



## Emotion Differentiation as a Protective Factor Against the Behavioral Consequences of Rumination: A Conceptual Replication and Extension in the Context of Social Anxiety

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Rumination is thought to play a central role in affective disorders such as social anxiety disorder (SAD). Past research indicates that rumination tends to exacerbate negative emotions and increase the risk of engaging in maladaptive coping behaviors (e.g., avoiding social activities). However, little is known on how to effectively protect against the negative outcomes of rumination. Previously, Zaki, Coifman, Rafaeli, Berenson, and Downey (2013) found that negative emotion differentiation (NED) protected against rumination and nonsuicidal self-injury in borderline personality disorder. Nevertheless, it is unclear whether this protective effect would extend to other populations and behaviors. Therefore, the present investigation sought to replicate and extend Zaki et al.'s (2013) findings in the context of SAD. In two studies, we examined if NED would moderate the positive association between rumination and frequency of social avoidance. Study 1 involved 29 individuals who met criteria for SAD with or without co-occurring major depressive episode, while Study 2 involved a nonclinical sample of 190 college students. All participants completed a measure of rumination and an experience-sampling diary which provided indices of NED and social avoidance. The results from both studies were

unanimous: NED significantly moderated the relationship between rumination and social avoidance such that the positive association between rumination and social avoidance was significant for low but not moderate to high NED. Overall, the findings provide a conceptual replication of Zaki et al. (2013) and further evidence for the protective effects of NED against the maladaptive behavioral consequences of rumination across populations.

*Keywords:* emotion differentiation; rumination; social anxiety; social avoidance; experience-sampling

RUMINATION IS A REPETITIVE negative thinking style that is theorized to be a transdiagnostic risk factor in the development and maintenance of affective disorders such as depression and anxiety (McLaughlin & Nolen-Hoeksema, 2011). According to Nolen-Hoeksema (1991), rumination refers to the propensity to focus repeatedly about the causes, situational factors, and outcomes of one's emotional experience. Past research indicates that rumination tends to exacerbate the intensity of negative emotions and self-reported negative affect via interactions with maladaptive cognitions (Ciesla & Roberts, 2007). Additionally, this increase in negative affect may lead to increased levels of rumination, thereby resulting in a vicious feedback loop, termed an *emotional cascade* (Selby, Anestis, & Joiner, 2008). Consequently, to terminate this repetitive cycle, individuals are thought to engage in behaviors that distract them from the cascade of maladaptive thoughts. Consistent with the emotional cascade hypothesis, previous research has

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found empirical support for the reciprocal relationship between rumination, negative affect, and maladaptive behaviors such as substance use and binge-eating in depression, substance abuse, and bulimia (Nolen-Hoeksema, Stice, Wade, & Bohon, 2007) as well as nonsuicidal self-injury (NSSI) in borderline personality disorder (BPD; Zaki, Coifman, Rafaeli, Berenson, & Downey, 2013). Taken together, extant literature suggests that rumination is associated with a greater risk of engaging in various maladaptive behaviors, particularly in response to negative emotional states, across different populations.

In the context of social anxiety disorder (SAD), which is characterized by marked fears and avoidance of social and/or performance situations, rumination is theorized to exacerbate and maintain the disorder (Hofmann, 2007). According to cognitive models of SAD (e.g., Clark & Wells, 1995), maladaptive ruminative thought processes tend to influence the severity of anxiety and fear of social situations as well as subsequent behaviors in response to these fears. These include *anticipatory worry* (e.g., thinking about an impending social situation), *self-focused attention* (e.g., directing attention towards physical appearance), and *post-event review*. Indeed, experimental evidence indicates that engaging in maladaptive rumination can lead to increases in anxiety and maladaptive self-beliefs (Wong & Moulds, 2009) and a greater tendency to avoid socially evaluative situations (Wong & Moulds, 2011). This may work because avoidance, which typically involves engaging in behavioral strategies to avoid feared situations, temporarily reduces anxiety. However, these strategies maintain the disorder by preventing opportunities to counter maladaptive cognitions and learn about the true threat value of the feared stimuli (Clark & Wells, 1995). Further, the temporary relief experienced reinforces and perpetuates avoidance behaviors. As such, avoidance is a critical target of treatment for SAD (Hofmann, 2007) and it is therefore pertinent to examine factors that could mitigate the occurrence of avoidance behaviors.

In contrast to rumination, some forms of attention to one's experience can be adaptive. Various clinical theories emphasize that the way we observe our emotions could influence their impact on subsequent affect, cognitions, and behaviors (Greenberg, 2002). One way of attending to our emotions adaptively that could interrupt the cycle of rumination and negative emotions is emotion differentiation (ED). ED involves recognizing, identifying, and labeling one's emotions discretely, thereby making fine-grained distinctions between similarly valenced emotional states (Barrett, Gross, Christensen, & Benvenuto, 2001). As discrete emotions offer information on how to cope with a

situation (Schwarz & Clore, 2003), the ability to differentiate emotions could be beneficial in contexts involving intense negative emotions by promoting greater awareness, understanding, and regulation of emotional experiences (Barrett et al., 2001). Indeed, previous research has shown that labeling one's feelings decreased fear (Kircanski, Lieberman, & Craske, 2012) and physiological reactivity (Niles, Craske, Lieberman, & Hur, 2015) in response to various stressors, which may result from a dampening of amygdala activation via the prefrontal cortex (Lieberman et al., 2007). In so doing, ED may enable one to adopt the psychological distance necessary to reflect on emotional experiences, allowing for a broader focus and increasing the potential for adaptive appraisal and action, thereby reducing rumination and distress (Kross & Ayduk, 2011).

Past research has found that individuals tend to vary widely in ED ability. Importantly, compared to healthy individuals, negative ED (NED) appears diminished among those with psychopathology involving affect and behavioral dysregulation like SAD (Kashdan & Farmer, 2014), depression (Demiralp et al., 2012), and BPD (Zaki et al., 2013). As such, NED could play a critical role in emotional well-being by buffering against the use of maladaptive behavioral strategies to regulate negative emotions. Indeed, individuals who are more adept at differentiating their emotions (high differentiators) tend to report being better at identifying and using a range of strategies to regulate their emotions (Barrett et al., 2001). Further, high differentiators are less likely to binge-drink when stressed (Kashdan, Ferssizidis, Collins, & Muraven, 2010) and demonstrate greater treatment adherence during chronic illness (Coifman, Ross, Kleinert, & Giardina, 2014). Conversely, individuals who have greater difficulties differentiating their emotions (low differentiators) are more susceptible to negative outcomes such as having angry outbursts (Pond et al., 2012) and higher frequency of NSSI (Zaki et al., 2013). Overall, these findings provide evidence that NED could protect against behavioral dysregulation across populations, which is particularly relevant in contexts involving intense negative emotions, where the need for emotion regulation may be the greatest.

#### CURRENT INVESTIGATION

Despite playing a central role in affective disorders, little is known on how to effectively protect against the deleterious effects of rumination. Presently, only one study has examined NED as a protective factor against the association between rumination and maladaptive behaviors. Zaki et al. (2013) found that NED moderated the positive association between

rumination and frequency of NSSI among individuals with BPD. Specifically, rumination predicted lower frequency of NSSI under moderate to high NED but higher frequency of NSSI under low NED. Considering that rumination is argued to be a transdiagnostic risk factor of behavioral dysregulation, it remains pertinent to examine whether the protective effects of NED demonstrated in Zaki et al. (2013) would replicate and extend to other populations and behaviors.

The present research sought to replicate Zaki et al. (2013) in the context of social anxiety. Given the transdiagnostic nature of rumination's maladaptive consequences, we investigated this research question in two samples (clinical and nonclinical) using an experience-sampling approach, as it provides a standard measure of NED and reduces retrospective biases commonly present in self-report research. The main hypothesis for the present investigation was guided by Zaki et al. (2013): we hypothesized that NED would moderate the positive association between rumination and social avoidance, a behavioral feature characteristic of social anxiety. First, in Study 1, we investigated this hypothesis in a clinical sample diagnosed with SAD. As in Zaki et al. (2013), we included a healthy control group to examine differences in rumination, NED, and social avoidance between socially anxious and healthy individuals to assist with the interpretation of the findings. In Study 2, we investigated if the same effect would hold in a nonclinical sample of college students where we would expect a reasonable distribution of social anxiety symptoms, where social avoidance could be particularly harmful, and that NED would be protective. To increase the reliability of our findings, we ensured that both studies had similar designs. These include having similar experience-sampling protocols and measures to assess rumination and social avoidance. However, the studies differed on the experience-sampling duration (14 days in Study 1 and 10 days in Study 2) and assessment of social anxiety symptoms (Study 1 used a clinical diagnostic interview, while a self-report measure was used in Study 2).

### Study 1

#### METHOD

##### Participants

A total of 69 participants ( $n = 39$  diagnosed with SAD for the clinical group,  $n = 30$  for the healthy control [HC] group) were recruited for this investigation, as part of a larger study. A subsample of 54 individuals are included here because they completed the experience-sampling diary ( $n = 8$  from the clinical group and  $n = 7$  from the HC

group were excluded as they did not provide any diary data). The mean ( $SD$ ) age of this sample was 32.00 (12.59), where the clinical group ( $M = 34.97$ ,  $SD = 13.38$ ) was significantly older than the HC ( $M = 28.00$ ,  $SD = 10.42$ ),  $t(52) = -2.15$ ,  $p = .036$ . Descriptive information for both groups, including sex, race/ethnicity, and medication and treatment history, are listed in Table 1.

Individuals were included in this study if they met criteria for a current DSM-IV diagnosis of generalized social phobia (GSP) based on the DSM-IV-TR (American Psychiatric Association, 2000) or were determined to be psychologically healthy. Participants were recruited as part of a larger study, titled "Emotion, Attention, and Mood in Daily Life," through printed flyers and postings at mental health clinics and public settings (e.g., libraries) in the community surrounding a large Midwestern university in the United States, and relevant listservs and online websites. All participants were interviewed with the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I; First,

Table 1  
Characteristics of Study 1 Participants as a Percentage of the Sample

Characteristic	Clinical ( $n = 31$ )	HC ( $n = 23$ )	Tests of Significance
Sex			$\chi^2(1, n = 54) = 2.67$ , $p = .102$
Female	67.7	87.0	
Male	32.3	13.0	
Race/Ethnicity			$\chi^2(2, n = 54) = .58$ , $p = .749$
White/European	87.1	91.3	
Black/African	9.7	4.3	
Asian	3.2	4.3	
Mental Health History			
Ever been on psychiatric medication	74.2	4.3	$\chi^2(1, n = 53) = 25.19$ , $p < .001$
Ever been in therapy	96.8	30.4	$\chi^2(1, n = 53) = 25.72$ , $p < .001$
Employment Status			
Employed full-time	22.5	26.1	$\chi^2(1, n = 54) = .09$ , $p = 1.00$
Employed part-time	32.3	30.4	$\chi^2(1, n = 54) = .02$ , $p = 1.00$
Attending school or a training program	22.6	43.5	$\chi^2(1, n = 54) = 2.67$ , $p = .141$
Not employed due to illness or disability	12.9	0	$\chi^2(1, n = 54) = 3.21$ , $p = .127$

Note. The clinical group consisted of 17 (59%) individuals with generalized social phobia with co-occurring major depressive episode and 14 (41%) individuals with generalized social phobia only. HC = healthy control group.

Gibbon, Spitzer, & Williams, 1996), Structured Clinical Interview for DSM-IV-TR Axis II Personality Disorders (SCID-II; Gibbon, Spitzer, Williams, Benjamin, & First, 1997) and supplemental modules from the Anxiety Disorders Interview Schedule–Lifetime Version (ADIS IV-L; Brown, Barlow, & DiNardo, 1994).

For the clinical group, the inclusion criteria for this study included meeting the diagnosis for GSP based on the DSM-IV-TR. Exclusion criteria included meeting diagnostic criteria for bipolar disorder (I or II), BPD, current psychosis, and current use of such medications as benzodiazepines, beta-blockers, tricyclic antidepressants, and anti-psychotics. The exclusion of these medication classes was due to aspects of the larger study that involved examining autonomic nervous system activity, and these medication classes have been found to influence cardiovascular activity in ways that would interfere with the larger study's hypotheses. The clinical group consisted of 17 (59%) individuals with GSP with co-occurring major depressive episode and 14 (41%) individuals with GSP only.

To compare levels of rumination, social avoidance, and NED in the clinical group to healthy individuals, HC participants were recruited after determining eligibility through the diagnostic interview. The inclusion criteria included an absence of any Axis-I disorder in the past year, absence of any personality disorder (less than two symptoms endorsed on any SCID-II scale), no use of psychiatric medications in the past year, global assessment of functioning score on the SCID-I that was greater than 79, and no evidence of elevated social desirability (i.e., scores  $\leq 25$  on the Marlowe-Crowne Social Desirability Scale; Crowne & Marlowe, 1960).

#### *Procedure*

Individuals who responded to the study flyers and online postings ( $N = 630$ ) first participated in phone screenings conducted by trained research team members and were assessed for potential eligibility to participate in the larger study. These screenings adapted items from the SCID-I and the Interview Guide for Evaluating DSM-IV Psychiatric Disorders (Zimmerman, 1994). Individuals ( $n = 158$ ) who endorsed sufficient symptoms to make them potentially eligible or did not endorse any symptoms were then invited to the laboratory for a detailed diagnostic assessment. Participants were compensated \$25 upon completion of the diagnostic assessment regardless of study eligibility.

Following the diagnostic interview, participants who met the eligibility criteria for the clinical or HC

group began study participation. As part of the larger study, participants first completed a take-home questionnaire packet and subsequently returned to the laboratory to complete two separate study sessions. During these sessions, participants completed a series of cognitive and emotional tasks that were unrelated to the current investigation. At the first study session, all participants were trained by a research staff on the experience-sampling diary portion of the study, which involved completing a 14-day electronic diary. Participants completed this portion of the study between the two laboratory sessions.

Participants were then compensated with \$95 for this part of the study (\$15 for completing the questionnaire packet, \$30 for the first study session, and \$50 for the experience-sampling diary) and a \$25 bonus if they completed more than 90% of diary entries. All parts of the study were approved by the Kent State University Institutional Review Board (IRB) prior to the start of data collection. All participants provided written informed consent prior to the initial diagnostic interview and again if they were deemed eligible for the research study.

#### *Diagnostic Interview*

A structured diagnostic interview was used for all participants. All interviews were conducted by clinical psychology doctoral students who were trained and supervised by a licensed clinical psychologist. Overall, the reliability for symptom and diagnostic level was reported to be good, average  $\kappa > .90$ . The diagnostic interview comprised an assessment of current functioning, history of medical and psychiatric treatments, the SCID-I, SCID II, and the Generalized Anxiety Disorder and Social Phobia modules from the ADIS IV-L.

#### MEASURES

##### *Rumination*

The 5-item brooding subscale of the Ruminative Responses Scale (RRS; Treynor, Gonzalez, & Nolen-Hoeksema, 2003) was used to capture participants' general tendency to engage in maladaptive rumination by measuring the frequency of engagement in ruminative thought processes (e.g., "What am I doing to deserve this?"). Previously, Treynor et al. (2003) reported that the items from the brooding subscale were not confounded by depression content and distinctively "reflect a passive comparison of one's current situation with some unachieved standard." Given that social anxiety often involves comparing oneself to a certain (unachievable) standard, the brooding subscale has considerable utility in capturing maladaptive rumination in the context of social anxiety (e.g., Joormann, Dkane, &

Gotlib, 2006). Participants rated on a 4-point Likert scale ranging from 1 (*almost never*) to 4 (*almost always*). An index of rumination was computed by obtaining the mean score across the ratings for all five items. The internal consistency of the brooding subscale was high (Cronbach's  $\alpha = .87$ ).

#### *Experience-Sampling Diary*

A 14-day electronic daily experience-sampling diary was used to measure the frequency of various behaviors and experience of positive and negative emotions. The experience-sampling data was collected using the Palm Centro personal digital assistant, programmed with the Purdue Momentary Assessment Tool. During the experience-sampling period, participants received five daily prompts at semirandom times over a 14-hour period daily for 14 days. Each diary prompt occurred at least 30 minutes after the previous diary, with a maximum gap of 5 hours in between diary prompts. If needed, participants were able to delay or stop a diary prompt for up to 2 hours if their circumstances prevented them from answering (e.g., when driving a car). Therefore, participants could complete up to 70 diary entries. Four (two from each group) of the 54 participants were excluded from the present study due to insufficient diary data. The criteria for exclusion was based on standardized procedures utilized in experience-sampling research recommended by Bolger, Davis, and Rafaeli (2003). This involved excluding participants who completed less than 2 standard deviations ( $< 13$  diaries) from the average number of diaries responded across the sample. Except for age, there were no significant demographic or diagnostic differences between the excluded individuals and the final sample. The remaining sample ( $n = 50$ ) completed a mean ( $SD$ ) of 61.47 (16.17) out of a possible 70 diary prompts (range: 16 – 90; compliance rate = 88%). Twelve participants completed more than 70 diary entries as they were late in returning the diary device. However, there were no significant differences in the primary outcome measures between individuals who completed more than 70 diaries compared to those who completed 70 diaries or less. There was no significant difference in the mean number of diaries completed by the clinical ( $M = 64.55$ ,  $SD = 14.31$ ) and HC groups ( $M = 57.10$ ,  $SD = 18.24$ ),  $t(48) = -1.62$ ,  $p = .112$ .

*Momentary self-reported emotions.* During each diary prompt, participants were asked to rate their current emotional state using a 5-point Likert scale ranging from 1 (*not at all*) to 5 (*extremely*). Participants responded to a series of emotion

terms and rated the extent to which they presently felt each of six negative emotion words (*fear, sadness, guilt, distress, anger, disgust*), which comprised the negative affect scale. At each prompt, although unrelated to the hypotheses of the present investigation, participants also rated the extent to which they felt each of six positive emotion words (*happiness, enjoyment, affection, satisfaction, amusement, relief*). The order of word presentation was counterbalanced across diaries. These negative and positive emotion words were selected to account for varying levels of activation across positive and negative valence dimensions of dominant circumplex models of affect (e.g., Russell, 1980). The reliability of the negative affect scale was computed at the between-person ( $R_{KF}$ ) and within-person ( $R_C$ ) levels based on the procedures recommended by Cranford et al. (2006). The between-person ( $R_{KF} = .99$ ) and within-person ( $R_C = .77$ ) reliabilities for this sample were good.

*Mean negative affect.* From the ratings of the negative emotion words, an index of mean negative affect (NA) was derived for each participant by calculating the mean score across the ratings of the six negative emotion words, across all diary prompts (Demiralp et al., 2012).

*Negative emotion differentiation.* From the ratings of the negative emotion words, an index of NED was derived for each participant following the procedures used in previous studies on ED (Kashdan et al., 2010; Tugade, Fredrickson, & Barrett, 2004). This involved computing the average intra-class correlation coefficient (ICC) with absolute agreement between the ratings of the six negative emotion words across all diary prompts for each participant. Four individuals (all from the HC group) had negative ICCs. Following the procedures performed by Boden, Thompson, Dizén, Berenbaum, and Baker (2013), these negative ICC scores were changed to 0 and included in subsequent analyses. As a high ICC reflects low NED, they were subtracted from 1.0 to reverse the score such that higher values would indicate higher NED and lower values would indicate lower NED for ease of interpretation.

*Momentary self-reported social avoidance.* During each diary prompt, participants indicated if they engaged in social avoidance (i.e., avoiding social activities that involve in-person contact with friends or others and/or engaging in solitary activities) since the previous diary by endorsing “yes”; “no”; or “no but I thought about it a lot or had a strong urge,” which was deemed an urge. The definition of social avoidance was provided (in parentheses) at every signal, and participants were trained with this definition prior to the diary start. Previous research

by Hofmann, Baumeister, Förster, and Vohs (2012) indicated that strong urges and behavioral enactments are closely positively associated although multiple contextual factors (e.g., opportunity limitations) could constrain the likelihood of enactment of behaviors. Therefore, for each diary prompt, we created an aggregate score by collapsing “urge” and “yes” as endorsing social avoidance (1) versus “no” which indicates no social avoidance (0).<sup>1</sup> As in Zaki et al. (2013), the frequency of social avoidance was derived by summing the aggregate score across all diaries for each participant and dividing it by the total number of diary prompts that the participant responded to (e.g., an overall aggregate score of 50 divided by 70 total diary prompts = 0.71). A square root transformation was applied as the distribution of scores was significantly positively skewed,  $|z| > 3.29$  (since  $50 < n < 300$ ; Kim, 2013), which successfully removed the skew ( $|z| = 2.76$ ). This was used as the dependent variable in subsequent analyses.

#### DATA ANALYTIC STRATEGY

First, means and standard deviations of the brooding subscale, mean NA, NED, and social avoidance were obtained. Following which, a series of independent samples t-tests were executed to examine between-group differences on these outcomes. Then, as in Zaki et al. (2013), we tested the possible moderation of the association between rumination and social avoidance by NED using Ordinary Least Squares (OLS) regression with the Hayes PROCESS macro (Model 1). This macro runs a series of OLS regressions with the centered product term representing the interaction of rumination by NED as a predictor of social avoidance. The estimated effects reported were unstandardized regression coefficients. Statistical significance was set at .05.

#### RESULTS AND DISCUSSION

##### *Analyses Involving Both Clinical and HC Groups*

First, group differences in rumination, mean NA, frequency of social avoidance, and NED were examined. Levene’s test for equality of variances for each comparison was significant. Therefore, the degrees of freedom for each comparison was adjusted accordingly. As expected, the clinical group reported significantly higher levels of rumination ( $M = 2.52, SD = 0.85$ ) than HC ( $M = 1.53, SD = 0.46$ ),  $t(44.75) = 5.29, p < .001$ , Cohen’s  $d = 1.51$ , 95% CI [.88; 2.15]. Across the diary period, the clinical group reported significantly higher levels of mean NA ( $M = 1.58, SD = 0.50$ ) compared

to HC ( $M = 1.11, SD = 0.09$ ),  $t(30.53) = 4.98, p < .001$ , Cohen’s  $d = 1.43$ , 95% CI [.75; 2.08]. Further, as anticipated, the clinical group reported significantly greater frequency of social avoidance ( $M = 0.41, SD = 0.28$ ) than HC ( $M = 0.07, SD = 0.10$ ),  $t(37.59) = 6.02, p < .001$ , Cohen’s  $d = 1.72$ , 95% CI [1.04; 2.40], and lower levels of NED ( $M = .37, SD = .19$ ) compared to HC ( $M = .54, SD = .32$ ),  $t(29.89) = -2.20, p = .036$ , Cohen’s  $d = -.63$ , 95% CI [-1.21; -.04].

We also obtained bivariate correlations between theoretically relevant variables and the dependent variable across both groups. These include rumination, NED, mean NA, and age. Notably, we found significant positive associations between social avoidance and rumination ( $r = .40, p = .004$ ), mean NA ( $r = .64, p < .001$ ), and age ( $r = .33, p = .018$ ). In contrast, NED was not significantly associated with social avoidance ( $r = -.16, p = .278$ ). Additionally, there was a trend for males ( $n = 12; M = .43, SD = .37$ ) to report a higher frequency of social avoidance than females ( $n = 38; M = .21, SD = .22$ ),  $t(13.70) = -1.99, p = .067$ .

##### *Primary Analyses*

Next, the primary hypotheses were examined in the clinical group. Within this group, we predicted that NED would moderate the positive association between rumination and frequency of social avoidance. To examine NED as a moderator of the relationship between rumination and social avoidance, the Hayes PROCESS macro (Model 1) was used. Rumination was entered as the independent variable, NED was entered as the moderator variable, and social avoidance (with square root transformation) was entered as the outcome variable. Last, mean NA was entered as a covariate. The interaction product term was mean centered and standard errors were corrected for heteroscedasticity. The results of the moderation analysis are presented in Table 2.

Overall, the regression model was significant,  $R^2 = .50, F(4, 24) = 7.10, p < .001$ . Although there was no significant main effect of rumination on social avoidance ( $B = .04, p = .575$ ), as hypothesized, the results of the moderation analysis indicated that the interaction term between rumination and NED explained a significant increase in variance in social avoidance,  $B = -.78, \Delta R^2 = .22, F(1, 24) = 7.90, p = .010$ . Therefore, NED significantly moderated the relationship between rumination and social avoidance. To probe the effects of the interaction, predicted values were plotted for individuals at the mean and 1 SD above and below the mean of rumination and NED (refer to Figure 1). Follow-up tests of the simple slopes indicated that the

<sup>1</sup> The correlation between urges + acts and acts only was high in this sample ( $n = 50$ ),  $r = .83, p < .001$ .

Table 2  
Significant Two-Way (Rumination by NED) Interaction in Predicting Social Avoidance in the Clinical Group ( $n = 29$ )

	Predictor	<i>B</i>	<i>SE</i>	95% CI	<i>sr</i> <sup>2</sup>	<i>F</i> <sup>2</sup>	$\Delta R^2$
Step 1	Rumination	.00	.06	-.12 to .12	.00	.28*	
	NED	.21	.27	-.34 to .77	.02		
	Mean NA	.31**	.10	.10 to .52	.27		
Step 2	Rumination	.04	.05	-.07 to .14	.01	.50**	.22**
	NED	.16	.23	-.32 to .63	.01		
	Mean NA	.24*	.09	.05 to .42	.15		
	Rumination $\times$ NED	-.78**	.24	-1.28 to -.28	.22		
	$F(4, 24) = 7.10, p < .001$						

Note. *B* = unstandardized coefficient; *SE* = standard error; CI = confidence interval; NED = negative emotion differentiation; NA = negative affect.

\*  $p < .05$ ;

\*\*  $p < .01$ .

association between rumination and social avoidance under low NED (1 *SD* below the mean) was significantly different from zero,  $b = .18, p = .042$ . However, the association between rumination and social avoidance under moderate ( $b = .04, p = .575$ ) to high (1 *SD* above the mean;  $b = -.11, p = .198$ ) NED was not significantly different from zero, thus indicating no significant difference in social avoidance between high and low ruminating individuals with moderate to high NED.

Therefore, only for low differentiators, higher rumination predicted higher frequency of social avoidance. In contrast, the positive association between rumination and social avoidance was no longer significant for moderate to high differentiators, thereby protecting against the negative behavioral outcomes of rumination. Finally, we simultaneously examined whether other potential covariates such as age, sex, diagnostic status (i.e., the

presence of a co-occurring major depressive episode), number of diaries completed, and history of taking psychiatric medications might impact the results but the interaction term remained significant,  $B = -.80, \Delta R^2 = .19, F(1, 19) = 11.38, p = .003$ . We also controlled for the interaction term between rumination and mean NA in our analyses as it could be theoretically relevant but found that it did not have any meaningful effect on our results (i.e., the interaction term between rumination and NED remained significant,  $B = -.86, \Delta R^2 = .13, F(1, 18) = 7.55, p = .013$ ).

Overall, the results of Study 1 replicated and extended Zaki et al.'s (2013) findings in a sample of individuals with SAD. This provides further evidence for the protective effects of NED and builds upon previous work that found significant negative associations between NED and maladaptive behaviors (Kashdan et al., 2010; Pond et al., 2012).

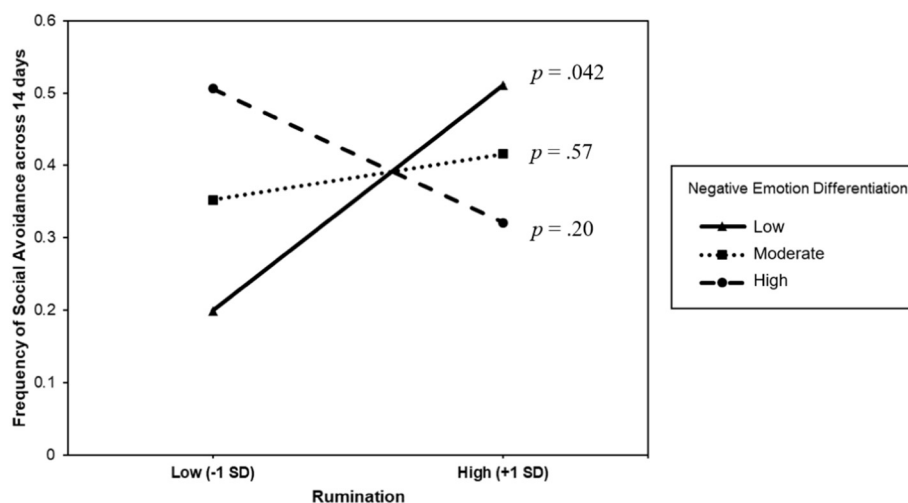


FIGURE 1 Study 1: This figure describes the interaction between rumination and negative emotion differentiation when predicting the frequency of social avoidance across the 14-day diary period in individuals with generalized social phobia with/without co-occurring major depressive episode.

Taken together, these findings indicate that NED could protect against the use of maladaptive behavioral strategies in response to negative thoughts and emotions. The convergence between Study 1 and Zaki et al.'s (2013) findings further suggests that NED could serve as a transdiagnostic protective factor against behavioral dysregulation. As such, we sought to replicate and extend the effects obtained in Study 1 in a non-clinical sample of college students in Study 2.

### Study 2

College is a period filled with academic, emotional, and social challenges. An important predictor of retention is social adjustment, which involves being integrated into the college social environment through participation in social activities (Gerdes & Mallinckrodt, 1994). As such, avoidance of social activities during college is likely detrimental. Further, college students often report experiencing significant levels of social anxiety, with up to 20% of students meeting clinical cutoffs (Beidel, Turner, Stanley, & Dancu, 1989). Therefore, we were interested in examining whether the protective effects of NED obtained in Study 1 could extend to a college population where (a) we might expect a reasonable distribution of social anxiety pathology, and (b) social avoidance would have significant costs. Using a similar method as Study 1, albeit all online, we examined if NED might protect against rumination and social avoidance in a nonclinical sample of college students.

## METHOD

### Participants

Participants were English-speaking college students (aged 18 and over;  $N = 216$ ) recruited through the research subject pool at Kent State University in the United States. From this initial sample of 216 individuals, a total of 23 individuals were excluded as they did not provide any diary data ( $n = 8$ ), did not provide data on key study variables ( $n = 8$ ), or failed accuracy checks embedded in the protocol ( $n = 7$ ). Like other online studies (e.g., Gilman et al., 2017), these accuracy checks were used to assess participants' engagement with the online content (e.g., "Please type in the number 7"). Participants were excluded if the number of failed accuracy checks were more than 2 standard deviations above the sample's mean. Thus, the final sample comprised a total of 193 individuals. The mean ( $SD$ ) age of the final sample was 20.07 (2.39). Descriptive information of the sample including sex, race/ethnicity, and undergraduate status are listed in Table 3.

Table 3

Characteristics of Study 2 Participants as a Percentage of the Sample ( $n = 193$ )

Characteristic	Study 2 Sample
Sex	
Female	79.3
Male	20.7
Race	
White/European	81.3
Black/African	9.8
Asian	2.6
American Indian/Alaska Native	0.5
Biracial/Multiracial	4.7
Other	1.0
Ethnicity	
Non-Hispanic or Latino	95.9
Hispanic or Latino	4.1
Undergraduate Status	
Freshman	35.2
Sophomore	20.7
Junior	25.4
Senior	18.1
Other	0.5

### Procedure

All participants were recruited as part of an online study titled "Emotion, Behaviors, and Social Context." Individuals who responded were directed to an online survey website where they were provided with the study information. All participants were given the opportunity to contact the study team if they had any questions or concerns about the study before providing informed consent. Following consent, all participants completed a series of questionnaires and were then provided with instructions to complete an online experience-sampling diary for 10 days. Upon completion of the online questionnaires and 10-day experience-sampling diary, participants were compensated with course credits. All parts of the study were approved by the Kent State University IRB prior to the start of data collection.

## MEASURES

### Social Anxiety

The 24-item Liebowitz Social Anxiety Scale–Self Report version (LSAS; Fresco et al., 2001) was used to measure levels of social anxiety. The LSAS assesses fear and avoidance across 24 scenarios that tend to elicit social anxiety. Thirteen items relate to performance-based situations (e.g., writing while being observed) while 11 items relate to situations involving social interactions (e.g., being the center of attention). For each item, individuals rated their levels of fear and avoidance in the past week using a 4-point Likert-type scale (ranging from 0 to 3). An



index of social anxiety was obtained by summing fear and avoidance ratings for all items. In this sample, the mean (*SD*) was 51.69 (25.46; range: 0 – 122), which was below the cut-off score of 55 but significantly higher than other college samples (e.g.,  $M = 34.70$ ,  $SD = 20.40$ ; Russell & Shaw, 2009). Approximately 15% of the sample reported moderate levels of social anxiety (score of 55 – 64), 14% reported marked levels (score of 65 – 79), 9% reported severe levels (score of 80 – 95), and 6% reported very severe levels (score > 95). The internal consistency of the LSAS in this sample was high (Cronbach's  $\alpha = .95$ ).

#### *Depression*

The 20-item Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) was used to measure levels of depressive symptoms (e.g., depressed mood, feelings of worthlessness, and sleep disruptions). Participants rated how often they experienced each symptom in the past week from 0 (*rarely or none of the time*) to 3 (*most or all of the time*). An index of depression was obtained by summing the ratings for all items. In this sample, the mean (*SD*) level of depression was 15.50 (10.07), which was below the cut-off score of 16 or higher (indicating mild to moderate levels of depressive symptoms) but relatively higher than other college samples (e.g.,  $M = 12.03$ ,  $SD = 8.98$ ; Shields, Matt, & Coifman, 2015). The internal consistency of the CES-D in this sample was good (Cronbach's  $\alpha = .78$ ).

#### *Rumination*

As in Study 1, the 5-item brooding subscale of the RRS (Treyner et al., 2003) was used to assess rumination. The sample mean (*SD*) was 2.13 (0.82), which was relatively higher than other college samples (e.g.,  $M = 1.72$ ,  $SD = 0.46$ ; Hoff & Muehlenkamp, 2009). The internal consistency of the brooding subscale was high (Cronbach's  $\alpha = .86$ ).

#### *Experience-Sampling Diary*

A 10-day online experience-sampling diary was used to measure the frequency of various behaviors and experience of positive and negative emotions. The experience-sampling diary was administered through the secure online survey portal Qualtrics ([www.qualtrics.com](http://www.qualtrics.com)). Participants were able to respond to these online diaries using their smartphone and/or computer at their convenience. During the experience-sampling period, participants received five daily e-mails that provided a link to the online diary to answer a series of questions. As in Study 1, participants were able to delay responding to a diary prompt if their circumstances prevented them from

doing so. These prompts occurred at semirandom times, over a 12-hour period daily for 10 days. As in Study 1, during the daily 12-hour sampling period, each diary prompt occurred at least 30 minutes after the previous diary, with a maximum gap of 5 hours in between diary prompts. As such, participants could complete up to 50 diary entries. Three individuals were excluded from the analyses due to insufficient diary data. The criteria for exclusion was similar to Study 1 and participants who completed less than 2 standard deviations from the average number of diaries responded across the sample were excluded. There were no significant demographic differences between the excluded individuals and the final sample. Participants ( $n = 190$ ) completed a mean (*SD*) of 31.64 (12.43) out of a possible 50 diary prompts (range: 4 – 50; compliance rate = 63%).

*Momentary self-reported emotions.* As in Study 1, during each diary prompt, participants were asked to rate their current emotional state by responding to the same set of six positive and six negative emotion words. The order of word presentation was counterbalanced and randomized for each diary. The between-person reliability ( $R_{KF} = .97$ ) and within-person reliability ( $R_C = .77$ ) of the negative affect scale for this sample were good.

*Mean negative affect.* As in Study 1, an index of mean NA was derived for each participant by calculating the mean score across the ratings of the six negative emotion words, across all diary prompts. In this sample, the mean (*SD*) NA reported was 1.53 (0.59).

*Negative emotion differentiation.* As in Study 1, an index of NED was derived for each participant by computing the average ICC with absolute agreement between the ratings of the six negative emotion words across all diary prompts. Sixteen individuals reported negative ICCs. As in Study 1, these negative ICC scores were changed to 0 and included in subsequent analyses. These scores were then subtracted from 1.0 to reverse the score such that higher values would indicate higher NED and lower values would indicate lower NED for ease of interpretation. The mean (*SD*) levels of NED reported in this sample was .46 (.29), which is relatively lower compared to other samples of college students (e.g.,  $M = .59$ ,  $SD = .14$ ; Kashdan et al., 2010).

*Momentary self-reported social avoidance.* As in Study 1, during each diary prompt, participants indicated if they engaged in social avoidance since the previous diary by endorsing “yes”; “no”; or “no but I thought about it a lot or had a strong urge.” Similarly, we created an aggregate score by

collapsing “urge” and “yes” as endorsing social avoidance (1) versus “no” which indicates no social avoidance (0). However, no participants reported urges and therefore these scores indicated acts of social avoidance only. The frequency of social avoidance was derived by summing the aggregate score across all diaries for each participant and dividing it by the total number of diaries responded to. The mean (*SD*) frequency of social avoidance across all diaries in this sample was 0.05 (0.08). However, a square root transformation was applied as the distribution of scores was found to be significantly positively skewed,  $|z| > 3.29$  (since  $50 < n < 300$ ; Kim, 2013). Despite applying the square root transformation, the distribution remained significantly positively skewed. As such, the Winsor procedure (Guttman, 1973) was used to truncate the distribution by substituting the highest value in the distribution with the next highest value. This was performed eight times, until the positive skew was removed ( $|z| = 3.13$ ). To examine if the truncation procedure influenced the significance of the findings, the same analyses were performed without truncation and the results obtained were the same.

#### DATA ANALYTIC STRATEGY

As in Study 1, the moderation of the association between rumination and social avoidance by NED was tested using OLS regression with the Hayes PROCESS macro (Model 1). Again, the estimated effects reported were unstandardized regression coefficients and statistical significance was set at .05.

#### RESULTS AND DISCUSSION

As in Study 1, we first examined bivariate correlations between theoretically relevant variables and the dependent variable to observe the data for potential covariates. Social avoidance

was significantly correlated with rumination ( $r = .28, p < .001$ ) and mean NA ( $r = .30, p < .001$ ). We also explored the relationship between the brooding subscale and social anxiety symptoms and found a significant positive association,  $r = .43, p < .001$ . However, there was no significant difference in social avoidance between males and females,  $t(188) = -1.47, p = .143$ . As such, mean NA was subsequently included as a covariate in the regression model. The results of the moderation analysis are presented in Table 4. Overall, the regression model was significant,  $R^2 = .18, F(4, 185) = 8.13, p < .001$ . Consistent with Study 1, although there was no significant main effect of rumination on social avoidance ( $B = .02, p = .153$ ), as hypothesized, the interaction term between rumination and NED explained a significant increase in variance in social avoidance,  $B = -.14, \Delta R^2 = .03, F(1, 185) = 6.94, p = .009$ . Therefore, as in Study 1, NED significantly moderated the relationship between rumination and social avoidance.

To probe the effects of the interaction, predicted values were plotted for individuals at the mean and 1 *SD* above and below the mean of rumination and NED (refer to Figure 2). Follow-up tests of the simple slopes indicated that the association between rumination and social avoidance under low NED (1 *SD* below the mean) was significantly different from zero,  $b = .06, p = .003$ . However, the association between rumination and social avoidance under moderate ( $b = .02, p = .153$ ) to high (1 *SD* above the mean;  $b = -.02, p = .428$ ) NED was not significant, thus indicating no significant difference in social avoidance between high and low ruminating individuals with moderate to high NED. Therefore, for low differentiators, higher rumination predicted higher frequency of social avoidance. In contrast, this association between rumination and social avoidance was not significant for moderate to high differentiators, thereby

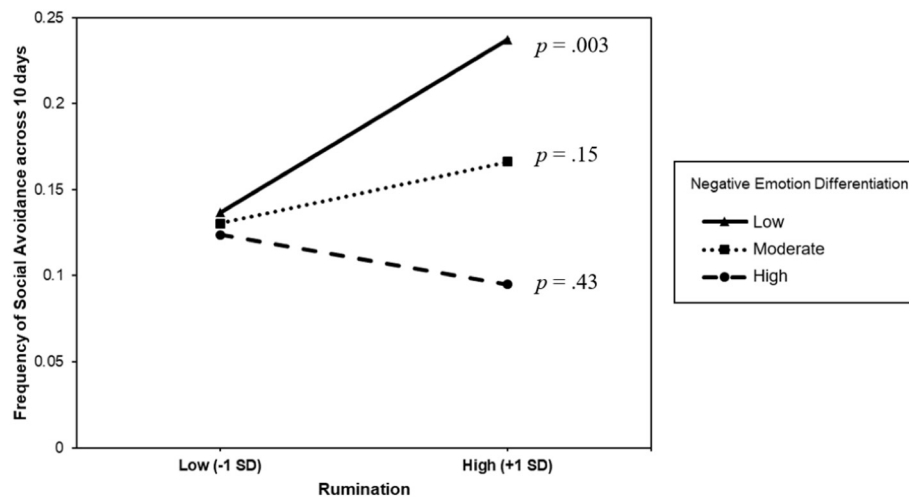
Table 4  
Significant Two-Way (Rumination by NED) Interaction in Predicting Social Avoidance ( $n = 190$ )

	Predictor	<i>B</i>	<i>SE</i>	95% CI	<i>sr</i> <sup>2</sup>	<i>R</i> <sup>2</sup>	$\Delta R^2$
Step 1	Rumination	.03	.01	-.00 to .06	.02	.14**	
	NED	-.11**	.04	-.19 to -.03	.04		
	Mean NA	.05*	.02	.01 to .09	.03		
Step 2	Rumination	.02	.02	-.01 to .05	.01	.18**	.03**
	NED	-.13**	.04	-.21 to -.06	.05		
	Mean NA	.04	.03	-.01 to .10	.02		
	Rumination × NED	-.14**	.05	-2.39 to -.03	.03		
<i>F</i> (4, 185) = 8.13, $p < .001$							

Note. *B* = unstandardized coefficient; *SE* = standard error; CI = confidence interval; NED = negative emotion differentiation; NA = negative affect.

\*  $p < .05$ ;

\*\*  $p < .01$ .



**FIGURE 2** Study 2: This figure describes the interaction between rumination and negative emotion differentiation when predicting the frequency of social avoidance across the 10-day diary period in a nonclinical sample of college students.

protecting against the negative behavioral outcomes of rumination. As in Study 1, sex, age, number of diaries completed, depression symptoms, and the interaction term between rumination and mean NA were simultaneously examined as additional covariates in the moderation analysis and the interaction term between rumination and NED remained significant,  $B = -.16$ ,  $\Delta R^2 = .04$ ,  $F(1, 180) = 9.55$ ,  $p = .002$ . Finally, to examine whether the moderation effect held for relatively healthy individuals, we conducted an exploratory analysis that excluded those who met the cutoff for social anxiety ( $n = 84$ ). The moderation effect remained significant even after controlling for mean NA, sex, age, number of diaries completed, depression symptoms, and the interaction term between rumination and mean NA,  $B = -.24$ ,  $\Delta R^2 = .07$ ,  $F(1, 96) = 10.88$ ,  $p = .001$ .

Replicating Study 1's findings, NED significantly moderated the relationship between rumination and social avoidance. As in Study 1, the positive association between rumination and frequency of social avoidance was only significant for low but not moderate to high differentiators. These results remained even after controlling for mean NA and additional covariates. These replications show that the effects found in Study 1 are reliable and extend to a nonclinical sample of college students with a relatively wide distribution of social anxiety symptoms, suggesting that NED serves as a protective factor even for individuals with subthreshold psychological symptoms. Additionally, this protective effect held for a reasonably healthy group of individuals who did not meet the cutoff for social anxiety.

## General Discussion

Given the central role of rumination in affective disorders such as SAD, it is important to examine factors that might protect against its negative consequences. In two studies, we unanimously found that NED protected against the behavioral outcomes (social avoidance) of rumination in a clinical sample of individuals with SAD and a nonclinical sample of college students. Notably, our findings appear to parallel the negative association between rumination and NSSI under moderate to high NED reported by Zaki et al. (2013). In addition, our results provide a conceptual replication and extension of Zaki et al. (2013), suggesting that NED could be a transdiagnostic protective factor against rumination and behavioral dysregulation across clinical and nonclinical populations.

Building upon cognitive models of SAD, the present investigation revealed that the impact of maladaptive rumination on avoidance behaviors is influenced by emotional processes like ED. To our knowledge, this is the first study that examined rumination together with ED in predicting avoidance behaviors in SAD. Like Zaki et al. (2013), our findings build on the emotional cascade model (Selby et al., 2008) suggesting that the capacity to differentiate one's emotions during a negative emotional experience may help reduce the likelihood of engaging in maladaptive behaviors to terminate the repetitive ruminative cycle. This ties in with previous work demonstrating the benefits of using words to label one's feelings in response to different stressors (Kircanski et al., 2012; Niles et al., 2015). Taken together, these findings suggest that discriminating and labeling one's emotional experience

discretely help dampen its intensity and function as a form of implicit emotion regulation (Gyurak, Gross, & Etkin, 2011). This could be particularly useful in contexts involving intense negative emotions, such as in an emotional cascade, where labeling one's emotional experience may decrease its intensity and prevent the use of maladaptive strategies to cope with negative emotions. Nevertheless, future studies should further explore the relationship between emotion labeling and other maladaptive behaviors, particularly in high risk populations (e.g., suicide risk in depression).

Our findings also contribute to extant literature suggesting that NED could function as a general protective factor against various maladaptive behaviors (e.g., binge-drinking, aggression, NSSI). However, the precise mechanisms for NED's salutary effects are still unclear. One possibility is that using emotion labels to categorize emotional experiences generates a conceptualization of the sensations linked to that experience, which then enables (adaptive) action in that context (Kashdan, Barrett, & McKnight, 2015). For example, "I feel sad, therefore I should talk to someone about it to feel better." Nonetheless, numerous unanswered questions remain. For instance, does the accuracy of the emotion label matter? How might cognitive processes like working memory influence ED? Future research should aim to uncover the mechanisms underlying ED, which would have important clinical implications. This is crucial given that emotion labeling is done with varied intentionality across different psychotherapies (Greenberg, 2002). The present research suggests that perhaps more explicit attention to emotion language use in therapy could be beneficial, particularly in reducing the frequency of maladaptive behaviors that maintain psychopathology. This would be especially valuable in treating affective disorders where patients tend to view their experience of negative emotions as aversive and attempt to avoid feeling them (Allen, McHugh, & Barlow, 2008).

The results of the present research need to be interpreted in light of the following limitations. First, Study 1 included a substantial proportion of individuals with comorbid depression. Therefore, the observed effects might be driven by current depression instead of social anxiety. However, we controlled for depression in our analyses in both studies and the results remained significant. Nevertheless, future studies could directly examine if having a comorbid affective disorder might influence the results by including a larger sample. Second, the use of experience-sampling methodology likely inflicted burden on participants and may have given rise to demand characteristics. For instance, requiring participants to monitor themselves daily

could influence the reported rate of social avoidance (Bolger et al., 2003). Further, although we counter-balanced the order of word presentation in Study 1, there is a possibility of order effects that might influence participants' ratings of subsequent emotion words. Third, we did not include measures that were developed specifically to assess rumination in SAD and there have been some criticisms of the brooding subscale, in that it may index rumination most common in depression (Kocovski, Endler, Rector, & Flett, 2005). However, as is evident in the present investigation and in many other studies, SAD very commonly co-occurs with depression (e.g., Merikangas & Angst, 1995) and hence these ruminative processes likely overlap. Finally, despite the study's longitudinal design, methodological limitations precluded the examination of variations in NED across time. For example, obtaining indices of NED at the signal-level would require rating numerous negative affect items each time (e.g., 17 items; Tomko et al., 2015). However, given that contextual factors likely influence avoidance in SAD, future investigations would benefit from examining variations in NED, rumination, and social avoidance across time.

In spite of these limitations, the current investigation also had several strengths. First, except for the experience-sampling duration, the measures used in both studies were equivalent. This equivalence in methodology increases the reliability and validity of our results, which enables us to derive more conclusive interpretations of the findings. Further, the use of experiencing-sampling methods reduces retrospective biases that are often problematic in self-report research and increases the ecological validity of our findings. More important, we examined clinical and nonclinical samples and were able to replicate the protective effects of NED in both studies. This demonstrates the robustness of our findings and provides further support for NED as a protective factor across different populations.

Overall, our findings contribute to an emerging literature indicating that NED may shield against various maladaptive behaviors. Consistent with Zaki et al. (2013), our findings provide support for the protective effect of NED against rumination demonstrating that NED buffers against social avoidance among ruminating individuals with social anxiety. The results also support various clinical theories and models of SAD where the ability to identify and label emotions is linked with better outcomes. These findings have important clinical implications for understanding and treating SAD and other affective disorders involving behavioral dysregulation. Nevertheless, more research is needed to understand the mechanisms through

which NED exerts its beneficial effects. In so doing, it is hoped that the knowledge gleaned would be used to inform and improve therapeutic treatments for various affective disorders.

#### Conflict of Interest Statement

The authors declare that there are no conflicts of interest.

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