

Creating a Language-Based Model of Anxiety and Depression Severity During the COVID-19 Pandemic

Abigail Beech^{1,*}, Haoxue Fan², Jocelyn Shu², Javiera Oyarzun², Peter Nadel¹, Elizabeth A. Phelps², and M. Alexandra Kredlow¹

¹Department of Psychology, Tufts University

²Department of Psychology, Harvard University

Summary Bridging recent research on mental health during the COVID-19 pandemic and research on language use and psychological states, this study aims to analyze pandemic narratives to create a language-based model of anxiety and depression severity using Differential Language Analysis. This study advances current research on language and mental health by using a novel, data-driven analysis technique.

Keywords · Anxiety · Depression · Language · Machine Learning · COVID-19

✉ Abigail Beech: abigail.beech@tufts.edu

Introduction Self-report studies during COVID-19 suggest anxiety and depression may be associated with financial struggles, social isolation, childcare responsibilities, and prior mental illness (Daly et al., 2020). Separate, non-pandemic research on linguistic markers of anxiety and depression has found evidence for higher use of negative emotion words and first-person singular pronouns in depressed groups (Newell et al., 2018). This research has primarily relied on closed vocabulary approaches comparing groups using pre-defined word lists. Novel, data-driven, open-vocabulary approaches, such as Differential Language Analysis (DLA), may reveal more nuanced relationships between language and mental health (Schwartz et al., 2017).

Aims In this study, we aimed to examine whether language use was associated with mental health during the pandemic, by using DLA to build a language-based regression model of anxiety, depression, and stress severity. We hypothesized that language use in pandemic narratives would be significantly associated with total anxiety, depression, and stress scores.

Methods Between 2020 and 2021, 1,147 participants completed the Depression Anxiety Stress Scale-21 Item Version (DASS) and the narrative response question, “Tell us how COVID-19 has impacted your life and what this situation means to you. What are you feeling and experiencing in this situation?”. We then used DLA to construct a language-based regression model with 10-fold cross validation, using BERT for feature extraction (Experimental word count thresholds = 10, 25, 50). Resulting *r* values represent the correlation between the model’s predicted total DASS scores based on participants’ narratives and their actual scores.

Preliminary Results Significant associations were observed between language use and DASS scores, including the overall model ($R^2 = 0.16$, $p < .001$, threshold = 25, $n = 1,109$), as well as individual words and phrases (shown below, $r = -0.14$ to 0.16 , all p 's $< .05$, combined across thresholds 10, 25, and 50).



Figure 1. Words significantly associated with higher DASS scores are colored in purple, whereas words significantly associated with lower DASS scores are colored in green. Predictive value is indicated by font size and hue, with darker, larger fonts representing stronger associations between word use and DASS scores.

Conclusions Using data-driven techniques, this study provides evidence of a link between language and mental health during the pandemic. Largely in line with past research, words related to anxiety and feelings appear to be markers of greater anxiety and depression, whereas words related to social support may reflect better mental health. Future studies should investigate links between language and mental health in larger samples and explore other feature extraction methods.

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Autism spectrum condition and positive emotions: A scoping review

Giona Di Poi^{1,2,3,*}, June Gruber⁴, James C. McPartland⁵ and Andrea C. Samson^{1,2,3}

¹Faculty of Psychology, UniDistance Suisse, Brig, Switzerland

²Institute of Special Education, University of Fribourg, Fribourg, Switzerland

³Swiss Center for Affective Sciences, University of Geneva, Geneva, Switzerland

⁴Department of Psychology and Neuroscience, University of Colorado Boulder, CO, USA

⁵Yale Child Study Center, New Haven, CT, USA

Summary Difficulties with positive emotion (PE) have been described across a variety of clinical conditions. Yet few studies have systematically reviewed the role of PE in autism spectrum condition (ASC) despite work suggesting hyposensitivity to both social and non-social reward stimuli. A review of PE in ASC can potentially detect preserved or even enhanced PE in this population and shed light on the similarities and differences between individuals with and without ASC.

Keywords · scoping review · autism spectrum condition · positive emotion · reward · appraisal

✉ Giona Di Poi: giona.dipoi@unidistance.ch

Introduction In recent decades, autism research witnessed a radical shift in the conception of ASC. Historically conceptualized from a medical paradigm with a normative approach focusing on deficits and symptoms, the field now recognizes a “neurodiversity” approach focusing on strengths and optimal functioning (Pellicano & den Houting, 2022). In this view, PE are known to strongly contribute to optimal functioning and resilience by broadening thoughts, activities, and relationships and by building enduring personal resources (Fredrickson & Cohn, 2009). Yet additional work is needed to understand the role of PE in ASC.

Theoretical framework PE can be conceived as complex, multi-component emotional responses evoked by perception of opportunities and rewards in the environment, among other things (Shiota et al., 2021). A recent meta-analysis describe individuals with ASC as hyposensitive to both social and non-social reward stimuli with potential hypersensitivity to interest-associated stimuli (Clements et al., 2022). However, the reward anticipation processes and underlying appraisal dimensions of these phenomena remain unclear.

Aims In order to better understand PE profiles in ASC, including reward anticipation processes and appraisal dimensions, we will conduct a scoping review on PE in this population. We assume that particular appraisal dimensions (Scherer, 2001) such as familiarity of the stimuli, understanding of the causes of events, feeling control of the situation, and reading the normative significance in the context might substantially differ between individuals with and without ASC and may lead to different reward anticipation processes.

Methods The review is guided by the PRISMA Extension for Scoping Reviews (PRISMA-ScR) (Tricco et al. 2018). Relevant databases (Medline, PsycINFO and Web of Science) are consulted with the following key terms: admir* OR amuse* OR awe* OR compass* OR contentment* OR contented* OR desir* OR elat* OR enthusia* OR grat* OR hope* OR inspir* OR interest* OR *joy* OR love* OR pleas* OR pride* OR proud* OR relie* OR seren* OR triumph* OR humo\$* OR happ* OR “positive emotion*” OR “positive affect*” OR “desirable emotion*” OR “desirable affect*” OR reward* OR liking OR wanting AND autis* OR asperger* OR ASD. Peer review articles written in English and focusing on preserved/enhanced PE or appraisal dimensions for PE in autistic individuals are included in the review.

Future directions The results of this study may pave the way for a more accurate understanding of PE profiles, as well as reward anticipation processes and appraisal dimensions, in autism. In a long-term perspective, this study may lay the foundation for a more systematic and accurate examination of particular appraisal dimensions in relation to specific PE in this population.

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Computational psychiatry in the wild: Probing reinforcement learning theories of depression on social media

Dan-Mircea Mirea¹, Erik C Nook^{1,*}, and Yael Niv^{1,*}

¹Department of Psychology, Princeton University

*both authors contributed equally

Summary Depression is thought to emerge from atypical reward processing. We propose to probe this theory in the naturalistic setting of social media. We will use a reinforcement-learning model to quantify how social rewards change social media users' posting behavior, and how this is related to depressive symptoms. We aim to understand the interaction between mental health and reward structures on social media.

Keywords depression · social media · reinforcement learning

✉ Dan-Mircea Mirea: dmirea@princeton.edu

Introduction Our minds naturally drive us to seek and savour rewards. Research has used computational models of reinforcement learning to link alterations in this reward-processing system to symptoms of depression such as anhedonia (Chen et al., 2015). However, previous studies have mostly focused on laboratory-based cognitive tasks with non-social rewards. Therefore, we will test the association between reinforcement learning and depression in the rich and naturalistic setting of social media, where views, "likes", and "shares" act as social rewards that shape users' posting behavior.

Aims We will test whether people with depression show fundamental differences in processing social rewards on social media from those without depression, as captured by a computational model of reinforcement learning.

Methods We will recruit participants through promotion on TikTok, Instagram and Twitter. Participants who pass a social media activity threshold (e.g, a certain posting frequency) will be invited to complete an initial questionnaire about their mental health (target N = 1000). This will contain the Patient Health Questionnaire (PHQ-9) (Kroenke et al., 2001), a widely used and validated psychometric scale that measures a range of depressive symptoms over the previous 2 weeks. Participants will then be asked to complete the PHQ-9 every 2 weeks for 6 months. Participants will also be asked to provide their social media handles, from which we will scrape data about the posts they made during the 6-month period.

To quantify individual differences in reinforcement learning, we will adapt a model of how rewards modulate response rates that we previously developed

(Niv et al., 2007). By fitting this model to participants' social media data, we will be able to estimate, for each individual, parameters of reinforcement learning: (1) reward sensitivity (how much a person's behavior is influenced by rewards), (2) learning rate (how much their expectations are updated by new rewards), and (3) effort sensitivity (how costly they perceive effort to be). We will then correlate these parameters with users' baseline depression scores. We will also test statistical models in which depression scores bias each of the computational parameters. This will allow us to distinguish whether reinforcement learning on social media changes with fluctuations in depressive symptoms.

Predicted Results In line with existing findings from the computational psychiatry literature (Chen et al., 2015), we predict that people with elevated symptoms of depression will show: (i) low reward sensitivity (meaning they alter their frequency of posting less in response to different amounts of reward received), (ii) high effort sensitivity (they alter their frequency of posting more in response to different amounts of effort required), and (iii) high learning rate for disappointing outcomes (they change their expectations rapidly in response to outcomes that are worse than expected).

Conclusions The proposed research will allow us to test hypotheses regarding fundamental differences in reward processing in depression in a naturalistic, ecologically valid setting. This will establish the extent to which existing laboratory findings generalize to real-world social rewards. Moreover, our findings will suggest ways in which mental health affects how we interact with other people on social media, a topic of great practical importance.

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Effects and Mechanisms of Smartphone-Based Mindfulness Training on Emotional Experience

Polina Beloborodova^{1,*} and Kirk Warren Brown²

¹Psychology Department, Virginia Commonwealth University

²Psychology Department, Carnegie Mellon University

Summary This randomized controlled trial explores the effects of a smartphone-based mindfulness training on daily mood, as well as the mediating role of social well-being and social behaviors (in-person and online communication), using the data collected from a racially and ethnically diverse college student sample via ecological momentary assessment and passive mobile sensing.

Keywords · Mindfulness · Daily mood · Social well-being · Ecological momentary assessment · Mobile Sensing

✉ Polina Beloborodova: beloborodp@vcu.edu

Introduction Prevalent daily mood is a key component of emotional well-being and includes an abundance of positive over negative emotions (Tov, 2018). Over the last decade, emotional well-being has declined substantially among young adults, particularly college students (Auerbach et al., 2016). There is an urgent need to develop cost-efficient, scalable solutions that can improve college students' daily mood. One such solution, we propose, is smartphone-delivered mindfulness-based intervention (sMBI).

Aims The study tests daily mood effects and mechanisms of a smartphone-delivered sMBI among college students. The specific aims are: (1) To evaluate the effect of a two-week sMBI, relative to a coping control intervention, on daily mood measured through ecological momentary assessment (EMA); (2) To examine the mediating role of felt connection and loneliness; (3) To exploratorily evaluate MBI effects on objective measures of social connection captured through mobile sensing.

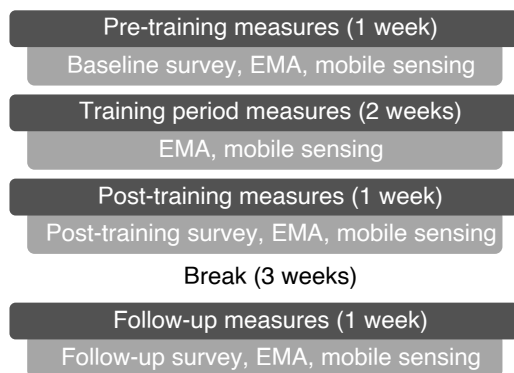


Figure 1: Data collection timeline.

Methods In this randomized controlled trial, we examine psychological mechanisms that help to explain the effects of an sMBI on daily mood, using a racially and ethnically diverse undergraduate student sample (planned $n = 154$, data collection is ongoing). The participants receive a 2-week smartphone-based mindfulness intervention or a structurally equivalent coping control intervention (Lindsay et al., 2019). Daily mood (depressive feelings, anxiety, and happiness) and social well-being (loneliness and felt connection to others) are assessed through EMA over five weeks (see Fig. 1). Overt social behaviors are measured via mobile sensing, including such indicators as calls, text messages, and social media applications usage.

Predicted results With a multilevel piecewise regression model, we will test whether there is a significant improvement in daily mood in the sMBI group, relative to the control group, by comparing their regression slopes in the baseline and post-training assessment periods. We propose that a key mechanism of sMBI effects on daily mood might be improved social well-being, and we will use a 2-1-1 multilevel parallel mediation model to test it. Finally, we explore sMBI effects on mobile-measured overt social behaviors without setting formal hypotheses.

Conclusions This study contributes to understanding the psychological and behavioral bases of positive daily mood maintenance by taking an experimental approach and using sophisticated data capture technologies. This line of research may permit brief, just-in-time smartphone-mediated interventions to alter behaviors associated with low emotional well-being.

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Can an Anti-Inflammatory Medication Reduce Feelings of Depression and Anxiety in a Lonely Population?

Jessica Allenbach^{1,*}, Hana Qureshi¹, Umiemah Farrukh¹, Laura Hazlett¹, Mona Moieni¹, Steven W. Cole²,
Joshua Hyong-Jin Cho², Richard Olmstead², and Naomi Eisenberger¹

¹Department of Psychology, University of California, Los Angeles

²Department of Psychiatry and Biobehavioral Sciences, University of California, Los Angeles

Summary Depression and anxiety are linked to poor health outcomes and are highly comorbid with loneliness. This study investigates whether an NSAID can decrease depression and anxiety in a lonely population and a potential mechanism that mediates this effect. Targeting biological processes such as inflammation may be useful to help lonely populations decrease mental health symptoms and re-engage with society.

Keywords · Mental Health · Inflammation · Social Interactions · Pharmacology · Randomized Controlled Trial
✉Name:jallenbach@g.ucla.edu

Introduction Depression and anxiety are linked to poor health outcomes (Fiske et al., 2010) and are highly comorbid with loneliness (Cacioppo et al., 2006). Inflammation can contribute to feelings of loneliness, depression, and anxiety (Eisenberger et al., 2017; Maydych 2019). Hypersensitivity to negative social stimuli reinforces anxiety and is increased by inflammation (Cacioppo et al., 2009; Eisenberger et al., 2017). While previous research has established a bidirectional relationship between loneliness and inflammation (Eisenberger et al., 2017), whether reducing inflammation in a lonely population can improve symptoms of anxiety and depression has not yet been tested. This study examines whether an anti-inflammatory medication can decrease depression and anxiety symptoms in a lonely middle-aged population, as well as a potential psychological mechanism that may underlie this effect.

Aims For this study, our central aim is to investigate the impact of an anti-inflammatory medication on the mental health of lonely middle-aged adults. We hypothesize that naproxen (vs. placebo) will lead to decreases in symptoms of depression and anxiety. Furthermore, we predict that hypersensitivity to negative social stimuli will mediate the relationship between naproxen and symptoms of depression and anxiety.

Methods Participants (N=70) ages 45-60 were recruited online (via Craigslist, Facebook, Google). In order to be eligible to participate, participants needed to score 40 or higher on the UCLA Loneliness Scale. Exclusion criteria included severe depression, current use of certain medications (e.g. oral steroids, NSAIDs), and a history of or current physical/mental health disorders (e.g. psychotic disorder, substance use, cardiovascular

disease). Participants were randomly assigned to receive 200mg naproxen (a nonsteroidal anti-inflammatory drug) or placebo twice per day for two weeks. Pre- and post-intervention, participants completed self-report measures of loneliness, depression (CESD-20) and anxiety (GAD-7), and an experimental task assessing sensitivity to negative social feedback.

Results We plan to use repeated measures ANOVA to analyze self-reported symptoms of depression and anxiety across conditions and timepoints. We predict that naproxen (vs. placebo) will reduce symptoms of depression and anxiety from pre- to post-intervention. We also predict that hypersensitivity to negative social stimuli will mediate the relationship between naproxen and reduced symptoms of depression and anxiety. We plan to test this mediation model using bias-corrected bootstrap confidence intervals.

Conclusions Support for our hypotheses would suggest that targeting biological processes such as inflammation may be useful to help lonely populations improve their mental health. Furthermore, these findings would suggest that hypersensitivity to negative social stimuli is an important process to consider when addressing mental health in the context of loneliness. This study would also contribute to the literature on pharmacological treatments for depression and anxiety.

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Cognitive Reappraisal and Expressive Suppression Frequency Predict Differential Changes in Grief Symptomology Over Time in Bereaved Spouses

Eva E. Dicker¹, Ryan L. Brown², Bryan T. Denny¹, and Christopher P. Fagundes¹

¹Department of Psychological Sciences, Rice University

²Department of Psychiatry and Behavioral Sciences, University of California, San Francisco

Summary Emotion regulation is crucial in mitigating stress caused by spousal loss. We analyzed 172 adult bereaved spouses' baseline usage of different emotion regulation strategies as well as levels of grief across 4 visits. Frequency of cognitive reappraisal predicted lower grief. A main effect of time was moderated by frequency of expressive suppression. These results motivate future interventions.

Keywords · Spousal Bereavement · Cognitive Reappraisal · Expressive Suppression · Grief Symptomology

✉Name: eva.dicker@rice.com

Introduction Spousal bereavement is one of the most stressful life events in adulthood and is associated with elevated depression, cognitive decline, and morbidity and mortality (Shin et al., 2018; Harlow et al., 1991). Adaptive emotion regulation is essential to overcoming daily stressful events via one or more strategies (Gross, 2015; Doré et al., 2016). Cognitive reappraisal is an antecedent strategy whereby one changes the way one thinks about an emotional stimulus (Gross, 2015). Expressive suppression is a response-focused strategy whereby one hides, inhibits or reduces emotion-expressive behavior (Gross, 2015). Prior work has shown that cognitive reappraisal is often more adaptive than expressive suppression (Gross & John, 2003; John & Gross, 2004).

Aims The aim of this study was to evaluate how the use of antecedent versus response-focused emotion regulation strategies differentially affect grief symptom severity in bereaved spouses over time. We hypothesized that cognitive reappraisal usage would be negatively associated with grief symptom severity and expressive suppression usage would be positively associated with grief symptom severity. We also predicted that strategy usage will moderate the effect of time on grief symptom severity.

Methods As a part of a larger study, 201 adults that lost a spouse within 3 months participated in 4 lab visits, up to 1 year post-loss. Participants reported baseline frequency of cognitive reappraisal and expressive suppression (Gross & John, 2003). During each visit participants reported grief symptom severity (Prigerson et al., 1995). Participants were excluded for

less than 2 visits or for grief scores more than 3.5 *SD* from the group *M* (*N* = 172, Female = 115, White, non-Hispanic = 154). We used linear mixed models to predict grief symptom severity with fixed effects for visit, frequency of cognitive reappraisal and expressive suppression, and interactions between visit and emotion regulation measures. We controlled for age, gender, race/ethnicity, education, subjective socioeconomic status, and days since passing to V1.

Results Participants reported lower grief over time, $F(3,446) = 37.77, p < .001$. Participants with a higher baseline use of cognitive reappraisal reported lower grief across all visits, $F(1,163) = 3.92, p = .049$. Baseline expressive suppression moderated the effect of visit on grief, $F(3,446) = 2.76, p = .042$. The moderation is consistent with the characteristic reduction in grief over time (V4—V1) in high suppressors, although simple slopes did not significantly differ.

Conclusions These results align with research looking at the contextual adaptivity of emotion regulation (Doré et al., 2016; John & Gross, 2004). Cognitive reappraisal may be an adaptive way to cope with spousal bereavement in contrast to expressive suppression. While correlational, these results motivate the development of contextually-dependent emotion regulation interventions to address grief.

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Stress and its Association with Emotion Regulation Success

Wei Huang¹, Parmida Favakehi¹, Leyan Zhai¹, Jocelyn Lai¹, Elizabeth A. Martin¹

¹Department of Psychological Science, University of California, Irvine

Summary Emotion regulation refers to ways of changing the intensity, valence, or duration of an emotion response (Gross, 2015). Prior work using electroencephalogram (EEG) has shown reductions in the late positive potential (LPP) when individuals are instructed to regulate emotions compared to viewing images and responding to the content naturally. Measuring reductions in LPP as an objective index for emotion regulation success, we aim to explore the role of perceived stress in an individual's ability to subjectively and objectively regulate negative affect using an in-lab paradigm.

Keywords · stress · emotion regulation · late positive potential · electroencephalogram

✉ Wei Huang: huangw12@uci.edu

Introduction Previous emotion regulation (ER) literature has focused on regulation tendencies and has since shifted to examine when and to what extent individuals regulate successfully. EEG studies examining ER have found reductions in the LPP amplitude (an indicator of emotional arousal) when comparing trials where individuals are asked to view versus regulate negative stimuli. Acute stress has important links with experienced affect (Richardson, 2017), and may also relate to how individuals regulate affect. Building on this work, we explore how perceived stress as an individual difference may relate to objective and subjective ER success.

Aims This study aims to examine the links between perceived stress and the successful down-regulation of negative affect. We hypothesize that individuals with higher levels of perceived stress would be less successful in down-regulating negative affect.

Methods Participants are recruited via campus flyers and the Social Science Human Subject Research Pool. Participants will complete a questionnaire assessing emotion traits and perceived life stress. Participants will then complete an ER paradigm while we record neural activity using EEG. The ER paradigm is adapted from a previous study (Thiruchselvam et al., 2011). Participants will first be trained on task instructions and ER strategies, and then will complete a practice task. For the ER paradigm, participants see a series of negative images and are instructed to VIEW, RETHINK, or DISTRACT. Task blocks and the order of the images will be randomized. After each image,

participants will rate their negative and positive affect as well their perceived success in regulating across RETHINK and DISTRACT trials (see Figure 1).

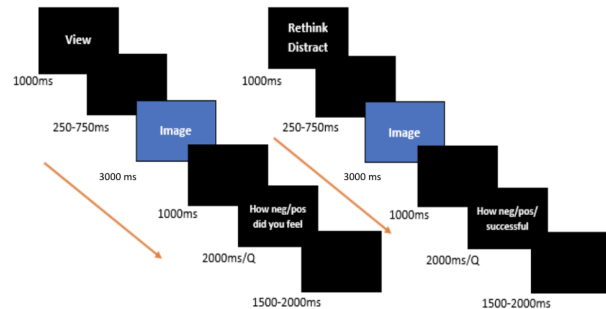


Figure 1: Order and timing for VIEW, RETHINK, and DISTRACT trials

Results Based on a *a priori* power analysis, a minimum of N = 55 participants will be recruited. For subjective ER success, linear regression will be used to assess the links between perceived stress and ratings of ER success. For objective ER success, hierarchical mixed modeling will be conducted (i.e., electrodes across time windows and across conditions [2 blocks] for each individual). Stress will be included as a moderator, where greater stress would modulate a smaller reduction of LPP amplitude in ER trials compared to VIEW trials.

Conclusions Our findings may provide further knowledge in the field of affective science by examining ER success alongside literature in ER difficulties. Supporting individuals in managing acute stress may help with successful ER and improved well-being overall. A future direction is to consider factors that support rather than hinder ER success.

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Are Depressed People Motivated to Change How They Feel? An Experience Sampling Study of Emotion Regulation Goals and Motives in Current and Remitted Major Depressive Disorder

Daphne Y. Liu^{1,*}, Tabea Springstein², Alison B. Tuck², Tammy English², and Renee J. Thompson²

¹Departments of Psychology and Psychiatry, Stony Brook University

²Department of Psychological and Brain Sciences, Washington University in St. Louis

Summary We examined everyday emotion regulation (ER) goals and motives in adults with current major depressive disorder (MDD), remitted MDD, and a control group. Most group differences were between the current-MDD and control groups, with the current-MDD group regulating emotion more frequently, showing a weaker link between ER frequency and affect, and reporting more frequent hedonic ER motives.

Keywords · Emotion regulation · major depressive disorder · experience sampling

✉ Daphne Y. Liu: daphne.liu@wustl.edu

Introduction People with MDD experience difficulties regulating emotion, with most work focused on how they select and implement various ER strategies (Liu & Thompson, 2017). It is important to study processes earlier in an ER cycle, such as desired emotional states (emotion goals) and reasons for regulation (ER motives; Mauss & Tamir, 2014). Such research can help further clarify where ER goes awry in MDD.

Aims We examined emotion goals and ER motives in adults with current and remitted MDD and a healthy control group. For emotion goals, we examined group differences in overall frequencies of reporting goals to regulate negative affect (NA) and positive affect (PA). We expected adults with current MDD to regulate NA more frequently and PA less frequently than controls. We also explored whether groups differed in the extent to which their goal frequency was associated with their momentary NA and PA. We did not have hypotheses for ER motives or for the remitted group.

Methods Using two-week experience sampling (5 surveys/day), adults with current MDD (cMDD; $n=48$), remitted MDD (rMDD; $n=80$), and controls (CTL; $n=87$) reported their NA, PA, and emotion goals (frequency of regulating NA and PA). They also reported frequencies of having hedonic motives (i.e., to change or maintain my mood) and six instrumental ER motives (e.g., to get a task done; to get along with others or avoid conflict). Analyses used multilevel modelling.

Results Regarding overall goal frequency, cMDDs regulated NA and PA more frequently than did rMDDs (NA: $b=.62$, $p=.01$; PA: $b=.76$, $p=.02$) and CTLs (NA: $b=.71$, $p=.004$; PA: $b=.80$, $p=.01$), who did not differ. Across groups, participants were more likely to

regulate NA and PA at higher levels of NA and lower levels of PA ($ps<.001$). These associations, however, were significantly weaker for cMDDs than for rMDDs and CTLs ($ps<.007$), who did not differ (Figure 1). For ER motives, cMDDs ($b=.91$, $p<.001$) and rMDDs ($b=.78$, $p<.001$) endorsed hedonic motives more frequently than CTLs, but they did not differ from each other. Groups did not differ in instrumental motives ($ps>.06$).

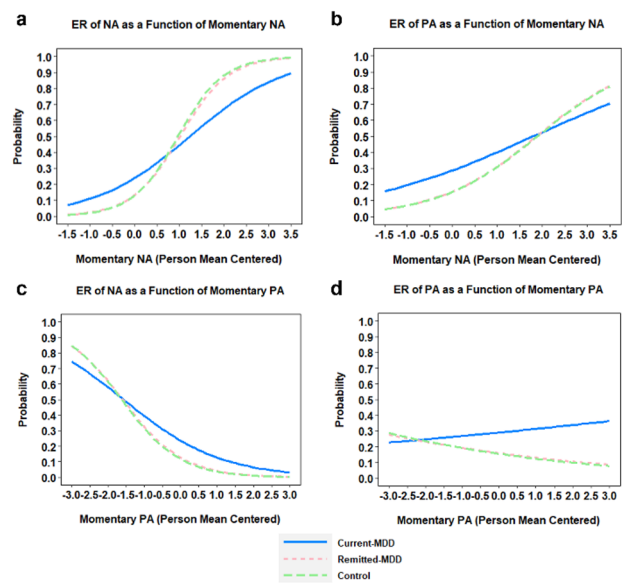


Figure 1: Probabilities of ER of NA and PA as a Function of Momentary NA (Top Row) and PA (Bottom Row)

Conclusions Adults with current MDD were motivated to change how they feel, but their ER attempts were less tied to momentary affect relative to those of the rMDD and CTL groups. Thus, emotion dysregulation in current MDD does not seem to be characterized by a lack of attempts to regulate emotion, but by more indiscriminate ER attempts at least in relation to momentary ER-relevant cues. Adults with remitted MDD showed many similarities to controls, suggesting that ER deficits do not always characterize those with MDD history and can be an episode-specific feature of MDD.

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Adolescent Depressive Symptoms Moderate the Effect of Spending Time with Friends on their Positive and Negative Affect

Kavya Mudiam¹, Ian Shryock¹, Yoel Everett¹, Sara Weston¹, Ranqing Lan^{2,3}, Karla Joyce⁴, David Brent⁴, Randy P. Auerbach^{2,3}, Nicholas B. Allen¹

¹Department of Psychology, University of Oregon

²Department of Psychiatry, Columbia University

³Division of Child and Adolescent Psychiatry, New York State Psychiatric Institute

⁴Department of Psychiatry, University of Pittsburgh Medical Center

Summary In a clinical sample of adolescents, MLM analyses of Ecological Momentary Assessment (EMA) data revealed that youths with greater depressive symptoms experienced more positive affect (PA) and less negative affect (NA) during social interactions with friends, but less NA while alone, when compared to youths with less severe depression.

Keywords · adolescent mental health · depression · interpersonal relationships · affect · emotion regulation
✉ Kavya Mudiam: kmudiam@uoregon.edu

Introduction In adolescence, friendships become an important source of emotional support (Stanton-Salazar & Spina, 2005), and are closely linked to emotional experiences (Keltner & Gross, 1999). Depressed adolescents often have fewer and lower quality friendships (Schwartz-Mette et al., 2020) and depressive symptoms may impact their emotional experiences with friends.

Aims The study aims to test the relationship between PA and NA and social context among a clinical adolescent sample, and whether depressive symptoms moderate this relationship. Researchers hypothesized depressive symptoms would moderate the relationship between PA and NA and social context. Specific hypotheses were not preregistered.

Methods Adolescents seeking mental health (MH) treatment (N = 178, 127 cisgender females, ages 13 - 18) reported depressive symptoms on the Mood and Feelings Questionnaire (M = 12) and completed 4-7 EMA prompts/day (“How [happy/sad/lonely, etc.] do you feel right now?”) for 7 days during 4 study waves to report current PA, NA, and whom they were with (e.g. family, friends, partners, colleagues, nobody). MLM analyses modelled the relationship between affect and social context and the influence of depression severity.

Results Depressive symptoms moderated the relationship between PA and NA and time spent with friends. Compared to adolescents with lower levels of depression, adolescents with more depressive symptoms experienced more PA (b = 5.37, 95% CI [1.63, 9.15]) and less NA (b = -4.95 [-8.29, -1.55]) with friends. Adolescents with higher levels of depression

experienced less NA while alone than adolescents with lower levels of depression (b = -3.12, 95% CI [-6.28, -0.01]).

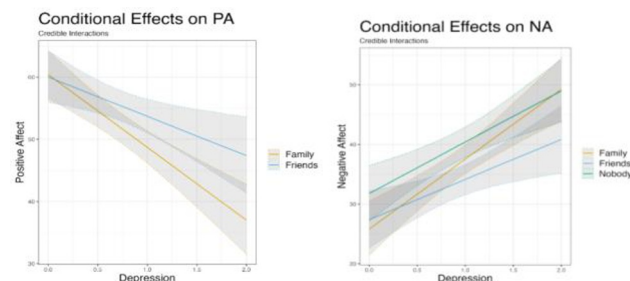


Figure 1: EMA-reported PA and NA as a function of who time was spent with and baseline depression

Conclusions Contrary to prior research (Kesselring et al., 2021), we found that those with higher levels of depressive symptoms experienced greater affective benefits when socializing with friends, than adolescents with lower levels of depressive symptoms. Results suggest depressed youth may benefit from increased social interactions with friends. These results should be considered in the context of a primarily female sample, as adolescent females' friendships may be more positive than those of adolescent males (Schwartz-Mette et al., 2020). Future research should establish how interpersonal emotion regulation from friends may impact affective states in depressed youth (Marroquín, 2011).

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But enough about me: Linguistic self-reference and the depressogenic effects of brooding

James S. Sheinbaum¹, Gwyneth A. L. DeLap¹, Angela C. Santee¹ and Lisa R. Starr^{1,*}

¹Department of Psychology, University of Rochester

Summary First-person singular pronoun usage (I, me, my), an indicator of low self-distancing, is associated with brooding and depression. Here, we demonstrate that greater first-person singular pronoun use among adolescents predicts stronger cross-sectional brooding-depression associations, suggesting low self-distancing may exacerbate the depressive maladaptivity of brooding.

Keywords · Depression · Linguistic Analysis · Brooding Rumination · Self-Distancing · Adolescence

✉ Lisa R. Starr: lisa.starr@rochester.edu

Introduction Frequent use of first-person singular pronouns (FPSP; I, me, my, mine) may indicate a heightened tendency to think about oneself, and is associated with lower use of self-distancing, the ability to shift one's proximity to a negative cognition (Nook et al., 2017). FPSP usage has been linked to elevated concurrent depression and brooding (Edwards & Holtzman, 2017). Little work, however, has examined FPSP in adolescence, a crucial age for development of ruminative style and depression (Kessler et al., 2005). Moreover, whether FPSP moderates the prospective association between brooding and changes in depression over time needs further elucidation.

Aims We hypothesized a moderation model such that high FPSP use, an indicator of low self-distancing, exacerbates the depressogenic effects of brooding by directing ruminative content to the self. Furthermore, we expect this effect in both a) cross-sectional analyses and b) longitudinal analyses, with depression measured after a 1.5 year follow-up period, controlling for baseline depression.

Methods Adolescents ages 14-17 ($n=241$) were assessed using a diagnostic interview and questionnaire measures of depression and brooding, as well as the UCLA Life Stress Interview (LSI; Hammen et al., 2000) to describe recent stressors. All measures were administered at baseline and follow-up 1.5 years later. Participant speech from audio recordings of the LSI was extracted, transcribed, and FPSP use rates were derived using Linguistic Inquiry Word Count (LIWC) software (Boyd et al., 2022).

Results Consistent with hypotheses, increased FPSP moderated cross-sectional associations between brooding and self-reported depression ($b=.40$, $SE=.14$, $p=.005$). At low levels of FPSP (1 SD below mean, with FPSP comprising 11.190% of total speech), effects were

weaker ($b=1.643$, $SE=.469$, $p<.001$), compared to high FPSP (1 SD above mean, or 15.534% of total speech, $b=3.370$, $SE=.410$, $p<.001$; see figure 1). However, this moderation effect was not significant when interviewer-assessed depression was the outcome ($p=.212$), and did not persist after 1.5 years, for both the interviewer ($p=.488$) and self-report measures ($p=.709$).

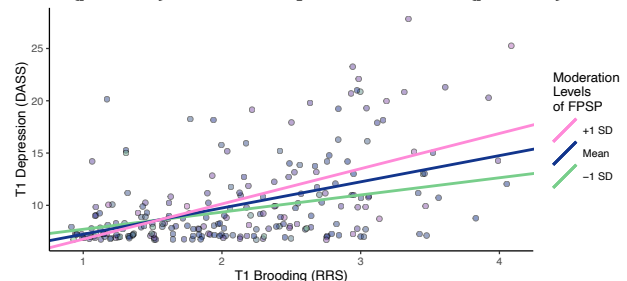


Figure 1: Cross-sectional association between brooding and depression, at low, mean, and high FPSP levels

Conclusions Self-distancing (understood through usage of FPSP) may buffer against the cross-sectional association between rumination and depression, potentially because it prevents brooding from damaging self-esteem and impairing problem solving. However, FPSP did not differentially predict increases in depression over time as a function of brooding. Future research should replicate findings and explore alternative time lags and temporal ordering.

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