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# Interpersonal Emotion Regulation in Current and Remitted Major Depressive Disorder: An Experience Sampling Study

by

Yunjing Liu

A dissertation presented to
The Graduate School
of Washington University in
partial fulfillment of the
requirements for the degree
of Doctor of Philosophy

August 2022
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# Table of Contents

# List of Figures

# List of Tables

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Yunjing Liu

*Washington University in St. Louis*

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Dedicated to my family who raised and have wholeheartedly supported me.

ABSTRACT OF THE DISSERTATION

Interpersonal Emotion Regulation in Current and Remitted Major Depressive Disorder: An Experience Sampling Study

by

Yunjing Liu

Doctor of Philosophy in Psychological & Brain Sciences

Washington University in St. Louis, 2022

Professor Renee J. Thompson, Chair

Individuals with major depressive disorder (MDD) have difficulties regulating emotion on their own. As people also turn to others for help with emotion regulation (i.e., interpersonal emotion regulation [IER]), we examined whether these difficulties extend to IER in current and remitted MDD. We generally expected individuals with current MDD (and remitted MDD to a lesser extent) to utilize IER in distinct ways compared to those with no history of psychiatric disorders (i.e., controls) due to differences in emotional, cognitive, and interpersonal functioning. Using experience sampling, adults with current MDD ($n$=48), remitted MDD ($n$=80), and controls ($n$=87) reported on how frequently (i.e., IER frequency), from whom (i.e., sharing partners), and why (i.e., IER goals) they sought IER, how the sharing partners responded (i.e., IER strategies, warmth), and how their feelings about the problem and the sharing partner changed following IER (i.e., IER outcomes). Using multilevel modeling, we found that the current-MDD group did not differ from controls in IER frequency and sharing partners, but they demonstrated a more mixed (albeit generally supportive) profile of received IER strategies and benefited similarly or more from supportive IER compared to the other two groups. These findings provided preliminary evidence that IER can serve as a promising avenue for effective emotion regulation in current MDD. The remitted-MDD group sought IER most frequently and demonstrated the most adaptive profile of received IER strategies among the three groups, and they, along with the

current-MDD group, reported seeking more types of IER goals than controls. These findings suggested that those with remitted MDD are highly motivated to pursue IER support and their pursuit often takes place in particularly supportive social contexts. As the first efforts to elucidate everyday IER in MDD, the present investigation shed light on the need for IER support as well as the distinct motivating factors and social contexts that may influence IER processes. Future research is needed to examine mechanisms driving these group differences and how IER processes predict the course of MDD.

# Chapter 1: Introduction

Major depressive disorder (MDD) is one of the most prevalent, debilitating, and costly mental disorders (Eaton et al., 2012; Kessler & Bromet, 2013). In 2017, over 17 million adults in the United States experienced one or more major depressive episodes (MDE; National Institute of Mental Health, 2017). MDD is also highly recurrent; most people who have recovered from an MDE will go on and experience another one (Burcusa & Iacono, 2007; Monroe & Harkness, 2011; Solomon et al., 2000). Thus, it is paramount to understand what characterizes MDD—not only during its active episode (i.e., current MDD) but also when MDD goes into full remission[1] (i.e., remitted MDD). Such understanding helps identify the risk and maintaining factors of MDD and informs targets for its treatment.

A hallmark feature of MDD is emotion dysregulation (Joormann & Stanton, 2016; D. Y. Liu & Thompson, 2017; Rottenberg, 2017; Visted et al., 2018). Although extensive evidence suggests that individuals with MDD have difficulty with regulating emotion on their own (i.e., intrapersonal emotion regulation), little research has examined how much and how well these individuals utilize others to regulate their emotions, a phenomenon known as *interpersonal emotion regulation* (IER; Zaki & Williams, 2013). Understanding IER in MDD helps to paint a fuller picture of how emotion regulation (ER) may go awry in MDD. Moreover, robust evidence has linked MDD with difficulties with interpersonal functioning (for reviews, see Hames et al., 2013; Kupferberg et al., 2016), an area of functioning on which IER heavily relies. As such, IER in MDD represents a critical research direction as it pertains to at least two areas of difficulties in MDD—ER and interpersonal functioning—and could inform intervention techniques that target both aspects. Therefore, in the current study, we aimed to understand everyday IER processes

[1] An MDE is in full remission if there are no significant symptoms of an MDE for two months or longer (APA, 2013).

among individuals with current MDD and those with remitted MDD. We examined both the basic elements (e.g., how often, with whom, and why one seeks IER and how they are responded to) and outcomes (e.g., how one feels about the problem following IER) of IER in current and remitted MDD relative to controls (i.e., individuals without current or past psychiatric disorders).

## 1.1 Extant Literature on IER

In the ER literature, there is a growing interest in IER. Various research groups have proposed their theoretical conceptualizations of IER (Dixon-Gordon et al., 2018; Niven, 2017; Nozaki & Mikolajczak, 2019; Reeck et al., 2016; Zaki & Williams, 2013). These theories all posit that IER involves social interactions and, like other ER processes, is motivated by the immediate goal of changing one's emotion, which is sometimes pursued to achieve broader, longer-term goals (e.g., enhance performance and strengthen relationships; English et al., 2017; Niven, 2016; Tamir, 2016). However, some define IER as the process of regulating someone else's emotion, meaning that the "regulator" is someone other than the person whose emotion is regulated, or the "target" (Niven, 2017; Nozaki & Mikolajczak, 2019; Reeck et al., 2016). In contrast, others offer a broader definition such that IER encompasses regulating one's own or someone else's emotions, which implies that the regulator may or may not be the target in IER (Dixon-Gordon et al., 2015; Zaki & Williams, 2013).

Our conceptualization of IER aligns with the broader definition—IER is a goal-directed process of regulating one's own or someone else's emotions through social interactions. Extending existing definitions, we highlight that IER is a highly dynamic process in which each person plays an active role in shaping the trajectory of IER and thus how the target feels as a result; in this sense, each person could serve as a regulator. In IER involving two people (i.e., dyadic IER), for example, the target has the agency to decide whether and from whom to seek

IER, what to disclose, and how to use the information obtained from others. These decisions, conscious or nonconscious, are all basic elements of the IER process and could impact how the target feels afterward. Responses from the other person, which also constitute basic elements of IER, play a critical role in shaping how the target feels as well, both through direct verbal communication and through nonverbal cues. Therefore, it is important to understand the behaviors enacted by both persons involved in IER.

In the present research, we focus on dyadic IER in the form of sharing negative emotional experiences, as people regulate emotions more frequently and effortfully in negative than in positive situations (English et al., 2017). More specifically, the target (i.e., *sharer*) seeks IER through sharing their negative emotions (e.g., "I am so upset right now!"), the emotion-triggering situation (e.g., "She bailed on our plans at the last minute!"), or both (e.g., "I am so upset that she bailed on our plans at the last minute!") with another person (i.e., *sharing partner*). We think that sharing emotional experiences represents one of the most common forms of IER. Consistent with this, after experiencing an emotional episode, people share it with others the majority of the time (Rimé, 2009), creating ample opportunities for IER. Additionally, in studies that examined everyday use of common ER strategies, socially sharing was frequently reported by adults (Bellingtier et al., 2022; Heiy & Cheavens, 2014).

### 1.1.1 Sharer's IER Seeking Behaviors

To understand the basic elements of the sharer's IER seeking behaviors, we focus on how much (i.e., IER frequency), with whom (i.e., sharing partner type: diversity of sharing partner network and tendency to share with close versus non-close others), and why (i.e., IER goal) people seek IER. These elements represent integral parts of IER and may have implications for well-being. For example, seeking IER frequently with a diverse network of sharing partners may

help build one's ER repertoire and thus has adaptive functions. Seeking IER too little or too much or excessively relying on a single source as the sharing partner could have maladaptive repercussions. For example, excessively relying on one's spouse to regulate negative emotions could bring undue burden to the spouse, possibly straining the relationship.

Because IER is a goal-directed process, it is critical to examine the sharer's IER goals. In line with theories on consequences of negative events (Nils & Rimé, 2012; Rimé, 2009), one way in which IER goals can be grouped is into two broad categories: problem-oriented goals and emotion-oriented goals. *Problem-oriented goals* involve obtaining information and advice that is likely to change the sharer's perceptions about the original problem or the situation. When people face negative events, their pre-existing beliefs, schemas, and expectations about the world are challenged (Duprez et al., 2015; Janoff-Bulman, 1992). They may be in great need to make sense of and come to terms with their negative experience, resulting in problem-oriented goals. On the other hand, individuals are also prone to feel vulnerable, insecure, and alone during times of distress. They may desire comfort, reassurance, and validation from other social beings (Bowlby, 1969), resulting in *emotion-oriented goals*. The sharer may be primarily seeking problem-oriented or emotion-oriented goals in some cases, but they may also be seeking both types of goals at other times. The sharer's IER goal is a critical part of IER as it could influence how the sharer discloses the emotional experience, how the sharing partner responds, and how the sharer evaluates whether IER is successful.

### 1.1.2 Sharing Partner's Response

Besides the sharer's IER seeking behaviors, we examine the basic elements of the sharing partner's responses. The sharing partner can respond to sharer's disclosure in a variety of ways, which we refer to as *IER strategies*. First, in line with the two types of IER goals, we distinguish

IER strategies that are problem-oriented and emotion-oriented. *Problem-oriented strategies* target aspects of the situation or the problem concerning the sharer's disclosure, such as the sharer's perception of the situation and ability to solve the problem. *Emotion-oriented strategies* directly address the sharer's emotional response to the negative event, such as providing empathy and affection. Such categorization is consistent with multiple groups of researchers who have previously drawn similar distinctions of IER strategies (Niven et al., 2019), listener responses (Nils & Rimé, 2012), and support provision (Horowitz et al., 2001).

Within each category, some strategies may be more supportive than others. Thus, we also distinguish IER strategies as *putatively supportive* (hereafter supportive) and *putatively unsupportive* (hereafter unsupportive), which refer to strategies that are, at least at face value, likely to improve or worsen, respectively, how the target feels. This categorization dovetails the distinction between pro-hedonic and contra-hedonic ER (Gross, 2015) and between affect-improving and affect-worsening IER strategies made by Niven et al. (2019).

### 1.1.3 Sharer's IER Outcomes and the Influence of Context

It is important to understand not only the basic elements of IER but also how these elements are related to the success of IER, or IER outcome. Two particularly relevant outcomes are (1) how the sharer feels about the original problem (i.e., *problem outcome*) and (2) how close the sharer feels towards the sharing partner (i.e., *relationship outcome*) after the interaction, which assesses IER outcome at the individual and the relationship level, respectively. Separating problem and relationship outcomes also allows us to examine whether distinct IER strategies could be differentially related to these two outcomes. For example, problem-oriented (vs. emotion-oriented) supportive strategies may be more strongly predictive of better problem outcomes, whereas emotion-oriented (vs. problem-oriented) supportive strategies may be more

strongly predictive of better relationship outcomes. Such reasoning aligns with research on social sharing of emotion that involves experimentally instructed cognitive versus socio-affective supportive listener responses (Nils & Rimé, 2012), which is similar to problem-oriented versus emotion-oriented, respectively. Supportive cognitive (vs. socio-affective) responses led to greater emotional recovery (i.e., reduced negative emotions elicited by the recall of the original upsetting event), whereas supportive socio-affective (vs. cognitive) responses facilitated social relationships (i.e., greater liking and closeness between the sharer and the sharing partner; Nils & Rimé, 2012). It would be important to extend this research by examining it through the lens of IER. Further, research could take a naturalistic approach such that emotions are induced by the sharer's everyday life events (vs. experimental stimuli) and that responses are spontaneously generated (vs. experimentally instructed) by the sharing partner.

Although problem-oriented and emotion-oriented supportive strategies could be differentially linked to problem and relationship outcomes, problem-oriented and emotion-oriented unsupportive strategies may be equally linked to both IER outcomes. In other words, negativity embedded in the unsupportive strategies may be so pervasive that their deleterious impact on IER outcomes does not vary depending on whether the content of the unsupportive strategy is problem-oriented or emotion-oriented. In other words, unsupportive IER strategies likely exert an impact in a global, undifferentiated fashion.

The context in which IER strategies are delivered may also shape IER outcomes. One relevant contextual factor is how warm the sharing partner is perceived to be during the interaction. Along with competence, warmth is one of the two dimensions of interpersonal behaviors, representing affiliative, cooperative, and prosocial motivations (Fiske et al., 2007; Horowitz et al., 2006; Judd et al., 2005; Wiggins, 1979). It signals sympathy, friendliness, and

trustworthiness and predicts the trajectory of social interaction (Fiske et al., 2007; Stinson et al., 2009). When the sharing partner is perceived as warm (vs. cold) by the sharer during the interaction, they may be more likely to be viewed as having good intentions and caring about the sharer's well-being (Cuddy et al., 2011; Horowitz et al., 2006). The positive emotional atmosphere created by a warm sharing partner allows the sharer to interpret the IER strategies more positively and less negatively compared to when the sharing partner is less warm. Thus, the sharing partner's warmth may moderate the impact of IER strategies on the sharer's IER outcomes. More specifically, the benefits of supportive strategies may be magnified when the sharing partner is warm (vs. cold; i.e., *the boosting effect of warmth*). Conversely, high (vs. low) levels of warmth may buffer against the potentially damaging impact of unsupportive strategies (i.e., *the buffering effect of warmth*). That is, when unsupportive strategies are accompanied by great warmth, the sharer may be more willing to interpret them less negatively and give the sharer the benefit of the doubt.

In addition to the idea that warmth is a contextual factor that moderates the impact of IER strategies on IER outcomes, it is possible that the perceived warmth of the sharing partner is an inherent part of the IER strategies they deliver. For example, a strategy may be perceived by the sharer as affection partially because the sharing partner conveys high levels of warmth. It is therefore important to examine whether IER strategies uniquely predict IER outcomes after accounting for the sharing partner's warmth.

## 1.2 IER and Depression

IER is a complex, dynamic process composed of a mixture of distinct basic elements. IER is influenced by various processes spanning across multiple domains of functioning—interpersonal, cognitive, and emotional. Specifically, interpersonal functioning impacts how

likely one is to seek others to regulate emotions and how one communicates emotion-laden information in social settings. Cognitive processes influence what information one attends to and how one interprets social information during IER. Emotional processes shape one's emotional reactivity to aspects of the IER process, such as the sharing partner's response. Notably, many processes tap more than one domain of functioning. For example, cognitive biases regarding social information fall within both cognitive and interpersonal domains. These processes, together, shape the trajectory of IER, including IER outcomes.

Below we theorize how IER may manifest differently depending on *the sharer's* MDD status by drawing upon a broad range of theory and research on interpersonal, cognitive, and emotional functioning in MDD. We describe relevant theoretical and empirical work that has informed our hypotheses for understanding IER in both current and remitted MDD. We organize this theorizing into three sections: (1) how individuals with MDD seek IER (i.e., IER seeking frequency, diversity of sharing partner network, and tendency to share with close versus non-close others), (2) responses they receive from sharing partners (i.e., sharing partner's IER strategies and warmth), and (3) how they are affected by IER (i.e., IER outcomes). Within each section, we address how the focal topic is related to current MDD first and then remitted MDD. In the current study, we did not directly measure the interpersonal, cognitive, and emotional processes that we hypothesize influence IER in MDD; instead, this theorizing serves to provide theoretical rationales for our proposed hypotheses. We also acknowledge that aspects of IER discussed in each section could be influenced, directly or indirectly, by interpersonal, cognitive, and emotional domains of functioning, but we choose to draw upon the most relevant work in each section.

### 1.2.1 Sharer's MDD and Sharer's IER Seeking Behaviors

Several interpersonal and emotional processes associated with MDD could impact IER seeking behaviors, including the frequency of seeking IER, diversity of sharing partner network, and the tendency to share with close (vs. non-close) others. Relative to controls, individuals with current MDD experience higher levels of social anhedonia (Blanchard et al., 2001; Stuhrmann et al., 2013), which is reflected in their reduced need for and enjoyment from social contact. Moreover, individuals with higher depressive symptomatology are less likely to disclose personal emotional experiences (i.e., emotional self-disclosure; Garrison et al., 2012; Kahn & Garrison, 2009), possibly due to concerns of being an unfair burden on others and not deserving others' attention (Coyne & Calarco, 1995). Although no studies have examined emotional self-disclosure in MDD, in light of the above findings, individuals with current MDD may show a reduced tendency of emotional self-disclosure relative to controls. Consistent with this line of reasoning, individuals with current MDD are more likely to avoid or fear expressing emotions (i.e., emotional suppression) than controls (Goldman & Haaga, David, 1995; Visted et al., 2018). As IER often entails the initiation of social contact and emotional self-disclosure, elevated social anhedonia and emotional suppression could reduce one's tendency to seek IER (W. C. Williams et al., 2018). Thus, those with current MDD may have a reduced tendency of seeking IER compared to controls. Moreover, the diminished interest in social engagement among individuals with current MDD limits opportunities for maintaining existing relationships and creating new ones, resulting in further isolation. When those with current MDD seek IER, they may almost exclusively do so with close others (e.g., spouse, close friend) rather than with individuals outside their close relationship circles (e.g., acquaintance). Thus, individuals with current MDD may report a more restricted network of sharing partners—seeking IER with a less diverse

network of sharing partners and more exclusively with close versus non-close others—compared to controls.

Some evidence indicates that elevated social anhedonia during an MDE shows reductions when it is measured after MDD remits, suggesting that social anhedonia is a state-specific symptom, rather than trait-like vulnerability factor, of MDD (Blanchard et al., 2001). However, those with remitted MDD still experience a higher tendency of emotional suppression than controls, albeit to a lesser extent relative to those with current MDD (Brody et al., 1999; Visted et al., 2018). Additionally, individuals with remitted MDD perceive themselves to be a burden on others and feel the need to hide their negative feelings from others to a greater extent than do never-depressed controls (Coyne & Calarco, 1995). Thus, those with remitted MDD may show a reduced tendency of seeking IER and a more restricted sharing partner network relative to controls, but the differences are likely smaller in magnitude compared to those between individuals with current MDD and controls.

### 1.2.2 Sharer's MDD and Sharing Partner's Response

Besides how much and from whom the sharer seeks IER, the sharer's MDD status may also be associated with the sharing partner's response—particularly, the sharing partner's choice of IER strategy and degree of warmth. It has been long established that MDD is associated with impairments in interpersonal functioning, including social skills (for a review, see Kupferberg et al., 2016). Compared to controls, currently depressed individuals engage in important social skills, such as smiling and maintaining eye contact, to a lesser degree (Fiquer et al., 2018; Girard et al., 2013; Sobin & Sackeim, 1997). Further, depressed individuals exhibit more problematic interpersonal behaviors that appear to be heavily driven by emotion-oriented goals (Coyne, 1976b; Joiner & Timmons, 2009). For example, compared to controls, individuals with current

MDD exhibit a higher tendency to repeatedly seek assurances from others about one's worth (i.e., excessive reassurance seeking; Hudson et al., 2018; Kwon et al., 2017) and solicit negative feedback from others that aligns with their negative self-view (i.e., negative feedback seeking; Giesler et al., 1996; Rehman et al., 2008). These social skill deficits and problematic interpersonal behaviors could result in negative perception and social rejection by others (Coyne, 1976a; Evraire & Dozois, 2011; Starr & Davila, 2008). Therefore, individuals with current MDD may be more likely than controls to face negative responses from the sharing partner, which are reflected by fewer supportive and more unsupportive IER strategies as well as less warm responses.

Evidence suggests that poor social skills observed in individuals with current MDD may be specific to the depressed state, rather than trait-like vulnerability factors for MDD (Fiquer et al., 2013; Joiner & Timmons, 2009). However, although those with remitted MDD report lower levels of problematic interpersonal behaviors than those with current MDD (Kwon et al., 2017; Rehman et al., 2008), it is unclear whether they no longer differ from controls. Research has documented that, compared to controls, individuals with remitted MDD report higher levels of problematic interpersonal behaviors in some studies but similar levels in others (Bistricky et al., 2016; Kwon et al., 2017; Rehman et al., 2008). These mixed findings could suggest that people may no longer exhibit some problematic interpersonal behaviors after recovering from an MDE but continue to exhibit others, albeit at an improved level. Thus, individuals with remitted MDD may be at higher risk for social rejection relative to controls due to the problematic interpersonal behaviors that persist during remission, although they may experience so to a lesser degree relative to those with current MDD. Following this line of reasoning, individuals with remitted MDD may experience fewer supportive IER strategies, more unsupportive IER strategies, and

less warmth from the sharing partner relative to controls, albeit to a lesser extent compared to those with current MDD.

### 1.2.3 Sharer's MDD and Sharer's IER Outcomes

Not only could the sharer's depression shape the basic elements of IER, but it could also influence how the sharer interprets and is subsequently affected by the sharing partner's response. That is, the sharer may experience different IER outcomes in response to similar responses from the sharing partner depending on their MDD status. This may apply to both unsupportive and supportive strategies, although different mechanisms may be at play in each case.

Receiving unsupportive IER strategies from the sharing partner can be thought of as social rejection, a form of interpersonal stress. Heightened rejection sensitivity associated with MDD may result in a greater negative impact on IER outcomes among individuals with (vs. without) MDD in the face of unsupportive strategies. Rejection sensitivity refers to the tendency to anxiously expect, readily perceive, and overreact to social rejection (Downey & Feldman, 1996). Individuals with greater sensitivity to rejection tend to be more hypervigilant for signs of rejection and more likely to interpret ambiguous social cues as evidence of rejection, which could prompt overreactions such as anger and hostility (Downey & Feldman, 1996). Individuals with current MDD are more sensitive to social rejection (Jobst et al., 2015; Kumar et al., 2017; Silk et al., 2014) and reactive to interpersonal stress than controls (Sheets & Armey, 2020). As such, those with current MDD may pay greater attention to and react more negatively to unsupportive IER strategies, thereby experiencing worse IER outcomes as compared to controls.

Although individuals with current MDD may experience worse IER outcomes as a result of unsupportive strategies, they may benefit more from the sharing partner's warmth in the face

of unsupportive strategies (i.e., experience greater buffering effect of warmth) than controls. Because MDD individuals may be highly sensitive to signs of social rejection (Jobst et al., 2015; Kumar et al., 2017; Silk et al., 2014), greater warmth can play a particularly critical role in counterbalancing the rejecting elements in unsupportive strategies, thereby mitigating their negative impact on IER outcomes. This buffering effect of warmth likely exists among controls as well, but it may be less strong because they may be more likely to overlook rejection cues and interpret unsupportive strategies as well-intentioned and benevolent.

Although no study has directly examined rejection sensitivity in those with remitted MDD relative to controls, several lines of indirect evidence indicate that heightened rejection sensitivity may not be present during remission. Specifically, rejection sensitivity is positively associated with depressive symptoms (Davidson et al., 1989; Kudo et al., 2017; Posternak & Zimmerman, 2001), indicating that rejection sensitivity reflects symptom severity. Supporting this claim, individuals with remitted MDD and controls do not differ in their reactivity to negative interpersonal daily stressors, including social rejection (Sheets & Armey, 2020). Thus, among individuals with remitted MDD, the degree to which unsupportive IER strategies have a deleterious impact on IER outcomes and the degree to which this impact is mitigated by sharing partner's warmth (i.e., the buffering effect of warmth) may be less relative to those among individuals with current MDD but similar to those among controls.

Unlike unsupportive IER strategies, receiving supportive IER strategies can be thought of as a positive interpersonal event. Individuals with (vs. without) MDD may experience more positive IER outcomes in the face of supportive strategies because they tend to experience greater reactivity to positive life events, or the mood-brightening effect in MDD (Bylsma et al., 2011). Specifically, individuals with current MDD show greater increases of positive affect

and/or greater reductions of negative affect in response to positive life events, including interpersonal ones (Bylsma et al., 2011; Khazanov et al., 2019; Panaite et al., 2018; Peeters et al., 2003; Thompson et al., 2012). Interestingly, interpersonal (but not non-interpersonal) positive life events are found to drive the mood-brightening effect among dysphoric individuals, highlighting the particular importance of social connection in MDD (Starr & Hershenberg, 2017). Therefore, relative to controls, individuals with current MDD may benefit more from receiving supportive IER strategies in the form of improved IER outcomes.

By the same token, the mood-brightening effect may manifest in how those with current MDD respond to interpersonal warmth. Just like receiving supportive IER strategies, being responded with great warmth by the sharing partner can also be construed as an interpersonal positive event. Those with current MDD may be able to capitalize on the benefits of the sharing partner's warm response to a greater extent (i.e., experience a stronger boosting effect of warmth) compared to controls.

Although the mood-brightening effect has only been found among individuals with elevated depressive symptomatology or current MDD, it is possible that this effect exists, albeit at a lessened level, among those with remitted MDD. For example, the mood-brightening effect has been found to vary by the severity of current depressive symptoms (Nezlek & Gable, 2001; Starr & Hershenberg, 2017). Accordingly, individuals with remitted MDD should be less reactive to positive events than those with current MDD due to their improved depressive symptoms. On the other hand, the mood-brightening effect was not accounted for by individuals' baseline mood (Bylsma et al., 2011; Khazanov et al., 2019; Thompson et al., 2012), suggesting that perhaps this effect is, at least partially, explained by the individual characteristics of those prone to depression (e.g., unstable self-worth; Bylsma et al., 2011). Taken together, in the

context of supportive strategies, the degree to which individuals with remitted MDD experience better IER outcomes and to which they benefit from sharing partner's warmth (i.e., the boosting effect of warmth) may be diminished relative to individuals with current MDD but enhanced relative to controls.

## 1.3 The Current Study

The overarching goal of the current study was to better understand how IER manifests in current and remitted MDD. We examined IER among individuals in a current depressive episode (i.e., current-MDD group), those whose depressive episodes had fully remitted (i.e., remitted-MDD group), and those with no history of psychiatric disorders (i.e., control group). Contrasting these three groups would offer valuable insights into how IER may be related to vulnerability for and a current episode of MDD. More specifically, what characterizes individuals with current MDD, but not those with remitted MDD, may represent symptoms that are specific to the depressive episode state (i.e., concomitants of MDE). Identifying concomitants of MDE helps to provide insights into what may be maintaining factors for MDD. What distinguishes individuals with remitted MDD from controls would provide indirect evidence for what may be vulnerability factors for MDD or, alternatively, consequences of having experienced MDEs in the past (i.e., scar effect; Burcusa & Iacono, 2007). Moreover, we used the experience sampling method (ESM; Csikszentmihalyi & Larson, 1987) to examine everyday IER processes in these three groups, which has high ecological validity and minimizes recall bias. A naturalistic approach to IER is especially critical because our samples include individuals with MDD, who consistently show a negative recall bias (e.g., Gotlib & Joormann, 2010; Williams et al., 2007).

The current study had four aims. To summarize, we examined how *the sharer's* MDD status was associated with (1) the sharer's IER seeking behaviors (**Aim 1**); (2) the sharing

partner's response (**Aim 2**); (3) the associations between sharing partner's IER strategies and the sharer's IER outcomes (**Aim 3**); and (4) how a contextual feature of IER—sharing partner's warmth—would moderate the associations between IER strategies and IER outcomes (**Aim 4**). Based on the theorizing outlined above, we present our hypotheses next (also summarized in the first column of Table 1).

**Aim 1** was to examine how the sharer's MDD status was related to three basic elements of IER seeking behaviors—how much, with whom, and why people seek IER. We hypothesized that the current-MDD group would be less likely to seek IER (**Hypothesis 1a**), have a less diverse network of sharing partners (**Hypothesis 1b**), seek IER more exclusively from close (vs. non-close) others (**Hypothesis 1c)**, and be more likely to seek emotion-oriented (vs. problem-oriented) goals (**Hypothesis 1d**) than would the control group, with the remitted-MDD group falling in between the two groups. **Aim 2** was to examine how the sharer's MDD status was related to the sharing partner's response—IER strategies and warmth. We hypothesized that the current-MDD group would be less likely to receive supportive IER strategies (**Hypothesis 2a**), be more likely to receive unsupportive IER strategies (**Hypothesis 2b)**, and receive less warm responses from the sharing partner (**Hypothesis 2c**) than would the control group, with the remitted-MDD group falling in between the two groups.

**Aim 3** was to examine how various IER strategies were associated with the two IER outcomes—problem outcome and relationship outcome—and how these associations varied as a function of the sharer's MDD status. We hypothesized that supportive strategies would be more strongly associated with improved problem and relationship outcomes for the current-MDD group than for the control group, with the remitted-MDD group falling in between the two groups (**Hypothesis 3a**). We hypothesized that unsupportive strategies would be more strongly

associated with worsened problem and relationship outcomes for the current-MDD group than for the remitted-MDD and the control group, who were not expected to differ from each other (**Hypothesis 3b**). Moreover, we hypothesized that problem-oriented (vs. emotion-oriented) supportive strategies would be more strongly associated with improved problem outcome, whereas emotion-oriented (vs. problem-oriented) supportive strategies would be more strongly associated with improved relationship outcome (**Hypothesis 3c**). We did not expect problem-oriented versus emotion-oriented unsupportive strategies to be differentially associated with problem or relationship outcome. We also examined whether these associations would hold after controlling for warmth.

**Aim 4** was to examine how the associations between IER strategies and IER outcomes were moderated by the sharing partner's warmth, as well as how the moderating effects varied as a function of the sharer's MDD status. We hypothesized that supportive strategies would be more strongly associated with improved problem and relationship outcomes when the strategy is accompanied by greater warmth (i.e., the boosting effect of warmth; **Hypothesis 4a**). We expected the magnitude of the boosting effect of warmth to be the largest for the current-MDD group and smallest for the control group, with the remitted-MDD group falling in between the two groups (**Hypothesis 4b**). Conversely, we hypothesized that unsupportive strategies would be less strongly associated with worsened problem and relationship outcome when the strategy is accompanied by greater warmth (i.e., the buffering effect of warmth; **Hypothesis 4c**). We expected the magnitude of the buffering effect of warmth to be larger for the current-MDD group than for the remitted-MDD and the control group, who were not expected to differ from each other (**Hypothesis 4d**).

# Chapter 2: Methods

## 2.1 Participants

A total of 215 participants between 18 and 77 years of age ($M$ = 44.3, $SD$ = 16.1) were recruited from the greater St. Louis community to participate in a large project on everyday emotion and depression. Participants were recruited through participant registries, advertisements posted online (e.g., Craigslist), and local clinics and businesses. Women composed 66.0% of the sample, with men composing the remaining 34.0%. The sample had a racial/ethnic distribution as follows: 69.8% White, 19.5% Black, 7.0% multi-racial, 2.8% Asian, 0.5% Native American or Alaskan Native, and 0.5% did not report. In addition, 1.4% of the sample identified as Latinx/a/o. Most participants had earned a bachelor's degree or higher (65.3%). We collected relationship status data on 203 of the 215 (94.4%) participants. Of these 203 participants, 69.0% indicated being in a romantic relationship: 91.4% had an opposite-gender partner, 5.5% had a same-gender partner, 1.4% had a partner whose gender was identified as "other" (e.g., non-binary), and 2.1% had a romantic partner whose gender was not reported. Among those in a romantic relationship, 44.3% were married or cohabiting with their romantic partner. Among the 31% who were not in a romantic relationship, 52.4% were never married, 46.0% were previously married (i.e., separated, divorced, or widowed), and 1.6% did not report.

For all participants, eligibility criteria included speaking English as a primary language and having no severe visual or hearing impairments. In addition, individuals needed to meet criteria for one of three groups as defined by the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM-5; American Psychiatric Association [APA], 2013). For the *current-MDD group* ($n$ = 48), participants needed to be in a current MDE as part of an MDD or persistent depressive disorder (PDD) diagnosis. For the *remitted-MDD group* ($n$ = 80),

participants needed to have met criteria for at least two depressive episodes—the most recent of which was in full remission. The depressive episodes needed to be either MDEs or persistent depressive episodes. For the *control group* ($n = 87$), participants had never experienced any depressive disorders or anxiety disorders (i.e., generalized anxiety disorder, social anxiety disorder, panic disorder, or agoraphobia; specific phobias were not assessed). Individuals with current comorbid anxiety disorders were eligible for the two depressed groups because MDD has high rates of comorbidity with anxiety disorders (Kessler et al., 2003). Exclusion criteria for all groups included bipolar I diagnosis, and bipolar II diagnosis, and current or past psychotic symptoms as defined by the DSM-5 (APA, 2013). Participants' characteristics by group are summarized in Table 2.

We recruited adults between the ages of 18 and 77, carefully recruiting participants so that each 10-year age bin had a similar number of participants within each group. Within each group, we made efforts to recruit two thirds of women and one third of men for each 10-year age bin. Not included in the final sample of 215 participants were 20 participants who withdrew ($n = 7$), experienced technical problems ($n = 6$), or due to low compliance with ESM surveys (i.e., completed less than 20.0% of the surveys; $n = 7$).

An *a priori* power analysis was conducted as part of the larger project to determine the target sample sizes for all three groups. For the current study specifically, two major analyses were multilevel linear regression and multilevel logistic regression (see the Analytic Plan section for more details). Prior simulation studies involving two-level modeling suggest that a larger sample size at the higher level is more important than that at the lower level to obtain accurate estimates (for a review, Maas & Hox, 2005). For multilevel linear regression models with continuous dependent variables, a sample size of at least 100 produces unbiased regression

coefficients and the variance components, even if the sample size at the lower level is as low as five (Maas & Hox, 2005). For multilevel logistic regression models, a minimum sample size of 50 at both the higher and the lower level is recommended for producing valid estimates (Moineddin et al., 2007). The current sample sizes of 215 at Level 2 and 70 at Level 1 by design meet the criteria of recommended sample sizes for two-level modeling. However, for the majority of the analyses, the empirical Level 2 sample size is likely to be lower after eliminating participants who never report instances of IER during ESM. Similarly, the empirical Level 1 sample size could also be reduced due to missing data caused by low compliance and low frequency at which participants report on IER. Thus, we planned to re-evaluate power incorporating empirical sample sizes and parameter estimates obtained from the current study.

## 2.2 Procedures

Interested individuals completed an initial telephone screen conducted by a post-baccalaureate project manager or an undergraduate research assistant, who briefly assessed participants' experiences with the two cardinal symptoms of MDD (i.e., depressed mood and anhedonia, APA, 2013). Individuals who were deemed as likely to be eligible for the study were invited to complete an online survey (i.e., home survey) before attending a laboratory session, during which their eligibility would be more thoroughly assessed. In the laboratory session, participants completed informed consent, an online survey consisting of a series of self-report measures, and certain modules of the SCID-5 interview (mood, anxiety, and psychotic modules). Interviews were conducted by clinical psychology graduate students, who had completed a course in which they learned to administer the SCID-5. Diagnostic issues were routinely discussed via phone consultation and during weekly project meetings with the principal investigator, a licensed clinical psychologist. Diagnostic reliability of the SCID-5 interviews was

calculated based on the first 30 interviews we conducted (chosen for training purposes to help establish diagnostic reliability) and 18 additional randomly selected interviews. Interrater reliability for current or past MDD and PDD diagnoses were perfect ($\kappa = 1.0$). Discrepancies regarding symptom ratings were resolved by reaching a consensus through discussions between the interviewers.

After eligibility was determined, ineligible participants were financially compensated. Eligible participants were invited to complete the rest of the study, including another online survey and several cognitive tasks. Then participants received a 30-minute interactive ESM tutorial, which consisted of an undergraduate research assistant providing instructions on how to complete ESM surveys, presenting information via PowerPoint-like presentation. Throughout the tutorial, the research assistant checked the participant's comprehension of survey items (e.g., asking participants to generate examples for items and providing standardized answers when necessary). Participants also completed a practice survey during the tutorial and chose their preferred 15-hour period to receive surveys on their iPhone or an iPod Touch 4 (Apple, Seattle, WA) that was provided to them. The ESM protocol was delivered through an iOS mobile application named Status/Post designed by Christopher Metts, M.D. We provided iPod Touch devices and used a mobile application that collected data offline to recruit a more diverse sample, including those without access to Wi-Fi. At the end of the laboratory session, participants were financially compensated for the laboratory portion of the study.

The ESM surveys began the day following the laboratory session. Each day during their 15-hour surveying period, participants received prompts five times, one occurring randomly within each of the five three-hour time windows, for a total of 70 prompts. Participants had fifteen minutes to respond to each prompt, receiving two reminder tones. Surveys occurred at an

average of 180 minutes apart (*SD* = 62). A lab member contacted each participant four days in their ESM period to inquire about their experience with answering surveys. To encourage compliance, research assistants informed the participants of their completion rates halfway through the ESM period. We collected a total of 11,191 surveys from participants. Participants completed, on average, 74.8% of all surveys for the ESM portion (*SD* = 18.3%; range = 20.0%–98.6%). After the ESM period, participants were sent an email with a written debriefing and financially compensated for their time ($40) with a bonus of $10 for completing at least 80% of the surveys. The research protocol was approved by a university institutional review board.

## 2.3 ESM Measures

### 2.3.1 Negative Emotion Sharing

To assess the occurrence of sharing negative emotional experiences, participants responded ("yes" or "no") to the following question at each prompt: "Since the last beep, have you shared any negative experiences or feelings with anyone?". At the ESM tutorial, participants were instructed to report situations where they shared information in person or over the phone (e.g., call, text). They were instructed not to report situations where it was unclear whether the sharing partner received the message (e.g., shared via text but did not receive a response). They could only report interactions with a specific person; that is, they did not report situations where they shared information with a group of people (e.g., posting on social media). If there was more than one time of sharing since a previous survey, participants were instructed to report on the interaction that was the most important to them. If they answered "yes" to the negative emotion sharing item, they were asked a series of questions described below.

Of the full sample (*N* = 215), 198 participants (current-MDD group=47, remitted-MDD group=77, and control group=74) reported having shared negative emotions with someone at

least once over the ESM period (hereafter *sharers*). The other 17 participants (current-MDD group=1, remitted-MDD group=3, control group=13) did not report any negative emotion sharing (hereafter *non-sharers*). The number of sharers (vs. non-sharers) significantly differed across groups, $p = .01$, Fisher's exact test (FET)[2]. *Post hoc* pairwise comparisons with Bonferroni correction suggested that the control group had a significantly higher number of sharers than the remitted-MDD group, $p = .05$. Because we did not have data on any IER measures that were contingent upon endorsing negative emotion sharing for non-sharers, we conducted analyses on both the full sample and the sharers for the negative emotion sharing variable, and we analyzed data only from the sharers for all other IER variables.

### 2.3.2 Sharing Partner Type

Participants reported their relationship with the sharing partner by responding to the question, "Who was the person you shared them with?". They were provided with a checklist of the following options: romantic partner; family member; friend; someone at work; acquaintance; and stranger. They could choose only one option. Participants were instructed that, if they knew the sharing partner in more than one capacity (e.g., friend and colleague), they were to indicate the sharing partner's primary role in their life. Given the infrequent endorsement of sharing with acquaintances and strangers, which were on average endorsed 4.1% and 5.3% of the time, respectively, we combined these two types and labeled it as "acquaintance/stranger" for data analyses, resulting in five types of sharing partners. We also grouped these five types of sharing partners into *close others* (i.e., romantic partner, family member, and friend) and *non-close others* (i.e., someone at work and acquaintance/stranger) and created a Level 1 binary variable

[2] We used the Fisher's exact test instead of the chi-square test because the expected values were small for certain categories (e.g., number of non-sharers in the current depressed group).

(i.e., *close-versus-non-close sharing partner*) indicating whether the sharing partner is a close (1) or non-close (0) other.

To index the diversity of participants' sharing partner networks, we calculated a *sharing partner diversity* index for each participant by adopting the Shannon (1948) diversity index. Popularly used in the ecological literature, the Shannon diversity index characterizes species richness (i.e., the total number of different types of species) and evenness (i.e., the similarity in abundances of different species; Magurran, 2004). In the context of sharing partner diversity, the Shannon's diversity index characterizes sharing partner richness (i.e., the total number of different types of sharing partners from whom a participant seeks IER) and evenness (i.e., the similarity in frequencies of sharing with different types of sharing partners). We computed sharing partner diversity using the formula: $\text{Sharing partner diversity} = -\sum_{i=0}^{R}(p_i \times \ln p_i)$, where $R$ is the total number of different types of sharing partners from whom a participant sought IER over the ESM period (i.e., richness), and $p_i$ is the proportion of times when the participant sought IER from the *i*th type of sharing partner. The sum of the $(p_i \times \ln p_i)$ products was multiplied by -1, so that higher numbers indicate greater sharing partner diversity. Sharing partner diversity is the lowest when the participant seeks IER from only one type of sharing partner ($R = 1$, $p_i = 1$), in which case $ln\ p_i$ equals 0 and thus sharing partner diversity equals 0. Sharing partner diversity is the highest when the participant seeks IER from all five sharing partners ($R = 5$) with equal frequencies ($p_i = 0.2$ for each sharing partner type), in which case $ln\ p_i$ equals -1.61 for each type of sharing partner and thus sharing partner diversity equals 1.61. Thus, the possible range of sharing partner diversity is 0 to 1.61. Of note, the Shannon's diversity index has been adopted in similar ways for other constructs in affective sciences (e.g., emodiversity; Quoidbach et al., 2014).

### 2.3.3 Sharer's IER Goals

Next, participants' IER goals were assessed by the question, "Why did you share your experiences or feelings with this person? To obtain:". Participants were provided with a checklist of the following two options: "to obtain advice, help, or information" (problem-oriented goal) and "to obtain empathy, care, or understanding" (emotion-oriented goal). Participants could select one or both types of the goals. The wordings of these two goals were based on the above mentioned definitions of problem-oriented and emotion-oriented goals. The problem-oriented and emotion-oriented goals were originally independent variables with each dichotomously coded, with 1 representing the goal was endorsed and 0 not endorsed. We re-coded these two variables into one categorical variable with three levels: *problem-oriented goals only* (when the participant endorsed seeking problem-oriented but not emotion-oriented goals), *emotion-oriented goals only* (when the participant endorsed seeking emotion-oriented but not problem-oriented goal), and *both types of goals* (when the participant endorsed seeking both problem-oriented and emotion-oriented goal).

### 2.3.4 Sharing Partner's IER Strategies

We focused on six IER strategies that aligned with our theoretical classification of the IER strategies (see Table 3 for the strategies and their definitions). Cognitive reappraisal (hereafter reappraisal), problem solving, and problem blaming (hereafter blaming) are classified as problem-oriented strategies because they are directly related to the disclosed problem. These three problem-oriented strategies were adopted from intrapersonal ER literature and correspond to the positive refocusing, refocus on planning, and self-blame subscales of the Cognitive Emotion Regulation Questionnaire, respectively (Garnefski et al., 2001). The other three IER strategies—encouraging sharing, affection, and emotion invalidation (hereafter invalidation)—

are classified as emotion-oriented strategies because they concern the sharer's emotional reactions to the situation. They correspond to interest, affection, and invalidation behaviors, respectively, that are commonly studied in communication among romantic couples (Coan & Gottman, 2007).

To assess which IER strategies the sharing partner employed, participants were asked the question, "How did this person respond to you? He/she… (Check all that apply.)" Participants were presented with the following options in random order at each prompt: interpreted the situation in a positive light (reappraisal); suggested solutions to the problem (problem solving); suggested that I contributed to the problem (blaming); encouraged me to share my feelings (encouraging sharing); showed love or affection (affection); suggested that I was overreacting (invalidation); and none of these. Participants could select one or more options. We designed the wordings of these items while taking multiple factors into account: how similar concepts are defined in relevant literatures, how we conceptualize each strategy in the context of IER, and how we can convey the essence of each strategy with the most concise wording to minimize participant burden.

A small pilot study was conducted partially to inform us of which IER strategies are the most commonly used. More specifically, we recruited ten romantic couples and interviewed each member of the dyad about the frequency and helpfulness of thirteen IER strategies (i.e., reappraisal, distraction, expressive suppression, encouraging sharing, problem solving, blaming, acceptance, reassurance, reciprocal sharing, normalization, empathic paraphrasing, invalidation, and affection) their partner used when they shared negative emotional experiences with them. The six strategies examined in the current study were among the most endorsed strategies in the pilot study. Further, this particular set of strategies also allowed us to assess both supportive (i.e.,

reappraisal, problem-solving, encouraging sharing, and affection) and unsupportive strategies (i.e., blaming and invalidation).

### 2.3.5 Sharing Partner's Warmth

To assess the perceived warmth of the sharing partner's response, participants were presented with the prompt, "During the interaction, this person acted." They rated the extent to which they perceive the sharing partner's response as cold or warm using a visual analog scale, ranging from *cold* to *warm*. The anchor was located at the midpoint of the scale by default, which indicated neutral response. Participants indicated their response by moving the slider along the scale. Their responses were automatically quantified by the app from -5 to 5, respectively, with the midpoint representing 0. This item was added to assess the warmth/coldness dimension indicated by the interpersonal circumplex (Markey & Markey, 2009).

### 2.3.6 Sharer's IER Outcomes

We assessed two IER outcomes—problem outcome and relationship outcome. For *problem outcome*, participants were prompted with the question, "How did you feel about your original problem after the interaction?" Participants were presented with a visual analog scale, ranging from *much worse* to *much better*. The anchor was located at the midpoint (*same*) of the scale by default, which indicated no change to feelings about the original problem. Participants' responses were automatically quantified by the app from -5 to 5, respectively, with the midpoint representing 0. For *relationship outcome*, participants were prompted with the question, "How did your closeness to this person change after the interaction?" Participants were presented with a visual analog scale, ranging from *much worse* to *much better*. The anchor was also located at the midpoint (*same*) of the scale by default, which indicated no change to felt closeness to the

sharing partner. Participants' responses were automatically quantified by the app from -5 to 5, respectively, with the midpoint representing 0.

## 2.4 Self-Report Measures

### 2.4.1 Depressive Symptoms

During the laboratory session, participants reported their depressive symptoms over the preceding week by completing the 20-item Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). The CES-D covers a wide range of depressive symptoms, including depressed affect (e.g., "I feel depressed"), lack of positive affect (e.g., "I feel hopeful about the future;" reverse-coded), somatic complaints (e.g., "I did not feel like eating; my appetite was poor"), and interpersonal concerns (e.g., "I felt that people dislike me"). Participants rated the frequency at which they had experienced each symptom using a 4-point Likert scale ranging from 0 (*rarely or none of the time*) to 3 (*most or all of the time*). A composite CES-D score was computed by summing each participant's scores of the 20 individual items, four of which were reverse-coded. Higher CES-D scores indicate greater severity of depressive symptoms, with scores equal or greater than 16 suggesting symptom severity of clinical significance (Radloff, 1977). The CES-D was developed to assess depressive symptoms of community samples and has demonstrated adequate reliability and validity as a screening instrument (Eaton et al., 2004). It has also been validated for its screening properties in clinical samples (Morin et al., 2011; Weissman et al., 1977). Internal reliabilities (i.e., Cronbach's alpha) for the items were good for each group: 0.85, 0.89, and 0.84 for the current-MDD, the remitted-MDD, and the control group, respectively.

# Chapter 3: Analytic Plans and Results

In this section, we first present the analytic plan and results of the confirmatory factor analyses (CFAs), which were conducted to determine the grouping of the six IER strategies. Following CFA results, we present the analytic plan of hypothesis testing, findings of descriptive analyses, and findings of main analyses and related follow-up exploratory analyses.

## 3.1 Analytic Plan for Preliminary Analyses: Factor Structure of IER Strategies

Because our theorized classification of IER strategies has not been empirically validated, we first conducted CFAs to test the factor structure of the six IER strategies. Considering the multilevel nature of our data (momentary surveys [Level 1] nested within participants [Level 2]), we conducted multilevel CFAs using Mplus 8.4 (L. K. Muthén & Muthén, 2017). We examined three factor structures: (1) a two-factor model (supportive and unsupportive strategy; Figure 1a), (2) a three-factor model (problem-oriented supportive, emotion-oriented supportive, and unsupportive strategy; Figure 1b), and (3) a four-factor model (problem-oriented supportive, emotion-oriented supportive, problem-oriented unsupportive, and emotion-oriented unsupportive; Figure 1c). We hypothesized that the four-factor model would be the preferred model as it aligns with our theoretical conceptualization. However, because the four-factor model has single indicators for two of its factors, we were cautious that underidentification issues would likely arise (Brown, 2015). See Table 1 for details of how we would handle IER strategy variables if any or none of these three CFA models were supported. Because we did not expect the factor structure to vary across the groups, we planned to first conduct CFA on the entire sample, which would also allow for higher statistical power, and then to test measurement

invariance to examine whether the factor structure varies by group if we were to identify a satisfactory CFA model (Brown, 2015).

The six IER strategy variables (i.e., indicators) were binary, so we used the robust weighted least squares estimator (WLSMV; Muthén, 1993; Muthén et al., 1997) with tetrachoric correlations to evaluate CFA models (Flora & Curran, 2004). We adopted the partially saturated model method for multilevel CFA (Hox, 2013; Ryu & West, 2009), which evaluates model fit at each level separately and helps identify the level at which misfit occurs (Ryu & West, 2009). We followed steps suggested by Stapleton (2013) in conducting two-level CFA using Mplus. First, we evaluated descriptive information, such as calculating the intraclass correlation coefficients (ICC) of the six IER strategy variables to determine the necessity of using multilevel modeling. Second, we ran baseline models for the within- and between-person levels, which allow all variables to covary at one level but restrict all variances and covariances to zero at another level. Specifically, the baseline model at the within-person level restricts all variances and covariances at the within-person level to zero while allowing all variances and covariances at the between level to covary (i.e., saturated at the between-person level); the reverse is true for the baseline model at the between-person level. We used these two baseline models as benchmarks to evaluate theorized models. Third, we ran theoretical models at the within-person level, leaving the between-person level saturated. After establishing an acceptable model at the within-person level, we then ran theoretical models at the between-person level, leaving the within-person level saturated. After establishing an acceptable model at the between-person level, as a final step, we tested the model fit when the two accepted models were imposed simultaneously at their respective level. We used the chi-square difference test to compare nested models.

We evaluated model fit using the following three goodness-of-fit indices: the root mean square error of approximation (RMSEA), the Tucker-Lewis index (TLI), and the comparative fit index (CFI). Lower RMSEA and higher TLI and CFI values indicate better fit. CFI and TLI in the range of .90 and .95 indicate acceptable fit (Bentler, 1990), and TLI and CFI close to or greater than .95 suggest relatively good fit (Hu & Bentler, 1999). RMSEA close to .06 or below indicates relatively good fit (Hu & Bentler, 1999; but see also Browne & Cudeck, 1992 for other proposed cutoffs of RMSEA).

## 3.2 Results of Preliminary Analyses: Factor Structure of IER Strategies

### 3.2.1 Step 1: Evaluate Descriptive Information of Strategy Variables

ICCs of the six IER strategy variables ranged from .15 to .40 (Table 4), which means that 15% to 40% of the variance of IER strategy variables were attributed to variability between participants. The ICCs suggested that considerable levels of dependency existed in the data, warranting multilevel modeling. Tetrachoric correlations among the six strategies at the within- and between-person levels of the full sample are presented in Table 4. Most correlation coefficients were in the low to moderate range. However, blaming and invalidation were very highly correlated at the between-person level. The unusually high correlation was likely the result of these two strategies being infrequently endorsed and thus having marginal proportions approaching zero (Table 5). Additionally, the extreme marginal proportions indicated that these two variables had limited variability and would likely cause estimation problems. We kept this issue in mind in later steps of CFA.

### 3.2.2 Step 2: Run Baseline Models for the Within- and Between-Person Levels

Before fitting the theoretical models at either level, we ran a baseline model for each level. The baseline model we obtained at the within-person level, $\chi^2 = 167.044$, $df = 15$, $p < .001$, was to be used to evaluate the theorized models at the within-person level. The baseline model we obtained at the between-person level, $\chi^2 = 63.217$, $df = 15$, $p < .001$, was to be used to evaluate the theorized models at the between-person level.

### 3.2.3 Step 3: Run Theoretical Models at the Within Level, Saturated at the Between Level

Because more variability existed at the within-person level, we first specified the theorized CFA models at the within-person level, while keeping the between-person level saturated. We specified three *a priori* models and then tested one that was exploratory in nature at the within-person level. We first specified the **two-factor model**, which produced unusual estimations for one of the indicators of the unsupportive IER factor (i.e., invalidation), suggesting that this factor was not appropriate for the data.

We specified the **three-factor model**. However, the model was underidentified, so we subsequently fixed the residual variances of the six indicators to the values that were freely estimated in the baseline models. Although the model was no longer underidentified, the standardized values of five parameters at the within-person level were unable to be estimated (i.e., two factor loadings, two factor covariances, one factor variance), and the estimated correlation between invalidation and blaming exceeded one (i.e., $r = 1.77$). These findings suggested that the three-factor model was not appropriate for the data.

We then specified the **four-factor model**, which also resulted in model underidentification. Substituting the residual variances with freely estimated values allowed the

model to run. However, ten standardized parameters were unable to be estimated, and the variance of one factor was estimated to be negative, suggesting that the four-factor model was not appropriate for the data.

As exploratory efforts, we specified a **one-factor model** at the within-person level. The model ran and did not produce issues with parameter estimation, $\chi^2 = 23.401$, $df = 9$, $p = .005$, RMSEA = .031, CFI = .922, TLI = .741. The level-specific CFI was calculated to be .905, suggesting a good fit of the one-factor model at the within-person level. Therefore, we accepted the one-factor model at the most appropriate model at the within-person level.

### 3.2.4 Step 4: Run Theoretical Models at the Between Level, Saturated at the Within Level

We then examined CFA models at the between-person level. Similar to Step 3, we specified three *a priori* models and then tested one exploratory model. We first specified the **two-factor model**. However, the residual variance of one indicator (i.e., invalidation) was estimated to be negative (i.e., -0.840). Thus, we respecified the model constraining the residual variance of invalidation to be positive, resulting in the following fit indices: $\chi^2 = 19.666$, $df = 8$, $p = .012$, RMSEA = .030, CFI = .937, TLI = .764. The level-specific CFI was calculated to be .758, suggesting poor fit of the two-factor model at the between-person level.

We then specified the **three-factor model**. The residual variance of invalidation was again estimated to be negative (i.e., -0.720). When we constrained the residual variance of invalidation to be positive, the fit indices were as follows: $\chi^2 = 6.569$, $df = 6$, $p = .363$, RMSEA = .008, CFI = .997, TLI = .985. The level-specific CFI was .988, suggesting good model fit (Figure 2).

We also specified the **four-factor model**. However, the model was unidentified. Thus, we substituted the residual variance of blaming and invalidation with values estimated by the

baseline models, which solved the underidentification problem. However, five standardized parameters were unable to be estimated, and the magnitude of two factor correlations coefficients exceeded one (*r*s = 5.050 and -29.557), suggesting that the four-factor model was inappropriate for the data at the between-person level.

As exploratory efforts, we also examined the **one-factor model**, $\chi^2 = 31.658$, $df = 9$, $p < .001$, RMSEA = .039, CFI = .878, TLI = .593. The level-specific CFI was .530, suggesting poor model fit.

Taken together, out of the four models we tested at the between-person level, only the three-factor model fit the data well. Therefore, we accepted the three-factor model as the most appropriate model at the between-person level.

### 3.2.5 Step 5: Run Theoretical Models at Both Levels

After identifying the appropriate model at each level, we simultaneously specified the accepted models at their respective level (i.e., one-factor within/three-factor between model; Figure 2), $\chi^2 = 31.879$, $df = 15$, $p = .007$, RMSEA = .026, CFI = .909, TLI = .818. The model appeared to be a good fit based on values of RMSEA and CFI, although the fit was suboptimal for TLI. See Table 6 for variance explained at the between- and within-person level of this model. To examine whether the high correlation between blaming and invalidation caused problems for this model, we ran a two-level CFA excluding these two strategies, while keeping the factor structure of the remaining four indicators the same; this resulted in only two factors at the between-person level: problem-oriented supportive IER and emotion-oriented supportive IER. The model fit decreased as a result, particularly the TLI, $\chi 2 = 12.469$, $df = 3$, $p = .006$, RMSEA = .044, CFI = .888, TLI = .552. This suggested that the high correlation between

blaming and invalidation may have artificially increased the model fit and that the model did not fit the remaining data well.

Another concern regarding the one-factor within/three-factor between model was that the factor loading of problem solving at the within-person level was non-significant, though the other five indicators all had significant factor loadings. Considering these concerns, we concluded that one-factor within/three-factor between model could not be accepted as the final model. Therefore, we examined the six IER strategies individually in testing our hypotheses. Even if the one-factor within/three-factor between model was argued to have the best fit out of all the models, we would still examine the six strategies individually because only the one-factor model was supported at the within-person level and grouping all six strategies into one variable would preclude us from examining how various IER strategies are differentially linked to other IER variables, which was of key interest to the current research.

## 3.3 Analytic Plan for Main Analyses: Hypothesis Testing

We conducted MLM for analyses related to our hypotheses via R statistical software (R Core Team, 2017), using R package lme4 (Bates et al., 2015) for MLM. We used multilevel linear regression and multilevel logistic regression analyses for models with Level 1 continuous and binary outcomes, respectively. Below we present Level 1 and Level 2 model equations corresponding to each hypothesis, organizing them by study aim. Subscripts *i* and *j* represent surveys and participants, respectively. The letters *e* and *u* represent Level 1 and Level 2 error terms, respectively. To examine group differences, we created three Level 2 dummy-coded binary group variables. Then for each analysis involving group comparisons, we ran models including two combinations of these group variables to ensure all three possible pairwise group

comparisons are examined. To preserve space, we only present model equations with the control group as the reference group.

The model equations presented below reflect our decision to examine IER strategies separately, which were represented by six Level 1 dummy-coded binary variables: *Rea* (reappraisal), *PS* (problem solving), *ES* (encouraging sharing), *Aff* (affection), *Bla* (blaming), and *Inv* (invalidation). In models involving IER strategies as predictors (i.e., Aims 3 and 4), we entered all strategy variables simultaneously in the model, which reduced the number of statistical models and thus reduced Type I error rates. This also allowed us to interpret the effect of each strategy while controlling for the presence of other strategies. Because we hoped to interpret the effect of each strategy in the context of other strategies not endorsed (i.e., coded as 0), we did not center the binary strategy variables. As uncentered Level 1 variables in MLM produce coefficients that represent a blend of coefficients of both levels (Raudenbush & Bryk, 2002), we partialled out the influence of Level 2 by including person means (or associated higher level interaction terms) in the model (Enders & Tofighi, 2007). However, when doing so led to an unnecessarily complex model, we simplified the model by removing sets of higher-order interaction terms, while using the anova() function to compare nested models to ensure that this would not significantly reduce the model fit. We do not present these higher-order terms in models below for simplicity, though we report which higher-term terms were included when presenting relevant results.

### 3.3.1 Statistical Models for Aims 1 and 2

The seven hypotheses in Aims 1 and 2 were related to group differences in single IER variables concerning the sharer's or the sharing partner's IER behaviors. For four of these hypotheses, the outcome was a Level 1 binary variable: negative emotion sharing (Hypotheses

1a), close-versus-non-close sharing partner (Hypothesis 1c), supportive IER strategies (Hypothesis 2a), and unsupportive IER strategies (Hypothesis 2b). Thus, we conducted multilevel binomial analyses using the following model:

Model 1

Level 1 Model:

$$\text{IER behavior}_{ij} = \beta_{0j} + e_{ij} \quad (1a)$$

Level 2 Model:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}\,\text{Current} + \gamma_{02}\,\text{Remitted} + u_{0j} \quad (1b)$$

At Level 1, $\beta_{0j}$ represents participant *j*'s mean probability (in logits) of endorsing the non-reference level of the outcome variable—sharing negative emotional experiences (**Hypothesis 1a**), sharing with a close (vs. non-close) sharing partner (**Hypothesis 1c**), receiving supportive IER strategy (i.e., reappraisal, problem solving, encouraging sharing, or affection; **Hypothesis 2a**), and receiving unsupportive IER strategy (i.e., blaming or invalidation; **Hypothesis 2b**)—across all surveys; $e_{ij}$ represents Level 1 (within persons) random effect. At Level 2, $\gamma_{00}$ represents the average probabilities (in logits) of endorsing the non-reference level for the control group; $\gamma_{01}$ represents the difference in probabilities (in logits) of endorsing the non-reference level between the control and the current-MDD group; $\gamma_{02}$ represents the difference in probabilities (in logits) of endorsing the non-reference outcome level between the control and remitted-MDD group; $u_{0j}$ represents Level 2 (between persons) random effect.

For **Hypothesis 2c**, the outcome variable was a Level 1 continuous variable (i.e., sharing partner's warmth). We tested Hypothesis 2c using the same model equations outlined above; however, the coefficients took on the original metric of the outcome variable rather than probability (in logits). Specifically, $\beta_{0j}$ represents participant *j*'s mean rating of sharing partner's

warmth; $\gamma_{00}$ represents the mean rating of warmth for the control group; $\gamma_{10}$ and $\gamma_{20}$ represent the differences in mean ratings of warmth between the control and the current-MDD or remitted-MDD group, respectively. We performed single-level linear regression analyses to test **Hypothesis 1b** since the outcome variable (i.e., diversity of sharing partner network) was a Level 2 variable and MLM was not necessary.

For **Hypothesis 1d**, the outcome variable was a Level 1 categorical variable with three levels (i.e., problem-oriented goal only, emotion-oriented goal only, and both types of goals). Thus, we conducted multilevel multinomial logistic regression analyses by taking a Bayesian approach. We used the brms package (Bürkner, 2017, 2018) and the brm() function, which derives samples using a Markov Chain Monte Carlo (MCMC) algorithm (Zhao et al., 2006). We used the brms (Bayesian) package because it is the most comprehensive R solution for the multilevel multinomial logistic regression model and its use mimics the glmer() function from the lme4 package, which we used for the binomial logistic regression models. Four chains were used, with each chain containing 20,000 iterations, 2,000 of which are warm-up runs, and a thinning interval of 10, resulting in a total of 7,200 samples for IER goals to generate posterior distributions of the model parameters. The modes of these distributions are the model fixed effects and the dispersion in the distributions is used to estimate 95% credible intervals. Model building in this framework used the same strategy as outlined for standard mixed models of other outcomes. An unconditional model was estimated first to examine the relative probabilities of different levels of the categorical outcome variable. The interpretations of the coefficients are similar to those of the multilevel binomial except that each dummy-coded group predictor is associated with two coefficients that represent group differences of the two non-reference levels of the categorical outcome variable *relative to the reference level*.

### 3.3.2 Statistical models for Aim 3

Part of Aim 3 was to examine how different IER strategies would be associated with IER outcomes and how these associations would vary across groups (**Hypotheses 3a and 3b**). To test these two hypotheses, we entered the six IER strategy variables to predict each of the two IER outcome variables, problem outcome and relationship outcome. Thus, we ran two models using the control group as the reference group, one for each IER outcome. The model equations are as follows:

Model 2

Level 1 Model:

$$\text{Problem (or relationship) outcome}_{ij} = \beta_{0j} + \beta_{1j}\,\text{Rea} + \beta_{2j}\,\text{PS} + \beta_{3j}\,\text{ES} + \beta_{4j}\,\text{Aff} + \beta_{5j}\,\text{Bla} + \beta_{6j}\,\text{Inv} + e_{ij} \quad (2a)$$

Level 2 Model:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}\,\text{Current} + \gamma_{02}\,\text{Remitted} + u_{0j} \quad (2b)$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}\,\text{Current} + \gamma_{12}\,\text{Remitted} + u_{1j} \quad (2c)$$

…

$$\beta_{6j} = \gamma_{60} + \gamma_{61}\,\text{Current} + \gamma_{62}\,\text{Remitted} + u_{6j} \quad (2d)$$

where $\beta_{0j}$ represents participant *j*'s mean rating of IER outcome; $\beta_{1j}$ represents the main effect of IER strategy on IER outcome for participant *j*. $\gamma_{10}$ through $\gamma_{60}$ represent the slope relating the six IER strategy variables to IER outcome for the control group; $\gamma_{11}$ through $\gamma_{61}$ and $\gamma_{12}$ through $\gamma_{62}$ represent the differences in slopes relating the six IER strategy variables to IER outcome between the control group and current-MDD or remitted-MDD group, respectively. This model was run in two steps: We first entered the six Level 1 strategy variables to obtain the associations between each strategy and IER outcome. We then added the Level 2 group variables to examine whether the associations would vary by group. For IER strategies that were significantly

associated with IER outcome, we examined whether the significant effects would hold after accounting for sharing partner's warmth by adding person-mean centered warmth as a Level 1 predictor.

### 3.3.3 Statistical models for Aim 4

Hypotheses 4a through 4d involved examining the boosting and buffering effects of warmth (Hypotheses 4a and 4c), and how these effects would vary across groups (Hypotheses 4b and 4d). We used the six IER strategy variables, person-mean centered warmth (i.e., $\text{warmth}_{ij} - \text{warmth}_{\cdot j}$; noted as *warmth_pc* below), and their interactions to predict IER outcomes. Separately models were run for problem and relationship outcome, using the following model equations:

Model 3

Level 1 Model:

$$\begin{aligned}\text{Problem (or relationship) outcome}_{ij} = {} & \beta_{0j} + \beta_{1j}\,\text{Rea} + \beta_{2j}\,\text{PS} + \beta_{3j}\,\text{ES} + \beta_{4j}\,\text{Aff} \\ & + \beta_{5j}\,\text{Inv} + \beta_{6j}\,\text{Bla} + \beta_{7j}\,\text{warmth\_pc} \\ & + \beta_{8j}\,\text{Rea} \times \text{warmth\_pc} + \beta_{9j}\,\text{PS} \times \text{warmth\_pc} \\ & + \beta_{10j}\,\text{ES} \times \text{warmth\_pc} + \beta_{11j}\,\text{Aff} \times \text{warmth\_pc} \\ & + \beta_{12j}\,\text{Inv} \times \text{warmth\_pc} + \beta_{13j}\,\text{Bla} \times \text{warmth\_pc} \\ & + e_{ij} \qquad (3a)\end{aligned}$$

Level 2 Model:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}\,\text{Current} + \gamma_{02}\,\text{Remitted} + u_{0j} \qquad (3b)$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}\,\text{Current} + \gamma_{12}\,\text{Remitted} + u_{1j} \qquad (3c)$$

…

$$\beta_{13j} = \gamma_{130} + \gamma_{131}\,\text{Current} + \gamma_{132}\,\text{Remitted} + u_{13j} \qquad (3d)$$

Of interest to **Hypotheses 4a and 4c** were the coefficients $\beta_{8j}$ through $\beta_{13j}$, which represent the changes in the slopes relating IER strategy variables to IER outcome per unit change in sharing partner warmth. Of interest to **Hypotheses 4b and 4d** were coefficients $\gamma_{81}$ through $\gamma_{131}$ and $\gamma_{82}$ through $\gamma_{132}$, which represent the differences in slopes for the strategy-warmth interaction terms

between the control group and current-MDD group or remitted-MDD group, respectively. Similar to Model 2, we first entered the six Level 1 IER strategy variables, person-mean centered warmth, and their interactions to obtain the moderating effects of warmth across groups (Hypotheses 4a and 4c). Then we added the group variables to the Level 2 Model to examine whether these moderating effects would vary by group (Hypotheses 4b and 4d).

## 3.4 Results for Descriptive and Main Analyses

### 3.4.1 Descriptive Analyses across the Full Sample

Means and standard deviations of key IER variables across groups are summarized in Table 7. Across the full sample, participants reported sharing negative emotional experiences 14.9% (*SD* = 12.1%, range = 0-56.0%) of the time, meaning that, on average, they reported sharing 7.78 times over two weeks (i.e., roughly once every two days). Almost all participants (*n* = 198; 92.1%) reported sharing negative emotional experiences at least once over the two weeks.[3] On average, participants reported sharing most frequently with close others and less frequently with non-close others. When sharing negative emotional experiences, participants most frequently reported seeking emotion-oriented goals only, followed by seeking problem-oriented goals only and seeking both types of goals. Regarding sharing partner's IER strategies, participants most frequently reported receiving supportive IER strategies and reported receiving unsupportive strategies relatively infrequently. Participants also frequently endorsed the "none of

[3] We re-evaluated our statistical power based on empirical sample sizes at Level 2 (i.e., number of participants who shared at least once = 198) and Level 1 (i.e., average number of IER interactions reported = 7.78). Prior simulation studies suggested that, for two-level regression analyses with continuous (Maas & Hox, 2005) and binary outcomes (Moineddin et al., 2007), a large Level 2 sample size is more important than large Level 1 sample size. Specifically, when Level 2 sample size reaches 100, the biases of estimating the parameters and SEs of fixed effects were very low even with a Level 1 sample size of 5. Our empirical sample sizes at Level 2 and Level 1 exceeded 100 and 5, respectively. Therefore, we conclude that we have sufficient power to produce fairly accurate estimates of the fixed effects of interest.

these" strategy category. On average, participants reported the sharing partner was moderately warm and reported somewhat improved problem and relationship outcome following IER.

Intercorrelations among IER variables at the within- and between-person levels are summarized in Table 4. Within-person level correlations were of most interest to the current research and are highlighted here. Problem-oriented goals and emotion-oriented goals showed differential result patterns in their associations with IER strategies, warmth, and IER outcomes. Namely, problem-oriented goals were positively associated with reappraisal, problem solving, blaming, and invalidation and negatively associated with affection; on the other hand, emotion-oriented goals were positively associated with reappraisal, encouraging sharing, and affection, and negatively associated with problem solving. Additionally, emotion-oriented (but not problem-oriented) goals were associated with higher sharing partner warmth and better relationship outcome. Moreover, supportive strategies were generally associated with higher sharing partner warmth and better problem and relationship outcomes, and unsupportive strategies were associated with lower warmth and worse outcomes. Problem and relationship outcomes were highly correlated with each other.

### 3.4.2 Group Differences in Sharer's IER Seeking Behaviors (Aim 1)

Regarding sharer's IER seeking behaviors, we hypothesized that the current-MDD group would be less likely to seek IER (**Hypothesis 1a)**, have a less diverse sharing partner network (**Hypothesis 1b**), seek IER more exclusively from close (vs. non-close) others (**Hypothesis 1c)**, and be more likely to seek emotion-oriented (vs. problem-oriented) goals (**Hypothesis 1d**) compared to controls, with the remitted-MDD group falling in between the two groups. Inconsistent with **Hypothesis 1a**, remitted-MDD participants were more likely to share negative emotional experiences than controls, $b = 0.40$, $SE = 0.16$, $p = .01$, with current-MDD participants

falling non-significantly in between these two groups, *p*s > .15 (Table 8). Unexpectedly, no group differences emerged for diversity of sharing partner network (**Hypothesis 1b**) or tendency to share with close versus non-close others (**Hypothesis 1c**) (Table 8).

Similarly, no group difference was found for the tendency to seek emotion-oriented goals only relative to seeking problem-oriented goals only (**Hypothesis 1d**; see rows starting with "CD [or RD or CTL]: emotion-oriented only" in Table 9, Panels 2a and 2b). Interestingly, compared to controls, the current-MDD and remitted-MDD groups were significantly more likely to seek both types of goals relative to seeking problem-oriented goals only (see rows starting with "CD [or RD]: both" in Table 9, Panel 2a) or seeking emotion-oriented goals only (see rows starting with "CD [or RD]: emotion-oriented only" in Table 10, Panel 2a). The two MDD groups did not differ from each other in their frequencies of seeking both types of goals relative to seeking either type of goal alone (see rows starting with "CD: emotion-oriented [or problem-oriented] only" in Table 10, Panel 2b; Figure 3).

### 3.4.3 Group Differences in Sharing Partner's Response (Aim 2)

Regarding supportive IER strategies, significant group differences emerged for encouraging sharing and affection, but not for reappraisal and problem solving (Table 8). Specifically, the current-MDD group, $b = 0.91$, $SE = 0.31$, $p = .004$, and remitted-MDD group, $b = 1.34$, $SE = 0.27$, $p < .001$, were more likely to receive encouraging sharing compared to the control group, though the two MDD groups did not differ from each other in receiving encouraging sharing, $p = .14$. Additionally, the remitted-MDD group was more likely to receive affection compared to the control group, $b = 0.80$, $SE = 0.24$, $p < .001$, with the current-MDD group falling non-significant in between these two groups, *p*s > .09. These results suggested that the current- and remitted-MDD groups received supportive strategies at a similar or higher

frequency compared to controls, contradicting **Hypothesis 2a**, which predicted that the current-MDD group would be less likely to receive supportive IER strategies than controls, with the remitted-MDD group falling in between.

In terms of unsupportive IER strategies, significant group differences emerged for blaming, but not for invalidation. Specifically, the current-MDD group was significantly more likely to receive blaming relative to remitted-MDD group, $b = 0.94$, $SE = 0.36$, $p = .01$, and the control group, $b = 0.79$, $SE = 0.37$, $p = .03$, who did not differ from each other in receiving blaming, $p = .66$. This finding on blaming partially supported **Hypothesis 2b**, which predicted that the current-MDD group would be more likely to receive unsupportive IER strategies than controls, with the remitted-MDD group falling in between. The finding on invalidation did not support **Hypothesis 2b**, however.

Regarding sharing partner's warmth, the groups did not show differences, *p*s >.11. This finding did not support **Hypothesis 2c**, which predicted that the current-MDD group would receive less warmth from the sharing partner than the control group, with the remitted-MDD group falling in between.

### 3.4.4 Group Differences in Associations between IER Strategies and Outcomes (Aim 3)

In examining associations between IER strategies and outcomes, we controlled for higher level terms (i.e., Level 2 strategy means or interactions between group and Level 2 strategy means, respectively), as eliminating them would significantly reduce model fit for some analyses.

**Supportive IER Strategies.** As expected, reappraisal, problem solving, encouraging sharing, and affection were positively associated with problem outcome and relationship outcome across the full sample (Table 11, Panel 1). We then tested our hypothesis that

supportive strategies would be more strongly associated with improved IER outcomes for the current-MDD group than for the control group, with the remitted-MDD group falling in between (**Hypothesis 3a**). Results revealed that group significantly interacted with reappraisal in predicting problem (but not relationship) outcome and interacted with affection in predicting both problem and relationship outcomes (Figure 4). Specifically, compared to the remitted-MDD group, reappraisal was associated with greater improvement in problem outcome for the current-MDD group ($b = 0.82$, $SE = 0.31$, $p = .007$) and control group ($b = 0.73$, $SE = 0.27$, $p = .008$), who did not differ. Additionally, affection was associated with greater improvement in both problem and relationship outcomes for the current-MDD group compared to the remitted-MDD group (problem outcome: $b = 0.62$, $SE = 0.30$, $p = .04$; relationship outcome: $b = 0.69$, $SE = 0.26$, $p = .008$) and control group (problem outcome: $b = 0.68$, $SE = 0.28$, $p = .02$; relationship outcome: $b = 0.81$, $SE = 0.24$, $p < .001$), who did not differ. All other associations between supportive strategies and problem or relationship outcome were not moderated by group. Thus, **Hypothesis 3a** was partially supported for affection, but it was not supported for the other supportive strategies.

After controlling for warmth, reappraisal, problem solving, and affection, but not encouraging sharing, remained significantly associated with problem outcome, and all four strategies remained significantly associated with relationship outcome (Table 11, Panel 2). All significant group-strategy interactions remained significant after accounting for warmth, except that the association between affection and problem outcome no longer differed between the two MDD groups.

**Unsupportive IER Strategies.** As expected, invalidation and blaming were negatively associated with problem and relationship outcomes (Table 11, Panel 1). These associations did

not vary across groups, which did not support our hypothesis that unsupportive strategies would be more strongly associated with worsened IER outcomes for the current-MDD group than for the remitted-MDD and the control group, who were not expected to differ from each other (**Hypothesis 3b**). After accounting for warmth, invalidation and blaming were no longer significantly associated with problem or relationship outcome (Table 11, Panel 2).

**Exploratory Analyses.** Because we could not test Hypothesis 3c due to CFA results, we explored which supportive and unsupportive strategies were most strongly associated with problem and relationship outcomes, controlling for warmth. Among the three supportive strategies that were significantly associated with problem outcome after controlling for warmth, reappraisal ($b = 0.37$, $SE = 0.15$, $p = .01$) and problem solving ($b = 0.29$, $SE = 0.13$, $p = .03$) were significantly more strongly associated with improved problem outcome than affection, with reappraisal and problem solving not differing from each other ($b = 0.07$, $SE = 0.15$, $p = .61$). Of the four supportive strategies, affection was significantly more strongly associated with relationship outcome than was problem solving ($b = 0.33$, $SE = 0.12$, $p = .004$); all other pairwise comparisons of coefficients were non-significant. For unsupportive strategies, blaming and invalidation did not differ in their associations with problem or relationship outcome, $p$s > .34.

### 3.4.5 Group Differences in the Moderating Effects of Warmth (Aim 4)

When testing the extent to which warmth moderated the associations between IER strategies and outcomes (Hypotheses 4a and 4c), we controlled for cross-level interactions between Level 2 strategy means and Level 1 person-mean centered warmth, as eliminating them would significantly reduce model fit for the model predicting problem outcome. When testing whether the significant moderating effects of warmth varied by group (Hypotheses 4b and 4d), we also included the cross-level interactions between Level 2 strategy mean and Level 1 person-

mean centered warmth, which was the most simplified model without significantly reducing model fit.

**Supportive IER Strategies.** We first examined the *boosting effect of warmth* (**Hypothesis 4a**), which predicted that supportive strategies would be more strongly associated with improved IER outcomes when the sharing partner's warmth is higher. Warmth did not significantly interact with any supportive strategies in predicting problem or relationship outcome (see rows with interactions between IER strategies and warmth in Table 12). Because of this, **Hypothesis 4b** was also not supported, which predicted group differences in the boosting effect of warmth.

**Unsupportive IER Strategies.** We found partial support for the *buffering effect of warmth* (**Hypothesis 4c**; Table 12), which predicted that unsupportive strategies would be less strongly associated with worsened IER outcomes when the sharing partner's warmth is higher. Warmth did not significantly interact with invalidation in predicting either IER outcome but significantly interacted with blaming in predicting relationship (but not problem) outcome. To better interpret the significant interaction between blaming and warmth, we computed simple slopes at low (-1 *SD*) and high (+1 *SD*) levels of person-centered warmth. At low level of warmth, blaming was inversely associated with relationship outcome at a trend level, $b = -0.32$, $SE = 0.18$, $p = .07$, whereas blaming was not associated with relationship outcome at high level of warmth $b = 0.27$, $SE = 0.26$, $p = .30$. A subsequent Johnson-Neyman test showed that blaming was significantly associated with worse relationship outcome when warmth was at or below 1.18 standard deviations below the mean but was not associated with relationship outcome when warmth was above 1.18 standard deviations below the mean. This pattern of findings for blaming supported the buffering effect of warmth (**Hypothesis 4c**), though findings for invalidation did

not. The interaction between blaming and relationship outcome did not significantly vary by group, and this finding did not support **Hypothesis 4d**, which predicted group differences in the buffering effect of warmth.

### 3.4.6 Examining Level 2 Covariates

We ran Models 1, 2, and 3 with age, gender, or the presence of current anxiety disorders included as a Level 2 covariate. All significant group difference findings held. Thus, we do not separately present the results of these analyses.

# Chapter 4: Discussion

Extensive research has documented that individuals with MDD experience difficulties with intrapersonal ER (Joormann & Stanton, 2016; D. Y. Liu & Thompson, 2017; Rottenberg, 2017). However, it is unclear whether these difficulties extend to IER. This area of research is important given growing evidence supporting the ubiquity and critical implications of IER in well-being (Bellingtier et al., 2022; Rimé, 2009; W. C. Williams et al., 2018). Further, IER has been theorized as a mechanism through which depressed individuals benefit from social support (Marroquín, 2011). We address this research gap by examining IER among adults with current and remitted MDD. Using ESM, we examined various aspects of everyday IER, including IER seeking behaviors, sharing partners' responses, and IER outcomes. Our findings shed light on the characteristics and utility of IER in MDD and inform clinical interventions.

## 4.1 Sharer's MDD and Sharer's IER Seeking Behaviors

Our first aim was to examine how MDD was associated with three basic elements of IER seeking behaviors--how much, with whom, and why people seek IER. The remitted-MDD group sought IER more frequently than controls, with the current-MDD group falling non-significantly in between. In contrast, we had expected that those with current MDD (and remitted MDD to a lesser extent) would seek IER less frequently than controls due to greater social isolation and emotional suppression (Hames et al., 2013; Visted et al., 2018; W. C. Williams et al., 2018). However, it is possible that they also have more opportunities where IER could be used because they experience more negative emotions (Dunkley et al., 2017; Springstein, 2022; Thompson, Bailen, et al., 2021) and difficulties with intrapersonal ER than controls (D. Y. Liu & Thompson, 2017). Therefore, these competing forces at play that could suppress or increase IER frequency may have balanced out and led to the two groups showing similar IER frequency. Future

research should examine how these processes contribute to IER frequency in MDD. The remitted-MDD group seeking IER most frequently may be because they have learned the value of utilizing others' help in regulating emotion through having recovered from previous depressive episodes, though this requires future longitudinal research to clarify.

Regarding why people seek IER (i.e., IER goals), independent of MDD status, participants were most likely to seek emotion-oriented goals only. The groups did not differ in their frequency of seeking emotion-oriented goals only relative to seeking problem-oriented goals only, contradicting our expectation that the current-MDD group would more frequently seek emotional comfort as opposed to help with the problem compared to controls. Unexpectedly, both MDD groups were more likely than controls to report seeking both problem-oriented and emotion-oriented goals as opposed to seeking either type of goal alone. Individuals with current and remitted MDD may need more support when seeking IER, possibly due to their greater emotional distress compared to controls (R. T. Liu & Alloy, 2011; Thompson, Bailen, et al., 2021). It may also be that they were less clear about their IER needs due to reduced clarity about their emotions (Thompson et al., 2015) and psychological needs (Dizén et al., 2005), and thus reported more generalized IER goals compared to controls, but future research is needed to test this. As IER goals can shape subsequent aspects of IER (e.g., choice of sharing partners, evaluation of IER outcomes), further clarifying IER goals in MDD can help inform what contributes to other MDD-related differences in IER.

In terms of participants' sharing partners, we hypothesized that the current-MDD (and remitted-MDD to a lesser extent) group would seek IER more exclusively from close (vs. non-close) others and have a less diverse network of sharing partners due to social anhedonia and isolation (Kupferberg et al., 2016). However, no group differences emerged for these two sharing

partner indices. As sharing one's emotional experiences represents basic social and emotional needs (Rimé, 2009), this fundamental desire may override one's diminished motivation in engaging in social activities in MDD. Alternatively, the lack of group differences may be because we asked participants to categorize their sharing partners based on six categories of social roles (e.g., friend), which did not allow us to assess sharing partners within each category. Those with (vs. without) MDD may turn only to a few close friends whom they trust as opposed to a wider network of friends due to heightened fear of rejection (e.g., Kumar et al., 2017). Future research should assess sharing partners in a more fine-grained manner to obtain a more nuanced understanding of social contexts of IER in MDD (e.g., Cheung et al., 2015).

## 4.2 Sharer's MDD and Sharing Partner's Response

Our second aim was to examine how MDD status was associated with sharing partners' responses. One important component of sharing partner's response is IER strategies, which we conceptualized as being supportive versus unsupportive and problem- versus emotion-oriented (Table 3). However, CFAs did not support our theorized classification, likely in part due not to having sufficient numbers of strategies as indicators. A greater number of indicators would have increased power and precision of estimation and likely addressed underidentification problems we encountered (Brown, 2015). Indeed, our theorization overlaps to some extent with classification of IER responses validated through CFAs with significantly more indicators (Swerdlow & Johnson, 2020). Further, we found indirect support for the distinction between theorized supportive and unsupportive strategies, with the former associated with greater warmth and improved IER outcomes and the latter showing the opposite result patterns. Similarly, theorized problem- and emotion-oriented strategies showed differential strengths in their associations with IER outcomes. For example, reappraisal and problem solving were more

strongly associated with problem outcome than was affection, which was more strongly associated with relationship outcome than was problem solving. Importantly, the six IER strategies we assessed characterized most IER interactions participants reported, painting a comprehensive picture of everyday IER strategies.

Regarding the frequency of receiving various IER strategies, distinct result patterns emerged for the two MDD groups. Those with current MDD showed a mixed profile of received strategies: They were more likely than controls to receive encouraging sharing and blaming, but they received other strategies with similar frequencies as controls. This mixed profile of strategies may suggest more polarized responses currently depressed individuals encounter, contradicting our expectation that they would show a less supportive profile of IER strategies than controls. The high distress level and problematic interpersonal styles that characterize those with current MDD (Kupferberg et al., 2016; R. T. Liu & Alloy, 2011) may invite more supportive strategies such as encouraging sharing from sharing partners who are willing to attend to their needs and provide support. On the other hand, these characteristics may elicit more negative responses from other sharing partners (Coyne, 1976b; Hammen, 1991; Swann et al., 1992), such as blaming depressed individuals for their expressed concerns. These more polarized responses may also be provided by the same sharing partners, who oscillate between supportive and unsupportive responses depending on their levels of empathy and frustration towards the depressed individual. Despite the mixed pattern, findings point to a generally supportive social network accessible to those with current MDD in that, though more likely to receive blaming (an infrequently endorsed strategy), they received supportive IER strategies with similar and higher frequencies compared to controls.

In contrast to the current-MDD group, the remitted-MDD group showed a more adaptive profile of received IER strategies. Individuals with remitted MDD were more likely to receive encouraging sharing and affection compared to controls, and (along with controls) less likely to receive blaming than those with current MDD. This reflects a particularly adaptive profile of received strategies among those with remitted MDD. Although we can only speculate, this profile could result from them recognizing the importance of surrounding themselves around supportive others in preventing future episodes. Alternatively, in line with evidence that higher perceived support predicts depression remission over time (Lakey & Cronin, 2008), the more adaptive profile of IER strategies in the remitted-MDD group may have contributed to their MDD remission. Future longitudinal research should examine how received IER strategies predict the course of MDD.

## 4.3 Sharer's MDD and Sharer's IER Outcomes

Our third aim was to examine whether the associations between IER strategies and outcomes varied by MDD status. Expectedly, supportive strategies were associated with better IER outcomes. Compared to controls, individuals with current MDD benefited more from affection and similarly from the three other supportive strategies. This result pattern partially supported our hypothesis that the current-MDD group would receive greater benefits from supportive IER compared to controls. This finding is promising given difficulties with intrapersonal ER in MDD (D. Y. Liu & Thompson, 2017), suggesting that those with current MDD can benefit from supportive IER as much as or to a greater extent than controls. Affection may particularly help currently depressed individuals feel connected to others due to their social isolation (Hames et al., 2013) and broaden their perspectives about the situation by elevating their positive affect (Fredrickson, 2001). On the other hand, the heightened benefits from

supportive IER, along with the mood-brightening effect, may reflect that the emotional experiences of those with current MDD are less stable and more dependent on external events (Nelson et al., 2020; Thompson, Liu, et al., 2021). Moreover, it remains unclear the long-term impacts of supportive IER in current MDD. For example, the greater benefits from affection might feed into excessive reassurance seeking in MDD (Hudson et al., 2018). Additionally, for those with current MDD, relying on external help with ER may perpetuate one's difficulties with intrapersonal ER (Marroquín, 2011). Future research should examine the mechanisms by which supportive IER impacts individuals with current MDD over time.

Like the current-MDD group, the remitted-MDD group benefited similarly from three of the four supportive strategies (i.e., problem solving, encouraging sharing, and affection) compared to controls. However, they benefited *less* from reappraisal than did controls (and the current-MDD group) in terms of problem outcome, though similarly in terms of relationship outcome. These results did not support our prediction that the remitted-MDD group would benefit more from supportive strategies compared to controls. Evidence suggests that those with remitted MDD already have effective reappraisal skills when regulating emotion on their own (Visted et al., 2018), so they may need less help with reappraisal from others. Their effective reappraisal skills might have contributed to the remission of their MDD, although this speculation remains to be tested in longitudinal research.

In contrast to supportive IER strategies, the two unsupportive strategies were associated with worsened problem and relationship outcomes, as expected. Additionally, the associations did not vary by group, suggesting that receiving unsupportive strategies is similarly detrimental regardless of one's MDD status. The lack of group difference was inconsistent with our prediction that the current-MDD group would be most negatively impacted by unsupportive IER

strategies due to their heightened rejection sensitivity (e.g., Kumar et al., 2017). It is likely that the unsupportive nature of blaming and invalidation was very salient to all participants and thus creating universally negative IER outcomes across groups (i.e., a ceiling effect). Individuals with current MDD may be more negatively impacted by IER strategies that are more ambiguous or subtly unsupportive (e.g., saying "sorry" in a dismissive way) compared to the other groups.

Besides IER strategies, another important component of the sharing partner's response is perceptions of how warm the person is, which provides a powerful context in which strategies are delivered. Groups did not differ in the levels of perceived warmth from the sharing partner, which did not support our hypothesis that MDD would be associated with lower perceptions of warmth. It may even be the case that depressed participants' sharing partners exhibit greater levels of warmth than controls', but those with MDD did not perceive so due to their negative biases in interpreting social feedback (Gotlib & Joormann, 2010). Observational research may be employed to test this. As expected, supportive strategies were associated with greater warmth, whereas unsupportive ones were associated with lower warmth. Both warmth and most supportive strategies were uniquely associated with improved IER outcomes, highlighting the unique contributions of both the content and the non-verbal context of sharing partner's response in predicting IER outcomes. Interestingly, unsupportive strategies were no longer associated with either IER outcome after warmth was taken into account, suggesting that unsupportive strategies negatively impact IER outcomes possibly through the lack of warmth in a sharing partner's response.

Although we hypothesized that higher levels of warmth would enhance the positive effects of supportive strategies, or the boosting effect of warmth, warmth did not moderate the associations between supportive strategies and IER outcomes. Considering that supportive

strategies were positively associated with warmth and appeared to be less strongly associated with IER outcomes after accounting for warmth, it may be that warmth is at least partially inherently delivered as part of the everyday IER strategies. As a result, it is difficult to separate warmth from the evaluation of the specific IER strategies. For example, the sharing partner suggesting an alternative way of viewing the situation may be construed as reappraisal when delivered with high warmth but as invalidation when delivered with low warmth. It is also possible that the responses participants classified as supportive strategies tended to be rated highly warm (i.e., a ceiling effect), likely because many IER interactions occurred via in-person contexts where people experience social pressure or have more opportunities to communicate in a warm manner. Future research may consider examining the role of warmth in writing-based IER strategies (e.g., manipulating warmth conveyed by text messages by using language with varying emotionality), in which cases warmth may not be as inherently conveyed as during in-person interactions.

In addition to the boosting effect of warmth, we predicted that high levels of warmth may buffer against the deleterious effects of unsupportive strategies (i.e., buffering effect of warmth), for which we found partial support. Warmth moderated the associations between blaming and problem (but not relationship) outcome similarly across groups. However, warmth did not moderate the association between invalidation and either IER outcome. Thus, conveying strategies that may be perceived as unsupportive with a high level of warmth can sometimes help buffer the potentially negative impact of these strategies. In our case, when pointing out the sharer's responsibility in the negative situation, doing so in a warm and compassionate way may be less damaging to how the sharer feels about the problem. As warmth is likely to change over time during an interaction, researchers can assess strategy and warmth at various points of an

IER interaction to examine the mutually influence of warmth and strategy and how it affects IER outcome.

## 4.4 General Discussion and Implications

The current research advances our understanding of ER in MDD by extending the focus to IER. On the one hand, our findings for those with current MDD may be interpreted as promising for several reasons. First, their diminished motivation in social engagement and impaired interpersonal functioning (Hames et al., 2013; Kupferberg et al., 2016) did not appear to suppress their motivation to seek IER frequently and from diverse groups of sharing partners. Additionally, despite abundant evidence that those with current MDD show negative biases in interpreting social information and evoke social rejection over time (Coyne, 1976b; Gotlib & Joormann, 2010; Hammen, 1991), their depiction of the IER responses they received were largely supportive and warm, though they did report receiving blaming most frequently. Furthermore, those with current MDD showed similar or heightened benefits from supportive IER compared to controls, highlighting the utility of supportive IER in current MDD. These promising interpretations contrast with the large body of research that has largely linked current MDD with impairments in intrapersonal ER (Joormann & Stanton, 2016; D. Y. Liu & Thompson, 2017) and highlight IER as an effective avenue through which currently depressed individuals receive help regulating their emotions.

On the other hand, many of the findings for the current MDD group were inconsistent with our hypotheses formulated based on the well-established impairments in emotional, cognitive, and interpersonal functioning in MDD. Therefore, more research is needed to better understand whether and how difficulties with IER manifest in current MDD. For example, IER difficulties may be more apparent when evaluating long-term repercussions of IER (e.g.,

perpetuating reassurance seeking and co-rumination; Spendelow et al., 2017; Starr, 2015) or impact on the sharing partner (e.g., feeling burdened). Regardless, these initial findings help stimulate research questions concerning IER in current MDD, such as what factors contribute group similarities and differences, the mechanisms underlying IER in MDD, and long-term emotional and social consequences of IER in MDD.

Several important findings concerning the remitted-MDD group are worth noting. Individuals whose MDD remitted were highly motivated to seek IER support, as evidenced by their higher frequency of seeking IER and (along with those with current MDD) seeking both types of IER goals compared to controls. Though this increased need for IER support may represent vulnerability factors that exist prior to MDD onset, they may also be the consequence of having experienced and recovered from previous depressive episodes. Additionally, the remitted-MDD group appeared to show the most adaptive pattern of IER strategies received from their sharing partners. For example, compared to controls, individuals with remitted MDD received two of the four supportive strategies more frequently, and unlike the current-MDD group, they did not receive more blaming compared to controls. If blaming from sharing partners is less frequent after a depressive episode remits, this would be consistent with research showing that problematic interpersonal behaviors that characterize current MDD improve when MDD is in remission (Hames et al., 2013). Importantly, longitudinal studies are needed to examine how various components of IER predict the course of MDD. Interestingly, unlike with the current-MDD group, those with remitted MDD benefited similarly or less from supportive IER strategies than controls, possibly because they already possess many effective intrapersonal ER skills (e.g., using reappraisal; D. Y. Liu & Thompson, 2017).

Moreover, the current research informs clinical interventions for depression. ER has been increasingly recognized as a viable target of intervention and mechanism of change in the treatment of psychopathology (Gratz et al., 2015), including depression (e.g., Berking & Lukas, 2015; Mennin & Fresco, 2014). As ER frequently occurs in social contexts (English et al., 2017), it would be important to incorporate IER into interventions targeting ER. Our finding that currently depressed individuals can benefit from supportive IER speaks to the value of clinicians encouraging depressed clients to actively seek IER when appropriate and from supportive others. Clinicians may also need to help depressed clients clarify their emotional needs and teach them interpersonal and communication skills that invite supportive responses. Clinicians can also facilitate depressed clients' learning of integrating effective skills accrued from IER interactions into their intrapersonal ER repertoire, such as modeling generating positive interpretations. Besides treating active MDD, it may be important to integrate IER into prevention efforts for MDD, particularly given high rates of recurrence of MDD (Monroe & Harkness, 2011) and few preventive interventions available (see Teasdale et al., 2000, for an exception). For example, it may be important to encourage those whose MDD has remitted to continue to utilize their supportive social environments to help manage their emotions and identify how they can maximize IER benefits. Future treatment research can test these speculations.

## 4.5 Limitations and Future Directions

We note several study limitations and promising avenues for future research. First, we focused on IER in the context of negative emotional experiences and did not examine how MDD is related to IER of positive emotions. For example, MDD may be associated with lower frequency of seeking others to enhance positive emotions due to anhedonia and negative beliefs about positive emotions (e.g., perceiving positive emotions as less attainable; APA, 2013;

Vanderlind et al., 2020). Second, we focused on intrinsic IER and did not examine how MDD is related to extrinsic IER (i.e., regulating others' emotions; Zaki & Williams, 2013). Those with MDD may be less likely to regulate others' emotions due to social withdrawal (Kupferberg et al., 2016) and a greater self-focus (Watkins & Teasdale, 2004). These lines of research will help clarify how IER may go awry in MDD, beyond intrinsic IER of negative emotions. Third, we broadly conceptualized IER as socially sharing one's experiences as people may not be aware of their emotion goals when engaging in IER (Zaki & Williams, 2013); however, people engage in social sharing for reasons other than changing their emotions (Duprez et al., 2015). Thus, IER researchers may consider more explicitly incorporating emotion goals into IER measures to address this limitation (Dixon-Gordon et al., 2015).

Additionally, although we examined both the sharer's and the sharing partner's IER behaviors, we only assessed them from the sharer's perspective. Examining the sharing partners' perspectives of the interactions (e.g., the sharing partners' intentions and IER outcomes) would help paint a more comprehensive picture of IER in MDD. For example, those with MDD may perceive sharing partners' behaviors as more negative due to their negative biases in interpreting social feedback (Joormann & Gotlib, 2010; Overall & Hammond, 2013). Additionally, sharing partners may be improving the sharer's emotions at the cost of their own (Rauers, 2022), particularly when regulating emotions of those with (vs. without) MDD. Lastly, we could not discern whether the systematic differences in contextual factors between groups (e.g., intensity and nature of negative daily emotional experiences) may explain differences in IER.

Despite these limitations, the current research represents the first efforts to elucidate everyday IER process among adults with current and remitted MDD. Although groups showed many similarities regarding their IER processes, they differed from each other in several aspects

of IER, including IER frequency and goals, IER strategies received from the sharing partners, and IER outcomes in response to certain IER strategies. Future research should further elucidate the mechanisms underlying these group differences and examine the long-term effects of IER characteristics in predicting the course of MDD. As IER is related to at least two important domains in which MDD show impairments--ER and interpersonal functioning, the current findings as well as future IER research can help inform clinical interventions that target both areas of difficulties and promote emotional and social well-being of those with and at risk for MDD.

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**Table 1**

*A Summary of Study Hypotheses and Statistical Analyses for Four Outcomes of Confirmatory Factor Analyses (CFA) of Interpersonal Emotion Regulation (IER) Strategies*

| Hypotheses | Type of Analyses | Handling IER Strategy Variables for Alternative CFA Outcomes | | | |
|---|---|---|---|---|---|
| | | **4-factor model is supported** | **3-factor model is supported** | **2-factor model is supported** | **none of the models are supported** |
| 1a: IER frequency: CD < RD < CTL | ML logistic regression | - | - | - | - |
| 1b: Diversity of sharing partner network: CD < RD < CTL | Linear regression | - | - | - | - |
| 1c: Sharing with close versus non-close others: CD > RD > CTL | ML Multilevel logistic regression | - | - | - | - |
| 1d: Seeking emotion-oriented versus problem-oriented goal: CD > RD > CTL | ML logistic regression | - | - | - | - |
| 2a: Receiving supportive IER strategies: CD < RD < CTL | ML logistic regression | Examine POS and EOS strategies separately | Examine POS and EOS strategies separately | Examine SUP strategy | Examine reappraisal, problem solving, encouraging sharing, and affection separately |
| 2b: Receiving unsupportive IER strategies: CD > RD > CTL | ML logistic regression | Examine blaming and invalidation separately | Examine UNS strategy | Examine UNS strategy | Examine blaming and invalidation separately |
| 2c: Sharing partner's warmth: CD < RD < CTL | ML linear regression | - | - | - | - |
| 3a: The associations between supportive strategies and improved IER outcomes: CD > RD > CTL | ML linear regression | Examine POS and EOS strategies separately | Examine POS and EOS strategies separately | Examine SUP strategy | Examine reappraisal, problem solving, encouraging sharing, and affection separately |

| | | | | | |
|---|---|---|---|---|---|
| 3b: The associations between unsupportive strategies and worsened IER outcomes: CD > RD = CTL | ML linear regression | Examine blaming and invalidation separately | Examine UNS strategy | Examine UNS strategy | Examine blaming and invalidation separately |
| 3c: Problem-oriented (vs. emotion-oriented) supportive strategies are more strongly associated with improved problem outcome, whereas emotion-oriented (vs. problem-oriented) supportive strategies are more strongly associated with improved relationship outcome | ML linear regression (contrast regression coefficients) | Compare regression coefficients of POS and EOS strategy | Compare regression coefficients of POS and EOS strategy | Compare regression coefficients of reappraisal, problem solving, encouraging sharing, and affection (exploratory analyses) | Compare regression coefficients of reappraisal, problem solving, encouraging sharing, and affection (exploratory analyses) |
| 4a: Supportive strategies are more strongly associated with improved IER outcomes when the sharing partner's warmth is higher (i.e., the boosting effect of warmth) | ML linear regression (test interaction) | Examine POS and EOS strategies separately | Examine POS and EOS strategies separately | Examine SUP strategy | Examine reappraisal, problem solving, encouraging sharing, and affection separately |
| 4b: The boosting effect of warmth: CD > RD > CTL | ML linear regression (test interaction) | Examine POS and EOS strategies separately | Examine POS and EOS strategies separately | Examine SUP strategy | Examine reappraisal, problem solving, encouraging sharing, and affection separately |
| 4c: Unsupportive strategies are less strongly associated with worsened IER outcomes when the sharing partner's warmth is higher (i.e., the buffering effect of warmth) | ML linear regression (test interaction) | Examine blaming and invalidation separately | Examine UNS strategy | Examine UNS strategy | Examine blaming and invalidation separately |
| 4d: The buffering effect of warmth: CD > RD = CTL | ML linear regression (test interaction) | Examine blaming and invalidation separately | Examine UNS strategy | Examine UNS strategy | Examine blaming and invalidation separately |

*Note*. CD = the current-MDD group; CTL = the control group; EOS strategy = emotion-oriented supportive IER strategy (coded as 1 if encouraging sharing and/or affection is endorsed and 0 if neither is endorsed); ML = multilevel; POS strategy = problem-oriented supportive IER strategy (coded as 1 if reappraisal and/or problem solving is endorsed and 0 if neither is endorsed); RD = the remitted-MDD group; SUP strategy = supportive IER strategy (coded as 1 if at least one of the following strategies is endorsed: reappraisal, problem solving, encouraging sharing, and affection and 0 if none is endorsed); UNS strategy = unsupportive IER strategy (coded as 1 if blaming and/or invalidation is endorsed and 0 is neither is endorsed).

**Table 2**

*Demographic, Clinical, and Compliance Data by Group*

| Variables | Current-MDD ($n$ = 48) | Remitted-MDD ($n$ = 80) | Control ($n$ = 87) | Difference Test |
|---|---|---|---|---|
| | | Demographics | | |
| Gender (% women) | 72.9% | 71.3% | 57.5% | $\chi^2(2) = 4.83$, $p = .09$ |
| Age (*M, SD*) | 42.0 (14.2) | 44.3 (16.3) | 45.5 (16.9) | $F(2, 212) = 0.72$, $p = .49$ |
| Race (%) | | | | $\chi^2(6) = 4.91$, $p = .56$ |
| African American | 20.8% | 18.8% | 19.5% | |
| Asian | 4.2% | 0% | 4.6% | |
| Caucasian | 70.8% | 72.5% | 66.7% | |
| Other/Multiracial | 4.2% | 8.8% | 9.2% | |
| Not reported | 0% | 1.2% | 0% | |
| Education (%) | | | | $\chi^2(6) = 7.96$, $p = .24$ |
| High school or lower | 12.5% | 8.8% | 9.2% | |
| Some college | 31.2% | 21.2% | 23.0% | |
| Bachelor's degree | 39.6% | 28.8% | 32.2% | |
| Professional degree | 16.7% | 40.0% | 33.3% | |
| Marital status (%) | | | | $\chi2(6)=7.87$, p=.25 |
| Never married | 33.3% | 31.6% | 29.1% | |
| Married or cohabiting | 29.2% | 43.0% | 47.7% | |
| Separated/divorced | 31.2% | 24.1% | 22.1% | |
| Widowed | 6.2% | 1.3% | 1.2% | |
| In relationship (%) | 68.9% | 63.6% | 74.1% | $\chi^2(2) = 2.01$, $p = .37$ |
| | | Clinical Characteristics (*M, SD*) | | |
| Depressive symptoms (CES-D) | 33.4 (10.0)[a] | 13.3 (9.6)[b] | 7.3 (6.27)[c] | $F(2, 210) = 147.0$, $p < .001$ |
| Total number of depressive episodes | 11.8 (21.8)[a] | 5.14 (14.9)[b] | 0 (0)[c] | $F(2, 209) = 11.37$, $p < .001$ |
| Total duration of depressive episodes (# of months) | 71.9 (82.5)[a] | 30.0 (41.9)[b] | 0 (0)[c] | $F(2, 211) = 11.37$, $p < .001$ |

| | | | | |
|---|---|---|---|---|
| Current anxiety disorder (%) | 70.8%[a] | 18.8%[b] | 0%[c] | $F(2, 211) = 89.4$, $p < .001$ |
| | | Compliance (*M*, *SD*) | | |
| % of surveys completed | 72.8% (19.0) | 75.7% (16.9) | 74.3% (19.6) | $F(2, 212) = 0.30$, $p = .74$ |

*Note*. CES-D = the Center for Epidemiologic Studies Depression Scale.
Different superscripts within a row indicate statistically significant ($p < .05$) differences between groups according to Tukey's honest significant difference tests.

**Table 3**

*Categorization and Definitions of Interpersonal Emotion Regulation Strategies*

| | Problem-Oriented | Emotion-Oriented |
|---|---|---|
| Putatively Supportive | *Cognitive reappraisal*: offering a different interpretation or perspective of the sharer's problem | *Encouraging sharing*: encouraging the sharer to share more how he or she feels about the problem |
| | *Problem solving*: providing a practical solution to the sharer's problem | *Affection*: expressing verbal (e.g. expressed love or care) and physical affection (e.g., hug) |
| Putatively Unsupportive | *Problem blaming*: Suggesting that the sharer has some responsibility for what happened | *Emotion invalidation*: suggesting the sharer's emotions are unwarranted |

**Table 4**

*Correlations between Interpersonal Emotion Regulation (IER) Goals, Strategies, Warmth, and Outcomes*

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Problem-oriented goal | - | - | .13** | .53*** | .20** | .34*** | .00 | -.19*** | -.06 | .06 | .04 |
| 2. Emotion-oriented goal | - | - | .12* | -.26*** | -.05 | -.16 | .41*** | .53*** | .20*** | .05 | .15*** |
| 3. Reappraisal | .51*** | -.10 | - | .09* | -.39*** | -.14 | .16** | .10* | .39*** | .39*** | .33*** |
| 4. Problem solving | .51*** | .04 | .50*** | - | -.07 | .10 | -.05 | -.10* | .22*** | .27*** | .16*** |
| 5. Invalidation | .20 | -.32* | -.03 | .18 | - | .43*** | -.43*** | -.23** | -.42*** | -.34*** | -.30*** |
| 6. Blaming | .26 | -.12 | -.04 | .21 | .93*** | - | -.14 | -.17* | -.32*** | -.25*** | -.23*** |
| 7. Encouraging sharing | .09 | .55*** | .22 | .19 | -.43** | -.16 | - | .29*** | .42*** | .23*** | .31*** |
| 8. Affection | -.14 | .70*** | .18 | .19 | -.53*** | -.16 | .66*** | - | .60*** | .38*** | .49*** |
| 9. Warmth | .13 | .08 | .35** | .20 | -.49*** | -.55*** | .49*** | .52*** | - | .57*** | .56*** |
| 10. Problem outcome | .07 | .05 | .30** | .04 | -.36** | -.45** | .37*** | .35* | .77*** | - | .58*** |
| 11. Relationship outcome | .09 | .00 | .29** | .21 | -.21 | -.32 | .29** | .31* | .59*** | .85*** | - |
| Intraclass correlations | .19 | .27 | .37 | .15 | .30 | .25 | .40 | .34 | .24 | .20 | .28 |

*Note*. Correlation coefficients above and below the diagonal represent within-person and between-person, respectively.
* $p < .05$, ** $p < .01$, *** $p < .001$

**Table 5**

*Marginal Proportions and Counts of the Six Interpersonal Emotion Regulation Strategies*

| Variable | Proportions | Counts |
|---|---|---|
| Reappraisal | | |
| No | .731 | 1185 |
| Yes | .269 | 437 |
| Problem solving | | |
| No | .703 | 1141 |
| Yes | .297 | 481 |
| Invalidation | | |
| No | .913 | 1481 |
| Yes | .087 | 141 |
| Blaming | | |
| No | .936 | 1519 |
| Yes | .064 | 103 |
| Encouraging sharing | | |
| No | .692 | 1123 |
| Yes | .308 | 499 |
| Affection | | |
| No | .636 | 1031 |
| Yes | .364 | 591 |

**Table 6**

*Relevant Parameter Estimates of the One-Factor Within/Three-Factor Between Model*

| Indicators | R-Square$_W$ (*SE*) | R-Square$_B$ (*SE*) |
|---|---|---|
| Reappraisal | .124 (.039)** | .413 (.270) |
| Problem solving | .002 (.004) | .615 (.386) |
| Invalidation | .715 (.158)** | 1.000 (.001)** |
| Blaming | .201 (.058)** | .531 (.185)** |
| Encouraging sharing | .297 (.071)** | .619 (.201)** |
| Affection | .160 (.042)** | .696 (.221)** |

*Note*. R-Square$_B$ = variance explained at the between-person level; R-Square$_W$ = variance explained at the within-person level.
** $p < .01$

**Table 7**

*Means and Standard Deviations of Key Interpersonal Emotion Regulation (IER) Variables across Groups*

| Variable | *M* or % | *SD* |
|---|---|---|
| Negative emotion sharing | 14.9% | 12.1% |
| *Sharing partner type* | | |
| Romantic partner | 26.1% | 32.1% |
| Family member | 22.0% | 26.5% |
| Friend | 31.0% | 30.1% |
| Someone at work | 11.5% | 17.8% |
| Acquaintance | 4.10% | 11.5% |
| Stranger | 5.29% | 15.7% |
| *IER goals* | | |
| Emotion-oriented goals only | 52.8% | 40.4% |
| Problem-oriented goals only | 29.2% | 26.1% |
| Both types of goals | 27.3% | 23.8% |
| *IER strategies* | | |
| Reappraisal | 27.3% | 28.0% |
| Problem solving | 29.2% | 26.1% |
| Invalidation | 10.0% | 16.2% |
| Blaming | 6.44% | 12.3% |
| Encouraging sharing | 26.0% | 27.5% |
| Affection | 33.2% | 29.0% |
| None of these | 17.9% | 23.4% |
| Sharing partner's warmth | 2.35 | 1.55 |
| Problem outcome | 1.44 | 1.33 |

| | | |
|---|---|---|
| Relationship outcome | 1.13 | 1.27 |

**Table 8**

*Interpersonal Emotion Regulation (IER) Variables by Group*

| Variables | Current-MDD ($n$ = 48) | Remitted-MDD ($n$ = 80) | Control ($n$ = 87) |
|---|---|---|---|
| Negative emotion sharing | **0.12 (0.02)$_{ab}$** | **0.14 (0.01)$_{a}$** | **0.10 (0.01)$_{b}$** |
| Diversity of sharing partner network | 0.72 (0.06)$_{a}$ | 0.72 (0.05)$_{a}$ | 0.75 (0.05)$_{a}$ |
| Sharing with close vs. non-close sharing others | 0.82 (0.03)$_{a}$ | 0.81 (0.02)$_{a}$ | 0.85 (0.02)$_{a}$ |
| *Supportive IER Strategies* | | | |
| Reappraisal | 0.25 (0.05)$_{a}$ | 0.21 (0.03)$_{a}$ | 0.18 (0.03)$_{a}$ |
| Problem solving | 0.34 (0.04)$_{a}$ | 0.26 (0.02)$_{a}$ | 0.27 (0.03)$_{a}$ |
| Encouraging sharing | **0.25 (0.04)$_{a}$** | **0.34 (0.04)$_{a}$** | **0.12 (0.02)$_{b}$** |
| Affection | **0.32 (0.05)$_{ab}$** | **0.39 (0.04)$_{a}$** | **0.22 (0.03)$_{b}$** |
| *Unsupportive IER Strategies* | | | |
| Invalidation | 0.07 (0.02)$_{a}$ | 0.04 (0.01)$_{a}$ | 0.07 (0.02)$_{a}$ |
| Blaming | **0.07 (0.02)$_{a}$** | **0.03 (0.01)$_{b}$** | **0.03 (0.01)$_{b}$** |
| Sharing partner's warmth | 2.28 (0.22)$_{a}$ | 2.59 (0.17)$_{a}$ | 2.20 (0.18)$_{a}$ |

*Note*. Different subscripts within rows indicate significant group differences at the $p < .05$ level, which are also bolded for clarity.

**Table 9**

*Bayesian Multilevel Multinomial Logistic Regression Model Predicting Interpersonal Emotion Regulation (IER) Goals (Problem-Oriented Only as the Reference Level)*

| Parameter | Estimate (*SE*) | Lower CI | Upper CI | ESS | Rhat |
|---|---|---|---|---|---|
| Panel 1: Unconditional Model | | | | | |
| *Random effects* | | | | | |
| *SD* (Intercept: emotion-oriented only) | 1.10 (0.12) | 0.87 | 1.36 | 6924 | 1.00 |
| *SD* (Intercept: both) | 1.70 (0.17) | 1.38 | 2.06 | 6789 | 1.00 |
| *r* (Intercept: emotion-oriented only; Intercept: both) | 0.62 (0.09) | 0.42 | 0.77 | 7203 | 1.00 |
| *Fixed effects* | | | | | |
| Intercept: emotion-oriented only | **0.86 (0.11)** | **0.65** | **1.09** | 7081 | 1.00 |
| Intercept: both | **-0.44 (0.18)** | **-0.80** | **-0.11** | 6474 | 1.00 |
| Panel 2a: Adding Level 2 Group Predictor (CTL as Reference Group) | | | | | |
| *Random effects* | | | | | |
| *SD* (Intercept: emotion-oriented only) | 1.09 (0.12) | 0.86 | 1.34 | 6920 | 1.00 |
| *SD* (Intercept: both) | 1.61 (0.17) | 1.29 | 1.96 | 7113 | 1.00 |
| *r* (Intercept: emotion-oriented only; Intercept: both) | 0.58 (0.10) | 0.36 | 0.76 | 7038 | 1.00 |
| *Fixed effects* | | | | | |
| Intercept: emotion-oriented only | **0.63 (0.18)** | **0.28** | **0.98** | 7272 | 1.00 |
| Intercept: both | **-1.25 (0.29)** | **-1.83** | **-0.70** | 7131 | 1.00 |
| CD: emotion-oriented only | 0.27 (0.30) | -0.31 | 0.85 | 7335 | 1.00 |
| CD: both | **1.23 (0.42)** | **0.41** | **2.07** | 7036 | 1.00 |
| RD: emotion-oriented only | 0.44 (0.25) | -0.06 | 0.94 | 6909 | 1.00 |
| RD: both | **1.26 (0.36)** | **0.56** | **1.99** | 7218 | 1.00 |
| Panel 2b: Adding Level 2 Group Predictor (RD as Reference Group) | | | | | |
| *Random effects* | | | | | |
| *SD* (Intercept: emotion-oriented only) | 1.09 (0.13) | 0.85 | 1.34 | 6932 | 1.00 |
| *SD* (Intercept: both) | 1.61 (0.17) | 1.30 | 1.97 | 6975 | 1.00 |
| *r* (Intercept: emotion-oriented only; Intercept: both) | 0.58 (0.10) | 0.37 | 0.76 | 6816 | 1.00 |
| *Fixed effects* | | | | | |
| Intercept: emotion-oriented only | **1.06 (0.18)** | **0.72** | **1.42** | 6813 | 1.00 |
| Intercept: both | 0.01 (0.25) | -0.49 | 0.49 | 7197 | 1.00 |
| CD: emotion-oriented only | -0.16 (0.30) | -0.74 | 0.41 | 6412 | 1.00 |
| CD: both | -0.03 (0.40) | -0.81 | 0.76 | 6760 | 1.00 |
| CTL: emotion-oriented only | -0.44 (0.25) | -0.93 | 0.05 | 7055 | 1.00 |

| | | | | | |
|---|---|---|---|---|---|
| CTL: both | **-1.26 (0.37)** | **-2.00** | **-0.55** | 6877 | 1.00 |

*Note*. Significant fixed effects are bolded. Both = seeking both problem-oriented and emotion-oriented goals; CD = current-MDD group; CI = 95% credible intervals; CTL = control group; emotion-oriented only = seeking emotion-oriented but not problem-oriented goals; ESS = effective sample size; problem-oriented only = seeking problem-oriented but not emotion-oriented goals; *r* = correlations between random effects; RD = remitted-MDD group.

**Table 10**

*Bayesian Multilevel Multinomial Logistic Regression Model Predicting Interpersonal Emotion Regulation (IER) Goals (Both as the Reference Level)*

| Parameter | Estimate (*SE*) | Lower CI | Upper CI | ESS | Rhat |
|---|---|---|---|---|---|
| Panel 1: Unconditional Model | | | | | |
| *Random effects* | | | | | |
| *SD* (Intercept: problem-oriented only) | 1.68 (0.17) | 1.37 | 2.04 | 7055 | 1.00 |
| *SD* (Intercept: emotion-oriented only) | 1.29 (0.14) | 1.03 | 1.59 | 7374 | 1.00 |
| *r* (Intercept: problem-oriented only; Intercept: emotion-oriented only) | 0.74 (0.07) | 0.57 | 0.86 | 6916 | 1.00 |
| *Fixed effects* | | | | | |
| Intercept: problem-oriented only | **0.41 (0.18)** | **0.08** | **0.77** | 6685 | 1.00 |
| Intercept: emotion-oriented only | **1.29 (0.15)** | **1.01** | **1.59** | 7283 | 1.00 |
| Panel 2a: Adding Level 2 Group Predictor (CTL as Reference Group) | | | | | |
| *Random effects* | | | | | |
| *SD* (Intercept: problem-oriented only) | 1.60 (0.17) | 1.29 | 1.96 | 7091 | 1.00 |
| *SD* (Intercept: emotion-oriented only) | 1.27 (0.14) | 1.01 | 1.57 | 6941 | 1.00 |
| *r* (Intercept: problem-oriented only; Intercept: emotion-oriented only) | 0.71 (0.08) | 0.53 | 0.85 | 7202 | 1.00 |
| *Fixed effects* | | | | | |
| Intercept: problem-oriented only | **1.22 (0.29)** | **0.67** | **1.80** | 7377 | 1.00 |
| Intercept: emotion-oriented only | **1.85 (0.25)** | **1.38** | **2.36** | 6824 | 1.00 |
| CD: problem-oriented only | **-1.21 (0.41)** | **-2.03** | **-0.43** | 6988 | 1.00 |
| CD: emotion-oriented only | **-0.94 (0.35)** | **-1.62** | **-0.27** | 6770 | 1.00 |
| RD: problem-oriented only | **-1.24 (0.37)** | **-1.98** | **-0.54** | 7086 | 1.00 |
| RD: emotion-oriented only | **-0.80 (0.31)** | **-1.41** | **-0.20** | 7218 | 1.00 |
| Panel 2b: Adding Level 2 Group Predictor (RD as Reference Group) | | | | | |
| *Random effects* | | | | | |
| *SD* (Intercept: problem-oriented only) | 1.60 (0.17) | 1.29 | 1.95 | 6774 | 1.00 |
| *SD* (Intercept: emotion-oriented only) | 1.28 (0.14) | 1.01 | 1.57 | 6865 | 1.00 |
| *r* (Intercept: problem-oriented only; Intercept: emotion-oriented only) | 0.71 (0.08) | 0.53 | 0.85 | 6929 | 1.00 |
| *Fixed effects* | | | | | |
| Intercept: problem-oriented only | -0.03 (0.25) | -0.52 | 0.45 | 6774 | 1.00 |
| Intercept: emotion-oriented only | **1.04 (0.20)** | **0.65** | **1.44** | 7159 | 1.00 |
| CD: problem-oriented only | 0.04 (0.40) | -0.74 | 0.84 | 6965 | 1.00 |

| | | | | | |
|---|---|---|---|---|---|
| CD: emotion-oriented only | -0.13 (0.32) | -0.75 | 0.50 | 7114 | 1.00 |
| HC: problem-oriented only | **1.25 (0.36)** | **0.55** | **1.96** | 6902 | 1.00 |
| HC: emotion-oriented only | **0.81 (0.31)** | **0.23** | **1.42** | 7309 | 1.00 |

*Note*. Significant fixed effects are bolded. Both = seeking both problem-oriented and emotion-oriented goals; CD = current-MDD group; CI = 95% credible intervals; CTL = control group; emotion-oriented only = seeking emotion-oriented but not problem-oriented goals; ESS = effective sample size; problem-oriented only = seeking problem-oriented but not emotion-oriented goals; *r* = correlations between random effects; RD = remitted-MDD group.

**Table 11**

*Interpersonal Emotion Regulation (IER) Strategies Predicting IER Outcomes (Panel 1) and IER Outcomes Controlling for Warmth (Panel 2)*

| Predictors/Contrasts | Problem Outcome | | | Relationship Outcome | | |
|---|---|---|---|---|---|---|
| | Panel 1 | | | | | |
| | *b* | *SE* | Group Moderation | *b* | *SE* | Group Moderation |
| Intercept | 0.81 | 0.19*** | | 0.31 | 0.20 | |
| Reappraisal | 1.02 | 0.12*** | CD, CTL > RD | 0.72 | 0.10*** | - |
| Problem solving | 0.89 | 0.11*** | - | 0.46 | 0.09*** | - |
| Encouraging sharing | 0.39 | 0.11*** | - | 0.58 | 0.10*** | - |
| Affection | 0.96 | 0.11*** | CD > RD, CTL | 1.10 | 0.09*** | CD > RD, CTL |
| Invalidation | -0.98 | 0.18*** | - | -0.54 | 0.15*** | - |
| Blaming | -0.74 | 0.20*** | - | -0.60 | 0.17*** | - |
| Mean-reappraisal | 0.05 | 0.34 | | 0.34 | 0.33 | |
| Mean-problem solving | -0.72 | 0.37 | | 0.09 | 0.36 | |
| Mean-encouraging sharing | 0.00 | 0.36 | | -0.38 | 0.35 | |
| Mean-affection | 0.05 | 0.35 | | 0.06 | 0.34 | |
| Mean-invalidation | 0.81 | 0.67 | | 0.57 | 0.65 | |
| Mean-blaming | -1.82 | 0.35* | | -0.95 | 0.81 | |
| | Panel 2: Controlling for Warmth | | | | | |
| | *b* | *SE* | Group Moderation | *b* | *SE* | Group Moderation |
| Intercept | 0.82 | 0.10*** | | 0.32 | 0.19 | |
| Warmth (person-centered) | 0.44 | 0.02*** | | 0.36 | 0.02*** | |
| Reappraisal | 0.62 | 0.11*** | CD, CTL > RD | 0.40 | 0.09*** | - |
| Problem solving | 0.55 | 0.10*** | - | 0.18 | 0.08* | - |
| Encouraging sharing | 0.04 | 0.10 | - | 0.29 | 0.09** | - |
| Affection | 0.25 | 0.10* | CD > CTL | 0.52 | 0.09*** | CD > RD, CTL |
| Invalidation | -0.24 | 0.16 | - | 0.06 | 0.14 | - |
| Blaming | -0.20 | 0.18 | - | -0.15 | 0.16 | - |
| Mean-reappraisal | 0.45 | 0.33 | | 0.69 | 0.32* | |
| Mean-problem solving | -0.39 | 0.36 | | 0.36 | 0.35 | |
| Mean-encouraging sharing | 0.32 | 0.35 | | -0.13 | 0.35 | |
| Mean-affection | 0.78 | 0.34* | | 0.65 | 0.34 | |
| Mean-invalidation | 0.02 | 0.65 | | 0.13 | 0.64 | |
| Mean-blaming | -2.29 | 0.80** | | -1.27 | 0.80 | |

*Note*. Significant group-strategy interactions are summarized in the "Group Moderation" column. All group differences in the magnitude of strategy-outcome associations (denoted by ">" and "<") were at the $p < .05$ level; dash denotes no group differences in the associations of interest. CD = current-MDD group; CTL = control group; RD = remitted-MDD group; warmth = person mean-centered sharing partner's warmth.

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

**Table 12**

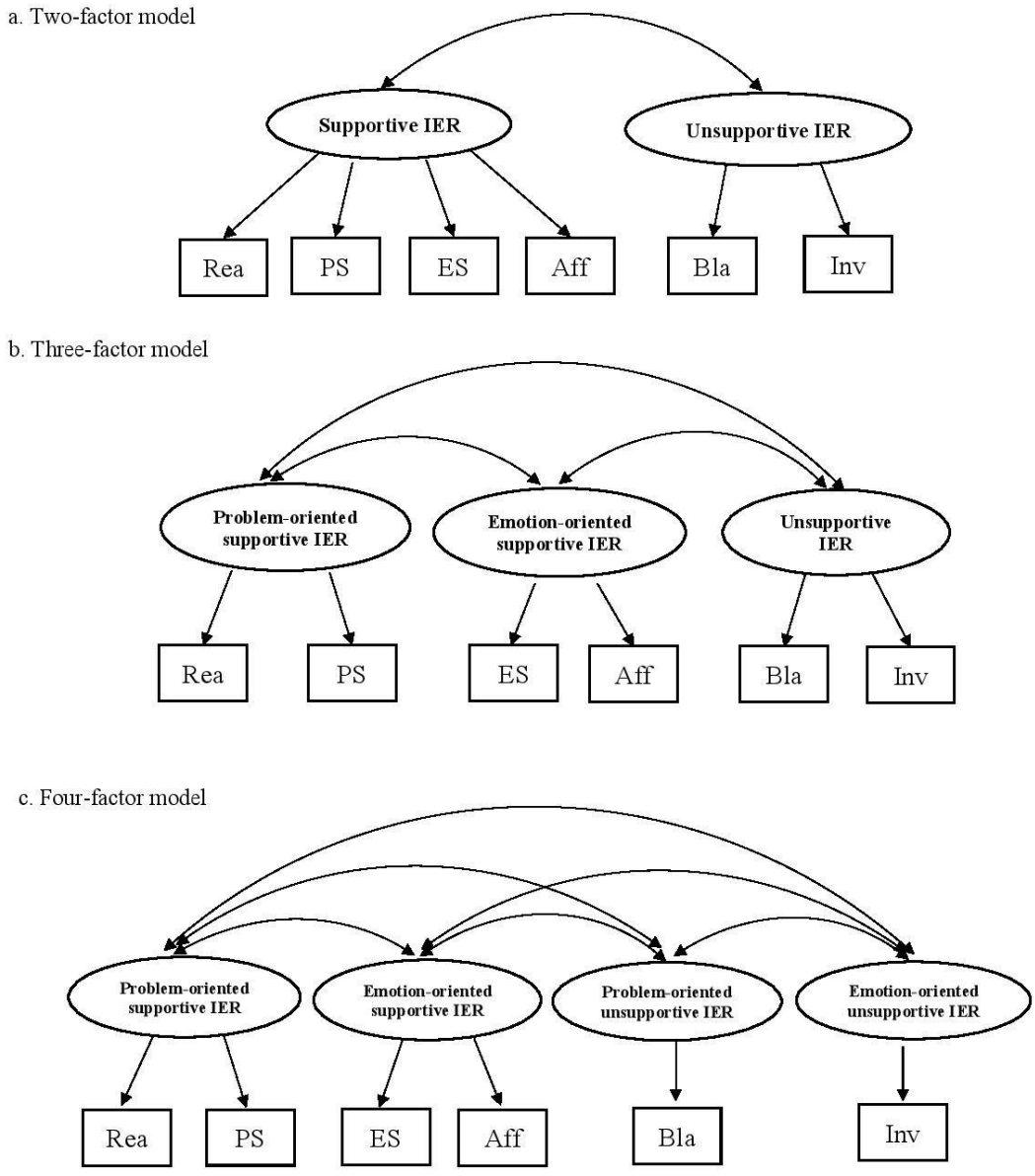
*The Moderating Effects of Sharing Partner's Warmth on the Associations between Interpersonal Emotion Regulation (IER) Strategies and IER Outcomes*

| Predictor | Problem Outcome | | | Relationship Outcome | | |
|---|---|---|---|---|---|---|
| | *b* | *SE* | *p* | *b* | *SE* | *p* |
| Intercept | 0.83 | 0.19 | < .001*** | 0.34 | 0.19 | .07 |
| Reappraisal | 0.61 | 0.11 | < .001*** | 0.42 | 0.10 | < .001*** |
| Problem solving | 0.54 | 0.10 | < .001*** | 0.19 | 0.08 | .03* |
| Encouraging sharing | 0.02 | 0.11 | .86 | 0.31 | 0.10 | < .002** |
| Affection | 0.34 | 0.11 | .003** | 0.60 | 0.10 | < .001*** |
| Invalidation | -0.20 | 0.19 | .28 | 0.07 | 0.16 | .67 |
| Blaming | -0.13 | 0.20 | .53 | -0.03 | 0.18 | .89 |
| Warmth | 0.44 | 0.05 | < .001*** | 0.38 | 0.04 | < .001*** |
| Mean-reappraisal | 0.50 | 0.33 | .13 | 0.70 | 0.32 | .03* |
| Mean-problem solving | -0.41 | 0.35 | .25 | 0.32 | 0.35 | .35 |
| Mean-encouraging sharing | 0.32 | 0.35 | .37 | -0.14 | 0.35 | .70 |
| Mean-affection | 0.74 | 0.34 | .03* | 0.61 | 0.34 | .07 |
| Mean-invalidation | -0.03 | 0.65 | .97 | -0.15 | 0.64 | .81 |
| Mean-blaming | -2.08 | 0.80 | .01* | -1.08 | 0.79 | .17 |
| Reappraisal × Warmth | -0.07 | 0.07 | .30 | -0.06 | 0.06 | .34 |
| Problem solving × Warmth | -0.03 | 0.05 | .54 | -0.02 | 0.05 | .64 |
| Encouraging sharing × Warmth | 0.02 | 0.07 | .80 | -0.06 | 0.06 | .30 |
| Affection × Warmth | -0.09 | 0.06 | .16 | -0.08 | 0.05 | .16 |
| Invalidation × Warmth | -0.03 | 0.07 | .61 | -0.03 | 0.06 | .51 |
| Blaming × Warmth | 0.13 | 0.08 | .09 | 0.15 | 0.07 | .03* |
| Mean-reappraisal × Warmth | 0.25 | 0.10 | .02* | 0.04 | 0.09 | .62 |
| Mean-problem solving × Warmth | 0.02 | 0.12 | .85 | 0.10 | 0.10 | .33 |
| Mean-encouraging sharing × Warmth | -0.03 | 0.11 | .76 | 0.03 | 0.10 | .77 |
| Mean-affection × Warmth | -0.09 | 0.11 | .43 | -0.08 | 0.09 | .38 |
| Mean-invalidation × Warmth | 0.18 | 0.17 | .29 | 0.02 | 0.15 | .92 |
| Mean-blaming × Warmth | -0.28 | 0.21 | .18 | -0.17 | 0.18 | .34 |

*Note.* * $p < .05$, ** $p < .01$, *** $p < .001$

**Figure 1**

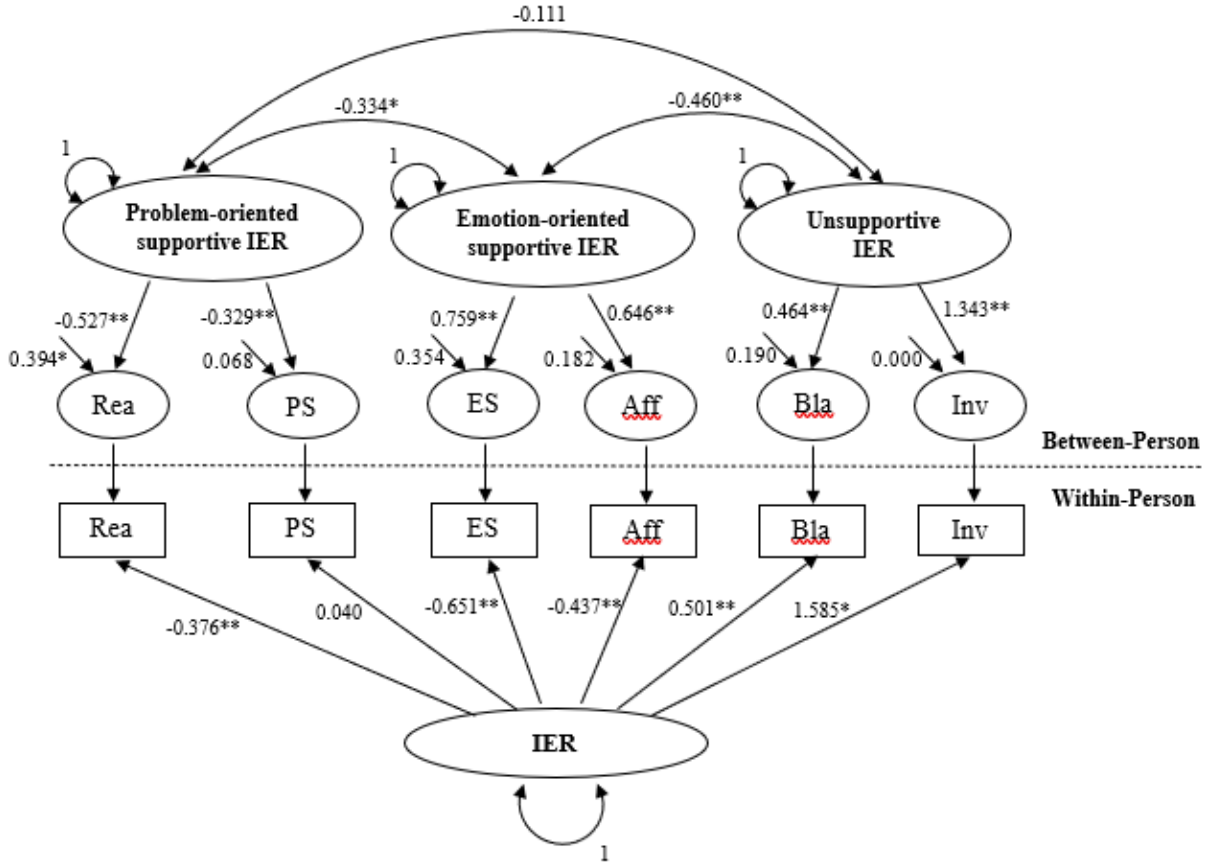
*Alternative Factor Structures of the Six Interpersonal Emotion Regulation (IER) Strategies*




*Note*. Multilevel confirmatory factor analyses were conducted to test the (a) two-factor, (b) three-factor, and (c) four-factor models of IER strategies. For each factor structure, Level 1 and 2 models were expected to be the same and thus not drawn separately. Aff = affection; Bla = blaming; ES = encouraging sharing; Inv = invalidation; PS = problem solving; Rea = reappraisal.

**Figure 2**

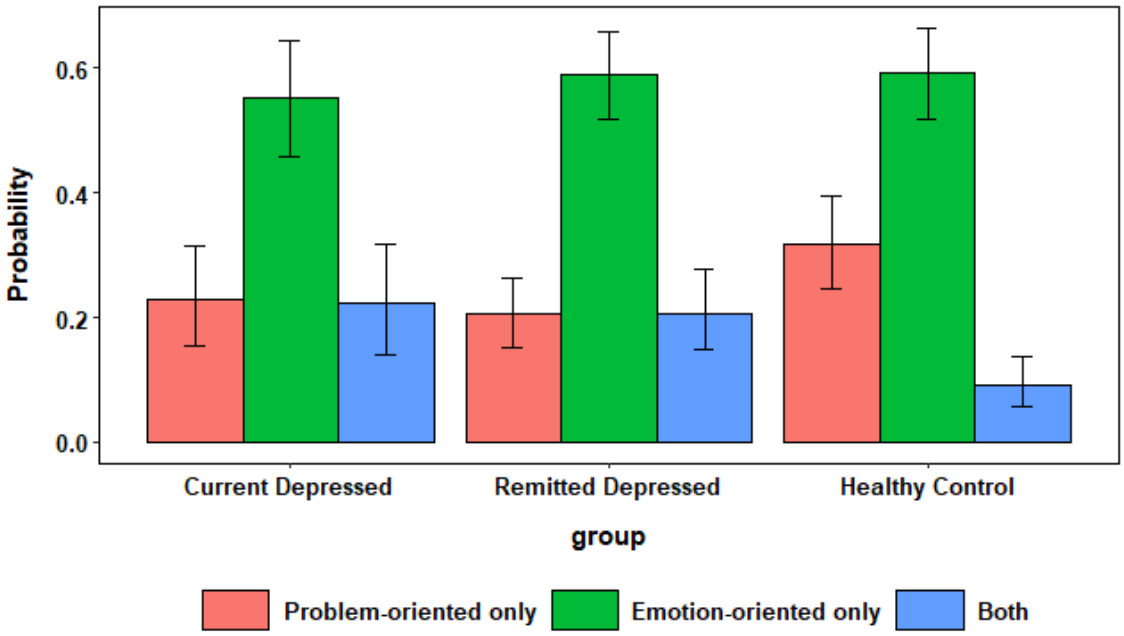
*Path Diagram of the One-Factor Within/Three-Factor Between Model*




*Note*. Unstandardized parameter estimates are presented. IER = interpersonal emotion regulation; Rea = reappraisal; PS = problem solving; ES = encouraging sharing; Aff = affection; Bla = blaming; Inv = invalidation; .
* $p < .05$, ** $p < .01$

**Figure 3**

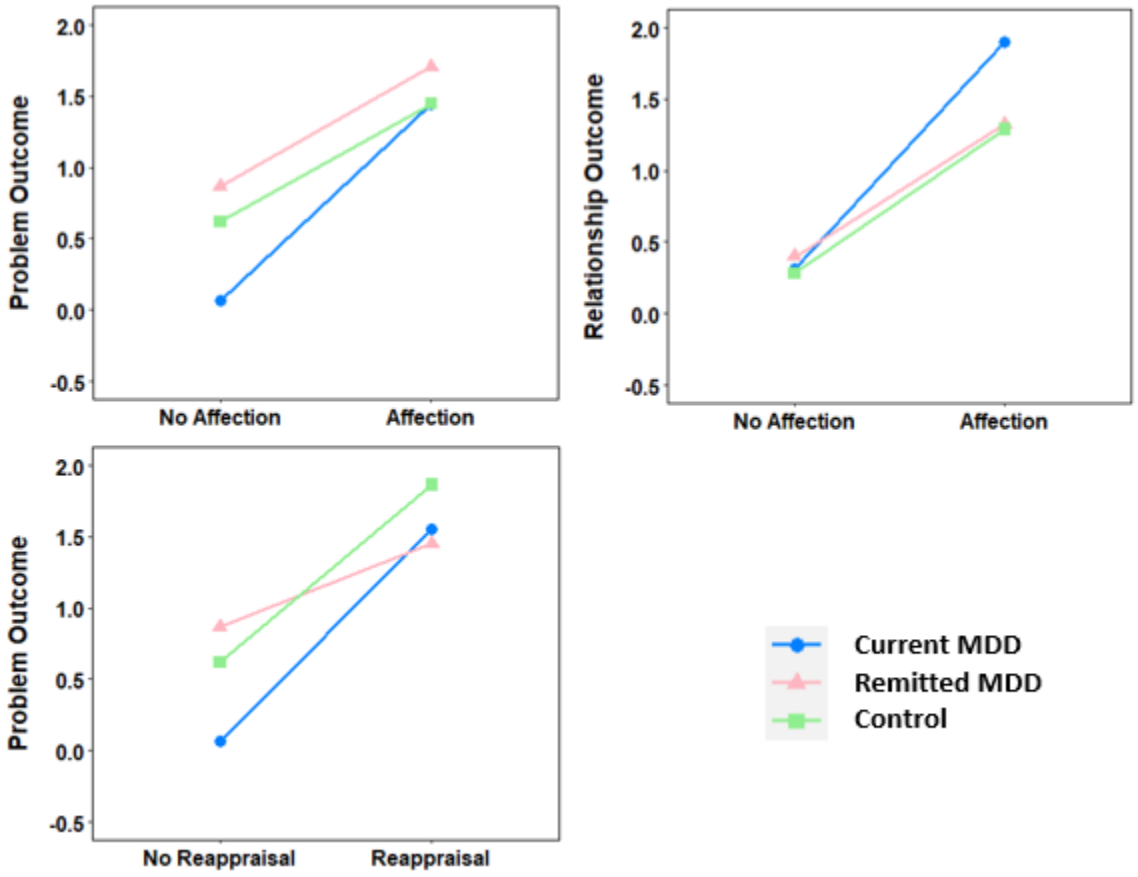
*Probabilities of Endorsing Different Types of Interpersonal Emotion Regulation Goals by Group*




*Note*. Error bars denotes standard errors. Both = seeking both problem-oriented and emotion-oriented goals; emotion-oriented only = seeking emotion-oriented but not problem-oriented goals; problem-oriented only = seeking problem-oriented but not emotion-oriented goals.

**Figure 4**

*Associations of Affection and Reappraisal with Interpersonal Emotion Regulation (IER) Outcomes by Group*




*Note.* The top two figures depict significant group differences in the associations between affection and the two IER outcomes. The bottom left figure depicts significant group differences in the associations between reappraisal and problem outcome.