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Examining the relationship between trait interpersonal sensitivity and loneliness: A serial mediation model

Qinglei Li[1], Qian Sun[1], Yongfang Liu[1]

[1]Department of Psychology and Cognitive Science, East China Normal University, People's Republic of China

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This study investigated the potential of a serial mediation model to examine the roles of self-esteem and perceived social support in the relationship between trait interpersonal sensitivity and loneliness. We used a two-wave survey to collect data from 761 Chinese students. The structural equation model analysis results show that the Chinese version of the Interpersonal Sensitivity Measure had good psychometric properties, and that trait interpersonal sensitivity indirectly predicted loneliness through the mediators of self-esteem and perceived social support. Our findings provide valuable guidance for ways to reduce the loneliness of individuals with interpersonal sensitivity.

Keywords
interpersonal sensitivity; interpersonal relationships; loneliness; self-esteem; perceived social support

As a social species, humans tend to have a strong need for social connection. The negative emotions experienced when individuals' needs for social connection are not met are collectively referred to as *loneliness* (Abdellaoui et al., 2019). Investigation of the correlates and effects of loneliness is important because loneliness increases the chance of psychological distress, physical health problems, and even mortality (Lim et al., 2020). Previous researchers have found that loneliness may be influenced by personality, which means not everyone is equally susceptible to loneliness given similar levels of objective social isolation (Buecker et al., 2020; Schermer & Martin, 2019). Accordingly, we have expanded on previous examinations of loneliness and personality by exploring not only the relationship between interpersonal sensitivity and loneliness, but also the largely unknown influence of trait interpersonal sensitivity on loneliness.

Interpersonal sensitivity (IS), as defined by Boyce and Parker (1989), is a personality trait characterized by excessive awareness of others' feelings and behavior. Individuals with IS are continually preoccupied with interpersonal relationships, vigilantly regarding others' moods and behavior (Bell & Freeman, 2014; Boyce & Parker, 1989). This stable personality trait leads to continuous attention to negative social evaluation (Boyce & Parker, 1989). Other researchers, however, regard IS as a psychological symptom reflecting the temporary symptomatic psychological patterns in psychiatric patients or in society (Wedgeworth et al., 2017). To distinguish between them, we have used the terms *state IS* to refer to temporal and fluctuating IS levels, and *trait IS* to refer to general or chronic IS levels, the latter of which we used as the focal variable in this study.

Although Jiang et al. (2019) found a positive correlation between state IS and loneliness in a sample of gay Chinese men, the relationship for trait IS still unclear. However, as a key component in trait IS, rejection sensitivity is positively correlated with loneliness (Watson & Nesdale, 2012). This is because individuals with rejection sensitivity react intensely to rejection, which undermines their ability to develop and benefit

CORRESPONDENCE Yongfang Liu, Department of Psychology and Cognitive Science, East China Normal University, 3663 North Zhongshan Road, Shanghai 200062, People's Republic of China. Email: yfliu@psy.ecnu.edu.cn

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from positive relationships; further, poor-quality relationships and loneliness are closely related (Zhang et al., 2015). Trait IS (vs. rejection sensitivity) has a broader definition, showing a strong reaction not only to rejection but also in general relationships. Thus, as individuals with trait IS are more likely to feel discomfort during interpersonal interactions, this may lead to loneliness. Those with trait IS are also susceptible to symptoms such as depression and anxiety (Harb et al., 2002; Otani et al., 2018). Otani et al.'s (2018) finding that trait IS is closely related to core negative self-beliefs suggests that this personality trait can be regarded as a cognitive vulnerability to depression. Social anxiety characteristics also correspond to many aspects of the definition of trait IS: interpersonal vigilance, fear of rejection, misinterpretation of others' behavior, inferiority thoughts, nonassertive behavior, and avoidance of interpersonal situations (Harb et al., 2002). Further, depression and anxiety interrelate with loneliness (Domènech-Abella et al., 2019). Thus, it seems reasonable that trait IS can be an important personality predictor of loneliness.

Individuals with trait IS, especially the attribute of high sensitivity to external evaluation, incorporate more negative external evaluation into their own concepts (Boyce & Parker, 1989). That is, trait IS is closely related to core negative self-beliefs. Previous researchers have found that self-esteem relates to confidence, adjustment, and self-belief (Zhao et al., 2017). Therefore, self-blame caused by trait IS leads to a lack of personal value and ability, further damaging self-esteem. It is proposed in mental dissonance theory that higher self-esteem leads to less loneliness (van Baarsen, 2002). Researchers have found that high susceptibility to loneliness in early adulthood is attributable to low self-esteem (Hall & Pennington, 2013; Zhao et al., 2017). These findings show that self-esteem is an important influencing factor in loneliness, because individuals with low self-esteem blame themselves for social failure or for having low social contact (Zhao et al., 2017), thereby reinforcing their loneliness.

Because they are overly sensitive to criticism and rejection, individuals with high trait IS continually feel uncomfortable in social interactions (Masillo et al., 2012) and exhibit interpersonal avoidance behavior (Hiçdurmaz & Öz, 2016), which impedes their perceived social support. For instance, Siegel and colleagues (2007) found that trait IS was significantly associated with lower perceived partner support. This result occurred because the feeling of embarrassment and vulnerability caused by trait IS can lead to avoidance and poor communication. *Perceived social support* is not the same as actual support from a social network. It is a cognitive component that is a perception of a close relationship (Wohn et al., 2016), whereas loneliness is an affective component involving a subjective feeling of distress when social connections are perceived to be lacking. Perceived social support has been found to negatively predict loneliness (Cao & Liang, 2020; Segrin & Passalacqua, 2010); therefore, we proposed that perceived social support would mediate the relationship between trait IS and loneliness.

In addition, the relationship between self-esteem and perceived social support appears to be bidirectional, such that the level of self-esteem predicts perceived social support, and vice versa (Lee et al., 2014). Individuals with low (vs. high) self-esteem are more likely to perceive others' behavior more negatively and to show excessive social avoidance (Routledge et al., 2010), which reduces perceived social support (Świtaj et al., 2015; Wohn et al., 2016). In contrast, perceived social support fosters feelings of belonging, security, and a sense of control over the environment, which may enhance self-esteem (Lee et al., 2014). Therefore, we believe it is necessary to re-examine the self-esteem–perceived social support relationship, which we proposed would be bidirectional and predictive.

Method

Participants and Procedure

We collected data from 761 undergraduates (403 women, 358 men; M_{age} = 19.36 years, SD = 1.20) at two universities in Shanghai and Nanjing, China. Of the original distributed 804 questionnaires, 43 were excluded owing to respondents failing to complete all the items. The study was approved by the Ethics Committee of East China Normal University. Participants all gave informed consent before taking part in

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the study. In the first data collection phase, 397 participants were recruited through an online survey invitation to complete the Interpersonal Sensitivity Measure. Participants were compensated with a random amount of money (USD 0.50–1.00). In the second data collection phase, another 364 participants were recruited to complete a series of offline questionnaires within 20 minutes, including demographics and the measures of IS, self-esteem, perceived social support, and loneliness. On completion of the questionnaires, participants were compensated with a small gift of a pen worth about USD 1.00.

Measures

Interpersonal Sensitivity

We adopted the 36-item Interpersonal Sensitivity Measure (Boyce & Parker, 1989) to measure participants' trait IS. Participants assess the items on a 4-point Likert scale ranging from 1 (*very inconsistent*) to 4 (*very consistent*). Higher scores indicate greater trait IS. As the factor structure and psychometric properties of the scale among Chinese people is unknown, and too many items in the original scale may cause varying fatigue effects, we deleted 17 items when simplifying the scale, and measured its reliability and construct validity (see Appendix Table A1). Cronbach's alpha for the simplified scale was .82, and for the subscales it ranged between .72 and .85 in this study.

Loneliness

We adopted a Chinese version (Cao & Liang, 2020) of the UCLA Loneliness Scale to assess participants' loneliness with 20 items (11 positive-scored items and nine reverse-scored items). Participants assess the items on a 4-point Likert scale ranging from 1 (*never*) to 4 (*always*). Sample items are "I feel isolated from others" and "I lack companionship." Higher scores indicate greater loneliness. Cronbach's alpha was .74 in this study.

Self-Esteem

The 10-item Rosenberg Self-Esteem Scale (Rosenberg, 1965) was adopted to assess participants' global self-esteem. Participants assessed the items on a 4-point Likert scale ranging from 1 (*very inconsistent*) to 4 (*very consistent*). A sample item is "I am able to do things as well as most other people." The eighth question ("I hope I can win more respect for myself") was deleted because it is unsuitable for the measurement of Chinese self-esteem (Lumei, 2006). Cronbach's alpha was .78 in this study.

Perceived Social Support

We adopted the 12-item Chinese version (Cao & Liang, 2020) of Zimet et al.'s (1988) Multidimensional Scale of Perceived Social Support to assess perceived social support. Three aspects of social support were assessed: family (FA), friends (FR), and significant others (SO). Sample items are "I can talk about my problems with my family" (FA), "My friends really try to help me" (FO), and "There is a special person who is around when I am in need" (SO). Participants evaluate the items on a 5-point Likert scale ranging from 1 (*completely disagree*) to 5 (*completely agree*). Higher scores indicate greater perceived social support. Cronbach's alpha for the scale was .90, and for the subscales for FA, FR, and SO, were .79, .82, and .89, respectively, in this study.

Results

Simplification of the Interpersonal Sensitivity Measure

We used SPSS to perform an item analysis and an exploratory factor analysis (EFA), and Amos to perform a confirmatory factor analysis (CFA). First, we performed the project analysis on the first-phase data (n = 397), and deleted Item 20 (the correlation coefficient with the total scale score was nonsignificant), then Items 21 and 25 (composite reliability values > 3) sequentially. The scale's internal consistency after we had deleted each item was not substantially improved (see Appendix Table A1).

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We then performed a factor analysis of the remaining items using half of the randomly selected data (n = 198). The results demonstrate that the data were suitable for EFA (Kaiser–Meyer–Olkin = .82, Bartlett's test of sphericity, χ^2 = 2269.48, p < .001). We employed principal component analysis to extract the common factors of the questionnaire items, and orthogonally rotated the factors, resulting in a rotated factor matrix. Contemporarily, we deleted, in sequence, Items 15, 19, and 34 because of low factor loadings (< .40), and Items 2, 10, 12, 13, and 29 because of high cross loadings (absolute value of the load difference between the two factors of the item < .20). We also deleted factors containing too few items (each factor contains at least three items) and deleted Items 6, 7, 16, 28, 31, and 32 in sequence. We eventually extracted five common factors with characteristic roots greater than 1 (19 items), and the total percentage of explained variance was 56.45% (see Appendix Table A2).

Finally, we used the remaining data (n = 199) to perform a CFA of the remaining items. To test the model fit, we adopted the conventional cutoff criterion, which is .90 or higher for goodness-of-fit index (GFI) and comparative fit index (CFI) and .08 or lower for root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR; Kline, 2011). The results show that the five-factor model provided a suitable fit to the data, χ^2 = 288.31, χ^2/df = 2.07, RMSEA = .05, GFI = .93, CFI = .90, SRMR = .03. Each path coefficient reached significance. We referenced the factors in the original scale when naming each factor: fragile inner self (six items), separation anxiety (three items), interpersonal awareness (four items), need for approval (three items), and timidity (three items).

Descriptive Statistics

Means, standard deviations, and correlations for the study variables are presented in Table 1.

Table 1. *Means, Standard Deviations, and Correlations for Study Variables*

Variable	*M*	*SD*	1	2	3	4
1. Interpersonal sensitivity	2.55	0.32	1			
2. Self-esteem	2.79	0.38	–.21**	1		
3. Perceived social support	3.88	0.70	.02	.35**	1	
4. Loneliness	2.16	0.39	.16**	–.50**	–.53**	1

Note. ** p < .01.

Structural Model

Amos was used to conduct structural equation modeling to test our hypothesized model, with maximum likelihood estimation. We also tested the mediation effects with the bootstrapping method, using 1,000 bootstrapped resamples to calculate 95% confidence intervals (CIs). We used a parceling approach when analyzing the hypothesized model to reduce the chance of residuals being correlated (Little et al., 2002). The model detected if the effect of IS on loneliness was mediated by self-esteem and perceived social support (see Figure 1). The hypothesized model had a good fit to the data, χ^2/df = 1.43, CFI = .97, GFI = .97, Tucker–Lewis Index (TLI) = .96, incremental fit index (IFI) = .97, RMSEA = .05. However, there were three nonsignificant pathways, from IS to perceived social support, β = .72, p = .16, from trait IS to loneliness, β = .20, p = .10, and from perceived social support to self-esteem, β = - .12, p = .35. After we had removed these pathways, the indices of the revised model had a good fit to the data, χ^2/df = 1.44, CFI = .97, GFI = .97, TLI = .96, IFI = .97, RMSEA = .05. Results show that the indirect effect of trait IS on loneliness through self-esteem was significant, β = .18, 95% CI [0.09, 0.28]. The indirect effect of trait IS on loneliness, through both self-esteem and perceived social support, was also significant, β = .08, 95% CI [0.04, 0.14].

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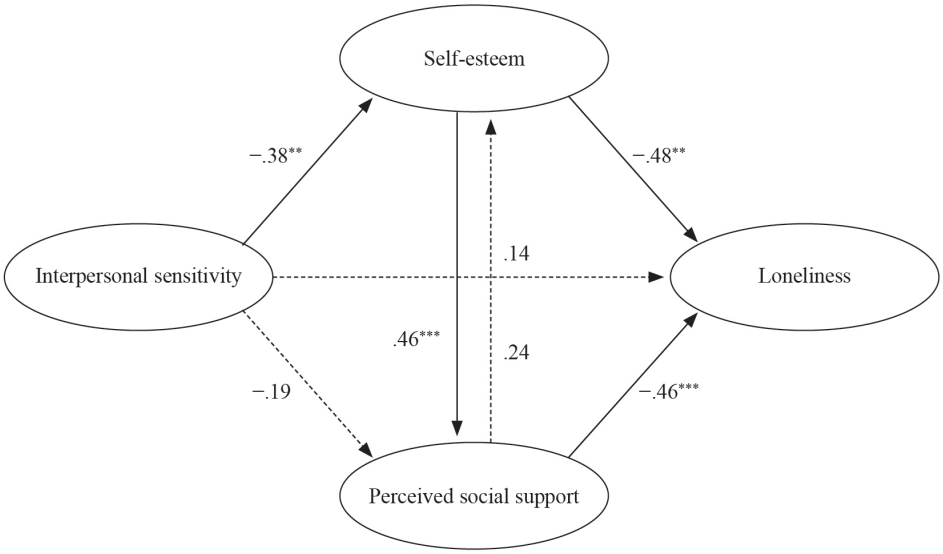

Figure 1. *Serial Mediation Model*

Note. Values shown are standardized coefficients. Significant pathways are indicated by solid black arrows.

*** $p < .001$.

Discussion

We examined the underlying mechanisms of self-esteem and perceived social support in the relationship between trait IS and individuals' feelings of loneliness. Our results show that trait IS had a significant positive predictive effect on loneliness, the indirect effect of self-esteem was statistically significant, and the serial indirect effect of self-esteem with perceived social support was statistically significant.

Our finding that individuals with (vs. without) trait IS were more likely to feel lonely corroborates previous results that state IS (Jiang et al., 2019) and rejection sensitivity (Watson & Nesdale, 2012) lead to loneliness. However, it remains undefined how trait IS significantly increases individuals' loneliness feelings. Our examination of the trait IS–loneliness relationship adds knowledge to the literature. We also explored the mediating roles of self-esteem and perceived social support to confirm that they interpret the strength of the trait IS–loneliness relationship. The findings show the indirect effect of self-esteem on this relationship, highlighting that trait IS causes low self-esteem, thereby triggering loneliness because self-blame caused by trait IS leads to a lack of personal value and ability, further lowering self-esteem (Bell & Freeman, 2014; Boyce & Parker, 1989).

Notably, we did not strengthen Siegel et al.'s (2007) finding that trait IS leads to less perceived social support. In model testing, trait IS did not directly predict perceived social support, but indirectly predicted perceived social support through self-esteem. Individuals with positive self-evaluation can adopt active and adaptive coping strategies (Świtaj et al., 2015). However, lower self-esteem reduces the use of beneficial coping strategies for seeking social support, and reduced perceived social support leads to intensification of feelings of loneliness. Further, Wohn et al. (20126) showed that the correlation between individuals' perceived social support and social support was moderate: Those with low (vs. high) self-esteem were more

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likely to have less stable relationships, and were less likely to subjectively see the provider as a supportive individual (see also Świtaj et al., 2015). Overall, we believe that individuals with trait IS incorporate negative external assessments in their minds, which results in lower self-esteem, and that individuals with low self-esteem perceive less support from important others because of their low social relationship evaluation, which further increases their sense of loneliness.

Implications

Our results contribute to the trait IS–loneliness relationship research in three ways. First, we generated a short version of the Interpersonal Sensitivity Measure, which is more suitable for use by Chinese people. We deleted some items, tested the factor structure of the revised scale, and provided additional evidence for the measure's validity and reliability. The structure of the retained factors is similar to that of the original measure (Boyce & Parker, 1989). Second, as few researchers have explored the potential influence of trait IS on loneliness, we have attempted to fill this gap. Finally, we have gained new insights into the underlying mechanism of trait IS's influence on loneliness, by showing that trait IS is negatively correlated with self-esteem, which predicts perceived social support, thereby contributing to feelings of loneliness.

Limitations and Directions for Future Research

There are some limitations in this study. First, it is unclear if alternative models would fit the data better than the proposed model. Although our findings support the idea that self-esteem is an antecedent of perceived social support, which is consistent with previous studies (Tan et al., 2016), future researchers could explore the impact of perceived social support on self-esteem (Cao & Liang, 2017). Second, our conclusions cannot reflect the dynamic causality of the model owing to the use of a cross-sectional research design. Future researchers could use experimental or longitudinal methods to verify causality. Third, we focused only on self-esteem and perceived social support. Future researchers could use other variables (e.g., social exclusion, interpersonal satisfaction, field dependence/independence) to explain the trait IS–loneliness relationship.

Conclusion

Our serial mediation model offers new insights for a pathway from self-esteem to perceived social support in the trait IS–loneliness relationship. The model provides a comprehensive viewpoint on why individuals with high trait IS tend to experience a high level of loneliness, and provides valuable guidance on the implementation of psychological interventions aimed at reducing the loneliness of these individuals. It is critical for individuals to be taught how to form high self-esteem objectively and, thereby, improve their perceived social support.

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Appendix
Table A1. Item Analysis of Interpersonal Sensitivity Measure

Variables	*M*	*SE*	*CR*	ITC	Cronbach's α
Interpersonal awareness					
Item 2. I worry about the effect I have on other people.	2.86	0.78	7.86***	.41**	.853
Item 4. I feel uneasy meeting new people.	2.09	0.79	9.45***	.49**	.851
Item 10. I worry about being criticized for things I have said or done.	2.78	0.68	10.88***	.57**	.849
Item 23. If someone is critical of something I do, I feel bad.	2.80	0.74	7.93***	.44**	.853
Item 28. If someone upsets me, I am not able to put it easily out of my mind.	2.39	0.85	6.67***	.37**	.855
Item 30. I worry about what others think of me.	2.80	0.78	12.29***	.60**	.848
Item 36. I care about what people feel about me.	2.83	0.76	9.80***	.50**	.851
Need for approval					
Item 6. I feel secure when I'm in a close relationship.	2.90	0.79	3.91***	.27**	.857
Item 8. After a fight with a friend, I feel uncomfortable until I have made peace.	2.95	0.79	7.38***	.42**	.853
Item 11. I always notice if someone doesn't respond to me.	2.75	0.74	9.12***	.50**	.851
Item 13. I feel that people generally like me.	2.60	0.68	2.98**	.23**	.857
Item 16. I will go out of my way to please someone I am close to.	2.75	0.71	5.16***	.32**	.855
Item 18. I feel happy when someone compliments me.	3.21	0.62	3.03**	.22**	.857
Item 20. I can make other people happy.	2.98	0.65	0.88	.08	.860
Item 34. I feel hurt when someone is angry with me.	2.84	0.69	8.51***	.49**	.851
Separation anxiety					
Item 1. I feel insecure when I say goodbye to people.	2.34	0.85	6.86***	.38**	.854
Item 12. I worry about losing someone close to me.	3.18	0.72	8.51***	.44**	.852
Item 15. I can only believe that something I have done is good when someone tells me it is.	2.52	0.79	12.78***	.59**	.848
Item 17. I feel anxious when I say goodbye to people.	2.26	0.78	9.19***	.50**	.851
Item 19. I fear that my feelings will overwhelm people.	2.56	0.78	8.23***	.41**	.853
Item 25. I always expect criticism.	1.87	0.69	2.26*	.15**	.859
Item 26. I can never be really sure if someone is pleased with me.	2.47	0.78	11.31***	.55**	.850
Item 29. I feel others do not understand me.	2.34	0.73	7.67***	.37**	.854
Timidity					
Item 3. I avoid saying what I think for fear of being rejected.	2.53	0.75	8.61***	.46**	.852
Item 7. I don't get angry with people for fear that I may hurt them.	2.48	0.78	8.97***	.45**	.852
Item 9. I am always aware of how other people feel.	2.96	0.68	6.70***	.36**	.854
Item 14. I will do something I don't want to do rather than offend or upset someone.	2.28	0.75	11.98***	.56**	.849
Item 21. I find it hard to get angry with people.	2.44	0.74	2.52*	.17**	.859
Item 22. I worry about criticizing other people.	2.54	0.76	9.03***	.48**	.852
Item 32. I am never rude to anyone.	2.43	0.78	5.23***	.29**	.857
Item 33. I worry about hurting the feelings of other people.	3.01	0.63	6.74***	.40**	.853
Fragile inner-self					
Item 5. If others knew the real me, they would not like me.	1.81	0.72	9.30***	.44**	.853
Item 24. If other people knew what I am really like, they would think less of me.	1.88	0.74	8.98***	.51**	.851
Item 27. I don't like people to really know me.	2.08	0.73	5.28***	.34**	.855
Item 31. I don't feel happy unless people I know admire me.	2.01	0.72	6.17***	.38**	.854
Item 35. My value as a person depends enormously on what others think of me.	2.17	0.75	10.65***	.51**	.851

Note. *SE* = standard error; *CR* = critical ratio; ITC = item–total correlation; α = internal consistency of the scale after deletion of item.
* $p < .05$. ** $p < .01$. *** $p < .001$.

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Table A2. Factor Loadings and Additional Estimates for the 20-Item Chinese Interpersonal Sensitivity Measure–Revised

Factor	Variables	Factor loading	Estimate	Common degree	Roots	Cumulative %
Fragile inner self	Item 3	.54	0.73***	.38	3.09	16.24
	Item 4	.71	1.00	.59		
	Item 5	.64	0.943***	.54		
	Item 24	.69	1.05***	.58		
	Item 26	.57	0.82***	.39		
	Item 27	.77	0.72***	.63		
Separation anxiety	Item 1	.82	1.00	.68	2.08	27.17
	Item 14	.50	0.98***	.45		
	Item 17	.73	1.08***	.61		
Interpersonal awareness	Item 11	.57	1.00	.48	2.07	38.10
	Item 30	.56	1.52***	.69		
	Item 35	.67	0.86***	.66		
	Item 36	.81	1.26***	.71		
Timidity	Item 8	.66	1.00	.55	1.79	47.50
	Item 9	.74	0.68***	.61		
	Item 33	.71	0.64***	.53		
Need for approval	Item 18	.66	1.00	.55	1.70	56.45
	Item 22	.49	2.03***	.51		
	Item 23	.73	2.11***	.60		

Note. *** $p < .001$.

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