Writing Sample

Table of Contents

From Status to State of Mind: Unpacking the Link Between Socioeconomic Status, Emotion Regulation, and Depression

Yuhui Chen
Department of Psychology, University of Manchester
Email: yuhui.chen-2@student.manchester.ac.uk

Note: *This writing sample is excerpted from a manuscript that reviews socioeconomic status, social functioning, and depression and is to be submitted for journal publication. Yuhui Chen is the lead author, with mentors Dr. Belen López-Pérez from University of Manchester and Dr. Yu Hao from Icahn School of Medicine at Mount Sinai as co-authors.*

Abstract

Lower socioeconomic status (SES) is associated with higher rates of depression, but research has predominantly focused on stress as a mechanism, with limited focus on the roles of social and emotional factors. Emotion regulation - the everyday social process by which individuals manage both their own and others' emotional reactions - represents a promising explanatory variable. This review investigates the effect of SES on emotion regulation and the role of emotion regulation in the higher incidence of depression among lower-SES groups. People of lower-SES face limited resources and power. On the other hand, those of higher SES have an abundance of resources and power. Building on this foundation, we present three hypotheses that detail the ways in which SES affects emotion regulation through emotion controllability, emotion regulation self-efficacy and emotion regulation flexibility. Clarifying potential pathways via emotion regulation is critical to elucidate how societal inequalities become embodied to impact mental health, and can provide theoretical foundation for future SES-emotion regulation studies.

Keywords: Socioeconomic Status, Depression, Emotion Regulation, Mental Health

SES and Depression

Socioeconomic status (SES) refers to the compound of material wealth and noneconomic characteristics such as social prestige and education (Hackman & Farah, 2009). SES can significantly impact various aspects of life, including access to resources (Broer et al., 2019; Moore et al., 2008) , health risks (Adler et al., 1994), and the environment (Evans, 2004).

Most research in psychology utilizes college students, middle-class adults with college degrees, or children from middle class families - all populations of relatively higher SES, which is typically characterized by more financial resources, social status, education, and other societal privileges (Arnett, 2016; Carey & Markus, 2017). However, such convenient samples overlook the lower-SES populations. Despite comprising a substantial proportion of the population, lower-SES individuals remain underrepresented in psychological research. In the United States, 37.9 million individuals (11.9%) live below the federal poverty line in 2022 (Shrider & Creamer, 2023); in the United Kingdom, 12 million individuals (18%) live in absolute poverty (Francis-Devine, 2023). China, as an example of developing countries, had 350 million people in poverty (24.7%) in 2019. This oversight is concerning given that those of low SES disproportionately experience mental health problems (Guhn et al., 2020). By continuing to focus psychology research predominantly on middle and upper class populations, psychology risks missing crucial insights about the lived experiences and mental health needs of large, even more vulnerable segments of the society.

Studies have found an inverse association between SES and depression, such that lower SES is linked to higher rates of depression (Brody et al., 2018; McLaughlin et al., 2012). Researchers have examined this relation using both objective measures of SES and subjective assessments. Objective SES refers to quantifiable socioeconomic indicators like income, educational attainment, and occupation status. On the other hand, subjective SES (SSS) reflects a person's perception of their own social and economic standing, often measured using the MacArthur Scale in which participants rated their own SES standing on a ladder from worst to best off in their community or in their nation (Adler et al., 2000). Studies have demonstrated the link between depression and both objective SES (Maske et al., 2016) as well as SSS (Hoebel et al., 2017), consistently show higher rates of depressive symptoms and disorders among lower SES and SSS. While the relationship between depression and SES can be bidirectional, most longitudinal analyses suggest a causal direction from SES to depression, indicating that the higher rates of depression among lower SES individuals are predominantly environmentally influenced (Johnson et al., 1999; Ritsher

et al., 2001). Examining environmental exposure mechanisms can thus help elucidate why lower SES confers greater risk for depression. In addition to the adverse physical conditions associated with lower SES, there has been comparatively little research on the social environment as a contributing factor. Emotion regulation inherently involves modifying reactions during social interactions (Zaki & Williams, 2013). Given evidence that social deficits are closely related to depression (Kupferberg et al., 2016), emotion regulation represents a promising construct that may help explain the pathway from lower SES to depression.

SES and Emotion Regulation

Emotion regulation refers to the "extrinsic or intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions, especially their intensive and temporal features, to accomplish one's goals" (Thompson, 1994). For instance, an individual might implement emotion regulation to control their own anxiety before a public speaking event (self-focused), or to mitigate another's emotions, such as a child's sadness, by distracting the child with toys or a humorous story (other-focused).

While a large body of emotion regulation research has focused on intrapersonal, self-focused processes - how individuals regulate their own emotions when alone - emotion regulation inherently occurs in interpersonal contexts as well (Zaki & Williams, 2013). This growing area of study demonstrates that just as intrapersonal emotion regulation is key for adaptive functioning, interpersonal emotion regulation plays crucial roles in navigating social life (Kwon & López-Pérez, 2022), underscoring the need for further investigation into these interactive regulatory processes.

Recent literature has clearly linked SES to differential outcomes in emotion regulation, although mainly focused on deficits in cognitive reappraisal (Elsayed et al., 2021; Kim et al., 2013). However, little work has focused on the link between SES and other facets of emotion regulation. A recent study by Zerwas and colleagues (2023) examined how social power influences beliefs about emotion, which in turn could predict strategies used in emotion regulation ($N = 1286$). The results showed that people with a greater sense of power reported lower use of suppression and greater use of reappraisal and acceptance. While this is the first study to directly examine power and emotion regulation, a more comprehensive exploration of SES's impact on emotion regulation stages is essential to fully understand its role in depression.

Therefore, this review will systematically examine evidence linking SES to outcomes across stages of emotion regulation, as described in the Extended Process Model of Emotion Regulation (PMER; Gross, 2015). We will also explain how SES disparities in emotion regulation may underlie the higher rates of depression among lower-SES populations. PMER proposed 4 key stages of emotion regulation—identification, selection, implementation, and monitoring, and views emotions as critical valuation systems, guiding responses to situations based on personal goals and contexts. Grounded in this framework, we propose three hypotheses for how SES may influence emotion regulation in ways that relate to depression risk. We will examine these hypotheses using relevant theory and empirical evidence, exploring how resource constraints shape individuals' beliefs about emotion controllability, regulation self-efficacy, and regulatory flexibility.

Emotion regulation-SES: Key Hypotheses

To explain how emotion regulation serves as a mechanism between SES and surplus of depression, we have sets of hypotheses pertains how SES can influence individuals' beliefs and ability in emotion regulations: beliefs about emotion controllability (Ford & Gross, 2018), emotion regulatory self-efficacy (Caprara et al., 2008), and emotion regulatory flexibility (Bonanno & Burton, 2013). By influencing these facets of emotion regulation, socioeconomic disadvantage may lead to dysregulation across the process model's key stages. **Table 1** summarizes our hypotheses about how SES may affect each regulatory factor, and how these in turn may disrupt specific regulatory stages, potentially resulting in the development and maintenance of MDD.

Lower SES-Related Hypotheses	How does lower SES influence emotion regulation?*
1. Belief about Emotion Uncontrollability	Impairs identification and selection stages Smaller repertoire of regulatory strategies
2. Belief about Emotion Regulation Self-Efficacy	Impairs identification, selection and implementation stages Smaller repertoire of regulatory strategies Learned Helplessness
3. Emotion Regulation Flexibility	Deficits in switching strategies/tactics according to changing environmental needs

Table 1. Impact of Lower-SES on Emotion Regulation: Beliefs, Self-Efficacy, and Flexibility, and Their Effects on Self- and Other-Focused Emotion Regulation Processes.

*The influence of SES on emotion regulation is subject to variability due to contextual dynamics, including the specific circumstances eliciting emotions and the nature of the interactions between the individual experiencing the emotion (agent) and others (targets).

Hypothesis 1: Lower-SES individuals are more likely to believe emotions are uncontrollable, while higher-SES individuals are more likely to believe emotions as controllable.

Here, we hypothesize that lower-SES individuals tend to think emotions as more uncontrollable. Empirical evidence on this topic has been limited (Ford & Gross, 2018; Tamir et al., 2007). Therefore, wes propose that lower-SES environments limit opportunities for efficacious emotion regulation. Facing the multitude of stressors (Evans & Kim, 2007) and diminished personal resources (Kraus et al., 2011), lower-SES individuals have difficulty changing their environment. When environments trigger undesired emotions in this population, environmental constraints can limit their ability to implement regulation strategies. Over time, recurrent emotion regulation failures may facilitate the adoption of entity beliefs viewing emotions as relatively fixed and uncontrollable traits. By contrast, higher SES contexts can empower beliefs about emotions being controllable, as greater resources facilitate successful emotion regulation.

Our hypothesis about belief about emotion controllability is partly supported by research on social class and beliefs of intelligence, a similar internal attribute like emotions (Claro et al., 2016; Destin et al., 2017; King & Trinidad, 2021). Claro and colleagues (2016) assessed Chilean students' beliefs about intelligence controllability using survey items such as "You can learn new things, but you can’t really change your basic intelligence" and "You have a certain amount of intelligence, and you really can’t do much to change it." Students from higher-income families were more likely to view intelligence as malleable rather than a fixed entity (Claro et al., 2016). A subsequent study by Destine et al (2017) found a similar pattern, with higher SES associated with beliefs that intelligence is malleable than lower SES. Although beliefs about controllability appear domain-specific, similar mechanisms related to one's socioeconomic context may shape views on the mutability of internal attributes like emotions and intelligence.

The belief that emotions are not controllable can impair different stages of emotion regulation. At the identification stage, this belief impedes lower SES individuals from activating a goal for self-focused emotion regulation, as their motivations are lower (Ford & Gross, 2018). Similarly, believing emotions are uncontrollable likely extends to others' emotions too, reducing the chance of initiating other-focused regulation.

Following the identification stage, the selection stage involves determining which strategy to use for regulation from their emotion regulation repertoire - the range of different ER strategies an individual utilizes across situations (Dixon-Gordon et al., 2015). Individuals from lower SES background, with beliefs about emotion being uncontrollable, may perceive a limited repertoire of strategies than their higher-SES counterparts (Gross, 1998; McRae, 2016). For example, stronger beliefs that emotions can be controlled are associated with preference for 'active' emotion regulation strategies like reappraisal and problem-solving that require regulatory skill. In contrast, those who believe emotions are uncontrollable prefer 'passive' strategies like avoidance that require less skill (Hong et al., 2020). Over time, lower-SES individuals who perceive a smaller repertoire of strategies have less opportunities to practice adaptive emotion regulation (Tamir & Mauss, 2011), which could ultimately result in less successful emotion regulation both in other- and self-focused emotion regulation.

Empirical studies have shown that the belief in emotions being uncontrollable reduces the motivation to exert effort in emotion regulation and is associated with lower well-being, poor social adjustment, and increased depressive symptoms (De Castella et al., 2013, 2018; Deplancke et al., 2023; Romero et al., 2014). This belief could be a key factor in explaining the higher rates of depression among lower-SES individuals. In MDD, a failure to effectively regulate emotions is a defining characteristic (Joormann & Stanton, 2016), often leading to prolonged negative emotional states (Aldao et al., 2010). The link between beliefs about emotion controllability and depressive symptoms has been shown to be mediated by various emotion regulation strategies, including reappraisal (De Castella et al., 2013; Deplancke et al., 2023), avoidance (De Castella et al., 2018), and expressive suppression (Deplancke et al., 2023). This further underscores the critical role of emotion regulation in the context of depression. Similarly, from an interpersonal standpoint, the belief in uncontrollable emotions can hinder proactive engagement in other-focused regulation strategies. This reluctance to regulate can exacerbate social isolation, a known predictor of depression (Chou et al., 2011).

In summary, while the impact of beliefs about emotion controllability on emotion regulation processes has been explored (Ford & Gross, 2018), there is a lack of research specifically examining how these beliefs may vary across different SES groups. Given that this belief is a central element in the emotion regulation model, understanding its influence across SES groups is crucial for better comprehending the disparities in emotion regulation and related depressive outcomes. Future research should focus more directly on this

hypothesis to clarify the differences in emotion regulation practices among various SES groups.

Hypothesis 2: Lower-SES individuals have worse emotion regulatory self-efficacy than higher-SES individuals.

Self-efficacy, the belief about one's personal ability to control an attribute (Bandura, 1977), is an important prerequisite for successful emotion regulation (Tamir & Mauss, 2011). The belief that emotions are controllable facilitates a sense of self-efficacy in regulating emotions (Tamir et al., 2007). We hypothesize that lower-SES individuals have worse emotion regulatory self-efficacy than higher-SES individuals. This effect may arise from the consistent, high-stress environments and limited resources that characterize low SES contexts (Evans, 2004). Difficulty controlling one's environment and emotions may undermine emotion regulation self-efficacy over time, and could result in learned helplessness, as defined as motivational deficits, passive behavior, and negative cognitive biases following exposure to uncontrollable situations (Seligman, 1975).

Emotion regulation self-efficacy refers specifically to one's belief in their ability to perceive, understand, and modify their own emotional states (Caprara et al., 2008). While research on SES and emotion regulation self-efficacy is limited, SES has shown a negative correlation with self-efficacy in other domains. For example, lower SES predicts lower academic self-efficacy (Wiederkehr et al., 2015), and is associated with more decline in self-regulatory efficacy across time (Caprara et al., 2008). In addition, higher-status individuals report greater self-efficacy overall compared to lower status groups, likely due to their increased control, more privileged positions, and superior life conditions (Gecas, 1989)**.**

In the realm of emotion, chronic environmental stressors common in lower SES contexts could similarly diminish emotion regulation self-efficacy. This decrease in self-efficacy impairs the selection stage of emotion regulation. Individuals with lower SES, presumed to have lower emotion regulation self-efficacy, may doubt their ability to effectively implement complex strategies. For example, they may perceive effort-requiring strategies like reappraisal as beyond their ability (Buhle et al., 2014), and prefer simpler, passive strategies like avoidance or suppression that are perceived as easier to implement

(Sheppes et al., 2011). In contrast, those with higher emotion regulation self-efficacy, hypothesized to be more prevalent in high-SES backgrounds, are more likely to perceive themselves as capable of employing a wider range of sophisticated strategies (Caprara et al., 2008). This belief in their emotion regulation skills allows them to consider more active strategies like reappraisal or problem-solving as viable options. In addition, similar to belief about emotions being uncontrollable, decreased emotion regulation self-efficacy can limit the repertoire of potential strategies and reduce the opportunities to practice and develop adaptive strategies among lower-SES individuals (Tamir & Mauss, 2011). These emotion regulation deficits in self-focused emotion regulation could extend to other-focused regulation as well. Lower-SES individuals might perceive themselves as having limited ability to regulate others' emotions, constrained by their doubts in their capabilities. This can hinder their participation in solving interpersonal issues, potentially exacerbating relationship challenges. Over time, the cumulative effect of relying on ineffective emotion regulation strategies may lead to increased negative affect and depressive symptoms among lower SES groups (Joormann & Stanton, 2016).

Hypothesis 3: Lower-SES individuals have worse emotion regulatory flexibility than higher-SES individuals.

Emotion regulation flexibility is the ability to adaptively switch strategies and targets in response to changing contextual demands, a key component of effective emotion regulation (Bonanno & Burton, 2013; Pruessner et al., 2020). We hypothesize that low-SES individuals will demonstrate worse emotion regulation flexibility compared to their higher-SES counterparts.

This hypothesis is based on the premise that effective emotion regulation requires cognitive control and executive functions, as it is inherently goal-driven (Ochsner & Gross, 2014). Recent research has underscored the importance of executive functions in emotion regulation flexibility (Pruessner et al., 2020). However, poverty and lower SES are linked to deficits in executive function across the lifespan (Evans et al., 2021; Hackman et al., 2015; Lawson et al., 2018). This impairment is not simply a result of fewer educational opportunities but can also stem from chronic stress and environmental instability associated with poverty (Evans, 2004). Poverty impacts brain development, particularly in regions like the prefrontal cortex that support executive functions (Farah et al., 2006). Resulting cognitive deficits can impair the complex processes needed for flexibly regulating emotions, like switching strategies and targets based on shifting contextual cues (Bonanno & Burton, 2013).

Regulatory flexibility has been argued to be most beneficial, as adaptiveness of a strategy greatly depends on the social context and the situational demands (Bonanno & Burton, 2013). For instance, the ability to use reappraisal correlated with fewer depressive symptoms when facing uncontrollable stress, but more symptoms for controllable stress (Troy et al., 2013). Similarly, greater well-being is associated with using reappraisal more frequently during uncontrollable situations, but less often for controllable situations (Haines et al., 2016). This highlights the importance of regulatory flexibility. Inflexibility in deploying strategies may directly contribute to depressive symptoms by preventing context-appropriate regulation (Chen & Bonanno, 2021). Following this line of evidence, lower-SES individuals, with worse emotion regulation flexibility, can have deficits in the switching between regulatory strategies in the monitor stage. They may be more likely to experience "failure to switch," indicated by their worse emotion regulation flexibility.

The ability to discontinue maladaptive strategies and switch to adaptive strategies is associated with fewer depressive symptoms (Kato, 2015, 2017). Additionally, individuals with lower regulatory flexibility exhibit greater depressive symptoms than those with higher regulatory flexibility (Chen & Bonanno, 2021). Reduced flexibility impairs one's ability to adjust emotion regulation as needed according to changing contextual factors to improve mood. Therefore, socioeconomic disparities in regulatory flexibility may be an important factor in the higher rates of depression observed among lower SES populations, yet direct studies are needed to establish the link.

In this section, we have outlined our primary predictions concerning the impact of SES on emotion regulation beliefs and flexibility. We propose that individuals from lower-SES backgrounds are more likely to perceive emotions as uncontrollable and demonstrate poorer emotion regulation self-efficacy and flexibility. In contrast, those from higher-SES backgrounds tend to perceive a greater degree of control over their emotions, exhibit better regulatory self-efficacy, and possess the ability to adaptively switch and terminate strategies in response to various contextual demands. This variance in emotion regulation, influenced by SES, potentially plays a critical role in determining mental health outcomes, particularly the prevalence and severity of depressive symptoms.

Pathways to Depression and Future Research

A large body of research clearly demonstrates associations between deficits in emotion regulation and depression (Joormann & Stanton, 2016; Marroquín, 2011).

Additionally, extensive evidence links lower SES to deficits in emotion regulation, mainly cognitive reappraisal (Elsayed et al., 2021; Kim et al., 2013). However, few studies have directly assessed the role of emotion regulation in explaining the links between lower SES and higher rates of depression. Our review sought to bridge this gap by examining how SES influences various stages of emotion regulation, considering both self-focused and other-focused strategies and tactics.

Specifically, lower SES individuals exhibit a tendency towards using more maladaptive emotion regulation strategies and tactics, and can exhibit several deficits at different stages of emotion regulation. However, research finds that greater use of maladaptive strategies, rather than less use of adaptive strategies, shows the most consistent prospective prediction of increased depressive symptoms over time (Aldao et al., 2010; Aldao & Nolen-Hoeksema, 2012; Dawel et al., 2021; Garnefski & Kraaij, 2007). This pattern suggests a potential refinement of our original mediational hypothesis. Rather than emotion regulation deficits broadly mediating the SES-depression gradient, the predominance of ineffective regulation approaches among lower SES groups may drive part of this relationship. In other words, it is not simply that socioeconomic disadvantage impairs all facets of emotion regulation, but rather that it steers regulatory behaviors towards specific maladaptive strategies that fuel depression susceptibility. At the same time, lower SES environments can foster subclinical depressive symptoms (Ritsher et al., 2001) or related cognitive control deficits (Farah et al., 2006) that also drives emotion regulation impairments. Disentangling the potential bidirectional relationships between emotion regulation, surplus depression, and socioeconomic stress represents an important goal for future research.

To establish the role that emotion regulation plays in explaining the higher rates of depression among lower SES populations, more research is needed. First, future studies should directly examine SES, not only as a demographic variable, but as an independent factor shaping emotion regulation. Going beyond using income or education solely as control covariates, research can manipulate SES factors or recruit groups varying on SES as active variables of interest. This approach can clarify causal impacts of disadvantage on regulatory abilities, revealing precisely how poverty-related adversity may redirect dysfunctional regulation patterns over time. Our review outlined several testable hypotheses for mechanisms that could be empirically explored, including SES influences on personal beliefs, self-efficacy, regulatory flexibility, and access to adaptive regulation strategies. Future research is encouraged to rigorously investigate these potential pathways to elucidate how

broader societal inequalities become embodied to impair emotional processing and social functioning.

Moreover, future work is encouraged to consider the interpersonal (i.e., other-focused) aspects of emotion regulation, given the fundamentally social nature of human emotional processes. By reviewing evidence, we found that most literature on emotion regulation has focused on how individuals regulate their own emotions. How they regulate others' emotions, an important part of everyday social life, is largely ignored. Although recent research has started to investigate interpersonal emotion regulation in both adults (López-Pérez et al., 2017; Niven, 2016) and children (Kwon & López-Pérez, 2022; López-Pérez & Pacella, 2021), how SES influence interpersonal emotion regulation is a new area underexplored. One thing to note is that lower SES individuals tend to be more interdependent, relying on social networks for support amid adversity (Carey & Markus, 2017; Kraus et al., 2012). Therefore, social support may act as an important source of strength, especially among lower-SES individuals. At the same time, social impairments and isolation accompanying MDD are additional risk factors (Cacioppo et al., 2006). This interplay highlights the need to investigate interpersonal emotion regulation in lower SES contexts, as it can be tied to social functioning, which is much more important for lower-SES populations than their higher-SES counterparts in promoting resilience.

Future research could also benefit from investigating the link between SES-emotion regulation from a counter-hedonic perspective. Existing emotion regulation literature predominantly adopts a hedonic perspective, focusing on strategies aimed at reducing negative emotions in others. However, people can intentionally induce negative emotions in others to achieve specific goals (Netzer et al., 2015), such as enhancing someone’s long-term wellbeing (López-Pérez et al., 2017).Similarly, at an intrapersonal level, research finds that individuals with current MDD appear more likely to amplify their own negative emotions compared to remitted and healthy controls (Liu et al., 2023). This affect worsening tendency may interact with socioeconomic environment – for instance, lower social class related to greater envy (Hong et al., 2020), potentially fueling interpersonal emotion worsening. However, future empirical work is needed to investigate these possibilities more directly and can reveal a complementary, socioeconomically-modulated perspective to the typical hedonic view of emotion regulation.

From an implication standpoint, our review provides a theoretical framework for potential future interventions targeting socioeconomic disparities in depression rates. Specifically, elucidating emotion regulation mechanisms linking lower SES to dysfunctional regulatory patterns points toward opportunities for fostering resilient regulation skills among disadvantaged communities. Interventions could focus on shaping beliefs around emotion controllability, bolstering regulatory self-efficacy, or building cognitive flexibility to deploy appropriate strategies. To our knowledge, there is currently no intervention targeting the surplus depression among lower SES populations. Emotion regulation, therefore, may be a feasible option for intervention.

Although this review has focused on emotion regulation, other social and emotional areas, such as personality, social cognition, and social support, may also help explain the higher rates of depression among lower SES individuals beyond just stress models. It is plausible that the interdependent social orientation and closer community bonds frequently present in lower SES contexts (Carey & Markus, 2017) may actually buffer against adversity under certain conditions. For instance, strong social support networks could protect against depression (Marroquín, 2011). However, chronic or acute erosion of those support ties may conversely exacerbate disorder susceptibility. Elucidating nuances in how aspects of socioeconomic environments shape social-emotional capacities - for better or worse - represents a critical direction.

This review sought to address a critical gap regarding psychosocial mechanisms linking broader socioeconomic inequalities to depression. While extensive evidence demonstrates emotion regulation impairments in both depression and lower SES, few studies directly connect these paths. Synthesizing theory and empirical findings, our analysis revealed that emotion regulatory disruptions occurring among those facing adversity may explain part of the firmly established SES-depression gradient.

References

Adler, N. E., Boyce, T., Chesney, M. A., Cohen, S., Folkman, S., Kahn, R. L., & Syme, S. L. (1994). Socioeconomic status and health: The challenge of the gradient. *American Psychologist*, *49*(1), 15–24. https://doi.org/10.1037/0003-066X.49.1.15

Adler, N. E., Epel, E. S., Castellazzo, G., & Ickovics, J. R. (2000). Relationship of subjective and objective social status with psychological and physiological functioning: Preliminary data in healthy, White women. *Health Psychology*, *19*(6), 586–592. https://doi.org/10.1037/0278-6133.19.6.586

Aldao, A., & Nolen-Hoeksema, S. (2012). When are adaptive strategies most predictive of psychopathology? *Journal of Abnormal Psychology*, *121*(1), 276–281. https://doi.org/10.1037/a0023598

Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review*, *30*(2), 217–237. https://doi.org/10.1016/j.cpr.2009.11.004

Arnett, J. J. (2016). The neglected 95%: Why American psychology needs to become less American. *Methodological Issues and Strategies in Clinical Research, 4th Ed.*, 115–132. https://doi.org/10.1037/14805-008

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191.

Bonanno, G. A., & Burton, C. L. (2013). Regulatory Flexibility: An Individual Differences Perspective on Coping and Emotion Regulation. *Perspectives on Psychological Science*, *8*(6), 591–612. https://doi.org/10.1177/1745691613504116

Brody, D. J., Pratt, L. A., & Hughes, J. P. (2018). *Prevalence of depression among adults aged 20 and over: United States, 2013-2016*.

Broer, M., Bai, Y., & Fonseca, F. (2019). A Review of the Literature on Socioeconomic Status and Educational Achievement. In M. Broer, Y. Bai, & F. Fonseca (Eds.),

Socioeconomic Inequality and Educational Outcomes: Evidence from Twenty Years of TIMSS (pp. 7–17). Springer International Publishing. https://doi.org/10.1007/978-3-030-11991-1_2

Buhle, J. T., Silvers, J. A., Wager, T. D., Lopez, R., Onyemekwu, C., Kober, H., Weber, J., & Ochsner, K. N. (2014). Cognitive reappraisal of emotion: A meta-analysis of human neuroimaging studies. *Cerebral Cortex*, *24*(11), 2981–2990.

Cacioppo, J. T., Hughes, M. E., Waite, L. J., Hawkley, L. C., & Thisted, R. A. (2006). Loneliness as a specific risk factor for depressive symptoms: Cross-sectional and longitudinal analyses. *Psychology and Aging*, *21*(1), 140–151. https://doi.org/10.1037/0882-7974.21.1.140

Caprara, G. V., Di Giunta, L., Eisenberg, N., Gerbino, M., Pastorelli, C., & Tramontano, C. (2008). Assessing regulatory emotional self-efficacy in three countries. *Psychological Assessment*, *20*(3), 227.

Carey, R. M., & Markus, H. R. (2017). Social class shapes the form and function of relationships and selves. *Inequality and Social Class*, *18*, 123–130. https://doi.org/10.1016/j.copsyc.2017.08.031

Chen, S., & Bonanno, G. A. (2021). Components of Emotion Regulation Flexibility: Linking Latent Profiles to Depressive and Anxious Symptoms. *Clinical Psychological Science*, *9*(2), 236–251. https://doi.org/10.1177/2167702620956972

Chou, K.-L., Liang, K., & Sareen, J. (2011). The association between social isolation and DSM-IV mood, anxiety, and substance use disorders: Wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions. *The Journal of Clinical Psychiatry*, *72*(11), 1468–1476. https://doi.org/10.4088/JCP.10m06019gry

Claro, S., Paunesku, D., & Dweck, C. S. (2016). Growth mindset tempers the effects of poverty on academic achievement. *Proceedings of the National Academy of Sciences*,

113(31), 8664–8668.

Dawel, A., Shou, Y., Gulliver, A., Cherbuin, N., Banfield, M., Murray, K., Calear, A. L., Morse, A. R., Farrer, L. M., & Smithson, M. (2021). Cause or symptom? A longitudinal test of bidirectional relationships between emotion regulation strategies and mental health symptoms. *Emotion*, *21*(7), 1511–1521. https://doi.org/10.1037/emo0001018

De Castella, K., Goldin, P., Jazaieri, H., Ziv, M., Dweck, C. S., & Gross, J. J. (2013). Beliefs about emotion: Links to emotion regulation, well-being, and psychological distress. *Basic and Applied Social Psychology*, *35*(6), 497–505.

De Castella, K., Platow, M. J., Tamir, M., & Gross, J. J. (2018). Beliefs about emotion: Implications for avoidance-based emotion regulation and psychological health. *Cognition and Emotion*, *32*(4), 773–795.

Deplancke, C., Somerville, M. P., Harrison, A., & Vuillier, L. (2023). It's all about beliefs: Believing emotions are uncontrollable is linked to symptoms of anxiety and depression through cognitive reappraisal and expressive suppression. *Current Psychology*, *42*(25), 22004–22012.

Destin, M., Rheinschmidt-Same, M., & Richeson, J. A. (2017). Status-based identity: A conceptual approach integrating the social psychological study of socioeconomic status and identity. *Perspectives on Psychological Science*, *12*(2), 270–289.

Dixon-Gordon, K. L., Aldao, A., & De Los Reyes, A. (2015). Repertoires of emotion regulation: A person-centered approach to assessing emotion regulation strategies and links to psychopathology. *Cognition and Emotion*, *29*(7), 1314–1325. https://doi.org/10.1080/02699931.2014.983046

Elsayed, N. M., Rappaport, B. I., Luby, J. L., & Barch, D. M. (2021). Evidence for dissociable cognitive and neural pathways from poverty versus maltreatment to

deficits in emotion regulation. *Developmental Cognitive Neuroscience*, *49*, 100952. https://doi.org/10.1016/j.dcn.2021.100952

Evans, G. W. (2004). The Environment of Childhood Poverty. *American Psychologist*, *59*(2), 77–92. https://doi.org/10.1037/0003-066X.59.2.77

Evans, G. W., Farah, M. J., & Hackman, D. A. (2021). Early childhood poverty and adult executive functioning: Distinct, mediating pathways for different domains of executive functioning. *Developmental Science*, *24*(5), e13084. https://doi.org/10.1111/desc.13084

Evans, G. W., & Kim, P. (2007). Childhood Poverty and Health: Cumulative Risk Exposure and Stress Dysregulation. *Psychological Science*, *18*(11), 953–957. https://doi.org/10.1111/j.1467-9280.2007.02008.x

Farah, M. J., Shera, D. M., Savage, J. H., Betancourt, L., Giannetta, J. M., Brodsky, N. L., Malmud, E. K., & Hurt, H. (2006). Childhood poverty: Specific associations with neurocognitive development. *Brain Research*, *1110*(1), 166–174. https://doi.org/10.1016/j.brainres.2006.06.072

Ford, B. Q., & Gross, J. J. (2018). Emotion regulation: Why beliefs matter. *Canadian Psychology/Psychologie Canadienne*, *59*(1), 1.

Francis-Devine, B. (2023). *Poverty in the UK: statistics*. UK Parliament. https://commonslibrary.parliament.uk/research-briefings/sn07096/#:~:text=Absolute%20low%20income%20is%20likely,same%20rate%20as%202019%2F20.

Garnefski, N., & Kraaij, V. (2007). The Cognitive Emotion Regulation Questionnaire. *European Journal of Psychological Assessment*, *23*(3), 141–149. https://doi.org/10.1027/1015-5759.23.3.141

Gecas, V. (1989). The Social Psychology of Self-Efficacy. *Annual Review of Sociology*, *15*(1), 291–316. https://doi.org/10.1146/annurev.so.15.080189.001451

Gross, J. J. (1998). Antecedent-and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology*, *74*(1), 224.

Gross, J. J. (2015). Emotion Regulation: Current Status and Future Prospects. *Psychological Inquiry*, *26*(1), 1–26. https://doi.org/10.1080/1047840X.2014.940781

Guhn, M., Emerson, S. D., Mahdaviani, D., & Gadermann, A. M. (2020). Associations of Birth Factors and Socio-Economic Status with Indicators of Early Emotional Development and Mental Health in Childhood: A Population-Based Linkage Study. *Child Psychiatry & Human Development*, *51*(1), 80–93. https://doi.org/10.1007/s10578-019-00912-6

Hackman, D. A., & Farah, M. J. (2009). Socioeconomic status and the developing brain. *Trends in Cognitive Sciences*, *13*(2), 65–73. https://doi.org/10.1016/j.tics.2008.11.003

Hackman, D. A., Gallop, R., Evans, G. W., & Farah, M. J. (2015). Socioeconomic status and executive function: Developmental trajectories and mediation. *Developmental Science*, *18*(5), 686–702. https://doi.org/10.1111/desc.12246

Haines, S. J., Gleeson, J., Kuppens, P., Hollenstein, T., Ciarrochi, J., Labuschagne, I., Grace, C., & Koval, P. (2016). The Wisdom to Know the Difference: Strategy-Situation Fit in Emotion Regulation in Daily Life Is Associated With Well-Being. *Psychological Science*, *27*(12), 1651–1659. https://doi.org/10.1177/0956797616669086

Hong, Y.-J., Lin, R.-M., & Lian, R. (2020). Social class and envy among Chinese undergraduates: Victim justice sensitivity as a mediator. *Social Behavior and Personality: An International Journal*, *48*(6), 1+. Gale Academic OneFile.

Johnson, J. G., Cohen, P., Dohrenwend, B. P., Link, B. G., & Brook, J. S. (1999). A longitudinal investigation of social causation and social selection processes involved in the association between socioeconomic status and psychiatric disorders. *Journal of*

Abnormal Psychology, *108*(3), 490–499. https://doi.org/10.1037/0021-843X.108.3.490

Joormann, J., & Stanton, C. H. (2016). Examining emotion regulation in depression: A review and future directions. *Contributions from Experimental Psychopathology to the Understanding and Treatment of Mental Disorders*, *86*, 35–49. https://doi.org/10.1016/j.brat.2016.07.007

Kato, T. (2015). The Impact of Coping Flexibility on the Risk of Depressive Symptoms. *PLOS ONE*, *10*(5), e0128307. https://doi.org/10.1371/journal.pone.0128307

Kato, T. (2017). Effects of Flexibility in Coping with Menstrual Pain on Depressive Symptoms. *Pain Practice*, *17*(1), 70–77. https://doi.org/10.1111/papr.12412

Kim, P., Evans, G. W., Angstadt, M., Ho, S. S., Sripada, C. S., Swain, J. E., Liberzon, I., & Phan, K. L. (2013). Effects of childhood poverty and chronic stress on emotion regulatory brain function in adulthood. *Proceedings of the National Academy of Sciences*, *110*(46), 18442–18447. https://doi.org/10.1073/pnas.1308240110

King, R. B., & Trinidad, J. E. (2021). Growth mindset predicts achievement only among rich students: Examining the interplay between mindset and socioeconomic status. *Social Psychology of Education*, *24*, 635–652.

Kraus, M. W., Piff, P. K., & Keltner, D. (2011). Social Class as Culture: The Convergence of Resources and Rank in the Social Realm. *Current Directions in Psychological Science*, *20*(4), 246–250. https://doi.org/10.1177/0963721411414654

Kraus, M. W., Piff, P. K., Mendoza-Denton, R., Rheinschmidt, M. L., & Keltner, D. (2012). Social class, solipsism, and contextualism: How the rich are different from the poor. *Psychological Review*, *119*(3), 546.

Kupferberg, A., Bicks, L., & Hasler, G. (2016). Social functioning in major depressive disorder. *Neuroscience & Biobehavioral Reviews*, *69*, 313–332.

https://doi.org/10.1016/j.neubiorev.2016.07.002

Kwon, K., & López-Pérez, B. (2022). Cheering my friends up: The unique role of Interpersonal emotion regulation strategies in social competence. *Journal of Social and Personal Relationships*, *39*(4), 1154–1174. https://doi.org/10.1177/02654075211054202

Lawson, G. M., Hook, C. J., & Farah, M. J. (2018). A meta-analysis of the relationship between socioeconomic status and executive function performance among children. *Developmental Science*, *21*(2), e12529. https://doi.org/10.1111/desc.12529

Liu, D. Y., Springstein, T., Tuck, A. B., English, T., & Thompson, R. J. (2023). Everyday emotion regulation goals, motives, and strategies in current and remitted major depressive disorder: An experience sampling study. *Journal of Psychopathology and Clinical Science*, *132*(5), 594–609. https://doi.org/10.1037/abn0000831

López-Pérez, B., Howells, L., & Gummerum, M. (2017). Cruel to Be Kind: Factors Underlying Altruistic Efforts to Worsen Another Person's Mood. *Psychological Science*, *28*(7), 862–871. https://doi.org/10.1177/0956797617696312

López-Pérez, B., & Pacella, D. (2021). Interpersonal emotion regulation in children: Age, gender, and cross-cultural differences using a serious game. *Emotion*, *21*(1), 17–27. https://doi.org/10.1037/emo0000690

Marroquín, B. (2011). Interpersonal emotion regulation as a mechanism of social support in depression. *Clinical Psychology Review*, *31*(8), 1276–1290. https://doi.org/10.1016/j.cpr.2011.09.005

McLaughlin, K. A., Costello, E. J., Leblanc, W., Sampson, N. A., & Kessler, R. C. (2012). Socioeconomic status and adolescent mental disorders. *American Journal of Public Health*, *102*(9), 1742–1750. https://doi.org/10.2105/AJPH.2011.300477

McRae, K. (2016). Cognitive emotion regulation: A review of theory and scientific findings.

Neuroscience of Education, *10*, 119–124. https://doi.org/10.1016/j.cobeha.2016.06.004

Moore, L. V., Diez Roux, A. V., Evenson, K. R., McGinn, A. P., & Brines, S. J. (2008). Availability of Recreational Resources in Minority and Low Socioeconomic Status Areas. *American Journal of Preventive Medicine*, *34*(1), 16–22. https://doi.org/10.1016/j.amepre.2007.09.021

Netzer, L., Van Kleef, G. A., & Tamir, M. (2015). Interpersonal instrumental emotion regulation. *Journal of Experimental Social Psychology*, *58*, 124–135. https://doi.org/10.1016/j.jesp.2015.01.006

Niven, K. (2016). Why do people engage in interpersonal emotion regulation at work? *Organizational Psychology Review*, *6*(4), 305–323. https://doi.org/10.1177/2041386615612544

Ochsner, K. N., & Gross, J. J. (2014). The neural bases of emotion and emotion regulation: A valuation perspective. *Handbook of Emotion Regulation, 2nd Ed.*, 23–42.

Pruessner, L., Barnow, S., Holt, D. V., Joormann, J., & Schulze, K. (2020). A cognitive control framework for understanding emotion regulation flexibility. *Emotion*, *20*(1), 21–29. https://doi.org/10.1037/emo0000658

Ritsher, J. E. B., Warner, V., Johnson, J. G., & Dohrenwend, B. P. (2001). Inter-generational longitudinal study of social class and depression: A test of social causation and social selection models. *The British Journal of Psychiatry*, *178*(S40), s84–s90. Cambridge Core. https://doi.org/10.1192/bjp.178.40.s84

Romero, C., Master, A., Paunesku, D., Dweck, C. S., & Gross, J. J. (2014). Academic and emotional functioning in middle school: The role of implicit theories. *Emotion*, *14*(2), 227.

Seligman, M. E. P. (1975). Helplessness: On depression, development, and death.

Helplessness: On Depression, Development, and Death., xv, 250–xv, 250.

Sheppes, G., Scheibe, S., Suri, G., & Gross, J. J. (2011). Emotion-Regulation Choice. *Psychological Science*, *22*(11), 1391–1396. https://doi.org/10.1177/0956797611418350

Shrider, E., & Creamer, J. (2023, September 12). *Poverty in the United States: 2022*. https://www.census.gov/library/publications/2023/demo/p60-280.html

Tamir, M., John, O. P., Srivastava, S., & Gross, J. J. (2007). Implicit theories of emotion: Affective and social outcomes across a major life transition. *Journal of Personality and Social Psychology*, *92*(4), 731.

Tamir, M., & Mauss, I. B. (2011). Social cognitive factors in emotion regulation: Implications for well-being. *Emotion Regulation and Well-Being*, 31–47.

Thompson, R. A. (1994). Emotion regulation: A theme in search of definition. *Monographs of the Society for Research in Child Development*, 25–52.

Troy, A. S., Shallcross, A. J., & Mauss, I. B. (2013). A Person-by-Situation Approach to Emotion Regulation: Cognitive Reappraisal Can Either Help or Hurt, Depending on the Context. *Psychological Science*, *24*(12), 2505–2514. https://doi.org/10.1177/0956797613496434

Wiederkehr, V., Darnon, C., Chazal, S., Guimond, S., & Martinot, D. (2015). From social class to self-efficacy: Internalization of low social status pupils' school performance. *Social Psychology of Education*, *18*, 769–784.

Zaki, J., & Williams, W. C. (2013). Interpersonal emotion regulation. *Emotion (Washington, D.C.)*, *13*(5), 803–810. https://doi.org/10.1037/a0033839

Zerwas, F. K., Tharp, J. A., Chen, S., & Mauss, I. B. (2023). Individual differences in social power: Links with beliefs about emotion and emotion regulation. *Journal of Personality*, *91*(2), 314–331. https://doi.org/10.1111/jopy.1272

Research Proposal

Everyday Interpersonal Emotion Regulation in Major Depressive Disorder: Investigating Differences and Intervening through Affect Improvement

Introduction

Extensive research has established a link between emotion regulation and major depressive disorder (MDD; Joormann & Stanton, 2016). However, most research has focused on intrapersonal emotion regulation (i.e., regulating one's own emotions independently; Joormann & Stanton, 2016; Liu & Thompson, 2017) Yet, emotion regulation inherently occurs in social contexts as well. The process of utilizing social resources to regulate emotions is termed interpersonal emotion regulation (IER; Zaki & Williams, 2013). Given the social impairments and isolation accompanying MDD (Cacioppo et al., 2006; Chou et al., 2011; Ge et al., 2017), examining deficits in IER may shed light on additional factors of MDD and could have significant implications in explaining MDD.

Interpersonal Emotion Regulation in Depression

IER has significant implications for interpersonal relationships, social support, affiliation, and wellbeing (Williams et al., 2018). In fact, it is the proposed mechanism underlying the link between social support and depression (Marroquín, 2011). IER is further categorized into two types: *intrinsic* IER involves regulating one's own emotions through social interactions, while *extrinsic* IER involves regulating others' emotions through social interactions (Zaki & Williams, 2013). Although distinct, both processes can co-occur within a single IER episode (Koval et al., 2015).

While research has clearly demonstrated intrapersonal emotion regulation difficulties in MDD, less is known about deficits in interpersonal regulation among this population. Liu and colleagues (2023) recently investigated everyday IER in people with current MDD, remitted MDD, and healthy controls. They found group differences in received IER strategies and IER goals between the currently depressed and healthy groups. However, Liu et al (2023).'s focus was on how individuals with MDD use *intrinsic* IER to regulate their own emotions, and how they perceive others as utilizing extrinsic IER to influence the patient's emotions. In addition, the review by Marroquin (2011) provided a comprehensive examination of social support's role in depression, highlighting how social interactions might

influence intrinsic IER in people with MDD, such as attentional deployment and cognitive change. However, research on IER in depression has primarily focused on the intrinsic pathway - how people with MDD utilize social resources to regulate their own emotions. The way in which people with MDD deploy extrinsic IER to actively regulate others' emotions is an area that remains unexplored in the literature.

Critically, investigating extrinsic IER in MDD may elucidate the bidirectional interpersonal impacts of emotion regulation difficulties in this population. People with MDD often already face challenges in their social functioning stemming from symptoms like persistent low mood, anhedonia, or irritability (Kupferberg et al., 2016). Their capacity for effectively regulating others' emotions has significant implications for their social partners, including friends, family, and caregivers. Examining deficits in extrinsic IER could provide unique insight into how MDD shapes not just the individual's internal state, but also the affective experiences within their broader social ecosystem. In addition, extrinsic IER capacities may have critical upstream effects on feelings of loneliness and isolation in MDD. Social isolation and loneliness robustly predict depressive symptoms across studies (Cacioppo et al., 2006; Chou et al., 2011; Ge et al., 2017). Difficulties with extrinsic emotion regulation may inadvertently contribute to this interpersonal distancing. Yet surprisingly, no research has directly investigated extrinsic IER tendencies in MDD. Elucidating deficits in this domain may point to novel interventions for improving social connectedness and reducing isolation in MDD.

Interpersonal Affect Worsening: an Underexplored Behaviour

Furthermore, existing emotion regulation literature predominantly adopts a hedonic perspective, focusing on strategies aimed at reducing negative emotions in others. However, people can intentionally induce negative emotions in others to achieve specific goals (Netzer et al., 2015) , such as enhancing someone's long-term wellbeing (López-Pérez et al., 2017). This process of worsening another person's feelings is termed Interpersonal Affect Worsening (IAW; Niven et al., 2009). Recent research found that individuals with current MDD were more likely to amplify their own negative emotions compared to remitted and healthy controls (D. Liu, Springstein, et al., 2023). However, no research has investigated whether MDD impacts tendencies to *worsen others' emotions*. Therefore, there is a need to examine whether this tendency to exacerbate one's own negative affect extends to interpersonal contexts for people with MDD, i.e., whether depressed individuals engage in greater

amplification of social partners' negative emotional states through increased interpersonal affect worsening.

Methodological Limitations

Methodologically, research on emotion regulation has predominantly utilized cross-sectional, trait-level questionnaires. However, these approaches may not fully capture the nuances of real-world IER occurrences over time. In addition, people living with MDD experience recall bias, clouding the reliability of retrospective self-reports (Gotlib & Joormann, 2010). There is also a need to understand the temporal interplay between discrete regulation stages (i.e., identifying the specific emotional experiences that prompt regulation attempts, and determining which regulatory strategies are then employed), which can strengthen the causal inferences and theoretical models of this process (Petrova & Gross, 2023). In terms of MDD, examining temporal relationships can establish priorities within cycles of socio-emotional functioning that may go awry in disorders.

Prosocial Behaviour: Potential Implications for MDD

The research gaps surrounding IAW in MDD underscore the need for novel interventions targeting these processes. Indeed, a growing body of research has revealed benefits of prosocial behavior (e.g., helping others, acts of kindness) for boosting personal wellbeing (Aknin et al., 2018). For example, Aknin and colleagues (2013) analyzed survey data from 136 countries, revealing a consistent association between prosocial spending and increased happiness. This relation persists across cultures and income levels, suggesting prosocial spending's mood benefits may be a psychological universal. Through experiments in Canada and Uganda, participants reported higher happiness when recalling spending on others versus themselves, further establishing prosocial spending's causal impact on well-being.

The wellbeing benefits of prosocial behavior are not limited solely to autonomous prosociality, but also prompted prosocial behavior, both in adults (Nelson et al., 2016) and children (Layous et al., 2012). For example, Nelson and colleagues (2016) conducted a 6-week longitudinal experiment that contrasted the effects of prosocial behavior (acts of kindness for others or the world) and self-oriented behavior (acts of kindness for oneself) on mood and well-being over a 6-week period. Prosocial actions lead to greater increases in psychological flourishing than self-focused actions.

Following this line of evidence, encouraging prosocial behavior, such as interpersonal affect improvement (i.e., improving others' emotions) may also benefit those with MDD, countering the social deficits underlying depression (Segrin, 2000). Small acts of kindness could create positive social exchanges and feedback loops, lifting others' moods while alleviating one's own symptoms. Such prosocial activation interventions leverage generosity's inherent mood benefits to disrupt depressive self-focus. Scaffolding opportunities for intentional, sustained generosity could reveal pathways for harnessing social connectedness and positive affect to boost functioning in MDD.

Current Study

Based on these critical gaps in the link between emotion regulation and MDD, the proposed PhD research uniquely aims to elucidate extrinsic IER patterns in MDD and pilot a prosocial-motivated IER intervention to improve psychological wellbeing. The core research questions are: 1) Does MDD influence extrinsic IER? And 2) Can promoting interpersonal affect improvement have wellbeing benefits for MDD? Study 1 will use Ecological Momentary Assessment (EMA; Shiffman et al., 2008) to investigate everyday extrinsic IER in MDD, focusing on both affect improvement and worsening. Building on these observational findings, Study 2 will pilot an intervention, prompting interpersonal affect improvement in daily life. Despite known socioemotional challenges in MDD, no interventions have specifically targeted improving IER capacities. Yet, prior research has revealed benefits of prosocial behavior (e.g., helping others) for boosting wellbeing (Aknin et al., 2012; Layous et al., 2012; Weinstein & Ryan, 2010). Following this line of evidence, we hypothesize that this affect improvement intervention will increase psychological well being, social functioning, and decrease depressive symptoms both in community and MDD samples. To our knowledge, this will be the first research program examining extrinsic IER dynamics, and implementing IER intervention in MDD.

Study 1: Investigating Group differences in extrinsic IER Behaviors

Study 1 aims to investigate the individuals' everyday extrinsic IER and assess if people with MDD exhibit differences as compared to controls. Building upon existing research on MDD with intrapersonal emotion regulation (Joormann & Stanton, 2016) and intrinsic IER (D. Liu, Strube, et al., 2023), this study seeks to explore the less examined realm of extrinsic IER. We will recruit 50 individuals currently diagnosed with MDD, as screened by the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM-5; American Psychiatric Association [APA], 2013) and 120 healthy adults. These groups will be matched on age, gender, education, and socioeconomic status.

As for baseline, participants will complete a set of questionnaires, including 1) the *Emotion Regulation of Others and Self* (EROS; Niven et al., 2011) to assess the tendency to engage in interpersonal affect improvement; 2) the *Interpersonal Affect Worsening Scale* (IAWS; Polias et al., in press) to assess their tendency for IAW; 3) the *Interpersonal Emotion Management Scale* (IEMS; Little et al., 2012) to evaluate the strategies people use to change others' emotions, including situation modification, attention deployment, cognitive change or response modulation to change others' emotions. Additionally, all participants, from both the MDD and healthy control groups, will complete the *Beck Depression Inventory* (Beck, 1979) to screen and assess the intensity of depressive symptoms over the last 2 weeks. This screening is crucial to confirm the diagnostic status of participants in the MDD group and to ensure the absence of significant depressive symptoms in the healthy control group. We hypothesize that there will be notable differences between the MDD and healthy groups in these measures, specifically in IAW.

After the baseline, participants are then invited to the second phase. They will participate in EMA 3 times a day, over 10 days, where they will report 1) their current emotional states (happy, satisfied, interested, sad, disappointed, nervous, afraid, angry, irritated, frustrated; Barrett et al., 2007; Olderbak et al., 2023), 2) their emotional goals (i.e., their desired emotional states, including sadness, neutral and happiness; Millgram et al., 2015), whether they have engaged in 3) affect improvement and 4) affect worsening, 5) the amount of time, 6) their relationship to the target (spouse/partner, child, other family members, friend, work colleague, stranger), 7) their motives (altruistic, instrumental, conformity, counter-hedonic), and 7) the strategies used (engagement and rejection).

To analyze patterns of emotion regulation, we will use a multilevel Dynamic Structural Equation Modeling (DSEM; Hamaker et al., 2018) to compare group differences in extrinsic IER, using Mplus 8.4 (Muthén & Muthén, 2017). The DSEM is suitable for analyzing intensive longitudinal data where observations from multiple individuals are collected at many points in time (Asparouhov et al., 2018).

Study 2: Enhancing Well-Being through Interpersonal Affect Improvement

Building on the insights from Study 1, Study 2 aims to implement an intervention designed to encourage affect improvement in people with MDD. The Primary goal is to assess if this intervention can enhance psychological well being and increase social functioning. We hypothesize that, compared to baseline, MDD patients trained in interpersonal affect improvement will exhibit significant improvements in these areas.

This study will recruit 120 individuals currently diagnosed with MDD and 200 healthy adults, different from Study 1. Participants will be divided into three groups according to a weight randomization procedure, in which 80% were assigned to the treatment condition and 20% to the delayed-treatment condition: two treatment groups (one community group, n = 160, and one MDD group, n = 96) and one controlled group (n = 64, 40 healthy controls, 24 current-MDD). At baseline, participants will complete the *Beck Depression Inventory* (Beck, 1979) to assess their intensity of **depressive symptoms** for the last 2 weeks prior to assessment. Additionally, their **relationship functioning** will be measured by 1) the *Revised UCLA Loneliness Scale* (Russell et al., 1980) for perceived loneliness, and 2) *the Social Support Questionnaire* (Sarason et al., 1983) to measure perceived social support. Their **psychological wellbeing** will be measured by the Satisfaction with Life Scale (Diener et al., 1985) and the Psychological Well-being Scale (Ryff & Keyes, 1995; Ryff & Singer, 2008).

Following the baseline assessment, the 16-day intervention phase will commence. This duration is chosen based on the findings of a paper by Renna et al. (2023) on intrapersonal emotion regulation therapy, which suggests that an intervention consisting of 16 sessions demonstrates superior outcomes in reducing distress, rumination, and worry, compared to shorter interventions. Each morning at 9 a.m., participants in both groups will receive a prompt on their smartphones, priming the benefits of improving others' moods on psychological well being. They will be presented with a scenario involving two virtual characters, one feeling upset and the other attempting to cheer them up. After the affect

improvement, both characters transit to a happier emotional state. Subsequent to the scenario, participants will be provided with a set of instructions to implement interpersonal affect improvement. These prompts will provide examples of potential opportunities suited to the participants' environments (e.g., complimenting a colleague, helping family members with chores, consoling a friend). Participants will be encouraged to perform at least one intentional act of affect improvement per day. This daily prompt is intended to reinforce the participants' understanding and application of affect improvement strategies in real-world situations.

In the evenings, at 8 p.m., participants will complete an Ecological Momentary Assessment, and will be required to finish it before 12 midnight of the same day. This questionnaire will inquire about their efforts to improve someone's mood during the day. If participants respond affirmatively, they will provide additional details about the interpersonal affect improvement, including 1) frequency, 2) total duration, 3) their relationship with the target person (spouse/partner, child, other family members, friend, work colleague, stranger), 4) their underlying motives (altruistic, instrumental, conformity, counter-hedonic), 5) the reasons for their actions, and 6) the specific strategies employed (situation selection, situation modification, attention deployment, cognitive change or response modulation). Additionally, they will report their current state of wellbeing using the Psychological Wellbeing Scale (Ryff & Keyes, 1995; Ryff & Singer, 2008) and report their current emotional state (happy, satisfied, interested, sad, disappointed, nervous, afraid, angry, irritated, frustrated; Barrett et al., 2007; Olderbak et al., 2023) and goals (i.e., their desired emotional states, including sadness, neutral and happiness; Millgram et al., 2015).

At post-intervention, participants will repeat completing the same battery from the baseline assessment. We will compare 1) scores at baseline versus post-intervention to evaluate the effect of this intervention, and 2) scores for controlled and intervention groups pre- and post-intervention. Specifically, in the community sample, we will examine whether the intervention is moderated by the level of depressive symptoms. For participants in the MDD group, we will compare changes in psychological wellbeing, social functioning, and depressive symptoms against their baseline levels. We predict that the intervention will lead to notable improvements in psychological wellbeing, social functioning and reduced depressive symptoms in the MDD group. Additionally, in the community sample, we anticipate that individuals with higher baseline levels of depressive symptoms will show more significant improvements compared to those with lower levels.

Implications

The current project can shed light on how promoting interpersonal affect improvement in MDD patients can improve their mental health. This can be conducted in other clinical groups who may also exhibit social impairments, including bipolar disorder, borderline personality disorder, ADHD, etc. To the best of our knowledge, there is no intervention conducted on extrinsic emotion regulation or interpersonal affect improvement in MDD or other mental health conditions, representing a very important and novel contribution.

Additionally, this intervention has the potential to be more practical and cost-effective compared to traditional psychotherapy. If shown to be effective, this simple text-delivered prompting approach can be easily disseminated to reach a broader spectrum of individuals experiencing low wellbeing and interpersonal difficulties. Beyond clinical groups, these prompts to intentionally improve others' moods can also benefit the general public and at-risk groups. Fostering a culture of small acts of kindness could have cascading positive impacts on social relationships and wellbeing at a societal level.

References

Aknin, L. B., Barrington-Leigh, C. P., Dunn, E. W., Helliwell, J. F., Burns, J., Biswas-Diener, R., Kemeza, I., Nyende, P., Ashton-James, C. E., & Norton, M. I. (2013). Prosocial spending and well-being: Cross-cultural evidence for a psychological universal. *Journal of Personality and Social Psychology*, *104*(4), 635–652. https://doi.org/10.1037/a0031578

Aknin, L. B., Hamlin, J. K., & Dunn, E. W. (2012). Giving Leads to Happiness in Young Children. *PLOS ONE*, *7*(6), e39211. https://doi.org/10.1371/journal.pone.0039211

Aknin, L. B., Van de Vondervoort, J. W., & Hamlin, J. K. (2018). Positive feelings reward and promote prosocial behavior. *Early Development of Prosocial Behavior*, *20*, 55–59. https://doi.org/10.1016/j.copsyc.2017.08.017

Asparouhov, T., Hamaker, E. L., & Muthén, B. (2018). Dynamic Structural Equation Models. *Structural Equation Modeling: A Multidisciplinary Journal*, *25*(3), 359–388. https://doi.org/10.1080/10705511.2017.1406803

Barrett, L. F., Mesquita, B., Ochsner, K. N., & Gross, J. J. (2007). The Experience of Emotion. *Annual Review of Psychology*, *58*(1), 373–403. https://doi.org/10.1146/annurev.psych.58.110405.085709

Beck, A. T. (1979). *Cognitive Therapy and the Emotional Disorders*. Penguin Publishing Group. https://books.google.co.uk/books?id=nSFvAAAAQBAJ

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction With Life Scale. *Journal of Personality Assessment*, *49*(1), 71–75. https://doi.org/10.1207/s15327752jpa4901_13

Gotlib, I. H., & Joormann, J. (2010). Cognition and Depression: Current Status and Future Directions. *Annual Review of Clinical Psychology*, *6*(1), 285–312. https://doi.org/10.1146/annurev.clinpsy.121208.131305

Hamaker, E. L., Asparouhov, T., Brose, A., Schmiedek, F., & Muthén, B. (2018). At the Frontiers of Modeling Intensive Longitudinal Data: Dynamic Structural Equation Models for the Affective Measurements from the COGITO Study. *Multivariate Behavioral Research*, *53*(6), 820–841. https://doi.org/10.1080/00273171.2018.1446819

Joormann, J., & Stanton, C. H. (2016). Examining emotion regulation in depression: A review and future directions. *Contributions from Experimental Psychopathology to the Understanding and Treatment of Mental Disorders*, *86*, 35–49. https://doi.org/10.1016/j.brat.2016.07.007

Koval, P., Butler, E. A., Hollenstein, T., Lanteigne, D., & Kuppens, P. (2015). Emotion regulation and the temporal dynamics of emotions: Effects of cognitive reappraisal and expressive suppression on emotional inertia. *Cognition and Emotion*, *29*(5), 831–851. https://doi.org/10.1080/02699931.2014.948388

Kupferberg, A., Bicks, L., & Hasler, G. (2016). Social functioning in major depressive disorder. *Neuroscience & Biobehavioral Reviews*, *69*, 313–332. https://doi.org/10.1016/j.neubiorev.2016.07.002

Layous, K., Nelson, S. K., Oberle, E., Schonert-Reichl, K. A., & Lyubomirsky, S. (2012). Kindness Counts: Prompting Prosocial Behavior in Preadolescents Boosts Peer Acceptance and Well-Being. *PLOS ONE*, *7*(12), e51380. https://doi.org/10.1371/journal.pone.0051380

Little, L. M., Kluemper, D., Nelson, D. L., & Gooty, J. (2012). Development and validation of the Interpersonal Emotion Management Scale. *Journal of Occupational and Organizational Psychology*, *85*(2), 407–420. https://doi.org/10.1111/j.2044-8325.2011.02042.x

Liu, D., Springstein, T., Tuck, A., English, T., & Thompson, R. (2023). Everyday emotion

regulation goals, motives, and strategies in current and remitted major depressive disorder: An experience sampling study. *Journal of Psychopathology and Clinical Science*, *132*. https://doi.org/10.1037/abn0000831

Liu, D., Strube, M., & Thompson, R. (2023). *Do Emotion Regulation Difficulties in Depression Extend to Social Context? Everyday Interpersonal Emotion Regulation in Current and Remitted Major Depressive Disorder*. https://doi.org/10.1037/abn0000877

Liu, D. Y., & Thompson, R. J. (2017). Selection and implementation of emotion regulation strategies in major depressive disorder: An integrative review. *Clinical Psychology Review*, *57*, 183–194. https://doi.org/10.1016/j.cpr.2017.07.004

López-Pérez, B., Howells, L., & Gummerum, M. (2017). Cruel to Be Kind: Factors Underlying Altruistic Efforts to Worsen Another Person's Mood. *Psychological Science*, *28*(7), 862–871. https://doi.org/10.1177/0956797617696312

Marroquín, B. (2011). Interpersonal emotion regulation as a mechanism of social support in depression. *Clinical Psychology Review*, *31*(8), 1276–1290. https://doi.org/10.1016/j.cpr.2011.09.005

Millgram, Y., Joormann, J., Huppert, J. D., & Tamir, M. (2015). Sad as a Matter of Choice? Emotion-Regulation Goals in Depression. *Psychological Science*, *26*(8), 1216–1228. https://doi.org/10.1177/0956797615583295

Nelson, S. K., Layous, K., Cole, S. W., & Lyubomirsky, S. (2016). Do unto others or treat yourself? The effects of prosocial and self-focused behavior on psychological flourishing. *Emotion*, *16*(6), 850–861. https://doi.org/10.1037/emo0000178

Netzer, L., Van Kleef, G. A., & Tamir, M. (2015). Interpersonal instrumental emotion regulation. *Journal of Experimental Social Psychology*, *58*, 124–135. https://doi.org/10.1016/j.jesp.2015.01.006

Niven, K., Totterdell, P., & Holman, D. (2009). A classification of controlled interpersonal affect regulation strategies. *Emotion*, *9*(4), 498–509. https://doi.org/10.1037/a0015962

Niven, K., Totterdell, P., Stride, C. B., & Holman, D. (2011). Emotion Regulation of Others and Self (EROS): The Development and Validation of a New Individual Difference Measure. *Current Psychology*, *30*(1), 53–73. https://doi.org/10.1007/s12144-011-9099-9

Olderbak, S., Uusberg, A., MacCann, C., Pollak, K. M., & Gross, J. J. (2023). The Process Model of Emotion Regulation Questionnaire: Assessing Individual Differences in Strategy Stage and Orientation. *Assessment*, *30*(7), 2090–2114. https://doi.org/10.1177/10731911221134601

Petrova, K., & Gross, J. J. (2023). The future of emotion regulation research: Broadening our field of view. *Affective Science*, 1–8. https://doi.org/10.1007/s42761-023-00222-0

Renna, M. E., Spaeth, P. E., Quintero, J. M., O'Toole, M. S., Sandman, C. F., Fresco, D. M., & Mennin, D. S. (2023). A randomized controlled trial comparing two doses of emotion regulation therapy: Preliminary evidence that gains in attentional and metacognitive regulation reduce worry, rumination, and distress. *Behaviour Research and Therapy*, *170*, 104420. https://doi.org/10.1016/j.brat.2023.104420

Russell, D., Peplau, L. A., & Cutrona, C. E. (1980). The revised UCLA Loneliness Scale: Concurrent and discriminant validity evidence. *Journal of Personality and Social Psychology*, *39*(3), 472–480. https://doi.org/10.1037/0022-3514.39.3.472

Ryff, C. D., & Keyes, C. L. M. (1995). The structure of psychological well-being revisited. *Journal of Personality and Social Psychology*, *69*(4), 719–727. https://doi.org/10.1037/0022-3514.69.4.719

Ryff, C. D., & Singer, B. H. (2008). Know Thyself and Become What You Are: A Eudaimonic Approach to Psychological Well-Being. *Journal of Happiness Studies*,

9(1), 13–39. https://doi.org/10.1007/s10902-006-9019-0

Sarason, I. G., Levine, H. M., Basham, R. B., & Sarason, B. R. (1983). Assessing social support: The Social Support Questionnaire. *Journal of Personality and Social Psychology*, *44*(1), 127–139. https://doi.org/10.1037/0022-3514.44.1.127

Segrin, C. (2000). Social skills deficits associated with depression. *Clinical Psychology Review*, *20*(3), 379–403. https://doi.org/10.1016/S0272-7358(98)00104-4

Shiffman, S., Stone, A. A., & Hufford, M. R. (2008). Ecological Momentary Assessment. *Annual Review of Clinical Psychology*, *4*(1), 1–32. https://doi.org/10.1146/annurev.clinpsy.3.022806.091415

Weinstein, N., & Ryan, R. M. (2010). When helping helps: Autonomous motivation for prosocial behavior and its influence on well-being for the helper and recipient. *J Pers Soc Psychol*, *98*(2), 222–244. PubMed. https://doi.org/10.1037/a0016984

Williams, W. C., Morelli, S. A., Ong, D. C., & Zaki, J. (2018). Interpersonal emotion regulation: Implications for affiliation, perceived support, relationships, and well-being. *Journal of Personality and Social Psychology*, *115*(2), 224–254. https://doi.org/10.1037/pspi0000132

Zaki, J., & Williams, W. C. (2013). Interpersonal emotion regulation. *Emotion (Washington, D.C.)*, *13*(5), 803–810. https://doi.org/10.1037/a0033839

Abstracts Submitted to Conferences and Journal

Note on Authorship: I am the sole author of all drafts of the submitted abstracts. The drafts may be revised by myself in accordance with suggestions from other contributors.

Longitudinal patterns of daily pain in children with sickle cell anemia

Yuhui Chen, Anna M. Hood, Jamie M. Kawadler, April Slee, Hanne Stotesbury, Melanie Kölbel, Chris A. Clark, Fenella J. Kirkham& Christina Liossi

*Accepted by *Women in Science: Pediatric Pain,* a special issue at *Frontiers of Pain Research*

Daily pain in children with sickle cell anemia (SCA) has previously been considered rare. Following our recent study introducing the Index of Pain Experience in Sickle Cell Anaemia (IPESCA), this study aims to elucidate longitudinal patterns of daily pain in children using serial IPESCA measurements, along with assessing the feasibility of collecting daily pain experiences through digital and paper-based diaries. We hypothesize that frequent daily pain would be related to higher frequency in older children, that hospital admissions were not an appropriate proxy for pain burden, and that IPESCA measurements would show high variability (e.g., fluctuations) over time. As an exploratory analysis, we hypothesized higher IPESCA are related to poorer executive function. This sample included children ≤18 years screened for the Prevention of Morbidity in Sickle Cell Anaemia (POMS) trial (n=41). Patients underwent cognitive testing at baseline. IPESCA was calculated from paper pain diaries at baseline, and patients continued tracking pain unprompted using an phone-based app (provided identical information to paper-based diaries) for up to 50 weeks. Children completed age-appropriate Wechsler subtests and Delis-Kaplan Executive Function System (D-KEFS) subtests (i.e., Tower Test) to assess executive function. Caregivers also completed the Behavior Rating Inventory of Executive Function (BRIEF). Despite receiving only limited reminders, feasibility of daily-pain diary reporting was demonstrated. Thirty-five patients (85%) reported daily pain across the study period. Mean IPESCA over time did not significantly correlate with increasing age. Children with higher mean IPESCA consistently performed worse on memory and executive function tests. Also, hospital admissions for pain did not correlate strongly with daily pain. Our findings indicate that children with SCA have frequent and variable daily pain and are willing to track symptoms for long periods, offering clinicians and opportunity to examine and tailor patient-specific solutions for daily pain.

Exploring the Temporal Dynamics of Motives and Strategies in Daily Interpersonal Affect Worsening

Yuhui Chen* & Belén López-Pérez, School of Health Sciences, University of Manchester
*Presenting author, submitted to *International Society for Research on Emotion*

Background: Prior studies (e.g., López-Pérez et al., 2017; Netzer et al., 2015) have identified individuals' tendencies to upregulate others' negative emotions, labeled as Interpersonal Affect Worsening (IAW). These investigations, however, are limited to experimental environments and have not explored the temporal relationship between motives and strategies in daily life.

Aims: This research investigates the association between motives of IAW (altruistic versus counter-hedonic) and the strategies (engagement versus rejection). Additionally, we will examine the role of sympathy.

Methods: Our current sample consists of 91 participants (mean age = 19.37; 79% female). They were involved in a week-long ecological momentary assessment, in which they reported 3 times a day whether they engaged in IAW, their relationship with the target, their motives, and strategies.

Results: Analysis revealed a significant within-person spillover between engagement and altruistic motive (β = .16; 95% CI: .009, .296). At the between level, we found a significant correlation between the intercepts (r =.97; 95% CI: [.759, .990]). Intriguingly, altruistic motive did not predict rejection (β = .317; 95% CI: -.133, 1.454) or vice versa (β = .37; 95% CI: -.262, 3.195). Counter-hedonic motive demonstrated significant spillover with both engagement (β = .29; 95% CI: .003, .51) and rejection (β = .263; 95% CI: .056, .486), and predicted higher use of rejection (β = .105; 95% CI: .013, .206).

Conclusion: Our study illuminates the temporal dynamics between motives and regulation strategies in IAW. While altruistic motive predominantly correlates with engagement, counter-hedonic AW shows a broader association with both engagement and rejection.

Evaluating the correspondence between qualitative and quantitative measures to assess interpersonal emotion regulation strategies

Yuhui Chen*, Shixing Cheng, Aparna Ajay, & Belén López-Pérez, School of Health Sciences, University of Manchester.

*Presenting author, presented as a poster at *British Psychology Society 2023 Social Psychology Annual Conference*

Interpersonal emotion regulation (IER) involves influencing others' emotions. Although various methods have been employed to investigate IER strategies, including quantitative questionnaires and qualitative open-ended questions, the correspondence between qualitative and quantitative responses remains unexplored. This is important to understand whether discrepancies observed across studies may be due to the different methods employed. Therefore, our study aims to examine whether there are discrepancies between different methods.

In this mixed-method study, 279 adults (M = 21.82 years, SD = 6.30, female = 174) were presented with 9 scenarios depicting different targets experiencing various negative emotions. After each scenario, participants were asked what they would do to make the target feel better (open-ended qualitative questions). In addition, participants were asked to select the strategies they would use from several IER strategies taken from two theoretical models (quantitative questions). Qualitative responses were coded by 3 independent coders into corresponding strategies through thematic analysis, revealing good interrater reliability (Ks > .82).

Regression analyses showed that, for affective engagement (AE), distraction and humour strategies, there was a perfect correspondence between participants' qualitative and quantitative responses. Cognitive engagement (qualitative) was positively linked to participants' quantitative responses of AE. For attention (qualitative), it was not significantly linked to any strategies at the quantitative level.

Our findings demonstrate that participants' quantitative responses largely correspond to their qualitative responses in IER. Our results suggest that there are important nuances between IERs. Therefore, this suggests that researchers need to be cautious when selecting the methods to investigate IER strategies.

Parent-reported Pain Intensity Predicts Cognitive Flexibility in Paediatric Patients with Sickle Cell Disease

Yuhui Chen* & Anna Hood, School of Health Sciences, University of Manchester
*Presenting author, presented as a poster at *the European Paediatric Psychology Conference 2023*.

Pain is a major complication of SCD and has been demonstrated to be associated with negative effects on quality of life and executive function (EF) difficulties. Yet, little is known about whether having severe pain over time impacts EF. The current study aimed to assess whether long-term pain intensity predicts EF or cognitive flexibility, a key aspect of EF, in children living with SCD.

Caregivers of 29 children between 8-16.99 years of age demographics and the Behavioural Rating Inventory of Executive Function (BRIEF). The Global Executive Composite (GEC) was used in our analyses. Caregivers reported the pain intensity of their child over the past 6 months. Three subtests of the Delis-Kaplan Executive Function System (D-KEFS) evaluated children's cognitive flexibility: the Trail Making, Verbal Fluency, and Colour-Word Interference Test. Data on covariates (Hydroxyurea [HU] or blood transfusion) was collected from the medical record. Four linear regressions examined the relationships between pain intensity, EF, cognitive flexibility, and covariates.

Parent-reported pain intensity significantly predicted Trail Making Test scores ($p = .03$). Pain intensity trended towards predicting category-switching in the Verbal Fluency Test ($p = .06$). Pain intensity did not significantly predict the Colour-Word Interference Test ($p = .80$). Finally, parent-reported pain intensity did not significantly predict BRIEF-GEC ($p = .44$); however, treatment type was a significant predictor ($p = .02$); patients treated with HU had worse executive function than those who received blood transfusion.

Our results demonstrate that higher pain intensity significantly predicted worse cognitive flexibility in children with SCD. Surprisingly, children treated with HU had worse EF scores than those receiving blood transfusions. These data emphasize that it may be important to investigate specific EF rather than overall cognition in future research involving children living with SCD.

Pain burden Predicts Executive Function in Paediatric Patients with Sickle Cell Disease

Yuhui Chen* & Anna Hood, School of Health Sciences, University of Manchester
*Presenting author, presented as an oral presentation at *the 17th Annual Scientific Conference on Sickle Cell and Thalassemia.*

Pain is a significant complication of sickle cell disease (SCD), including persistent and acute pain (often caused by vaso-occlusive crises). Chronic and persistent pain is associated with significant adverse effects on physical, emotional, social, and cognitive functioning. In terms of cognitive function, executive function (EF) is a domain where children with SCD experience the most profound difficulties. However, little is known about the effects of persistent pain on EF in children with SCD. The current study aimed to assess whether persistent pain (pain burden) predicts EF in children with SCD after controlling for demographic and medical variables (i.e., age, sex assigned at birth, and hydroxyurea treatment status).

Our study was a secondary analysis of baseline assessment data of children with SCD aged 8–15 years (n = 30; 60% boys) in the Prevention of Morbidity in Sickle Cell Anaemia Phase 2b (POMSb2) randomized controlled clinical trial of auto-adjusting continuous positive airways pressure. Caregivers provided demographic information and reported on their child's EF using the Behavioural Rating Inventory of Executive Function (BRIEF). The Global Executive Composite (GEC), Behavioural Rating Index (BRI), and Meta-cognition (MI) scales were used in our analyses. Higher T-scores (>65) indicate clinical concern (i.e., greater executive dysfunction). Children reported pain burden (Sickle Cell Pain Burden Inventory-Youth; SCPBI-Y) each month over eight visits.

Three hierarchical linear regression analyses were conducted. For our first regression analysis with BRIEF GEC as the dependent variable, the overall model was not significant (p = .17); however, pain burden was a significant predictor of the BRIEF GEC, $t(23) = 2.36$, p = .03, = .19. For our second regression analysis with BRIEF BRI as the dependent variable, the overall model was not significant (p = .15); nevertheless, hydroxyurea treatment status $t(23)$ = -2.11, p = .04, = .16 and pain burden $t(23) = 2.12$, p = .04, = .16 were significant predictors of the BRIEF BRI. Finally, for our third regression analysis with BRIEF MI as the dependent variable, the overall model was not significant (p = .30); however, pain burden was a significant predictor of the BRIEF MI, $t(23) = 2.14$, p = .04, = .17.

Our results demonstrate that higher pain burden significantly predicted worse EF in children with SCD with large effects. Our findings indicate that persistent pain adversely impacts behavioral and cognitive self-management EF skills. Additionally, hydroxyurea treatment status was a significant predictor of behavioral regulation. These data emphasize the significance of pain measurement before cognitive assessment and the potential role of medical treatments, such as hydroxyurea, in reducing EF dysfunction. Future development of cognitive interventions for children with SCD should consider including these critical factors in clinical trials.