



Mediating Effects of Self-Esteem on the Relationship Between Self-Compassion and Empathy Among Vietnamese University Students

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Abstract

Empathy is a critical element of subjective well-being and an important personality trait among undergraduate students. To improve empathy among undergraduate students, the current study examined the relationship between self-compassion and empathy and the mediating role of self-esteem in this relationship. Participants were six hundred and twenty-two (320 males and 302 females) students from five Vietnamese universities, aged 18–21 years ($M_{age} = 19.5$; $SD_{age} = 0.95$ years), who completed the self-compassion scale (SCS), empathy scale in adults (BES-A), and self-esteem scale of Toulouse (ETES). The results indicated that (1) self-compassion was positively associated with empathy; (2) self-esteem mediated the relationship between the two variables. Therefore, enhancing undergraduate students' self-compassion may be an effective way to improve their empathy. However, additional studies are required to elucidate the role of self-compassion in the educational context.

Keywords Empathy · Self-compassion · Self-esteem · Students · Universities · Vietnam

Introduction

Empathy is a multifaceted concept that entails both affective and cognitive elements; and these elements consist of “the capacity to experience the emotions of another” and “the capacity to comprehend the emotions of another” respectively (Jolliffe & Farrington, 2006, p. 589). For instance, empathetic individuals can connect to and

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understand someone else's suffering by putting themselves in their shoes (Hemmerdinger et al., 2007; Sinclair et al., 2017). More interestingly, research on empathy has been extensively conducted in the field of health professions education, demonstrating that empathy is a crucial personality trait for students (e.g., Huang et al., 2019; Sa et al., 2019). Preliminary findings have found positive associations between empathy towards others and subjective well-being among college students (Wei et al., 2011). For example, students with higher empathy reported higher levels of life satisfaction (Coll et al., 2020) and lower levels of negative affect and higher levels of happiness (Tkach, 2005; Wei et al., 2011). However, young adults in college are unlikely to have an in-depth understanding of themselves or others, particularly the interconnected nature of their own and others' suffering that comes with getting older and having necessary life experiences (Grotevant et al., 1999; Marcia, 1994). Therefore, it is important to cultivate empathy in undergraduate students.

Various studies have demonstrated a link between self-compassion and empathy (e.g., Lyvers et al., 2020; Marshall et al., 2020; Welp & Brown, 2014). However, their research findings have been limited, and empirical research on mediating mechanisms in the relationships between self-compassion and empathy remains unclear. Regarding the research findings, several studies have demonstrated a positive association between self-compassion and empathy (as measured by Toronto Empathy Questionnaire) (Lyvers et al., 2020) while other research has supported mixed results (Marshall et al., 2020) or they did not report any relationships between self-compassion and empathetic concern which is a subscale of empathy (Neff & Pommier, 2013). Previous studies have also shed light on the direct influences of (1) self-compassion on empathy (Lyvers et al., 2020; Welp & Brown, 2014), (2) self-compassion on self-esteem (Barry et al., 2015; Souza & Hutz, 2016; Tran et al., 2022c), and (3) self-esteem on empathy (Huang et al., 2019; Sa et al., 2019). Due to the inconsistencies in previous work and a few studies on the mediating mechanisms between self-compassion and empathy, there has been a need for more research to investigate the factors that may intervene in the relationships between self-compassion and self-esteem (see Marshall et al., 2020). This is also the gap that this current study seeks to cover. Our research aimed to uncover the factors that contribute to achieving and sustaining undergraduate students' empathy.

Self-Compassion and Empathy

Cross-sectional studies have found a positive link between self-compassion and empathy (e.g., Lyvers et al., 2020; Marshall et al., 2020; Neff & Pommier, 2013; Welp & Brown, 2014). According to Yang et al. (2019), 'self-compassion involves treating oneself with kindness rather than harsh judgment, viewing imperfection as an inherent part of shared human experience rather than seeing them as isolating, and being mindful of painful feelings rather than over-identifying with them' (p. 2035). Since one primary component of self-compassion involves feeling connected to the wider human experience of suffering without isolating and separating oneself (Neff, 2003), self-compassionate students should be able to perceive and respond sensitively to their own and others' suffering. Therefore, self-compassion improves

different elements of empathy and provides special qualities of being motivated by love, forgiveness, and kindness (Sinclair et al., 2017). For example, in a sample of 384 college undergraduates, higher levels of self-compassion were significantly related to greater perspective taking as a subscale of empathy (Neff & Pommier, 2013). Among 253 young adults from two Australian universities, all three positive self-compassion subscales—self-kindness, common humanity, and mindfulness were significantly positively associated with empathy (Lyvers et al., 2020). Similarly, cognitive empathy is positively related to self-compassion among adolescent students (Marshall et al., 2020). From the arguments and evidence above, we assumed that self-compassion is significantly positively correlated with empathy.

Self-Esteem as a Mediator in the Relationship Between Self-Compassion and Empathy

To the best of our knowledge, no recent studies have examined self-esteem as a mediator in the link between self-compassion and empathy. Nonetheless, our research hypothesized that self-esteem mediates the relationship between self-compassion and empathy. Self-esteem refers to an individual's overall positive evaluation of the self, including two different components: competence and worth (Cast & Burke, 2002; Rosenberg et al., 1995) and increasing from adolescence (Orth & Robins, 2014). Cross-sectional and experimental studies have supported a positive correlation between self-esteem and empathy (e.g., Huang et al., 2019; Sa et al., 2019; Stotland & Dunn, 1963). In particular, at the University of Washington, undergraduate students with high self-esteem were more empathetic towards someone who worked on similar tasks (Stotland & Dunn, 1963). This finding suggests that students with high degrees of self-esteem are less preoccupied with themselves and more likely to “lose themselves” in other people (Stotland & Dunn, 1963, p. 539). Sa et al. (2019) also found a positive relationship between self-esteem and empathy in all 515 freshmen. In a cross-sectional study of 1690 medical students in Shanghai, self-esteem positively correlated with empathy (Huang et al., 2019). Similarly, according to Social Identity theory (Tajfel & Turner, 2004), individuals' self-esteem emerges from the social group to which they live and feel belonging to. Moreover, if individuals tend to have a good perception of the group, especially group members, they can have more empathy and positive emotions (e.g., happiness, optimism, and pride). In this situation, self-esteem may positively correlate with empathy.

However, various studies have suggested that self-compassion and self-esteem are positively correlated (Barry et al., 2015; Reilly et al., 2014; Souza & Hutz, 2016). Theoretically, self-compassion is based on feelings, concerns, and non-judgmental comprehension of oneself and others, whereas self-esteem is based on positive self-evaluation (Neff & Vonk, 2009). Neff (2003) also revealed that self-compassion and self-esteem are equivalent predictors of happiness, optimism and positively impact mental health. For instance, students with high levels of compassion and self-esteem experience fewer negative emotions when receiving bad feedback (Leary et al., 2007). This means that self-compassion could be positively correlated with self-esteem as both contribute to reducing negative feelings (Donald et al., 2018; Reilly et al., 2014). Empirically, the

‘self-compassion-as-antecedent’ model suggests that self-compassion is highly associated with self-esteem (Souza & Hutz, 2016). In other words, self-compassionate individuals have a forgiving attitude toward their faults and failures (Neff et al., 2005), and such forgiveness is found to lead to less negative self-evaluations, such as social comparison and self-rumination, thus enhancing self-esteem (Neff & Vonk, 2009). Similarly, Reilly et al. (2014) revealed that higher levels of self-compassion were positively correlated with higher self-esteem in male students with lower trait shame. This finding suggests that men who are self-compassionate have a higher sense of self-esteem than those who do not forgive their faults. Similarly, Barry et al. (2015) found that self-compassion signals “a relatively secure and positive sense of self”, which demonstrated a significant positive association with self-esteem in a sample of 251 male adolescents (p. 122). In summary, self-compassion predicts self-esteem, which in turn can promote empathy. Thus, self-esteem can play a mediating role in the relationship between self-compassion and empathy.

In the Current Study

In this study, self-esteem was hypothesized to be a mediator in the link between self-compassion and empathy. According to Self-compassion theory, self-compassion is conceptualized as to include three main elements: (i) to enrich feelings of caring and kindness towards oneself; to acknowledge that suffering is a common part of the human condition; and to believe that oneself and others deserve kindness and understanding (Neff, 2003). Being caring and kind to oneself protects individuals against their engagement in (positive or negative) self-evaluation or conformity to ideal standards to consider themselves acceptable, which may maintain positive self-esteem (Neff, 2003). Moreover, the notion that all humans suffer and deserve human kindness is inherent in self-compassion, which may motivate compassionate responses towards others (e.g., empathy) (Neff, 2003). The Self-compassion theory has also acknowledged that gender can affect the above variables (self-compassion, self-esteem, and empathy) (Neff, 2003). Additionally, several studies have indicated that gender influences self-compassion (Neff, 2003), self-esteem (Bleidorn et al., 2016; Helwig & Ruprecht, 2017; Orth et al., 2012, 2014), and empathy (Christov-Moore et al., 2014). From the above studies and theories, gender can be a factor that impacts the aforementioned variables. This is why gender was controlled for in our hypothesized model to examine the relationships among self-compassion, self-esteem and empathy (Fig. 1).

Hypothesis 1 Self-compassion is positively associated with empathy.

Hypothesis 2 Self-esteem will mediate the relationship between self-compassion and empathy.

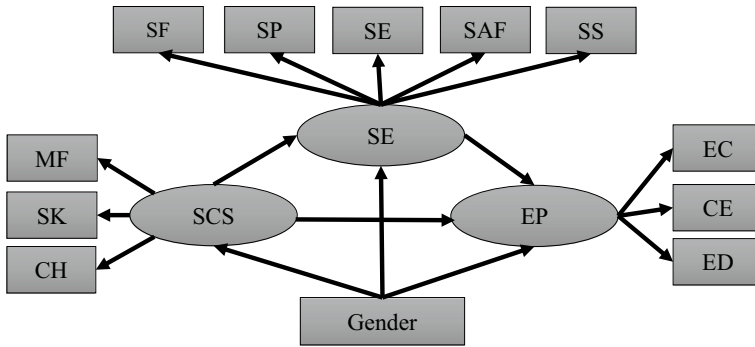


Fig. 1 Model of the hypothesized mediator role of self-esteem in the relationship of self-compassion with empathy while controlling for gender. *Notes:* SCS: self-compassion; MF: mindfulness; SK: self-kindness; CH: common humanity; SE: self-esteem; PS: physical self; AF: academic future self; ES: emotional self; SS: social self; FS: family self; EP: empathy; EC: emotional contagion; CE: cognitive empathy; ED: emotional disconnection

Methodology

Participants and Procedures

The survey instrument was sent to 622 Vietnamese participants from five universities located in Ho Chi Minh City, Vietnam. The participants' ages ranged from 18 to 21 years ($M_{age} = 19.5$; $SD_{age} = 0.95$ years). Among the 622 students, 320 (51.4%) were male and 302 (48.6%) were female. Regarding school year, 101 (16.2%), 208 (33.4%), 214 (34.4%), and 99 (15.9%) were freshmen, sophomores, juniors, and seniors respectively.

Procedure

Ethical approval was obtained from the corresponding author's university. This study was designed using a convenience sampling method to select participants.

Our sampling approach aimed to (a) obtaining a nationally diverse sample from undergraduate universities in Vietnam through Google. (b) Students were contacted from various university majors (e.g., social work, psychology, social science, medicine, and engineering). (c) Participating university students were contacted by our group, provided with information about the research aims, and asked for their consent to participate. (e) The participants completed the study measures using an anonymous self-report questionnaire. (f) Students took an average of 20 min to complete all questions, including demographic information, self-compassion, self-esteem, and empathy.

Measures

Self-Compassion Scale (SCS)

The Self-Compassion Scale (SCS) introduced by Neff (2003) was used, with a total of 26 items. It has six dimensions measured on a 5-point Likert scale ranging from 1 (almost never) to 5 (almost always). The scale adapted to Vietnamese students (Nguyen et al., 2020; Tran et al., 2022a, 2022b) has good reliability and validity. Our Confirmatory Factor Analysis (CFA) showed that the measurement model achieved a satisfactory fit at $X^2/df=3.07$ ($p < 0.001$); $CFI=0.90$; $TLI=0.90$; $RMSEA=0.06$, and $90\% CI [0.06,0.07]$, Cronbach's $\alpha=0.90$.

Self-Esteem Scale of Toulouse (ETES)

The Self-Esteem Scale of Toulouse consisted of 33 items. Respondents indicated their extent of agreement with each item on a scale ranging from 0 = strongly disagree to 4 = strongly agree. Participants were asked to complete the Vietnamese version of the self-esteem scale of Toulouse (ETES) in Vietnam for students (Trinh et al., 2017). ETES includes five subscales: Physical self (PS), Academic future self (AF), Emotional self (ES), Social self (SS), and Family self (FS) (Linh et al., 2017). CFA showed that the measurement model obtained an adequate fit at: $X^2/df=2.75$ ($p < 0.001$); $CFI=0.90$; $TL=0.91$; $RMSEA=0.05$; and $90\% CI [0.05, 0.06]$.

Empathy Scale in Adults (BES-A)

Empathy is to understand and share others' thoughts or feelings, requiring people to place themselves in another's position (Bellet, 1991). Jolliffe and Farrington (2006) developed the Basic Empathy Scale (BES) with 20 items for students in England. It includes two components: cognitive and affective empathy (Jolliffe & Farrington, 2006). There have been several studies that have attempted to test the psychometric properties of the BES in different cultures and languages, such as Italian (Albiero et al., 2009), French (D'Ambrosio et al., 2009), Slovak (Čavojská et al., 2012), Portuguese (Anastacio et al., 2016), Spanish (Villadangos et al., 2016), and German (Heynen et al., 2016).

In 2013, Carré and colleagues validated the English version of the Basic Empathy Scale on French adult participants (BES-A). Participants responded on a 5-point Likert scale ranging from 1 = strongly disagree, to 5 = strongly agree. In the three-factor model, five items assessed emotional contagion (EC) (Items 2, 5, 11, 15, and 17), eight items assessed cognitive empathy (CE) (Items 3, 6, 9, 10, 12, 14, 16, and 20), and six items assessed emotional disconnection (ED) (Items 1, 7, 8, 13, 18, and 19). The BES-A was chosen to collect data for this study as the content of the scale was more suitable for the participants. Furthermore, no Vietnamese version has been translated and validated to measure Vietnamese students' empathy. The BES-A was translated into Vietnamese by two Vietnamese researchers proficient in English. Subsequently, an independent translator translated the scale again from Vietnamese to English. Then a pilot test with ten

participants from five universities in Ho Chi Minh City was conducted to verify the Vietnamese version of the BES-A. The students involved in the study were asked to evaluate the language of each subscale. In the next step, the language could be revised if students felt that it was inappropriate in the Vietnamese context or hindered their understanding. Finally, our study used AMOS software to analyze CFA of the BES-A Scale. The relevance of the model was accepted at $\chi^2/df = 4.06$ ($p < 0.001$), $GFI = 0.95$; $TLI = 0.90$; $CFI = 0.90$; $RMSEA = 0.07$, and 90% CI [0.06, 0.08]. In this study, the cronbach alpha for the overall scale was 0.66.

Data Analysis

The data were analyzed using SPSS 20 and AMOS 24. First, we investigated the correlations among self-compassion, self-esteem, and empathy. Second, CFA was conducted to confirm the adequacy of the factor structure for BES-A. Third, we examined the mediation model, so path analysis which is a subset of Structural Equation Modeling (SEM) was used to test the direct and indirect effects of self-compassion on empathy. The model included three latent variables (self-compassion, self-esteem, and empathy) comprising 11 parameters. Finally, we evaluated the model fit, following the requirements of a good model fit proposed by Hu and Bentler (1999). A good model fit needs to satisfy the following criteria: Root Means the Square Error of Approximation ($RMSEA$) < 0.08 , Comparative Fit Index (CFI) > 0.90 , and Tucker-Lewis Index (TLI) > 0.90 , Comparative fit index (CFI) > 0.90 .

Measurement Model

We test three latent variables (self-compassion, self-esteem, and empathy) and 11 observed variables in the model. The results indicated a satisfactory model fit: χ^2 (35, $N = 622$) = 155.80, $p < 0.001$; $CFI = 0.96$; $TLI = 0.90$; $GFI = 0.92$; $RMSEA = 0.08$, 90% CI [0.06, 0.09], which demonstrated that the respective indicators were the true representatives of their latent factors.

Results

Common Method Bias Test

In this study, we collected data using students' self-reports, which may lead to a popular bias deviation approach. To test this phenomenon, we used a single-factor Harman test for all the measurement items. The analysis revealed that all 11 variables had value greater than one. The first factor was responsible for 21.65 percent of the overall variation, which is less than 40% (Kock, 2015) (Table 1, Fig. 2).

Table 1 Self-compassion, self-esteem, and empathy were positively correlated (.11 to .49, $p < .01$)

Constructs	M	SD	1	2	3	4
1. Gender	1.49	.50	1			
2. Self compassion	3.27	.43	-.03	1		
3. Self Esteem	3.02	.36	-.12**	.49**	1	
4. Empathy	45.07	6.18	.17**	.24**	.11**	1

Gender was negatively correlated with self-esteem ($r = -.12$, $p < .01$) and positively correlated with empathy ($r = .17$, $p < .01$). However, gender was not significantly correlated with self-compassion ($r = -.03$, $p = .73$)

** $p < 0.01$; * $p < 0.05$

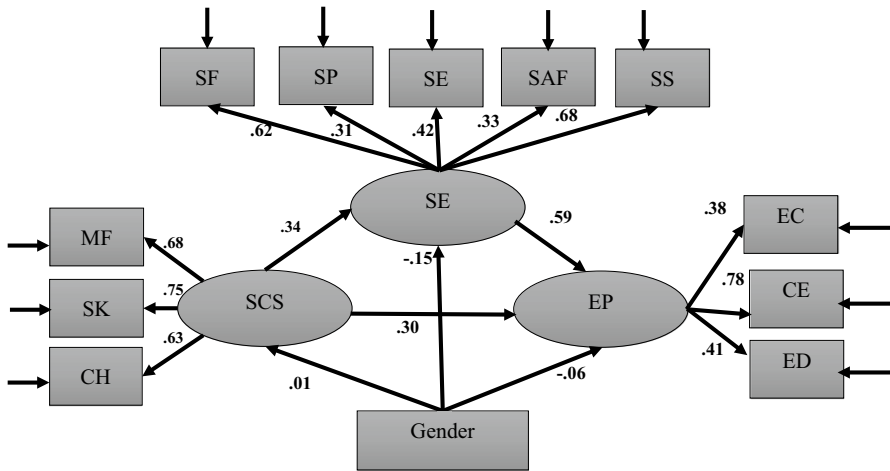


Fig. 2 Standardized parameter estimates of the final model. ($N = 622$). Notes: SCS: self-compassion; MF: mindfulness; SK: self-kindness; CH: common humanity; SE: self-esteem; PS: physical self; AF: academic future self; ES: emotional self; SS: social self; FS: family self; EP: empathy; EC: emotional contagion; CE: cognitive empathy; ED: emotional disconnection

Structural Model

After controlling for gender, the structural model examined the relationships among self-compassion, self-esteem, and empathy. The results showed a good fit for the data: ($\chi^2/41$ ($N = 622$) = 183.19, $p < 0.001$, $GFI = 0.95$; $CFI = 0.90$; $TLI = 0.90$; $RMSEA = 0.08$, and $90\% CI [0.07, 0.09]$). First, the direct path coefficient from self-compassion to empathy was significant ($\beta = 0.30$, $p < 0.05$, $95\% CI [0.17; 0.42]$). Therefore, supported hypothesis 1. Both the path coefficients from self-compassion to self-esteem ($\beta = 0.34$, $p < 0.05$, $95\% CI [0.17, 0.51]$) and from self-esteem to empathy were significant ($\beta = 0.59$, $p < 0.05$, $95\% CI [0.45, 0.73]$). Third, as shown in Table 2, the indirect effect of self-compassion on empathy mediated by self-esteem was estimated at ($\beta = 0.50$, $p < 0.01$, $95\% CI [0.10; 0.60]$), indicating self-compassion on empathy via self-esteem. Thus, supported hypothesis 2. Finally, the

Table 2 Direct and indirect effect of variables

Variables	Estimate	95% CI	
		Lower	Upper
SCS → SE	.34	.17	.51
SE → EP	.59	.45	.73
SCS → EP	.30	.17	.42
G → SE	-.15	-.25	-.06
G → SCS	.01	-.09	.12
G → EP	-.06	-.15	.03
SCS → SE → EP	.50	.10	.60

G Gender, SCS self-compassion, SE self-esteem, EP empathy

fully mediated model had an acceptable fit to the data: ($\chi^2/41$ ($N=622$)=183.19, $p < 0.001$, $GFI=0.95$; $CFI=0.90$; $TLI=0.90$; $RMSEA=0.08$, and 90% CI [0.07, 0.09]).

Discussion

Self-Compassion and Empathy

The present study confirms that self-compassion plays a significant role in empathy. Specifically, this finding is congruent with previous studies indicating that self-compassion is a positive predictor of empathy (Lyvers et al., 2020; Marshall et al., 2020; Neff & Pommier, 2013; Welp & Brown, 2014), supporting hypothesis 1. Attachment theory (Bowlby, 1982) emphasizes that caring for and protecting others are based on the capacity of empathy, love, and positive behaviors to support others, meaning that empathy is the foundation of compassion for others. Specifically, individuals with higher self-compassion levels demonstrate better levels of empathy (e.g., tolerating and helping other people) (Neff & Pommier, 2013; Sinclair et al., 2017). Our findings confirmed that self-compassion is correlated with empathy, which is in line with previous studies indicating that self-compassion and empathy are related as they both ask people to relate themselves to others (Birkett, 2014; Birnie et al., 2010).

The Mediation Role of Self-Esteem Between Self-Compassion and Empathy

After controlling gender, self-esteem significantly mediated the impact of self-compassion on empathy. SEM (Structural Equation Model) analysis showed that self-esteem played a mediating role in the relationship between self-compassion and empathy. In other words, high self-compassion can create empathy and self-esteem, which supports our second hypothesis—hypothesis 2.

In the first phase of the single pathway from self-compassion to self-esteem, our results are consistent with previous findings that self-compassion is

significantly positively associated with self-esteem (Barry et al., 2015; Reilly et al., 2014; Souza & Hutz, 2016). Neff (2003) argued that self-compassion helps increase a sense of self-worth as an obvious outcome of being kind to oneself and acknowledging common humanity:

Self-compassionate participants were more likely to have high self-esteem than those who lacked self-compassion. This relationship was expected, as those individuals who are kind to themselves, recognize their common humanity, and can take a balanced emotional perspective on themselves should also be likely to have a higher sense of self-worth than those who are harshly critical of themselves, feel isolated in their failure or inadequacy, and who are over-identified with their feelings (p. 241).

Furthermore, self-compassion and self-esteem can help people attenuate and avoid negative feelings, and both play essential roles in self-regulation processing (Neff, 2011). Another study also proved the effect of self-compassion on self-esteem (Neff & Vonk, 2009), which suggests that self-compassion could effectively contribute to increasing self-esteem because it provides self-esteem with positive elements (e.g., non-judgmental understanding of self-esteem based on positive self-evaluation) (Neff, 2011; Neff & Vonk, 2009). Namely, self-esteem may increase when an individual has high levels of self-compassion. Therefore, consistent with our hypothesis, self-compassion could predict the increase of self-esteem.

In the second phase of the single pathway from self-esteem to empathy, our study showed that the effect of self-esteem on empathy was positively correlated. This finding agrees with previous studies showing that self-esteem is associated with empathy (Huang et al., 2019; Sa et al., 2019; Stotland & Dunn, 1963). According to top-down theory (Brief et al., 1993), individuals tend to experience and react to events and circumstances either positively or negatively (Marshall et al., 2015). Specifically, if individuals live in a less safe or unhealthy environment, they have lower self-esteem, which can lead to negative mental outcomes (such as violence and aggressive behaviors) and less empathy (Neff & Vonk, 2009). In contrast, if individuals live in good condition, their high personal self-esteem can lead to good empathic expression (Fredrickson, 2001; Neff, 2003). Therefore, living environment can affect empathy by influencing self-esteem. The argument is that self-compassion leads to more effective empathy practices via self-esteem, such as using self-compassion as a mechanism for emotional regulation. Thus, self-esteem can influence empathy, supporting our hypothesis.

Finally, the current study adds to the growing literature indicating that self-esteem, understood as disposition, can partially mediate the effects of self-compassion on empathy. In addition, our present findings provide increasing evidence that self-compassion may be a protective factor (Neff, 2003). For example, Holas et al. (2021) demonstrated that self-compassion significantly predicts empathy in almost all areas of psychology, including positive psychology, psychological health, motivation, and interpersonal functioning, in which self-compassion plays a role in increasing empathy via self-esteem.

Contributions and Limitations

First, our results suggest that the adaptation of the BES-A by Carré et al. (2013) is the first study to translate and validate the BES-A scale in the Vietnamese context, which helps us better understand this concept and provides an instrument for future studies in Vietnam and research evidence for further research in the world. Second, our research helps enrich the literature on the mediating role of self-esteem in the relationship between self-compassion and empathy while controlling gender, which has received minimal attention. Third, the findings of this study suggest that undergraduate students practice exercises to enhance self-compassion to improve empathy, especially in the context of Covid 19 with a lot of anxiety and stress (Hawes et al., 2021; Liu & Wang, 2021; Luo et al., 2019). Fourth, integrating self-compassion education into counselor school education is a practical option for many universities and produces counseling skills with a more enriched relationship with themselves and others (Nelson et al., 2018). Finally, psychiatrists, counselors, and therapists in Vietnam need to develop psychoeducational training programs for Vietnamese students to practice self-compassion and empathy to create happy schools in the country (e.g., Tandazo Rigazio, 2021; Teding van Berkhout & Malouff, 2016).

However, our study had certain limitations. First, the use of self-reports for data collection is a limitation of this research. Thus, participants may respond with bias to the questionnaire (Dalton & Ortegren, 2011). Future studies should consider conducting longitudinal and experimental studies to reduce bias. Second, all the study variables were collected through students' online self-reports, so a standard common bias test is likely to affect the results. Future researchers may apply a wide range of data collection methods to reduce standard method bias and increase the validity of the research results. Finally, as our study was only conducted on a Vietnamese sample from one city in Vietnam, it cannot be a representative sample for Vietnamese students in the whole country. Future studies should be conducted in different areas of the nation and other countries as well in order to compare the similarities and differences among a variety of groups.

Authors' contribution MAQT: study design, statistical analysis, writing-review and editing. NNTC, TAH, MAQT manuscript preparation, editing. TAND, VTN, MAQT: data collection. NNTC, TAH, MAQT: response reviewers. All authors approved the final manuscript for publication.

Data availability The authors confirm that the data supporting the findings of this study are available.

Declarations

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

Ethical approval All procedures performed in studies involving human participants followed the ethical standards of the institutional and/or national research committee and the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study

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