The mediating role of self-compassion and its components in the relationship between maladaptive perfectionism and life satisfaction among Chinese medical students

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Abstract

Research shows that maladaptive perfectionism as a personality trait can result in a number of mental health problems and lowered life satisfaction levels. Since self-compassion has been demonstrated in numerous studies as an important emotional regulation resource and as an essential mental health protective factor, it is hypothesized that self-compassion may play a mediating role in the relationship between maladaptive perfectionism and life satisfaction among medical students and we tried to explore this mediation by using a bi-factor model. In this cross-sectional study, 1653 Chinese undergraduate medical students (aged 17–26 years) completed questionnaires including the Frost Multidimensional Perfectionism Scale (FMPS) maladaptive perfectionism subscales, the 26-item Self-Compassion Scale (SCS), the Satisfaction With Life Scale (SWLS) and demographic information. Mediation analysis showed that self-compassion as a general factor together with its two specific factors of self-kindness and mindfulness played a full mediating role in the relationship between maladaptive perfectionism and life satisfaction among medical students. This study has important implications for medical education as it adds to the literature on further understanding of the mechanism underlying the relationship between maladaptive perfectionism and life satisfaction in medical students.

Keywords Self-compassion · Maladaptive perfectionism · Life satisfaction · Mediation · Medical students

It is widely acknowledged that medical education is a demanding process which may bring about various mental health problems such as stress, anxiety, depression and burnout in medical students (e.g., Galan et al., 2011; Ludwig et al., 2015; Mayer et al., 2016). These problems would seriously affect the life quality and the academic performance of medical students, leading to the lowered life satisfaction in them (e.g., Shi et al., 2015). Life satisfaction, as a key indicator of subjective well-being, is the evaluation of one's life as a whole based on an individual's self-set standards (Diener et al., 1985). It is a subjective assessment and cognitive appraisal of one's life conditions against the standards constructed and perceived as appropriate by oneself (Pavot et al., 1991). In addition to focusing on the mental health problems which exert a negative impact on life satisfaction, some researchers adopted a personality perspective and found that perfectionism as a personality trait also had significant effects on one's life satisfaction (e.g., Çapan, 2010; Chang, 2000).

Perfectionism and Life Satisfaction

Until now, there has been no consensus on the precise definition of perfectionism. Frost et al. (1990) viewed perfectionism as a personality trait which was characterized by setting excessively high standards with being overly self-critical upon evaluation. Flett & Hewitt (2002) described perfectionism as "striving for flawlessness". In the past, perfectionism once had been regarded as a unidimensional construct which

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was associated with negative psychological outcomes such as shame and depression (e.g., Ashby et al., 2006). Recently, however, a growing body of literature promoted the multidimensional conceptualization of this construct, and one representative was the distinction made between adaptive perfectionism and maladaptive perfectionism (e.g., Rice & Ashby, 2007). Adaptive perfectionism involved setting high standards and feeling satisfied when goals were achieved, but even though the standards were not reached, adaptive perfectionists were resilient and could adjust themselves without being overly self-critical (Gnilka et al., 2012). On the other hand, maladaptive perfectionism was associated with setting unrealistically high standards and feeling incapable to meet those standards, which resulted in dissatisfaction with one's performance with an extreme self-critical attitude (Bieling et al., 2004). Adaptive perfectionism was shown to be associated with multiple positive psychological outcomes, such as higher levels of hope, self-esteem and self-efficacy (Ganske & Ashby, 2011; Rice et al., 1998; Rice et al., 2006). In contrast, maladaptive perfectionism was found to be associated with a number of negative health outcomes, such as higher levels of perceived stress, anxiety, depression and reduced levels of life satisfaction (Ashby et al., 2012; Kawamura et al., 2001; Rice & Van Arsdale, 2010). Stoeber & Stoeber (2009) found a negative correlation between socially prescribed perfectionism, a kind of maladaptive perfectionism measured with Multidimensional Perfectionism Scale developed by Hewitt & Flett (1991), and satisfaction with life in both university students and Internet users. A study by Mitchelson & Burns (1998) also revealed that negative and socially prescribed perfectionism predicted a decreased sense of overall satisfaction with life. However, as of yet, few studies explored the relationship between maladaptive perfectionism and life satisfaction among medical students and we tried to fill in this research gap.

In the field of medical education, previous research mainly focused on the correlation of maladaptive perfectionism with mental health problems in medical learners. A study by Seeliger and Harendza revealed that maladaptive perfectionism was a strong predictor of anxiety and depression in newly enrolled medical students (Seeliger & Harendza, 2017). Another study by Hu and colleagues showed that pre-clinical medical students who met the criteria for maladaptive perfectionism were more likely to have feelings of shame, embarrassment and inadequacy (Hu et al., 2019). In addition, maladaptive perfectionism was found to be significantly positively associated with psychological distress and impostor syndrome in medical, dental, nursing and pharmacy students (Henning et al., 1998). Empirical research also demonstrated that there was a significantly positive relationship between maladaptive perfectionism and academic burnout among medical students (Yu et al., 2016). Based on these previous studies, we hypothesized

that maladaptive perfectionism would be negatively related to life satisfaction in medical students since medical students with high maladaptive perfectionism levels have been demonstrated to experience more negative emotions, dysfunctional thoughts and psychological maladjustment, which may in turn, lead to their lower life satisfaction levels.

Self-Compassion as a Potential Mediator

Self-compassion presented by Neff (2003) is a relatively new concept which has its root in Buddhism. Defined as compassion for oneself in personal inadequacies or difficult life circumstances, self-compassion is considered as a healthy and an adaptive way of relating to the self (Neff & McGehee, 2010). The construct comprises three main components: self-kindness versus self-judgment, common humanity versus isolation, mindfulness versus over-identification (Neff, 2003). Self-compassionate people embrace personal failures or life difficulties with care, warmth and kindness rather than with harsh self-judgment or self-criticism (Neff, 2003). They understand that no one is perfect and the imperfection, mistakes, failures as well as difficulties are shared human experiences and thus put themselves in the context of humanity rather than in isolation or feel separated from others when things go wrong (Neff et al., 2007a). People with high self-compassion levels take a balanced perspective and view the suffering objectively rather than suppress or ruminate on painful feelings. In other words, they hold their painful thoughts in balanced awareness rather than over-identify with them (Neff, 2003).

Research has revealed that self-compassion is significantly and positively correlated with life satisfaction, subjective well-being, happiness, positive affect (Barnard & Curry, 2011; Neff, 2011a; Neff et al., 2007b; Neff & Vonk, 2009), while negatively associated with depression, anxiety, stress and negative affect (Birnie et al., 2010; Leary et al., 2007; Neff & McGehee, 2010). As for the correlation of self-compassion with perfectionism, Neff (2003) found a significantly negative relation between self-compassion and maladaptive perfectionism among undergraduate students by using Almost Perfect Scale-Revised (Slaney et al., 2001). Ferrari and colleagues also detected the negative correlation of maladaptive perfectionism with self-compassion in both adolescents and adults (Ferrari et al., 2018). Linnett & Kibowski (2020) used a multi-dimensional approach to analyzing the relationship between perfectionism and self-compassion in a sample of general population, and the results show that the maladaptive perfectionism dimensions (Concern over Mistakes; Discrepancy) predicted lower levels of self-compassion and its positive dimensions (Self-kindness; Common Humanity; Mindfulness).

In addition to cross-sectional and correlational studies, interventional studies consistently found that self-compassion interventions are effective in raising self-compassion, mindfulness, positive affect and life satisfaction (e.g., Armstrong & Rimes, 2016; Matos et al., 2017; Perez-Blasco et al., 2013), and are helpful in reducing stress, rumination, anxiety, depression and self-criticism (e.g., Birnie et al., 2010; Neff & Germer, 2013; Palmeira et al., 2019; Smeets et al., 2014). A meta-analysis evaluating the effects of self-compassion-based interventions on psychosocial outcomes with randomized controlled trials (RCTs) by Ferrari et al. (2019) found that self-compassion interventions significantly reduced rumination with a large effect size, and considerably decreased stress, depression, anxiety and self-criticism with moderate effects. On the other hand, self-compassion-based interventions, such as compassion-focused imagery, compassionate mind training and mindful self-compassion, increased self-compassion and mindfulness dramatically with a moderate effect size.

In view of the above-mentioned literature on the associations among maladaptive perfectionism, self-compassion and life satisfaction, and since empirical studies have demonstrated that self-compassion is an essential mental health protective factor, we hypothesized that self-compassion may play a mediating role in buffering the negative impacts of maladaptive perfectionism on life satisfaction among medical students. We predicted that higher levels of maladaptive perfectionism would be associated with lower self-compassion which, in turn, would be associated with lower life satisfaction and lower levels of maladaptive perfectionism would be associated with higher self-compassion which, in turn, would be associated with higher life satisfaction.

The Present Study

Perfectionism as a personality trait in medical students and health professionals has been recorded in a large number of studies (e.g., Craiovan, 2014; Hu et al., 2019; Yu et al., 2016). As medical students' psychological health exerts a significant impact on the quality of care they will provide as future physicians, it is of vital importance to implement effective interventions early. In the medical field, previous research mainly focused on the psychological problems maladaptive perfectionism may bring about, such as stress, anxiety, depression and burnout (e.g., Eley et al., 2020; Robakowska et al., 2018; Seeliger & Harendza, 2017), but few studies examined the correlation of maladaptive perfectionism with positive well-being. Through a search of literature, we found that the relationship between maladaptive perfectionism (a personality trait) and life satisfaction (an indicator of positive well-being) has rarely been explored among medical students. In addition, research on

the protective role of self-compassion in medical students' mental health is still scant and needs to be expanded upon. Although the mediating effects of self-compassion on the relationship between maladaptive perfectionism and life satisfaction have been explored among Korean undergraduate students (Lee & Yang, 2018) and among British undergraduate students (Stoeber et al., 2020), to the best of our knowledge, there has been no study probing the mediating role of self-compassion in the relationship between maladaptive perfectionism and life satisfaction among medical students. Therefore, our study tried to extend the previous research by testing whether such mediating effect of self-compassion would generalize to the population group of medical students. As Neff et al. (2018) has demonstrated the sound psychometric properties of the Self-Compassion Scale in a bi-factor model, we thereof tried to further examine the mediating effects of self-compassion and its components on the associations between maladaptive perfectionism and life satisfaction among medical students by using a bi-factor model.

Method

Participants and Procedure

Participants were 1653 undergraduate medical students in their 1st to 4th year studies in a major medical university in Northeast China. Among the participants, 619 (37.4%) students were male and 1034 (62.6%) students were female, with the age ranging from 17 to 26 (19.47 ± 1.35 years old); 502 (30.4%) were 1st year students, 481 (29.1%) were 2nd year students, 330 (19.9%) were 3rd year students and 340 (20.6%) were 4th year students. The ethnic breakdown of the sample was 80.2% Han, 8.5% Man, 2.4% Wei, 1.4% Hui and 7.5% Other.

The university in which the present study was conducted was a large medical university with a long and honored history in China. On average, there were 50 classes in each grade and approximately 30 medical students in each class. The undergraduate medical education usually took four or five years in China, but the 5th year medical students were in their internship in hospitals and were scattered in different locations, so they were not included in the current study. For students in their 1st to 4th academic years, a random cluster sampling method was used and paper-based questionnaires were distributed from September to November 2018 when medical students were taking English courses. The purpose of the study was explained beforehand by an English teacher in each randomly selected class and participation was voluntary with no incentives given. Every student who agreed to participate signed the written informed consent form and completed the questionnaire. After the questionnaires

were returned, we used the expectation maximization (EM) imputation method to replace the missing data. The study was approved by the Ethical Review Board of the authors' institution and complied with the Declaration of Helsinki.

Measures

Maladaptive Perfectionism

Medical students' levels of maladaptive perfectionism were measured by the Frost Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990) maladaptive perfectionism subscales. The 9 items of the Concern over Mistakes subscale in the original English version were reduced to 6 items in the Chinese version (Zi, 2007), which demonstrated good validity and reliability among Chinese college students. It is noticeable that the Chinese version of FMPS supported a five-factor structure without the subscale of Parental Criticism (Cheng et al., 1999), so we excluded the subscale of Parental Criticism in the current study. Thus, the three maladaptive perfectionism subscales used in the current study were Concern over Mistakes (6 items) (e.g., "People will probably think less of me if I make a mistake"), Parental Expectations (5 items) (e.g., "My parents set very high standards for me"), and Doubts about Actions (4 items) (e.g., "I usually have doubts about the simple everyday things I do"). Each item was scored on a 5-point Likert scale, ranging from 1 (completely disagree) to 5 (completely agree) and the total score of each of the three subscales was calculated and then summed up to indicate the overall levels of medical students' maladaptive perfectionism. The Cronbach's alpha coefficients for the three maladaptive perfectionism subscales in the present study were Concern over Mistakes (CM: 0.869), Parental Expectations (PE: 0.762), Doubts about Actions (DA: 0.661) and the Cronbach's alpha coefficient for the total Maladaptive Perfectionism Scale was 0.849. Confirmatory factor analysis (CFA) showed that the three-dimensional Maladaptive Perfectionism Scale had good validity ($\chi^2 = 337.265$, df = 73, p < 0.001, CFI = 0.970, TLI = 0.957, RMSEA = 0.047, SRMR = 0.032).

Self-Compassion

The 26-item Self-Compassion Scale (SCS; Neff, 2003) Chinese version was adopted to measure medical students' levels of self-compassion. Each item was rated on a 5-point Likert scale, ranging from 1 (almost never) to 5 (almost always) with a higher total score indicating a higher level of self-compassion. Among the six subscales, three were positively worded which included Self-Kindness (5 items) (e.g., "When I'm going through a very hard time, I give myself the caring and tenderness I need"), Common Humanity (4 items) (e.g., "When things are going badly for me, I see

the difficulties as part of life that everyone goes through"), and Mindfulness (4 items) (e.g., "When I fail at something important to me, I try to keep things in perspective"). By contrast, three subscales were negatively worded including Self-Judgment (5 items) (e.g., "I can be a bit cold-hearted towards myself when I'm experiencing suffering"), Isolation (4 items) (e.g., "When I fail at something that's important to me, I tend to feel alone in my failure"), and Over-Identification (4 items) (e.g., "When something painful happens, I tend to blow the incident out of proportion"). The items in these three negatively worded subscales needed to be reverse scored when calculating the total score to measure the overall levels of self-compassion. The Chinese version of the Self-Compassion Scale demonstrated good psychometric properties in previous studies (e.g., Zhang et al., 2016) and the Cronbach's alpha coefficients for the six subscales in the current study were Self-Kindness (SK: 0.771), Common Humanity (CH: 0.656), Mindfulness (MF: 0.780), Self-Judgment (SJ: 0.652), Isolation (IL: 0.741), Over-Identification (OI: 0.642) and the Cronbach's alpha coefficient for the total Self-Compassion Scale was 0.857. CFA showed that the Self-Compassion Scale as in a bi-factor model had good validity ($\chi^2 = 1346.661$, df = 255, p < 0.001, CFI = 0.924, TLI = 0.903, RMSEA = 0.051, SRMR = 0.037).

Life Satisfaction

The 5-item Satisfaction With Life Scale (SWLS; Diener et al., 1985) was used to measure medical students' cognitive judgments of life satisfaction. Each item was answered on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree), and the total score ranges from 7 to 35 with higher scores indicating more satisfaction with life. Example questions in SWLS are "The conditions of my life are excellent" and "So far I have gotten the important things I want in life". Wang et al. (2019), Wang & Du, 2020) used the Chinese version of SWLS in medical students which demonstrated the sound reliability of the scale. The Cronbach's alpha coefficient for the Satisfaction With Life Scale in the present study was 0.877. CFA showed that the unidimensional Satisfaction With Life Scale had good validity ($\chi^2 = 12.723$, df = 4, p = 0.013, CFI = 0.998, TLI = 0.996, RMSEA = 0.036, SRMR = 0.009).

Data Analyses

Statistical Package for the Social Sciences (SPSS) version 22.0 was used to conduct Pearson correlation analyses among the three subscales of maladaptive perfectionism, the six subscales of self-compassion and life satisfaction. Mplus version 7.4 was used to test the mediating effects of self-compassion and its components as in a bi-factor model using structural equation modeling (SEM) on the

relationship between maladaptive perfectionism and life satisfaction among medical students. In this mediation analysis, maximum likelihood estimator (ML) with 5000 bootstrap samples was adopted (Muthén & Muthén, 1998-2012). The mediating effects were regarded as significant if the bias-corrected and accelerated 95% confidence interval (BCa95%CI) for the indirect effects did not include zero (Baron & Kenny, 1986). As for SEM, model fit was indicated by the following indexes: (1) Chi-squares (χ^2) divided by degree of freedom (df); (2) Comparative Fit Index (CFI); (3) Tucker-Lewis Index (TLI); (4) Root Mean Squared Error of Approximation (RMSEA); (5) Standardized Root Mean Square Residual (SRMR). According to Hu & Bentler (1999), the model was of good fit with χ^2/df < 3 and the model was of acceptable fit with χ^2/df < 5. However, this index is sensitive to sample size, so other indexes need to be considered with CFI > 0.95, TLI > 0.95, RMSEA < 0.05, SRMR < 0.05 showing good model fit and CFI > 0.90, TLI > 0.90, RMSEA < 0.08, SRMR < 0.08 showing acceptable model fit.

Results

Common Method Bias Test

Since self-administered questionnaires were used as our data collection method, common method bias may occur. Therefore, we adopted Harman's single-factor approach to testing whether the common method bias effect was significant (Podsakoff et al., 2003). The test result reveals that there were 10 factors with Eigenvalues larger than 1 and these 10 factors cumulatively explained 59.699% of the total variance. The interpretation rate of the first factor was 20.256%, which was lower than the cut-off point of 40% (Podsakoff et al., 2003), so the common method bias effect in our study was not significant.

Descriptive Statistics and Correlations of Continuous Variables

Table 1 shows Pearson's correlation coefficients and descriptive statistics (M ± SD) of all study variables. As can be seen from the table, the three dimensions of maladaptive perfectionism (concern over mistakes, parental expectations, doubts about actions) were significantly negatively correlated with self-compassion and life satisfaction. The six subscales of self-compassion (self-kindness, self-judgment, common humanity, isolation, mindfulness, over-identification) were significantly negatively correlated with maladaptive perfectionism, while positively associated with life satisfaction. Maladaptive perfectionism was significantly negatively correlated with both self-compassion (r = −0.49, p < 0.001) and life satisfaction (r = −0.23, p < 0.001). The correlation between self-compassion and life satisfaction was significantly positive (r = 0.41, p < 0.001).

Factor Loadings for MP, SC and LS in the Mediation Model

Factor loadings for MP (maladaptive perfectionism), SC (self-compassion) and LS (life satisfaction) in the mediation model are presented in Table 2. The latent factor of

Table 1 Means (M), standard deviation (SD) and correlations of continuous variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1.CM	1											
2.PE	0.37***	1										
3.DA	0.44***	0.32***	1									
4.SK	−0.25***	−0.07**	−0.16***	1								
5.SJ	−0.43***	−0.25***	−0.33***	0.15***	1							
6.CH	−0.15***	−0.01	−0.07**	0.58***	−0.05*	1						
7.IL	−0.46***	−0.21***	−0.40***	0.21***	0.65***	0.05*	1					
8.MF	−0.27***	−0.05*	−0.16***	0.67***	0.05	0.62***	0.22***	1				
9.OI	−0.41***	−0.21***	−0.40***	0.13***	0.58***	−0.04	0.69***	0.20***	1			
10.MP	0.84***	0.74***	0.70***	−0.22***	−0.45***	−0.11***	−0.47***	−0.22***	−0.44***	1		
11.SC	−0.50***	−0.20***	−0.39***	0.71***	0.62***	0.54***	0.72***	0.69***	0.64***	−0.49***	1	
12.LS	−0.23***	−0.09**	−0.22***	0.33***	0.20***	0.23***	0.32***	0.29***	0.23***	−0.23***	0.41***	1
M	13.03	14.94	12.63	16.59	16.44	13.04	13.10	13.77	12.68	40.59	85.62	22.63
SD	5.79	4.77	3.63	3.90	3.61	3.10	3.47	3.24	3.04	10.91	13.38	6.48

N = 1653. *p < 0.05 (two-tailed); **p < 0.01 (two-tailed); ***p < 0.001 (two-tailed). *CM* Concern over mistakes; *PE* Parental expectations; *DA* Doubts about actions; *SK* Self-kindness; *SJ* Self-judgment; *CH* Common humanity; *IL* Isolation; *MF* Mindfulness; *OI* Over-identification; *MP* Maladaptive perfectionism; *SC* Self-compassion; *LS* Life satisfaction; SJ, IL and OI were reverse scored

Table 2 Factor loadings for MP, SC and LS in the mediation model

Construct	Indicator	Specific factor			General factor		
		loadings	SE	p	loadings	SE	p
MP	CM				0.642	0.048	<0.001
	PE				0.562	0.036	<0.001
	DA				0.728	0.051	<0.001
SK	S5	0.431	0.020	<0.001	0.457	0.028	<0.001
	S12	0.540	0.031	<0.001	0.603	0.032	<0.001
	S19	0.546	0.029	<0.001	0.652	0.031	<0.001
	S23	0.339	0.033	<0.001	0.462	0.027	<0.001
	S26	0.363	0.040	<0.001	0.423	0.030	<0.001
SJ	S1	0.376	0.014	<0.001	0.411	0.029	<0.001
	S8	0.510	0.025	<0.001	0.123	0.048	0.011
	S11	0.398	0.026	<0.001	0.369	0.043	<0.001
	S16	0.276	0.032	<0.001	0.545	0.040	<0.001
	S21	0.445	0.028	<0.001	0.294	0.051	<0.001
CH	S3	0.456	0.036	<0.001	0.568	0.036	<0.001
	S7	0.450	0.031	<0.001	0.274	0.030	<0.001
	S10	0.438	0.032	<0.001	0.436	0.030	<0.001
	S15	0.445	0.045	<0.001	0.586	0.039	<0.001
IL	S4	0.422	0.033	<0.001	0.450	0.051	<0.001
	S13	0.428	0.031	<0.001	0.399	0.048	<0.001
	S18	0.380	0.028	<0.001	0.354	0.041	<0.001
	S25	0.408	0.031	<0.001	0.444	0.046	<0.001
MF	S9	0.423	0.031	<0.001	0.581	0.033	<0.001
	S14	0.507	0.041	<0.001	0.649	0.039	<0.001
	S17	0.457	0.040	<0.001	0.602	0.037	<0.001
	S22	0.374	0.036	<0.001	0.582	0.031	<0.001
OI	S2	0.395	0.029	<0.001	0.391	0.046	<0.001
	S6	0.426	0.031	<0.001	0.458	0.028	<0.001
	S20	0.331	0.029	<0.001	0.435	0.037	<0.001
	S24	0.416	0.032	<0.001	0.477	0.046	<0.001
LS	LS1				0.793	0.011	<0.001
	LS2				0.933	0.007	<0.001
	LS3				0.888	0.008	<0.001
	LS4				0.717	0.015	<0.001
	LS5				0.504	0.019	<0.001

MP Maladaptive perfectionism; *CM* Concern over mistakes; *PE* Parental expectations *DA* Doubts about actions; *SC* Self-compassion; *SK* Self-kindness; *SJ* Self-judgment; *CH* Common humanity; *IL* Isolation; *MF* Mindfulness; *OI* Over-identification; *LS* Life satisfaction; S1-S26: the 26 items of the Self-Compassion Scale; LS1-LS5: the 5 items of the Satisfaction With Life Scale; SE: standard error

maladaptive perfectionism was represented by the three indicators, i.e. concern over mistakes, parental expectations and doubts about actions. The general factor of self-compassion and its six specific factors, i.e. self-kindness, self-judgment, common humanity, isolation, mindfulness and over-identification, were represented by the 26 items of the Self-Compassion Scale using a bi-factor model. Life satisfaction was represented by the 5 items of the Satisfaction With Life Scale. As can be seen in the table, factor loadings were all significant (p < 0.05), suggesting that all

latent factors were well represented by their corresponding indicators.

Direct and Indirect Effects in the Mediation Model

In order to test the mediating effects of self-compassion and its components on the relationship between maladaptive perfectionism and life satisfaction in medical students, we used structural equation modeling. Figure 1 shows the mediation model, which demonstrated good model fit:

Fig. 1 The Mediation model depicting mediating effects of self-compassion and its six factors on the relationship between maladaptive perfectionism and life satisfaction among medical students. *Note.* For simplicity, only structural paths with unstandardized path coefficients are shown. Dashed lines represent non-significant relationships. MP: maladaptive perfectionism; CM: concern over mistakes; PE: parental expectations; DA: doubts about actions; SC: self-compassion; SK: self-kindness; SJ: self-judgment; CH: common humanity; IL: isolation; MF: mindfulness; OI: over-identification; LS: life satisfaction; S1-S26: the 26 items of the Self-Compassion Scale; LS1-LS5: the 5 items of the Satisfaction With Life Scale; *p < 0.05 (two-tailed);***p < 0.001 (two-tailed)
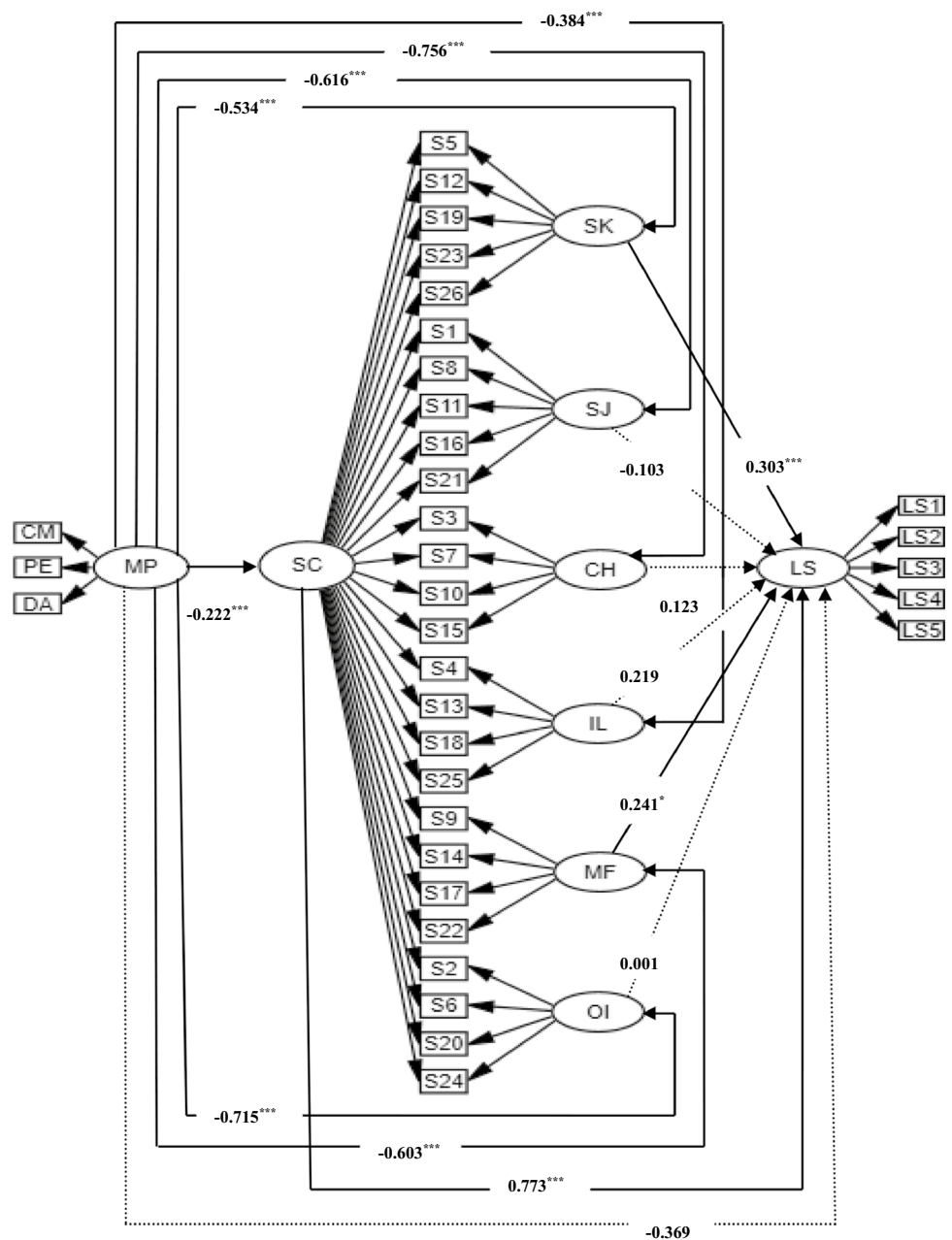
$\chi^2(898, \text{N} = 1653) = 5186.145$, p < 0.001, CFI = 0.958, TLI = 0.937, RMSEA = 0.054 [95%CI: 0.052, 0.055], SRMR = 0.078. The direct and indirect effects on the relationship among maladaptive perfectionism, self-compassion with its components (self-kindness, self-judgment, common humanity, isolation, mindfulness, over-identification), and life satisfaction are presented in Table 3. It is clear to see from the table that the associations between maladaptive perfectionism and self-compassion, and between maladaptive perfectionism and the components of self-compassion were all significant (p < 0.001), while only self-compassion and its two specific factors of self-kindness and mindfulness were significantly correlated

with life satisfaction (p < 0.05). As for the mediating effects, the general factor of self-compassion and its two specific factors of self-kindness and mindfulness played significant mediating roles (BCa95%CI of indirect effects did not include 0) in the relationship between maladaptive perfectionism and life satisfaction among medical students. Since the direct effect of maladaptive perfectionism on life satisfaction became non-significant (B = −0.369, p = 0.375) after adding the potential mediators, the general factor of self-compassion with its two specific factors of self-kindness and mindfulness fully mediated the relationship between maladaptive perfectionism and life satisfaction in medical students (Judd & Kenny, 1981).

Table 3 Direct and indirect effects on the relationship among MP, SC and LS

	B	BCa95%CI	p
Direct effects			
From MP to SC	−0.222		<0.001
From MP to SK	−0.534		<0.001
From MP to SJ	−0.616		<0.001
From MP to CH	−0.756		<0.001
From MP to IL	−0.384		<0.001
From MP to MF	−0.603		<0.001
From MP to OI	−0.715		<0.001
From SC to LS	0.773		<0.001
From SK to LS	0.303		<0.001
From SJ to LS	−0.103		0.422
From CH to LS	0.123		0.235
From IL to LS	0.219		0.360
From MF to LS	0.241		<0.05
From OI to LS	0.001		0.999
From MP to LS	−0.369		0.375
Specific indirect effects			
From MP to LS via SC	−0.172	−0.300 ~ −0.171	<0.001
From MP to LS via SK	−0.162	−0.214 ~ −0.136	<0.001
From MP to LS via SJ	0.064	−0.058 ~ 0.119	0.479
From MP to LS via CH	−0.093	−0.127 ~ 0.072	0.309
From MP to LS via IL	−0.084	−0.280 ~ 0.191	0.382
From MP to LS via MF	−0.145	−0.187 ~ −0.135	<0.05
From MP to LS via OI	0.000	−0.030 ~ 0.019	1.000
Sum of indirect effect	−0.592	−0.732 ~ −0.185	<0.001

MP Maladaptive perfectionism; *SC* Self-compassion; *SK* Self-kindness; *SJ* Self-judgment; *CH* Common humanity; *IL* Isolation; *MF* Mindfulness; *OI* Over-identification; *LS* Life satisfaction; *B* Unstandardized regression coefficients; BCa95%CI: bias-corrected and accelerated 95% confidence interval

Discussion

The present study used a bi-factor model to explore the mediating effects of self-compassion and its components on the relationship between maladaptive perfectionism and life satisfaction among Chinese medical students. The results show that maladaptive perfectionism was negatively associated with life satisfaction in medical students, and self-compassion as a general factor with its two specific factors of self-kindness and mindfulness played significant mediating roles in this relationship.

Our study found that maladaptive perfectionism was negatively associated with life satisfaction and this finding is consistent with conclusions of some previous research (e.g., Mitchelson & Burns, 1998; Stoeber & Stoeber, 2009). Life satisfaction, as a major component of positive well-being, is subjective perception of one's life as a whole and is found to predict long-term health outcomes. Among medical students,

life satisfaction was reported to be negatively correlated with behavioral exhaustion, cynicism, stress and attention-deficit/hyperactivity disorder (ADHD) (Cho & Jeon, 2019; Shi et al., 2015; Shi et al., 2018). Medical institutions should pay attention to the negative impacts of medical students' maladaptive perfectionism on their life satisfaction levels and should try to implement effective interventions. Chand et al. (2018) used a case series methodology with an A-B design plus follow-up and implemented an eight-session Cognitive Behavioral Therapy (CBT) program to decrease maladaptive perfectionistic tendencies in medical students. The results show that the CBT program was effective in lowering medical students' maladaptive perfectionism levels, and at the 3- and 6-month follow-ups, the effect of reduced levels of maladaptive perfectionism was maintained. Students also reported that the CBT program was effective in helping them relieve stress and improve life quality. This study provided promising results for the use of CBT in medical education to help medical students reduce maladaptive perfectionism and enhance life satisfaction. However, except for this study by Chand and colleagues, through a search of literature, we found few studies exploring the effective measures to lower medical students' maladaptive perfectionism levels in order to help them improve life satisfaction levels, so more research needs to be conducted in this area.

The mediation analysis of the present study confirmed our hypothesis that self-compassion as a general factor played a significant mediating role in the relationship between maladaptive perfectionism and life satisfaction among Chinese medical students. Lower levels of maladaptive perfectionism in medical students were associated with higher levels of self-compassion, which in turn, contributed to medical students' higher life satisfaction levels. Conversely, higher levels of maladaptive perfectionism in medical students were associated with lower levels of self-compassion, which in turn, led to medical students' lower life satisfaction levels. Rooted in Buddhism, self-compassion is considered a healthy way of relating to oneself, a kind of emotional resilience that helps an individual recover from negative attitudes brought by mistakes, failures and difficulties. Medical students with high self-compassion levels take a balanced stance and objective perspective in predicament as they recognize that imperfection is inherent and painful life situations are unavoidable. Thus, self-compassionate medical students would embrace the painful thoughts and emotions generated by perceived inadequacies rather than run away from or ruminate on them. They would view the negative circumstances with mindful awareness rather than over-identify with them, treat themselves with understanding and kindness rather than with criticism or self-judgment, and regard painful life situations as shared human experiences rather than feel isolated or separated. With this type of positive attitudes in negative situations, medical students with

high self-compassion levels first actively feel and embrace the pain and then effectively alleviate the pain. As the saying goes "What we can't feel, we can't heal" (Neff, 2011b), if we want to recover from the suffering in negative life situations, we need to accept what happened and embrace the pain rather than avoid or run away from them. Therefore, self-compassion can be viewed as an adaptive emotion-focused strategy that helps medical students recover from emotional suffering and promotes mental health. This may probably explain the reason why self-compassion could buffer the negative impacts of maladaptive perfectionism on medical students' life satisfaction.

By using a bi-factor model, self-kindness and mindfulness, two specific factors of self-compassion, were shown to play significant mediating roles in the relationship between maladaptive perfectionism and life satisfaction among Chinese medical students. Self-kindness, as opposed to self-judgment, entails extending kindness towards oneself instead of treating oneself with harsh criticism in negative life situations. Mindfulness, as a major component of self-compassion, entails viewing one's present-moment experience in a clear and balanced perspective so that one neither ignores nor exaggerates the painful thoughts and emotions engendered by negative life experiences. It is worth mentioning that mindfulness, as an important component of self-compassion, is not exactly the same as the concept "mindfulness" in a broad sense. The mindfulness component of self-compassion entails taking a balanced, or "mindful" approach to painful life experiences, neither repressing nor exaggerating the negative emotions evoked by life difficulties. On the other hand, mindfulness in a general sense means concentrating on the present experience with equanimity – no matter what kind of experience it is - positive, negative or neutral (Neff & Germer, 2013). Another difference is that mindfulness in general emphasizes the experience itself (i.e. thoughts, feelings, etc.) while the mindfulness component of self-compassion focuses on the person in suffering, the experiencer (Germer, 2009). Despite the differences, however, the two constructs of mindfulness and self-compassion are closely related, and interventions such as the Mindful Self-Compassion program (MSC) and mindfulness-based stress reduction (MBSR) were found to be promising at enhancing self-compassion, mindfulness and well-being (de Vibe et al., 2013; Erogul et al., 2014; Neff & Germer, 2013).

Neff presented the concept of self-compassion as it comprised three main components: self-kindness versus self-judgment, common humanity versus isolation, mindfulness versus over-identification (Neff, 2003). These components interacted and combined to create a self-compassionate frame of mind. Although mindfulness as an essential component of self-compassion is not exactly the same as the concept "mindfulness" in general, they are both rooted in Buddhism and involve focusing on the present-moment experience with acceptance. This mindful approach helps a person recover from suffering as the person, the experiencer, would not be carried away or ruminate on the painful feelings, but fully aware of these feelings to extend compassion towards the self. Compassion, as an important part of psychotherapy, is interpreted as the intimate awareness of the suffering by oneself or others, with the wish to alleviate it (Germer & Neff, 2013). Research shows that when asked directly, most people reported that they were more compassionate to others than to themselves (e.g., Neff, 2003). In medical education, empathy has long been emphasized as a goal since qualified healthcare professionals need to stand in patients' shoes, to understand and share their emotions and feelings. Considering the associations among the concepts of compassion for others, compassion for oneself, sympathy and empathy as they all contain the element compassion, self-compassion should have its implications and meaningfulness in medical education. A study by Neff & Pommier (2013) concluded that self-compassion and compassion for others went hand in hand and suggested that self-compassion was not only associated with personal well-being, but was also linked to concern for the well-being of others. Neff and Germer (2013) implemented a Mindful Self-Compassion program (MSC) and found that besides enhancing participants' self-compassion and mindfulness, MSC also increased compassion for others, which suggested that self-compassion nurtured mutual understanding and empathy for all. Since our study shows that the general factor of self-compassion with its two-specific factors of self-kindness and mindfulness together had a full mediating effect on the relationship between maladaptive perfectionism and life satisfaction among medical students, medical institutions and related authorities need to consider providing training programs such as the Mindful Self-Compassion program (MSC), mindfulness-based stress reduction (MBSR) and mindfulness-based cognitive therapy (MBCT) to enhance medical students' self-compassion levels and improve their mental health. By raising medical students' mindful awareness, students' empathy and their compassion for others can also be fostered, which should be of significant value for these future physicians and health professionals.

Strengths and Limitations

Since the establishment of the discipline positive psychology by Martin Seligman and colleagues (Seligman, 2002; Seligman & Csikszentmihalyi, 2000), great emphasis has been put on emotional regulation resources such as self-esteem and psychological capital (self-efficacy, resilience, optimism and hope). In recent years, however, self-compassion has been demonstrated in numerous studies as another important emotional regulation resource and an essential psychological

health protective factor (e.g., Allen et al., 2012; Karl et al., 2018; Mackintosh et al., 2018). Although empirical studies have demonstrated the negative correlation of maladaptive perfectionism with self-compassion (e.g., Neff, 2003), the positive association between self-compassion and life satisfaction (e.g., Neff et al., 2007b), and the negative relationship between maladaptive perfectionism and life satisfaction (e.g., Stoeber & Stoeber, 2009), to the best of our knowledge, there has been no study probing the mediating role of self-compassion in the relationship between maladaptive perfectionism and life satisfaction among medical students. Our study is the first one to explore the mediating effects of self-compassion and its components on this relationship by using a bi-factor model among a large sample of undergraduate medical students. The results show that medical students' maladaptive perfectionism was significantly negatively related to their life satisfaction, and self-compassion as a general factor with its two specific factors of self-kindness and mindfulness played significant mediating roles in this relationship.

The findings of the present study have important implications for medical education. First, medical institutions can improve medical students' life satisfaction levels through reducing their maladaptive perfectionism levels. Currently, Cognitive Behavioral Therapy (CBT) is considered as the mainstream intervention targeted for decreasing perfectionistic tendencies which has been implemented and tested in different population groups with elevated perfectionism, such as people with depression and anxiety disorders (Mahmoodi et al., 2020), people with obsessive compulsive disorder (OCD) (Sadri et al., 2017), people with eating and mood disorders (Handley et al., 2015), among pregnant women (Lowndes et al., 2019) and among university students (Radhu et al., 2012). However, research on effective interventions to lower medical students' maladaptive perfectionism in order to raise their life satisfaction is scarce, and we found only one such study by Chand et al. (2018), so more research needs to be conducted in this area. Second, medical institutions can nurture medical students' self-compassion, a malleable construct, to enhance their life satisfaction. In medical education, some studies have already demonstrated the effectiveness of mindfulness-based stress reduction (MBSR) and mindfulness training programs in increasing medical students' self-compassion, mindfulness and psychological well-being, while decreasing their stress, anxiety and depression (de Vibe et al., 2013; Erogul et al., 2014; Moore et al., 2020; Shapiro et al., 1998; van Dijk et al., 2017). One direction for future studies in medical education is to test whether mindfulness-based and self-compassion-based interventions can also be effective in lowering medical students' maladaptive perfectionism levels. To the best of our knowledge, up to now, no literature has explored this issue.

Several limitations of the present study should be acknowledged. First, the cross-sectional design of the present study did not allow conclusions about causality to be drawn and future experimental as well as longitudinal research is suggested. Second, self-administered questionnaires were distributed as our data collection method which means response bias and social desirability bias cannot be avoided. Third, this study was conducted at only one medical university in China, so generalizations about the results should be made with caution and multi-institutional studies in different cultures are recommended in the future. Fourth, the questionnaires used in this study were pencil and paper-based, so response order effect may influence the research results.

Conclusion

In conclusion, maladaptive perfectionism was negatively related to life satisfaction among medical students and self-compassion as a general factor with its two specific factors of self-kindness and mindfulness played a full mediating role in this relationship. Medical institutions and related authorities need to find effective interventions to lower medical students' maladaptive perfectionism levels and raise their self-compassion levels in order to improve their life satisfaction.

Declarations

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