How Response Styles Moderate the Relationship between Daily Stress and Social Interactions in Depression, Social Phobia, and Controls

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Abstract

Introduction: Stress and social isolation are potent predictors of negative health outcomes and are impacted in mood and anxiety disorders. Difficulties in social interactions have been particularly noted in people diagnosed with major depression disorder (MDD) and social phobia (SP). It remains poorly understood, however, how these variables interact on a moment-to-moment basis and which variables moderate this relationship. Psychological flexibility, or the ability to be open to experiences while maintaining engagement in valued activities, may help moderate the relationship between stress and social interaction. **Objective:** This study examined these variables in participants diagnosed with MDD and SP and compared them to a control group. **Methods:** Participants were diagnosed with a mental disorder ($n = 118$ MDD; $n = 47$ SP) or were in the control group consisting of participants without MDD or SP ($n = 119$). Using the event

sampling methodology (ESM), participants were queried six times per day for 7 days about stress, social interactions, and emotional response (rigid vs. flexible). **Results:** Higher current stress levels were related to more social interactions. This relationship was even stronger in situations when response flexibility was increased, especially in the clinical groups. **Conclusions:** Data suggest that a healthy psychological process (flexible emotional responding) buffers the relationship between stress and social interactions. We discuss how these variables interact and whether these patterns may paradoxically contribute to the maintenance of psychopathology.

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Introduction

Stress can be understood as what one experiences when the demands of a situation exceed one's ability to address them [1]. Subjectively experienced stress is therefore a function of both the individual and the situation in which the individual is acting. Detrimental effects of

stress have been comprehensively demonstrated [2]. However, life without stress is inconceivable, and many individuals function efficiently under stress. Thus, stress can be viewed as a motivator or byproduct of engagement, but may impede activity when it becomes too intense. Understanding the contexts and psychological variables that moderate the perception and consequences of stress remains a central scientific endeavor.

As humans are social animals whose survival depends on social interactions [3], the stress surrounding these interactions is among the most important aspects of human existence. Social integration is generally associated with positive outcomes such as well-being [4]. Conversely, lack of social support and the absence of social contacts have generally been shown to have negative psychological outcomes [5]. Not all social interactions are beneficial, however, and some may be associated with immediate negative outcomes [6]. Nevertheless, social interactions are so crucial that deficits in maintaining them are considered key syndromes in several mental disorders (e.g., social phobia [SP], major depression disorder [MDD]) [7]. Despite these associations, the mechanisms of action that maintain problems in social domains in these two prevalent and impairing disorders remain unclear, especially outside the laboratory and in the context of peoples' natural lives.

A promising variable shown to moderate the negative effects of stress and increase well-being is a response style known as psychological flexibility: the ability to be aware of and open to emotions and thoughts while maintaining the ability to engage in the areas of life that are deemed important [8]. The ability to react flexibly versus rigidly is increasingly considered a fundamental aspect of health [8, 9]. Epidemiological evidence found that higher levels of flexible response style moderated the relation between stress and health outcomes by functioning as protective factor to the effects of stress [10]. However, cross-sectional research does not inform how important factors play out in peoples' daily lives. In order to better understand the when and how of adaptive or maladaptive reactions to stress and to inform possible interventions, a research perspective allowing a more exact description of problematic psychological functioning is needed.

Studies using the event sampling methodology (ESM) are well suited to reveal such processes by assessing participants' behavior (e.g., social interaction) in their natural environment usually via technology to capture behaviors shortly after their occurrence. ESM studies on social interactions in participants with mental disorders have found important results. For example, it was observed

that individuals with depressive symptoms displayed more negative affect after unpleasant social interactions [11]. The negative reactivity observed in response to social interactions was specific and not observed after other stressful daily activities [11]. ESM studies revealed how trait anxiety impacts the everyday life of students: Those high in trait social anxiety encountered the fewest positive events on days when they were anxious and reacted to the anxiety with higher levels of rigid avoidance. On days when they were flexible despite being anxious, however, they experienced more positive events [12]. These ESM studies suggest that as people navigate their daily lives, they encounter various stressors that interact with their appraisals of the stressor [1]. It remains to be directly tested, whether the way people interact (e.g., flexible vs. rigid) impacts (a) their engagement in social interactions and (b) whether clinical and non-clinical patients react differently.

In order to examine social interactions across a large variety of people and to test the specificity of the findings, we examined clinical groups with known difficulties in social domains (MDD & SP) and a control group. The aim of this investigation was to examine the relationship between current levels of stress and social interactions measured in peoples' natural environment and whether flexible versus rigid response styles facilitate and/or impede this relationship. We aimed to observe how two central etiological-pathogenic factors for mental disorders interact and whether the malleable factor of psychological flexibility is beneficial, detrimental, or inert. We hypothesized, first, that stress would be negatively associated with the frequency of social interactions; second, that the relationship between stress and frequency of social interactions is buffered by participants' flexible response styles; and third, that the above pattern would be different between clinical groups (MDD & SP) and controls.

Materials and Methods

Hypotheses were tested with data from an ESM study with diagnostic status of group (i.e., MDD, SP, & controls) as a quasi-experimental factor. Participants underwent standardized diagnostic clinical assessments [13], and their primary diagnosis determined eligibility and group assignment: (a) current MDD, (b) current SP, or (c) control participants with neither MDD nor SP (but other diagnoses were allowed). The percentage of participants with 0, 1, 2, or 3+ comorbid disorders were: Control (0: 90.8%; 1: 6.7%; 2: 1.7%; 3+: 0.8%); MDD (0: 0%; 1: 45.8%; 2: 29.7%; 3+: 24.6%); SP (0: 0%; 1: 44.7%; 2: 27.6%; 3+: 27.7%). See online supplementary Table 1 (for all online suppl. material, see www.karger.com/doi/10.1159/000511102) for more diagnostic de-

Fig. 1. Relationship between stress and social interactions as moderated by psychological flexibility for controls and the clinical group (MDD and SP).

tails. The groups were matched by age and sex. The final sample consisted of $n = 284$ participants: MDD, $n = 118$; SP, $n = 47$; Control, $n = 119$. On average, the sample was 31.75 years old (range 18–63), and 66.5% female. For further details see [10].

Participants engaged in the ESM procedure for 7 days. They completed questionnaires contingent on an audible signal at six fixed times throughout the day, every 3 h. Items queried “Since the last signal...” For the present analyses, three concepts were targeted: stress, social interaction, and psychological flexibility. The item *stress* was worded: “...how stressed were/are you?” (0–100). The variable *social interaction* read: “...how many social interactions did you have?” We assessed psychological flexibility with three items from the Open & Engaged State Questionnaire [14]: “What percent of the time...” “...did the way you deal with your feelings and emotions (e.g., stress, anxiety, depression) keep you from doing the things that are important to you?”; “...did you try to get rid of unwanted thoughts, emotions, and feelings?”; “...were you upset or worried about your feelings/emotions (e.g., stress, anxiety, depression)?”

Hypothesis 1 was tested using a multilevel model of social interaction as outcome and state stress level as predictor. For hypothesis 2, we added state psychological flexibility as moderator to the first model, plus the interaction between state stress and state psychological flexibility. For hypothesis 3, we used the same model as for the first two hypotheses but added the contrast between clinical groups and the control group, including all interaction terms with stress and psychological flexibility. All models contained time as a covariate to control for temporal linear trends across the week in the outcome, which otherwise would be attributed to the predictor/moderator. The coefficient for the linear trend over time was: -0.0186 (95% CI $[-0.0282, -0.0090]$), $t = 3.91$, $p < 0.001$, showing a slight but significant negative linear trend

over the week for the number of social interactions. In the model’s random terms, we included the intercept and the slope for time and state stress (but not for state psychological flexibility) as this led to the most parsimonious model.

Results

Overall, participants responded to $n = 10,928$ valid assessments (91.9%). A total of $n = 6,965$ social interactions were recorded. Prior to hypothesis testing, we examined whether the groups differed in their perceptions of the social interactions. On average, the clinical groups (MDD & SP) experienced the social interactions as less pleasant ($b = -1.458$ [CI-95 = $-1.828/-1.089$], $t[282] = -7.77$, $p < 0.001$), less intimate ($b = -0.656$ [CI-95 = $-1.044/-0.268$], $t[282] = -3.32$, $p = 0.001$), less harmonious ($b = -0.950$ [CI-95 = $-1.290/-0.625$], $z = -5.71$, $p < 0.001$ [OR = 0.39]), and more conflictual ($b = 0.896$ [CI-95 = $0.483/1.323$], $z = 4.22$, $p < 0.001$ (OR = 2.45)) than the control group.

Contrary to our first hypothesis, there was a strong positive association between instantaneous stress level and the frequency of social interaction in the same time span ($b = 0.051$, 95% CI $[0.041, 0.061]$, $t = 10.1$, $p < 0.001$). Specifically, the more current stress participants experienced, the more social interactions they had. Regarding

our second hypothesis, the association between stress and frequency of social interactions was moderated by state psychological flexibility values such that higher flexibility values lead to a more positive association compared to lower flexibility values ($b = 0.0065$, 95% CI [0.0031, 0.0010], $t = 3.78$, $p < 0.001$). For our third hypothesis, we first tested whether the two clinical groups differed from each other with respect to the moderating role of psychological flexibility. This was not the case ($b = 0.006$, $SE = 0.005$, $F = 0.120$, $p < 0.23$). We then combined the two clinical groups for comparison against the control group. The moderating influence of psychological flexibility was more pronounced in the combined clinical groups than in the controls. Psychological flexibility significantly moderated this association in clinical groups ($b = 0.008$, 95% CI [0.004, 0.012], $t = 3.78$, $p < 0.001$), but not in the controls ($b = 0.003$, 95% CI [-0.004, 0.009], $t = 0.75$, $p = 0.454$) (Fig. 1). However, based on the three-way interaction between stress, psychological flexibility and group, the moderating influence of psychological flexibility on the association between current stress level and the frequency of social interaction did not significantly differ between clinical groups and the control group ($b = 0.0056$, 95% CI [-0.002, 0.013], $t = 1.46$, $p = 0.143$). This was likely due to the lower statistical power for this comparison.

Discussion

This study found a positive association between momentary stress and engagement in social interactions that was independent from diagnostic status of the participants. This was specifically pronounced when participants were more psychologically flexible – despite being stressed. The buffering effect of flexible responding applied to all groups, but the coefficients were strongest in the combined clinical groups (i.e., MDD and SP). This suggests that responding in a flexible manner serves to maintain engagement in social interactions, even when individuals experience stress. The benefit of flexible responding may be especially important in individuals diagnosed with mental disorders. Possibly, these individuals are able to respond flexibly, but these skills have not been generalized to the degree that lead to a remission of the disorder [15].

Social interactions require effort. It appears that daily engagement in social interactions increases stress insofar as the effort needed to engage is greater than if a person is simply relaxed alone. Thus, stress is neither helpful nor

hurtful per se, but rather its impact depends on the task at hand. Ultimately, individuals must balance between stress and strain when engaging in things they care about. Skills such as a flexible response style that help an individual balance between effort and reward are practically and clinically useful. Engagement in social activities such as hobbies can reduce depressive symptoms [16] and future studies may also include psychophysiological parameters when examining these interactions [17].

Similar to stress, the presence or absence of social interactions is not good or bad per se. Some studies have even found that social interactions are associated with negative outcomes [6]. Other ESM studies have shown that the association between anticipating that an event will be rewarding and actually following through to engage in the activity was reduced in mild levels of depression symptoms [18]. Whether engaging in more social interactions during a week helps reduce symptomatology in the longer term, however, remains to be tested.

This study has limitations. First, the participants were free to determine what constituted a social interaction. This likely differed across participants and interactions. Whereas it is also a strength of the study that ecologically valid social interactions were examined, the variance due to different types of interactions is unknown. Second, although ESM is the gold-standard for assessing ecologically valid information that limits retrospective bias, the assessments remain based on self-report.

These limitations notwithstanding, this ESM study showed that engaging in social interactions is associated with concurrent increases in state level stress and a flexible response style buffers this relationship. The results further suggest not only a specific intervention target (rigid response style) but also provide contextual information as to when it would be most useful (particularly when individuals are stressed). This study was conducted prior to the COVID-19 pandemic. The results may be helpful for people who wish to remain in social contact despite limitations, irritations, or even stress of physical distance recommendations.

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Statement of Ethics

Participants in the study were treated in accordance with international ethical standards, including APA standards of ethics, and as approved by our Institutional Review Board (reference No. for this study EKBB: 236/12).

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Conflict of Interest Statement

No authors declare any possible conflicts of interest.

Author Contributions

A.T.G. developed the study concept and design. Testing and data collection were supervised by A.T.G. Data were analyzed and interpreted by A.M. and A.T.G. The paper was drafted by A.T.G., and all authors provided critical revisions. All authors approved the final version of the paper for submission.

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