at different extents.

### 3.2. Polynomial regression with response surface analysis

First, the discrepancies between CSR and USR are shown in Table 4, which indicates the feasibility of further polynomial regression analyses (Shanock et al., 2010). Then, the results of polynomial regression with RSA of CSR and USR on depressive symptoms, life satisfaction, PTSS, and PTG were shown in Table 5 and Figure 3. For depressive symptoms, the congruence line had a positive slope ($a_1 = 0.08$, $p < .001$) and the incongruence line had a negative slope ($a_3 = -0.72$, $p < .001$), and $|a_3|$ was significantly larger than $|a_1|$ (Wald[1] = 562.15, $p < .001$). Besides, for life satisfaction, both congruence and incongruence lines had positive slopes ($a_1 = 0.17$, $p < .001$; $a_3 = 0.25$, $p < .001$), and $|a_3|$ was significantly larger than $|a_1|$ (Wald[1] = 15.14, $p < .001$). In addition, for PTSS, the congruence line had a positive slope ($a_1 = 0.19$, $p < .001$) and the incongruence line had a negative slope ($a_3 = -1.01$, $p < .001$), and $|a_3|$ was significantly larger than $|a_1|$ (Wald[1] = 269.82, $p < .001$).

**Table 4.** Discrepancies between compassionate and uncompassionate self-responding.

| Agreement groups | *n* | % | $Z_{CSR}$ | $Z_{USR}$ |
|---|---|---|---|---|
| CSR higher than USR | 1251 | 28.1 | 0.76 | −0.72 |
| In agreement | 1131 | 25.4 | 0.23 | 0.26 |
| USR higher than CSR | 2068 | 46.5 | −0.59 | 0.30 |

Note. *Z* = standard score. CSR = compassionate self-responding, USR = uncompassionate self-responding.

Furthermore, for PTG, both congruence and incongruence lines had positive slopes ($a_1 = 1.15$, $p < .001$; $a_3 = 0.56$, $p < .001$), and $|a_1|$ was significantly larger than $|a_3|$ (Wald[1] = 40.09, $p < .001$). At last, regression models indicated several significant yet relatively minor curvatures for surfaces with small-to-medium effect sizes ($|\beta| \leq .28$).

## 4. Discussion

Based on the bi-factor view of self-compassion (Muris & Otgaar, 2022), the present study employed RSA to examine the combined effects of CSR and USR on the depressive symptoms, life satisfaction, PTSS, and PTG of college students during the initial wave of the COVID-19 pandemic. The findings supported the view of Muris and Otgaar (2022) and previous research (e.g. Chi et al., 2022; Li et al., 2023; Ullrich-French & Cox, 2020; Wu et al., 2021), indicating the protective nature of CSR and the vulnerable nature of USR. Furthermore, compared to traditional methods, the novel approach presented detailed descriptions and graphical illustrations of the interactions between CSR and USR, offering more theoretical and practical implications.

### 4.1. The combined effects of CSR and USR based on the response surface analyses

In this study, the interplay of CSR and USR showed consistent patterns in depressive symptoms and PTSS. Specifically, concurrent increased CSR and USR were linked to a small yet significant increase in depressive symptoms and PTSS. Conversely, increased CSR and decreased USR corresponded with a substantial decrease in these symptoms. These findings support the bi-factor model of self-compassion that while CSR acts as a protective factor, USR may increase vulnerability to psychopathology (Muris & Otgaar, 2022). Additionally, these results are consistent with prior research (e.g. Li et al., 2023; Ullrich-French & Cox, 2020; Wei et al., 2023; Wu et al., 2021), that high-CSR-only individuals showed fewer psychopathology symptoms, high-USR-only individuals showed more psychopathology

**Table 5.** Results of polynomial regression and response surface analyses.

| Variables | Depressive symptoms | | | Life satisfaction | | | PTSS | | | PTG | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *B* [95% CI] | *β* | *p* | *B* [95% CI] | *β* | *p* | *B* [95% CI] | *β* | *p* | *B* [95% CI] | *β* | *p* |
| Covariates | | | | | | | | | | | | |
| Sex | −1.450 [−1.907, −0.993] | −.083 | **<.001** | 0.011 [−0.314, 0.337] | .001 | .946 | −2.344 [−3.190, −1.502] | −.077 | **<.001** | 1.805 [0.298, 3.312] | .031 | **.019** |
| Age | 0.115 [−0.037, 0.268] | .020 | .115 | 0.071 [−0.038, 0.179] | .018 | .200 | 0.153 [−0.132, 0.429] | .015 | .286 | −0.093 [−0.594, 0.408] | −.005 | .716 |
| Family SES | −0.616 [−0.904, −0.328] | −.055 | **<.001** | 0.840 [0.635, 1.045] | .109 | **<.001** | −1.026 [−1.558, −0.496] | −.053 | **<.001** | −0.535 [−1.484, 0.414] | −.015 | .269 |
| Current location | 0.842 [0.356, 1.327] | .045 | **.001** | 0.241 [−0.105, 0.587] | .018 | .172 | 0.765 [0.468, 1.078] | .023 | .094 | −1.645 [−3.245, −0.045] | −.026 | **.044** |
| Predictors | | | | | | | | | | | | |
| $b_1$: CSR | −0.321 [−0.348, −0.295] | −.430 | **<.001** | 0.205 [0.186, 0.224] | .395 | **<.001** | −0.410 [−0.459, −0.361] | −.312 | **<.001** | 0.856 [0.768, 0.943] | .346 | **<.001** |
| $b_2$: USR | 0.402 [0.374, 0.430] | .497 | **<.001** | −0.040 [−0.060, −0.020] | −.071 | **<.001** | 0.599 [0.547, 0.650] | .420 | **<.001** | 0.298 [0.206, 0.390] | .111 | **<.001** |
| $b_3$: $CSR^2$ | 0.001 [−0.001, 0.002] | .016 | .524 | 0.000 [−0.001, 0.002] | .008 | 0.776 | −0.001 [−0.005, 0.002] | −.018 | .497 | −0.007 [−0.013, −0.001] | −.055 | **.033** |
| $b_4$: CSR × USR | −0.007 [−0.009, −0.004] | −.145 | **<.001** | −0.003 [−0.005, −0.002] | −.101 | **<.001** | −0.009 [−0.013, −0.005] | −.109 | **<.001** | −0.012 [−0.019, −0.005] | −.080 | **.001** |
| $b_5$: $USR^2$ | 0.006 [0.005, 0.008] | .123 | **<.001** | 0.003 [0.002, 0.005] | .095 | **<.001** | 0.005 [0.002, 0.009] | .059 | **.002** | −0.001 [−0.007, 0.005] | −.008 | .654 |
| $R^2$ | .240*** | | | .196*** | | | .167*** | | | .246*** | | |
| Surface tests | | | | | | | | | | | | |
| $a_1$: Slope (congruence) | 0.081 [0.050, 0.112] | .067 | **<.001** | 0.165 [0.143, 0.187] | .324 | **<.001** | 0.189 [0.131, 0.246] | .108 | **<.001** | 1.153 [1.050, 1.256] | .457 | **<.001** |
| $a_2$: Curvature (congruence) | 0.000 [−0.001, 0.002] | −.006 | .590 | 0.000 [−0.001, 0.002] | .002 | .444 | −0.004 [−0.007, −0.002] | −.068 | **.002** | −0.020 [−0.025, −0.015] | −.143 | **<.001** |
| $a_3$: Slope (incongruence) | −0.724 [−0.768, −0.679] | −.927 | **<.001** | 0.244 [0.212, 0.276] | .466 | **<.001** | −1.009 [−1.091, −0.926] | −.732 | **<.001** | 0.558 [0.410, 0.705] | .235 | **<.001** |
| $a_4$: Curvature (incongruence) | 0.013 [0.009, 0.017] | .284 | **<.001** | 0.007 [0.004, 0.010] | .204 | **<.001** | 0.013 [0.005, 0.020] | .150 | **.001** | 0.004 [−0.009, 0.017] | .017 | .558 |

Note. Since three participants didn't report their age, a total of 4447 participants were included in the analyses. CSR = compassionate self-responding, USR = uncompassionate self-responding. Bold indicates $p < .05$, ***$p < .001$.

symptoms, and individuals with the same level of CSR and USR had an intermediate level of psychopathology symptoms. Moreover, the slope of the congruence line surpassed the absolute value of the slope of the incongruence line, indicating that CSR may buffer the detrimental effects of USR, further showing the protective role of CSR (Muris & Otgaar, 2022). According to Muris et al. (2018), CSR typically reflects self-soothing and coping behaviours, promoting a response to challenges characterised by understanding, kindness, and constructive self-dialogue rather than focusing on negative aspects. During the pandemic, college students with high self-compassion were more likely to accept the fact of the lockdown and acknowledge its necessity for epidemic prevention and control, which could reduce the adverse effects of feelings of uncontrollability (Xue et al., 2023). Meanwhile, compared to other difficulties, the distinctiveness of the pandemic lies in its representation as a formidable challenge people worldwide face. And for college students during the pandemic, social isolation was one of their main difficulties (Brooks et al., 2020). In this context, CSR might make college students reassess themselves and their suffering experiences and help them relate themselves to the world in a kind and mindful way, thereby alleviating their psychopathological symptoms (Chi et al., 2022).

Meanwhile, the combined effects of CSR and USR also showed similar patterns on life satisfaction and PTG. Overall, the increase in life satisfaction and PTG was only associated with increased CSR regardless of USR. These results aligned with the view of Muris and Otgaar (2022) and were consistent with previous studies (e.g. Chi et al., 2022; Li et al., 2023; Wu et al., 2021), that high CSR is associated with more positive psychological responses. However, there were some discrepancies in the detailed patterns of the congruence and incongruence lines for life satisfaction and PTG. Regarding life satisfaction, the incongruence line of CSR and USR displayed a steeper slope than the congruence line. This indicates that USR impedes the positive effect of CSR on life satisfaction, which supports the vulnerable roles of USR (Li et al., 2023; Muris & Otgaar, 2022). On the contrary, for PTG, the congruence line of CSR and USR had a larger step than the incongruence line. This indicates that the coexistence of CSR and USR can be more advantageous for PTG following the pandemic. This may be attributed to the unique characteristics of PTG. The comprehensive model of PTG (Tedeschi et al., 2018) suggests that PTG involves challenging old beliefs and establishing new ones. The model emphasizes the role of personal efforts in overcoming the adverse effects of traumatic events, and moderate distress can serve as the driving force for the development of PTG (Tedeschi et al., 2018). Also, Zhao et al. (2021) demonstrated that young Chinese tend to view

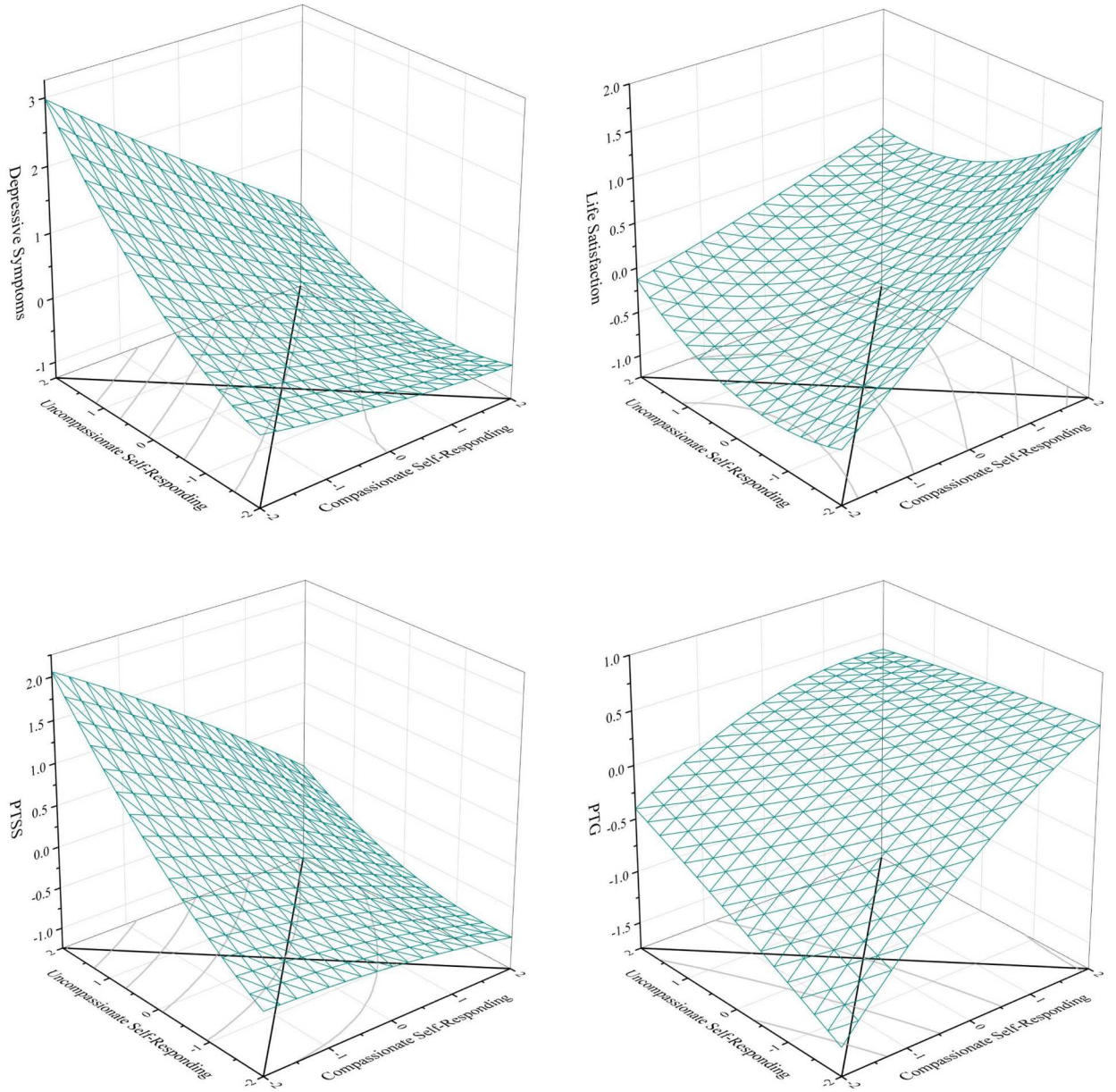


**Figure 3.** Response surfaces reflecting the combined effects of compassionate and uncompassionate self-responding on depressive symptoms, life satisfaction, PTSS, and PTG.

Note. The black lines on the bottom represent congruence and incongruence lines. Grey lines represent the contour lines of the surfaces. Standardised data were shown for clarity.

certain aspects of self-compassion dialectically due to Chinese culture. They argued that USR could also imply self-knowledge, improvement, reflection, and motivation, which are helpful processes in the realisation of PTG (Tedeschi et al., 2018). Hence, the coexistence of CSR and USR might prompt participants to engage in deeper thinking and understanding of the pandemic via moderate distress, ultimately facilitating the formation of PTG.

### *4.2. Implications, limitations, and future directions*

Under the guidance of the bi-factor view of self-compassion (Muris & Otgaar, 2022), this study focused on the interplay of CSR and USR on college students' mental health within the context of the COVID-19 pandemic, which provided several implications. At the theoretical level, the present study supported and extended the bi-factor model of self-compassion (Muris & Otgaar, 2022). By employing the RSA, the present results detailly delineated the continuous combined effects of CSR and USR on one's mental health. In specific, except for the direct protective effects on mental health, CSR also buffered the negative impacts of USR. These results indicated that, beyond the respective effects of CSR and USR on mental health, they also constitute an interactive system and impact one's mental health synergistically. On a practical level, the present results suggest that clinicians may consider how best to promote clients' welfare when implementing interventions centred on self-compassion.

Given that CSR and USR combination patterns may vary across individuals, clinicians may determine the specific implementation plan based on individual characteristics. Moreover, the specific intervention may also hinge on the clients' primary concerns. For instance, according to the present study, while enhancing CSR benefits mental health, in some situations (e.g. PTG), moderate USR may also show adaptive qualities.

Several limitations warrant consideration. Firstly, the cross-sectional design restricted the causal inference of the present results. Further studies can apply longitudinal data to establish a more robust causal relationship to support this study. Besides, all results relied on self-report measurements, which may introduce subjective biases. Further studies could consider incorporating more objective indicators like multi-subject assessment or physiological data. In addition, the sample was confined to Chinese college students during the initial wave of the COVID-19 pandemic, potentially limiting the external validity of the present results. Subsequent studies could seek to replicate the current research approach in various samples for further exploration. Finally, this study exclusively investigates the direct relationships between self-compassion and mental health variables. Future research could explore the potential mechanisms in these associations to provide further implications.

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No potential conflict of interest was reported by the author(s).

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## Data availability statement

The data and analysis code supporting the findings of this study have been made publicly available via the Open Science Framework and can be accessed at can be accessed at https://osf.io/9ujw4/.

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