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Self-Critical Perfectionism, Daily Interpersonal Sensitivity, and Stress Generation: a Four-Year Longitudinal Study

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Abstract

This study of 145 community adults examined heightened interpersonal-sadness sensitivity as a mediator of the relationship between self-critical (SC) perfectionism and stress generation four years later. Participants completed questionnaires assessing perfectionism dimensions at Time 1, baseline depressive symptoms at Time 1 and Year 3, daily negative social interactions and affect for 14 consecutive days at Month 6 and Year 3, and a contextual-threat stress interview at Year 4. Path analyses indicated that SC perfectionism predicted daily interpersonal-sadness sensitivity (i.e., greater increases in sadness in response to increases in negative social interactions) between Month 6 and Year 3. This, in turn, explained why individuals with higher SC perfectionism had greater interpersonal stress generation four years later, controlling for the effects of depressive symptoms. Findings also demonstrated that responding to negative social interactions with broader negative affect or accumulated negative social interactions did not mediate the prospective relation between SC perfectionism and interpersonal stress generation. SC perfectionism was not related to Year 4 noninterpersonal stress generation or independent stress. Findings highlight the importance of targeting interpersonal-sadness sensitivity in order to reduce the propensity of SC perfectionistic individuals to generate negative interpersonal life events several years into the future.

Keywords Self-criticism · Perfectionism · Interpersonal-sadness sensitivity · Stress generation · Contextual-threat stress interview

Stress has been implicated in the development and exacerbation of a wide range of mental health difficulties including mood difficulties (e.g., Marin et al. 2011), as well as significant physical health conditions, such as cancer, stroke, and heart disease (e.g., S. Cohen et al. 2007). The stress generation perspective posits that individuals play an active role in constructing their environments through their interactions and choices, such that they contribute to the occurrence of negative stressful events (Hammen 1991; Hewitt and Flett 2002). Perfectionism is an important multidimensional personality construct that has been associated with stress generation (Chang 2000; Hewitt and Flett 2002; Hammen 2006). Although perfectionism has been described using a number of distinct conceptualizations (Blatt et al. 1976; Frost et al. 1990; Hewitt and Flett 1991; Slaney et al. 2001), research has identified two higher-order dimensions, referred to as *personal standards (PS) perfectionism* and *self-critical (SC) perfectionism*, that underlie two respective groups of different measures of perfectionism (e.g., Dunkley et al. 2003; see Stoeber and Otto 2006). PS perfectionism is defined as having and working towards achieving high standards and goals for oneself. SC perfectionism, on the other hand, involves harshly critical attitudes towards oneself as well as concerns regarding others' approval and possible criticism (Dunkley et al. 2003). Research has demonstrated that SC perfectionism, in contrast to PS, is associated with the presence of stress over both the short- and long-term (Achtziger and Bayer 2013; Chang 2000; Dunkley et al. 2014b; Dunkley et al. 2003).

Although previous research has explored the relationship between SC perfectionism and stress generation, much of this

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work has examined stress generation as an explanatory variable between SC perfectionism and negative outcomes. Given the deleterious impact of stress on well-being, research must better identify those factors that contribute to and explain the generation of future negative life events. Researchers have only recently begun to explore potential mechanisms through which SC perfectionists generate stressors for themselves (Achtziger and Bayer 2013). The purpose of the present study was to better understand why individuals with higher SC perfectionism are more likely to generate interpersonal stress over time (Hammen 2006).

Self-Critical Perfectionism, Daily Interpersonal Sensitivity, and Stress Generation

The stress generation perspective focuses on identifying negative life events that are at least partially due to the individual's behavior or characteristics, which are referred to as *dependent* events (e.g., an argument with a friend, performance on an exam) (Hammen 1991, 2006). On the other hand, 'fateful' random negative events whose occurrence is unrelated to personality characteristics are referred to as *independent* events (Hammen 2006). The stress generation perspective emphasizes the importance of assessing dependent interpersonal stressors as these have been shown to play a more significant role in increasing negative outcomes over time (Hammen 2005; 2006; Vrshek-Schallhorn et al. 2015). SC perfectionism may be associated with interpersonal stress generation, including increased conflict and disruption in interpersonal relationships (Hewitt and Flett 2002). Empirical findings have demonstrated that facets of SC perfectionism contribute to the generation of friendship and roommate stress (Shahar et al. 2004), interpersonal negative events over a period of several months (Priel and Shahar 2000), interpersonal daily hassles (Hewitt and Flett 1993), and less trust and self-disclosure in their romantic relationships (Zuroff et al. 2004).

One mechanism through which SC perfectionism is theorized to relate to stress generation is interpersonal sensitivity (Hewitt and Flett 2002). Interpersonal sensitivity refers to the degree to which an individual's mood fluctuates in response to negative social interactions, such as anger, insensitivity, and/or interference from others (Finch et al. 1999; O'Neill et al. 2004; Parrish et al. 2011). These changes occur within the individual, where highly reactive individuals report larger increases in negative emotions when appraising social interactions as adverse. Individuals with higher SC perfectionism are thought to be especially sensitive to interpersonal stressors because they were raised in controlling and demanding early environments, with harsh and punitive parents whose approval was conditional on their child meeting and surpassing unrealistic expectations (Blatt 1995). As a result, SC perfectionists are constantly preoccupied with gaining approval and admiration, and chronically fear being criticized by important others (see Blatt 1995; Dunkley et al. 2012a). They may, therefore, be particularly sensitive to negative social exchanges as these are experienced as a form of personal failure, which may in turn contribute to feelings of loss of belonging and acceptance (Besser and Priel 2005).

Empirical findings have demonstrated that SC perfectionistic individuals demonstrate increased sensitivity to interpersonal difficulties. In prior analyses based on the same sample, Dunkley et al. (2014b) used daily diaries to assess the prospective impact of SC perfectionism on the within-person relationship between negative social interactions and both sadness and negative affect at two future time points. Results from multilevel modeling of cross-level interactions showed that high SC perfectionists had heightened increases specifically in sadness, but not broader negative affect, on days where they experienced more negative social interactions than usual, both six months and three years after their initial measures. Similarly, SC perfectionistic individuals have been found to be emotionally reactive to both perceived criticism, as well as fears of closeness (Dunkley et al., 2012a; Dunkley et al. 2003). Core dislike of the self, one aspect of self-criticism, has been correlated with negative affective responses to interpersonal stress (Joo et al. 2012). Furthermore, individuals with higher SC perfectionism have also been shown to experience neutral interpersonal interactions as negative and threatening (Hewitt and Flett 2002).

Heightened interpersonal sensitivity may explain the link between higher SC perfectionism and stress generation because the tendency to overreact to negative interpersonal interactions with intensified feelings of sadness and dejection may transform the experience of benign situations into stressful ones (see Hewitt and Flett 2002; Zuroff et al. 2004). More specifically, overreacting to minor comments may lead others to withdraw, precipitating a spiral of negative interpersonal stressors that are dependent upon the individual (Starr and Davila 2008). Further, the interpersonal sensitivity of SC perfectionistic individuals might become manifested as a defensive interpersonal style that then leads to negative reactions from others, therefore contributing to greater interpersonal stress (Dunkley et al. 2006; Flett et al. 1997; Zuroff et al. 2004).

Although prior research has established links between SC perfectionism, interpersonal sensitivity, and stress generation, there remain four important gaps in the literature that require attention. First, to our knowledge, no research to date has specifically examined whether interpersonal sensitivity explains why SC perfectionistic individuals have heightened vulnerability to experiencing stress generation. Interpersonal sensitivity as a mediator variable extends beyond the simple measurement of either negative social interactions or mood variables alone; rather it represents the relationship between

negative social interactions and mood over time within each individual. This innovative method of analysis uses daily diaries to gather a sequence of data points, and then uses multilevel modeling to derive the within-person relationship between negative social interactions and mood, represented by a slope, for each participant. These interpersonal sensitivity slopes can then be used as independent or mediator variables to examine increasingly complex hypotheses (L. H. Cohen et al. 2005; Cole et al. 2014). This method of analysis has been used in two previous studies (O'Neill et al. 2004; Parrish et al. 2011) that both found that undergraduates who were more reactive to daily interpersonal stressors were more likely to have increases in depressive symptoms two months later. Although prior research has demonstrated the harmful nature of daily interpersonal sensitivity, further research is needed in order to examine whether interpersonal sensitivity predicts stress generation outcomes and whether it can explain the relationship between SC perfectionism and prospective stress generation.

Second, although personality is generally considered relatively stable (McCrae and Costa Jr., 2008), the stability of interpersonal sensitivity has yet to be examined. Dunkley et al. (2014b) showed that SC perfectionists were emotionally reactive to negative social interactions at both Month 6 and Year 3. However, these analyses did not evaluate the stability of interpersonal sensitivity as they were done separately at each time point. Emotional regulation patterns are fundamentally less stable than core personality traits. However, they highlight an important component of an individual's vulnerability to stress generation because they capture more situation-specific vulnerabilities by representing an enduring pattern of emotional fluctuations in response to specific interpersonal stressors (Singer 2013; Sliwinski et al. 2009).

Third, Dunkley et al. (2014b) demonstrated that SC perfectionists responded to higher levels of negative social interactions with greater increases in sadness but not more broad negative affect. This distinction may be important because research has shown that sadness encompasses more disengagement-like emotions such as feeling lonely, blue, and despondent, whereas negative affect incorporates more active emotions such as anger and frustration (Watson et al. 2011). Sadness may elicit more avoidance and withdrawal behaviors that serve to increase the severity, duration, or both, of daily interpersonal conflicts, thereby contributing to major interpersonal negative events in the future (e.g., loss of relationships). On the other hand, active negative emotions (e.g., anger) may facilitate more protective 'approach' behaviors that encourage the individual to actively engage or cope with the presenting conflict (see Carver and Harmon-Jones 2009; Lindebaum and Jordan 2014). Research has yet to establish whether reacting to negative social interactions with sadness (referred to as *interpersonal-sadness sensitivity*) as compared to negative affect (referred to as *interpersonal-NA sensitivity*) better explains the relation between SC perfectionism and future interpersonal stress generation.

Finally, previous research has demonstrated that negative social exchanges are related to major stressful life events (Lakey et al. 1994; Edwards et al. 2001). However, research has yet to examine whether an individual's emotional response to negative social interactions predicts stress outcomes several years later. Theorists have suggested that reactions to an event may be a greater predictor of maladjustment than the event itself (Beck et al. 1979). Appraisals of negative social interactions are distinct from interpersonal-sadness sensitivity, as the former refers to individual differences in levels of negative social interactions, whereas the latter refers to individual differences in the strength of the relationship between appraisals of daily negative social interactions and mood (Tong 2010). Research is needed in order to evaluate whether it is an individual's average levels of negative social interactions or the strength of the emotional response to them that best explains the relationship between SC perfectionism and future stress outcomes.

The Present Study Aims and Hypotheses

The present study was the first to examine daily interpersonal-sadness sensitivity as an explanatory variable in the relationship between SC perfectionism and stress generation several years later. In order to examine this, we used assessments at four successive time points over four years that allowed considerable time to elapse between assessments to provide stronger tests of interpersonal sensitivity mediational hypotheses than previously provided in the literature (see Cole and Maxwell 2003). Interpersonal sensitivity slopes were created representing an individual's relationship between negative social exchanges and sadness at both Month 6 and Year 3. These slopes were then used as sequential mediators in the relationship between SC perfectionism and stress generation four years later. Additionally, we examined interpersonal-NA sensitivity as a potential alternative mediator in the relation between SC perfectionism and stress generation in order to examine the relevance of responding to interpersonal stress specifically with sadness versus broader negative affect. Finally, we also assessed whether average levels of negative social interactions, as opposed to interpersonal-sadness sensitivity, better explained the relation between SC perfectionism and later stress generation.

A major methodological strength of the current study involved using a contextual-threat interview (Hammen 1991) to assess interpersonal stress generation. The majority of prior research has relied on self-report stress checklists to assess negative life events as opposed to performing contextual-threat interviews, which rely on objective team-ratings of events (Luyten et al. 2011). Research has shown that interviews

control for the influence of participants' current mood and subjective biases due to personality characteristics, as well as inflated reporting of minor events (McQuaid et al. 2000; Ostiguy et al. 2009). Previous research has demonstrated that facets of SC perfectionism are related to not only interpersonal stress but also noninterpersonal stress generation (Priel and Shahar 2000; Shih et al. 2009). As a result, the current study examined both interpersonal and noninterpersonal stress generation outcomes separately in order to verify whether interpersonal-sadness sensitivity leads SC perfectionists to specifically generate more interpersonal stressors (Hammen 1991). Furthermore, some studies have found SC perfectionism components to be specifically related to dependent, but not independent, negative events (Shih et al. 2009), whereas other studies have shown that SC perfectionism facets are related to both dependent and independent events (Luyten et al. 2011). Thus, events were further separated into dependent and independent categories in order to help clarify whether individuals with higher SC perfectionism are indeed generating negative life events.

Hypotheses

As depicted in Fig. 1, based on the above theory and previous empirical findings, we hypothesized that Time 1 SC perfectionism would uniquely predict Month 6 and Year 3 interpersonal-sadness sensitivity, Month 6 interpersonal-sadness sensitivity would predict Year 3 interpersonal-sadness sensitivity, and Year 3 interpersonal-sadness sensitivity would predict Year 4 interpersonal stress generation. Given that interpersonal-sadness sensitivity is a dynamic variable that is somewhat less stable than personality traits, we expected that interpersonal-sadness sensitivity would remain moderately stable between Month 6 and Year 3 (see Sliwinski et al. 2009). Most importantly, we hypothesized that enduring interpersonal-sadness sensitivity would mediate the prospective relation between Time 1 SC perfectionism and dependent interpersonal stressful events four years later. Further, as the potential confounding of perfectionism with concurrent depressive symptoms is an important issue (see Zuroff et al. 2004) and depressive symptoms have been shown to be a predictor of stress generation (Hammen 1991), Time 1 and Year 3 depressive symptoms were included in the model as covariates. We expected that the hypothesized relations would remain significant after controlling for the effects of depressive symptoms. In addition, we hypothesized that interpersonal-NA sensitivity and aggregated negative social interactions would provide weaker explanatory value than interpersonal-sadness sensitivity in explaining the relationship between Time 1 SC perfectionism and Year 4 dependent interpersonal stress. Finally, we examined whether the hypothesized mediation model extended to dependent noninterpersonal stress and/or to independent stress. We expected that the hypothesized model would be specific to interpersonal stress generation.

Method

Participants

The sample consisted of 145 English- and French-speaking community adults, who were a subset of an originally larger sample of 223 participants (see Dunkley and Kyparissis 2008). Recruitment was done through newspaper advertisements and posted bulletins. Participants were between the ages of 18–65 and currently employed at the beginning of the study. The study included questionnaires at Time 1, 14 daily diaries at Month 6 and Year 3, and a contextual-threat stress interview at Year 4. Participants were compensated $25 for completing the Time 1 questionnaires, $75 for each of the Month 6 and Year 3 diaries, and $50 for the Year 4 episodic stress interview. Participants who did not complete all 14 daily dairies at Month 6 and Year 3 were compensated in proportion to the number of diaries that they had completed.

In order for a participant's data to be included in the present study, the participant had to have completed all four time points and at least seven out of 14 daily diaries at the Month 6 and Year 3 time points. The final sample consisted of 145

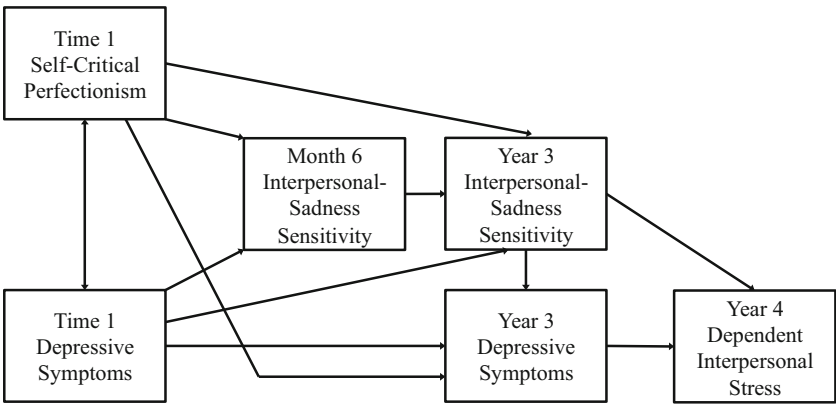

Fig. 1 Hypothesized model relating Time 1 self-critical perfectionism, Time 1 and Year 3 depressive symptoms, Month 6 and Year 3 interpersonal-sadness sensitivity, and Year 4 dependent interpersonal episodic stress

participants (100 women, 45 men) who completed their Month 6 diaries approximately six months (M = 5.93, *SD* = .35) after their initial Time 1 questionnaires, where 142 participants completed all 14 days of daily diaries, one participant completed 13 consecutive diaries, one participant completed 13 days of daily diaries with one day of item nonresponse (i.e. Day 12 is missing), and one participant completed 12 daily diaries with two days of item nonresponse. Participants completed their second set of diaries approximately three years after Time 1 (M = 36.70 months, *SD* = .91), with 139 participants completing all 14 daily diaries, one participant completing 13 consecutive diaries, two participants completing 13 days of diaries with one day of item nonresponse, one participant completing 12 consecutive diaries, one participant completing 10 consecutive diaries, and one participant completing eight consecutive diaries. The sample had a mean age of 41.2 years (*SD* = 12.28), and participants were primarily of European descent (76%), with 7% Asian, 3% East Indian, 3% Middle Eastern, 2% African, 1.5% South American, 1.5% Aboriginal, 1% Caribbean, and 5% unspecified. Participants either completed the English version of the questionnaires (57 female, 24 male) or the French version of the questionnaires (43 female, 21 male), depending on their preference.

Procedure

At Time 1, participants were invited to the laboratory for a 1.5 to 2-h session in order to complete questionnaires assessing demographic information, personality, and depressive symptoms. Participants were then invited back to the lab six months and again three years later to collect 14 stamped and addressed envelopes, each containing a daily diary questionnaire booklet. The daily diary packages contained questionnaires measuring daily affect and negative social interactions. Each section of the daily diary was explained in detail, and participants were asked to complete one daily diary at bedtime, beginning that evening, consecutively for the next 14 nights. Participants were then asked to mail the completed daily diary booklet the following morning. Participants were urged to complete their diary each evening; however, if this was not feasible, they were asked to complete them as soon as possible the following morning. At Year 3, participants were also asked to complete questionnaires assessing their current depressive symptoms. At Year 4, participants were invited back to the lab for a 60–75 min interview, where they were asked about stressful life events that had occurred throughout the last year.

Measures

Questionnaires and daily diary booklets were available in both English and French, as the sample consisted of English and French speaking participants. The French versions of the Time 1 perfectionism and depressive symptoms measures (see Dunkley et al. 2012b; Dunkley and Kyparissis 2008) and the Month 6 and Year 3 daily negative social interactions and affect measures (see Dunkley et al. 2014a; Dunkley et al., 2014b) were found to have similar internal consistencies and validity as the English equivalents.

Perfectionism The SC and PS perfectionism measures were created from the 45-item (Hewitt and Flett 1991) Multidimensional Perfectionism Scale (HMPS), the 35-item (Frost et al. 1990) Multidimensional Perfectionism Scale (FMPS), the 23-item Almost Perfect Scale-Revised (APS-R; Slaney et al. 2001), the 66-item Depressive Experiences Questionnaire (DEQ; Blatt et al. 1976), and the 40-item Dysfunctional Attitude Scale (DAS; Weissman and Beck 1978). Based on findings from previous factor analyses (Dunkley et al., 2014a; Powers et al. 2004; see Stoeber and Otto 2006 for a review), SC was indicated by DEQ self-criticism, DAS self-criticism, FMPS concern over mistakes, HMPS socially prescribed perfectionism, and APS-R discrepancy. PS was assessed by HMPS self-oriented perfectionism, FMPS personal standards, and APS-R high standards. The reliability and validity of the DEQ (e.g., Zuroff et al. 2004), DAS (e.g., Dunkley and Kyparissis 2008; Powers et al. 2004), APS-R (e.g., Slaney et al. 2001), HMPS (e.g. Hewitt and Flett 1991), and FMPS (e.g., Frost et al. 1990) have been well-established. Coefficient alphas for DEQ self-criticism (coefficient alpha for a weighted composite), DAS self-criticism, FMPS concern over mistakes, HMPS socially prescribed perfectionism, APS-R discrepancy, FMPS personal standards, HMPS self-oriented perfectionism, and APS-R high standards were .81, .90, .88, .89, .95, .81, .90, and .88, respectively. As was done in previous research (Dunkley et al., 2012a; Dunkley et al., 2014b; Dunkley et al. 2003), the DEQ, DAS, FMPS, HMPS, and APS-R measures were standardized and saved as z-scores, and then averaged together to create the relevant SC and PS perfectionism composite scores. The validity of these higher-order dimensions has been established in previous studies (e.g., Dunkley et al., 2014b; Dunkley et al. 2003; see Stoeber and Otto 2006). Cronbach's alphas for the SC perfectionism and PS perfectionism composite scores in the present study were .79 and .79, respectively.

Depressive Symptoms Depressive symptoms were evaluated using the Beck Depression Inventory (BDI; Beck et al. 1961), a 21-item self-report questionnaire measuring current depression levels. Participants rated how they were feeling over the past week, with higher scores indicating more severe levels of depression. The internal consistency and validity of the BDI has been well-established (Beck et al. 1988). In the present study, the Cronbach's alpha for the BDI was .86.

Daily Affect Five adjectives from the Positive and Negative Affect Schedule-Expanded (PANAS-X; Watson and Clark

1994) were administered in order to assess sadness for *today*. Negative affect for *today* was measured using the 10-item negative affect scale of the PANAS (Watson et al. 1988). The daily sadness and negative affect measures have been found to be reliable and valid (e.g., Dunkley et al., 2014b). The within- and between-person reliabilities were computed using Cranford et al.' (2006) procedure, and were .81 and .79 at Month 6, and .79 and .85 at Year 3 for sadness, and were .80 and .80 at Month 6, and .79 and .84 at Year 3 for negative affect, respectively.

Negative Social Interactions The revised 24-item Test of Negative Social Exchange (TENSE; Finch et al. 1999) was used to measure negative social interactions. Participants rated how often they experienced various types of negative social interactions (e.g., anger, insensitivity, interference) *today*. Reliability and validity for the TENSE has been well-established (e.g., Dunkley et al., 2014b; Finch et al. 1999). Computed using Cranford et al.' (2006) procedure, the within- and between-persons reliabilities in the present study were .94 and .93 at Month 6, and .95 and .94 at Year 3, respectively.

Contextual-Threat Stress Interview The UCLA Life Stress Interview (Hammen 1991) is a semi-structured contextual-threat interview that assesses episodic negative events. Events were elicited by asking participants if they had experienced any discrete life events during the last 12 months. If participants had difficulty recalling events, they were shown a list of possible life events in order to facilitate recollection. For participants who completed the study in French, bilingual graduate students translated general probes from English to French using forward and backward translation techniques in order to ensure that the meaning of each probe was retained. Participants described each event in detail, and the interviewer documented the facts without including the subjective emotional reactions of the participant.

The interviewer then presented the information to a team of independent raters, who coded each event in terms of its degree of contextual threat, whether the event was interpersonal or noninterpersonal, as well as dependent or independent of the individual. An event was deemed to be a negative interpersonal event if it involved: interpersonal loss, social rejection, disapproval from significant others, disruption in relationships, or abandonment. All other events were considered noninterpersonal. Contextual threat was determined by rating the event's objective impact on an average person in an identical context using a 5-point scale ranging from 1 (*no or minimal impact*) to 5 (*severe impact*) with increments of 0.5 (Hammen 1991; Uliaszek et al. 2012). Positive events were not retained. Dependence ratings represented the degree to which the occurrence of the event was dependent upon the individual's behavior using a 5-point scale ranging from 1 (*entirely independent of the person*) to 5 (*entirely dependent on the person*), with a score of 3 or higher being considered a dependent event (Hammen 1991; Ostiguy et al. 2009). Events were then separated into four distinct categories: dependent interpersonal, dependent noninterpersonal, independent interpersonal, and independent noninterpersonal events. Objective impact severity scores were calculated by summing the objective contextual-threat ratings across all events in each category (Ostiguy et al. 2009). Inter-rater reliability was established by having two separate groups of doctoral level graduate students in clinical psychology and licensed clinical psychologists with doctoral degrees rate the interpersonal nature, objective severity, and independence of 60 events. The single measure intraclass correlation coefficients (ICC) for the interpersonal nature, objective severity, and independence portions of the interview were .91, .90, and .91, respectively, which is in line with what has been reported in previous studies (Hammen 1991; Hammen and Brennan 2002). Having established reliability, one of the teams coded the remainder of the events.

Model Testing

We created daily interpersonal sensitivity variables by conducting multilevel modeling using SAS PROC MIXED (Version 9.2) and maximum likelihood estimation. More precisely, within-person daily variability in sadness and negative affect was predicted from within-person daily fluctuations in negative social interactions (with the slope modeled as randomly varying across participants). The individual slopes were empirical Bayes estimates, and the variance associated with these slopes was significant. The resulting regression coefficient represents a personal slope for each participant representing their degree of reactivity in response to negative interpersonal interactions. This individualized slope was then used as a between-persons interpersonal sensitivity variable in all subsequent path analyses.

Path model testing was performed using Analysis of Momentary Structure 5.0 (AMOS Version 5.0; Arbuckle 2003) in order to test for the mediated effects of Time 1 SC perfectionism on Year 4 dependent interpersonal stress through Month 6 and Year 3 interpersonal sensitivity, controlling for Time 1 and Year 3 depressive symptoms. Consistent with recommendations from Hoyle and Panter (1995), we considered incremental fit index (IFI) and comparative fit index (CFI) values above .95 and Root Mean Square Error of Approximation (RMSEA) values below .06 (Browne and Cudeck 1993) as indicating acceptable model fit (see Hu and Bentler 1999). In order to evaluate whether the relations between SC perfectionism and Year 4 dependent interpersonal stress was fully or partially mediated by interpersonal sensitivity, we performed nested comparisons between the hypothesized fully mediated model (see Fig. 1) and a partially mediated model that included a direct path between Time 1 SC

perfectionism and Year 4 dependent interpersonal stress. As suggested by Hoyle and Panter (1995), we compared the models using a chi-square difference test and fit indices that take into account model complexity. The parsimony-adjusted indices of fit that were used to compare the models were the Akaike information criterion (AIC) and the Bayes information criterion (BIC), where smaller values are preferred and the BIC more strongly favors more parsimonious models (see Arbuckle 2003). If the contrasting models demonstrated no significant difference, the more parsimonious, fully mediated model was retained (see Kline, 2005). Finally, indirect effects were tested using the Monte Carlo bootstrap procedure in AMOS (Arbuckle 2003), where 2000 bootstrap samples were created by randomly sampling and replacing the original data. These tests were based on 95% bias-corrected confidence intervals (CI), where any CI that did not include zero was considered statistically significant at $p < .05$.

Results

Descriptive Statistics

The Time 1 SC and PS perfectionism and BDI measures had item nonresponse percentages ranging between 0% for the FMPS concern over mistakes items and 1.3% for the BDI items. At Month 6, 145 participants completed a total of 2026 out of a possible 2030 daily measures of negative social interactions and sadness, where a single report was considered missing due to attrition and three reports were missing due to item nonresponse. At Year 3, participants completed a total of 2015 reports out of a possible 2030 reports, where 13 were found to be missing due to attrition and two were considered missing due to item nonresponse. Item nonresponse percentages were calculated for both the Month 6 and Year 3 diaries and ranged between 0% for the Month 6 sadness items and 1.2% for Year 3 negative social interactions. Percentages for missing variables at both time points were below 0.01%. Missing data for the interpersonal sensitivity variables were dealt with using a maximum likelihood method in SAS Version 9.2 (see Schlomer et al. 2010).

The total number of episodic events reported was 378, where participants reported between zero and seven events (M = 2.61, *SD* = 1.29). Of these, the number of dependent interpersonal events was 119, the number of dependent noninterpersonal events was 84, the number of independent interpersonal events was 56, and the number of independent noninterpersonal events was 119. The means and standard deviations for the Time 1 perfectionism and depression measures, Month 6 and Year 3 interpersonal-sadness and interpersonal-NA sensitivity and aggregated negative social interactions variables, and Year 4 episodic stress scores are shown in Table 1. The means of the Time 1 perfectionism and depression measures (Dunkley et al., 2012b; Dunkley and Kyparissis 2008), and the Month 6 and Year 3 negative social interactions and affect measures (Dunkley et al., 2014a; Dunkley et al., 2014b) were found to be comparable between individuals who completed English and French questionnaires. No significant differences were found when we ran independent sample *T* tests in order to compare English and French episodic stress scores. In addition, given that the present sample was a subset of an original sample of 223 participants recruited for a larger community study, *T* tests were performed comparing the means of the Time 1 perfectionism and depressive symptoms measures. Results from the *T* tests revealed that there were no significant differences between the current study's subsample of 145 participants and the additional 78 participants from the original sample.

Zero-Order Correlations

Zero-order correlations are reported in Table 1 between Time 1 SC perfectionism and PS perfectionism, Time 1 and Year 3 depressive symptoms, Month 6 and Year 3 daily interpersonal-sadness and -NA sensitivity and aggregated negative social interactions, and Year 4 episodic stress outcomes. Time 1 SC perfectionism exhibited stronger correlations than PS perfectionism with Month 6 and Year 3 interpersonal-sadness sensitivity and Year 4 dependent interpersonal stress. None of the Time 1, Month 6, or Year 3 variables correlated with the other Year 4 stress outcomes (dependent noninterpersonal stress and independent stress). In contrast to interpersonal-NA sensitivity and aggregated negative social interactions, Year 3 interpersonal-sadness sensitivity correlated with Year 4 dependent interpersonal stress.

Path Analyses Relating SC Perfectionism, Interpersonal-Sadness Sensitivity, and Dependent Interpersonal Stress

As shown in Fig. 1, our model included six measured variables: Time 1 SC perfectionism, Month 6 and Year 3 interpersonal-sadness sensitivity, and Year 4 dependent interpersonal stress, with Time 1 and Year 3 depressive symptoms included as covariates. Our hypothesized path model was tested with the inclusion of PS perfectionism. PS perfectionism did not provide unique explanatory value and, therefore, was not retained as a predictor in the following analyses, consistent with previous studies (Dunkley et al. 2003; Mandel et al. 2015). Further, given that none of the other stress outcomes were correlated with any of the predictors or mediators, these variables were not examined in further analyses.

The hypothesized structural model (see Fig. 1) was estimated and had the following acceptable fit indices: χ^2 (3, N = 145) = 2.73, *ns*; IFI = 1.00, CFI = 1.00; RMSEA = .00; AIC = 38.73; and BIC = 92.31. Following this, a path was estimated between Time 1 SC perfectionism and Year 4 dependent interpersonal

Table 1 Intercorrelations, means, and standard deviations of the perfectionism, depression, interpersonal sensitivity, aggregated negative social interactions, and episodic stress measures

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. T1 SC Perfectionism	–													
2. T1 PS Perfectionism	.55***	–												
3. T1 Depressive Sx	.62***	.23**	–											
4. M6 Int-Sad Sensitivity	.22**	.18*	.16	–										
5. M6 Int-NA Sensitivity	.07	.08	.12	.54***	–									
6. M6 Agg. NegSocInt	.34**	.14	.38***	.05	.21*	–								
7. Y3 Int-Sad Sensitivity	.36***	.18*	.21*	.33***	.12	.05	–							
8. Y3 Int-NA Sensitivity	−.09	.05	−.12	.21*	.28**	−.26**	.38***	–						
9. Y3 Agg. NegSocint	.37***	.18*	.48***	−.08	−.19*	.81***	.09	−.35***	–					
10. Y3 Depressive Sx	.54***	.20*	.68**	.04	−.06	.25**	.21*	−.17*	.34***	–				
11. Y4 Dep. Int. Stress	.24**	.22**	.18*	.13	.14	.19	.29***	.11	.12	.14	–			
12. Y4. Dep. Nonint. Stress	−.04	.02	−.12	.05	−.09	.04	.10	.01	−.01	.02	−.08	–		
13. Y4 Indep. Int. Stress	−.05	−.01	.03	−.08	.04	−.15	−.15	.03	−.02	−.06	−.05	−.21*	–	
14. Y4 Indep. Nonint. Stress	.02	.07	−.01	−.04	−.06	.10	−.01	.01	.04	−.02	.04	−.21*	−.12	–
M	.00	.01	9.27	.00	.00	20.73	.00	−.01	22.01	9.56	2.24	1.48	1.37	2.25
S.D.	1.00	1.00	7.38	.02	.04	21.41	.02	.02	24.30	7.74	2.49	2.20	2.25	2.57

$n = 145$

T1 = Time 1. M6 = Month 6. Y3 = Year 3. Y4 = Year 4. SC = Self-Critical. PS = Personal Standards. Sx = Symptoms. Int-Sad = Interpersonal-Sadness. Int-NA = Interpersonal-NA. Agg. NegSocInt. = Aggregated Negative Social Interactions. Dep. = Dependent. Indep. = Independent. Int. = Interpersonal. Nonint. = Noninterpersonal

* $p < .05$; ** $p < .01$; *** $p < .001$

events in order to contrast a partially mediated model with the hypothesized fully mediated model. The chi-square difference test was non-significant, $\Delta\chi^2$ (1, $N = 145$) = 2.46, *ns,* the BIC was 94.83 for the partially mediated model, and there was minimal difference in the AIC between models (38.27 for the partially mediated model). Taken together, the values favored the more parsimonious, fully mediated model. In addition, the direct path relating Time 1 SC perfectionism to Year 4 episodic stress ($\beta = .15$, $p = .12$) was nonsignificant. Thus, the hypothesized mediated model was retained.

As seen in Fig. 2, the 95% CI (.063, .610) between Time 1 SC perfectionism and Year 4 dependent interpersonal events supported the conclusion that the effect of SC perfectionism on interpersonal stress generation was fully mediated by Month 6 and Year 3 interpersonal-sadness sensitivity, adjusting for the effects of Time 1 and Year 3 depressive symptoms. In addition, SC perfectionism had a direct effect on Year 3 depressive symptoms, controlling for Time 1 depressive symptoms. Time 1 and Year 3 depressive symptoms were not uniquely related to interpersonal-sadness sensitivity or interpersonal stress generation in the model.

Supplementary Analyses

Supplementary analyses examined interpersonal-NA sensitivity as a potential explanatory variable in the relationship between SC perfectionism and Year 4 interpersonal stress generation. A separate path analysis and tests of indirect effects were conducted examining interpersonal-NA sensitivity, instead of interpersonal-sadness sensitivity, in the model relating Time 1 SC perfectionism to Year 4 dependent interpersonal events (see Fig. 1). In contrast to the interpersonal-sadness sensitivity mediation effects, SC perfectionism was not indirectly related to Year 4 dependent interpersonal events through interpersonal-NA sensitivity. In addition, a separate path analysis was conducted testing aggregated negative social interactions. In contrast to the results for interpersonal-sadness sensitivity, SC perfectionism was not indirectly related to Year 4 dependent interpersonal events through aggregated negative social interactions.

Discussion

The present study is the first to identify interpersonal-sadness sensitivity as an explanatory variable in the relationship between SC perfectionism and interpersonal stress generation over a period of four years. This research used repeated sequences of daily dairies to develop individual interpersonal-sadness sensitivity slopes, which were then tested as mediators in the relationship between SC perfectionism and stress generation four years later. Further, the present study used a contextual-threat interview to assess the dependence and

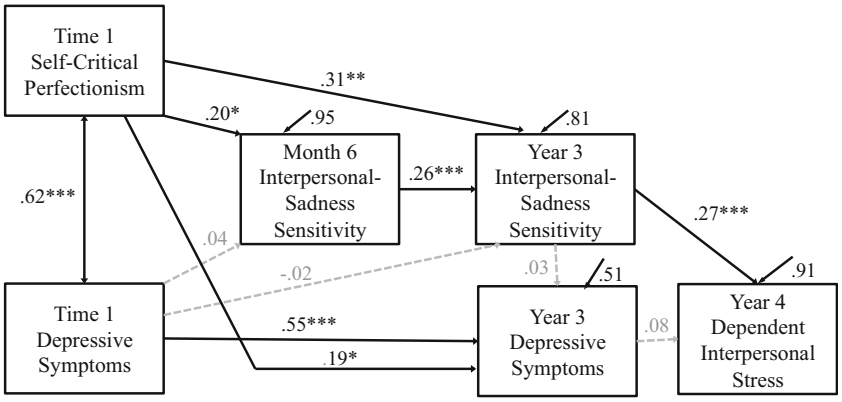

Fig. 2 Standardized parameter estimates of the final structural model relating Time 1 self-critical perfectionism, Time 1 and Year 3 depressive symptoms, Month 6 and Year 3 interpersonal-sadness sensitivity, and Year 4 dependent interpersonal episodic stress. The residual arrows denote the proportion of variance in the measured variable that was unaccounted for by other variables in the model. Significant estimates are shown in solid black and nonsignificant estimates ($p > .05$) in dashed gray. Note. * $p < .05$; ** $p < .01$; *** $p < .001$

interpersonal nature of stressful events, which provided a more stringent examination of the relationship between SC perfectionism and stress generation.

SC Perfectionism and Interpersonal Stress Generation Four Years Later

The present findings address important gaps in the literature by identifying who is most at risk for, and which factors contribute to interpersonal stress generation several years into the future (Hammen 2006). Our results underscore the impact of SC perfectionism on stress generation by demonstrating that SC perfectionism was directly related to dependent interpersonal events four years later. Our findings also show that SC perfectionism was not related to noninterpersonal stress generation or independent events over time. These results are consistent with previous research supporting a link between SC perfectionism facets and interpersonal stress generation (Priel and Shahar 2000; Shahar et al. 2004; Shih et al. 2009; Starrs et al. 2017) and interpersonal daily hassles (Hewitt and Flett 1993; Dunkley et al. 2003), but are in contrast to research noting a link between SC perfectionism facets and noninterpersonal stress generation (Hewitt and Flett 1993; Priel and Shahar 2000; Shahar et al. 2004; Shih et al. 2009). By providing more detailed information regarding which types of stress individuals with higher SC perfectionism generate over time, our results add to the literature on the perfectionism stress generation perspective (Hewitt and Flett 2002). One possible explanation for the specificity of our findings may be our use of a contextual-threat interview that evaluated the objective impact, the interpersonal nature, and the degree of dependence of the stressful life events, which is in contrast to most previous research that has relied on subjective self-reports (Luyten et al. 2011; Priel and Shahar 2000). Furthermore, in contrast to previous research, the current study spanned four years, a significantly longer time period, demonstrating that these relationships extend well into the future, highlighting the particularly detrimental impact of higher SC perfectionism on stress generation.

SC Perfectionism, Enduring Interpersonal Sensitivity, and Interpersonal Stress Generation Four Years Later

The present study examined the mediating role of enduring interpersonal-sadness sensitivity in the prospective relation between SC perfectionism and interpersonal stress generation four years later. In order to assess for interpersonal-sadness sensitivity, multiple sequences of daily diaries and multilevel modeling were employed at both Month 6 and Year 3 to create individualized slopes that represent the degree to which an individual's sadness fluctuates in response to their daily negative social interactions. This method provided a unique within-person interpersonal-sadness sensitivity slope, which was then used as an explanatory mediator in the relationship between SC perfectionism and dependent interpersonal stress four years later. Previous research testing within-person variables has focused on observing how a single variable (i.e., mood) fluctuates within an individual (Cole et al. 2014), whereas the current innovative method assesses how two variables (i.e., negative social interactions and sadness) fluctuate concurrently within an individual over time.

We found that aggregated daily negative social interactions exhibited higher levels of stability than interpersonal sensitivity between Month 6 and Year 3, which is in keeping with the suggestion that interpersonal sensitivity is inherently more likely to change over time than mean levels of daily negative social interactions (see Cole et al. 2014; Sliwinski et al. 2009). At the same time, our findings demonstrate the enduring

nature of interpersonal-sadness sensitivity, whereby SC perfectionism was indirectly related to Year 3 interpersonal-sadness sensitivity through Month 6 interpersonal-sadness sensitivity. These findings are in keeping with theory suggesting that SC perfectionistic individuals are highly sensitive to interpersonal difficulties (Dunkley et al. 2003; Hewitt and Flett 1993). This hypersensitivity is thought to be due to a harsh and controlling upbringing, that relied on conditional parental approval, leading them to overly value the approval of significant others and respond with increased sadness in the face of negative interpersonal exchanges in adulthood (see Blatt 1995; Dunkley et al., 2012a).

The present results extend the perfectionism diathesis-stress model (Dunkley et al., 2014b) by demonstrating that the enduring, heightened interpersonal-sadness sensitivity of individuals with higher SC perfectionism leads to higher levels of self-generated interpersonal events in the long-term future. Furthermore, these findings remained significant after controlling for Time 1 and Year 3 depressive symptoms, suggesting that the effects do not merely represent concomitants of depressive symptoms (Coyne and Whiffen 1995). One possible explanation for these findings is that because individuals with higher SC perfectionism tend to interpret negative social exchanges as a form of failure and respond with feelings of sadness and dejection (Besser and Priel 2005), they tend to respond by avoiding and withdrawing socially from the interaction in an effort to escape further criticism for the failure (Hewitt and Flett 2002), which leads to increased dependent interpersonal negative events in the long-term.

Our findings extend previous research in a number of ways. First, our findings further recent research aiming to explain the relationship between SC perfectionism facets and higher levels of perceived stress (Achtziger and Bayer 2013) by focusing on a more stringent objective stress measure that includes information on both the dependent and interpersonal nature of each event, and by examining these relations over a significantly longer period of time. Furthermore, our results also build on previous research demonstrating the destructive nature of interpersonal sensitivity in relation to depressive symptoms (O'Neill et al. 2004) by demonstrating interpersonal sensitivity in relation to other negative outcomes (i.e. interpersonal stress generation) and by identifying it as an important mediator in the relationship between SC perfectionism and stress generation. Lastly, the present findings advance previous research that has demonstrated a link between SC perfectionism and stress generation (Shahar et al., 2004), as well as research that has hypothesized links between self-criticism, disturbed relationships, and stress generation (Hewitt and Flett 2002; Zuroff et al. 2004; Starrs et al. 2017) by identifying interpersonal-sadness sensitivity as a specific mediator explaining the relationship between SC perfectionism and future interpersonal stress generation.

Interpersonal-NA Sensitivity and Aggregated Daily Negative Social Interactions as Alternative Mediators

The present study distinguished interpersonal-sadness sensitivity from interpersonal-NA sensitivity in that interpersonal-NA sensitivity did not mediate the relation between SC perfectionism and dependent interpersonal stress four years later. These results highlight the long-term cost of responding to negative social interactions with sadness, as opposed to other broader negative emotions, as reacting with sadness may elicit more withdrawal and avoidance, leading to stressful interpersonal life events in the long-term future (see Carver and Harmon-Jones 2009). To elaborate, the more an individual withdraws and avoids conflict, the less likely they are to adequately cope with the presenting conflict. As a result, the conflict may become increasingly problematic, which appears to contribute to stress generation over time.

The present study also distinguished daily interpersonal-sadness reactivity from aggregated daily negative social interactions. In contrast to interpersonal-sadness reactivity, average negative social interactions did not mediate the relation between SC perfectionism and stress generation outcomes four years later. Thus, our findings suggest that individuals with higher SC perfectionism do not experience stress generation because they are exposed to negative social interactions, but rather because they respond to negative social interactions with sadness. This supports the theoretical perspective that it is how one responds to stress, as opposed to the presence of stress, that better predicts future distress outcomes (Beck et al. 1979).

Clinical Implications

By assessing stress generation outcomes, as opposed to clinical symptoms, our findings provide important information about how to intervene before the onset of clinically significant outcomes. In order to prevent escalating stress generation, our results suggest that SC perfectionistic individuals may benefit from interventions that target daily interpersonal sensitivity. Our findings indicate that interventions for individuals with higher SC perfectionism should focus primarily on better regulating the degree of sadness that they experience when they are exposed to negative social interactions more so than reducing their frequency of negative social interactions. Emotion regulation skills utilized in dialectical behavioral therapy (DBT; Linehan 1993), which aim to lessen the intensity of negative moods by identifying and describing emotions and by working to respond more effectively to interpersonal stressors, may be helpful in decreasing sadness. Furthermore, recent interventions have been developed that utilize cognitive behavioral techniques to specifically target interpersonal sensitivity cognitions (Bell and Freeman 2014), which may be helpful for individuals with higher SC perfectionism. In

addition, Interpersonal Therapy (IPT; Klerman et al. 1984) focuses on better coping with present interpersonal dysfunction, as opposed to enduring personality features, and has been shown to be effective in altering how individuals respond to and engage with interpersonal difficulties (de Mello et al. 2005).

Limitations and Directions for Future Research

The current study had several notable strengths, including the four-year longitudinal design, the daily diary methodology, and the contextual-threat interview. However, certain limitations were present in our methodology and future research should aim to address some of these shortcomings. First, the predictor, mediator, and outcome variables were not evaluated at each time point, which would have allowed for stronger causal statements (see Cole and Maxwell 2003). Future studies should incorporate measures of stress generation at multiple time points in order to better establish the temporal ordering of these processes (see Uliaszek et al. 2012). Second, both theory and research suggest that SC perfectionism is related to avoidant coping (Dunkley et al., 2014b), and avoidant coping has been theorized as a potential link between stress-sadness reactivity and stress generation (see Carver and Harmon-Jones 2009; Lindebaum and Jordan 2014). Therefore, future research should investigate whether avoidance and withdrawal coping styles do indeed help to explain the relationship between stress-sadness sensitivity and stress generation for individuals with higher SC perfectionism. Third, future research should assess the generalizability of our findings to larger samples of adults as well as to clinical and other nonclinical populations, including adolescents and more culturally diverse samples. Lastly, future studies should evaluate the potential effectiveness of interventions targeting sadness-sensitivity to negative interpersonal exchanges in order to test whether these interventions help to reduce the development of future stress generation for SC perfectionistic individuals.

Conclusion

The current study incorporated repeated sequences of daily diaries and individual interpersonal-sadness sensitivity slopes to examine the long-term relationship between SC perfectionism and stress generation. Our findings showed that the presence of enduring interpersonal-sadness sensitivity, as opposed to average negative social interactions or interpersonal-NA sensitivity, explained the relationship between SC perfectionism and interpersonal stress generation four years later. More specifically, individuals higher on SC perfectionism were more likely to have higher levels of dependent interpersonal events in the future because they responded to daily negative social interactions with heightened sadness. These findings suggest that interpersonal-sadness sensitivity may serve as an important target for future interventions that aim to reduce later stress generation for SC perfectionistic individuals.

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Compliance with Ethical Standards

Conflict of Interest Dr. Tobey Mandel declares that she has no conflict of interest. Dr. David Dunkley declares that he has no conflict of interest. Dr. Claire Starrs declares that she has no conflict of interest.

Experiment Participants All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors. Informed consent was obtained from all individual participants included in the study.

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