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Emotional Support and Mental Health: Investigating Interpersonal Emotion Regulation in Chinese and Dutch Contexts

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Chapter 1

General Introduction

"One who loves others is constantly loved by them. One who respects others is constantly

respected by them." - Mencius

Traditionally, psychologists have viewed coping and emotion regulation as processes that unfold within the person, for instance, by emphasizing how they relate to personal control and action readiness (e.g.., Lazarus & Folkman, 1984; Gross, 1998). However, this theoretical approach has been criticized for its lack of attention to social and relational aspects (Butler, 2015; Rimé, 2007; Van Kleef & Côté, 2022). This dissertation adopts the latter, interpersonal approach to coping and emotion regulation, by focusing on the relation between emotional support and mental health.

Emotional support refers to the help that people receive from others in managing emotionally charged situations, stress, and other life challenges. It typically takes the form of others' expressions of care, understanding, or encouragement (Burleson, 2003; Reblin & Uchino, 2008). Over the past four decades, emotional support has attracted considerable research attention, especially in the field of mental health (Prescott et al., 2019; Strine et al., 2008; Reblin & Uchino, 2008). This work has yielded important insights regarding the psychological impacts of emotional support. Nevertheless, many questions remain about the psychology of emotional support. In the present dissertation, my aim is to address some of the most pertinent of these questions.

In this introductory chapter, I review the state of the art in psychological research on emotional support. I start by discussing traditional theories regarding emotional support, with a specific focus on familial emotional support, along with its significance within Chinese culture (Li, 2011), where much of the research for this dissertation was conducted. Next, I turn to theories of interpersonal emotion regulation, which offer a more process-oriented window into the psychology of emotional support (e.g., Butler & Randell, 2013; Rimé, 2009b; Zaki, 2020). I discuss some of the leading approaches to interpersonal emotion regulation, which have been mostly studied in the context of close relationships. Moreover, I investigate how theories of interpersonal emotion regulation may illuminate emotional support processes. Throughout this chapter, I highlight the relevance of emotional support in dealing with major life events, like the corona crisis and cancer,

and severe reactions to stressors such as self-injury and suicidal ideation, because these themes have been important in my dissertation research. Toward the end of this chapter, I identify some of the main gaps in understanding the psychology of emotional support. Finally, I provide an overview of the subsequent chapters of this dissertation.

Theories of Social Support

One of the earliest and most influential theories regarding emotional support was developed as an extension of the traditional stress and coping theory (Lazarus & Folkman, 1984). According to social support theory, emotional support plays a crucial role by providing individuals with love, trust, empathy, and care (Lakey & Cohen, 2000; Langford et al., 1997). Emotional support comes from personal relationships, such as those with family, friends, and significant others, and it helps individuals to cope with stress, boosts their self-esteem, and fosters a sense of belonging and security (Thoits, 2011). Emotional support is particularly vital during times of distress or crisis, when it may provide a buffer against negative emotions (Guo et al., 2020) and enhances psychological resilience (Hu et al., 2022).

According to social support theory, people derive benefits not only from the tangible help they receive but also from their perception of the support available to them (Lakey & Cohen, 2000). More specifically, a person's beliefs in the availability of support (i.e., perceived support) may lead the person to regard their situation as less threatening (Coan et al., 2017), thereby lowering the likelihood that the person will experience negative emotions (Phillips et al., 2021). Consequently, perceived support may serve as a buffer against the adverse effects of stress on both physical and psychological health (see also Coan & Sbarra, 2015, for a social neuroscience model of social support).

The nuclear or extended family is one key source of social support across all stages of development, from early childhood to adolescence (Pinkerton & Dolan, 2007; Gilligan, 2000). As the family is the initial social unit children are part of, the family provides a fundamental sense of security and emotional support, essential for healthy development (Sheeber et al., 1997; Hoagwood

et al., 2010). This support significantly impacts adolescents' mental health, with robust family support systems shown to reduce risks of self-harm and suicidal thoughts among teenagers (Cox & Hetrick, 2017; Fortune et al., 2016). On the other hand, lack of family support or presence of frequent family conflicts heightens vulnerability among adolescents to mental health issues such as depression (Sheeber et al., 1997), anxiety (Dadds & Barrett, 1996), and suicidal ideation (Miller et al., 2015).

Family functioning, which includes the social and structural aspects of the family environment such as interactions and relationships within the family, plays a crucial role in supporting the child's development and providing psychological benefits (Lewandowski et al., 2010). It promotes secure attachment, enhances a sense of belonging, and offers opportunities for socialemotional support, contributing to the well-being of family members (Bögels & Brechman-Toussaint, 2006; Baumeister & Leary, 2017; Eşkisu, 2014). The family process model underscores the importance of collective engagement in daily tasks and the adaptive management of challenges for optimal family functioning, leading to personal growth for both individuals and the family unit (Skinner, 1997; Scabini & Manzi, 2011).

To date, studies examining emotional support from the family have predominantly focused on Western societies (Baldassar, 2007; Uysal Irak et al., 2020). This emphasis aligns with the remainder of modern psychology, which has so far primarily investigated individuals from so-called WEIRD populations—those from Western, educated, industrialized, rich, and democratic societies (Henrich et al., 2010). However, there is a growing body of research on familial emotional support in Asian countries (Yeo et al., 2022), including China (Kwok et al., 2015). Within Chinese culture, the family holds immense significance as a cornerstone of social structure, with traditional philosophies emphasizing familial harmony as a fundamental value (Cheung et al., 2020). Consequently, family support may exert a particularly profound influence on the mental well-being of Chinese family members (Shek, 1998). The first part of this doctoral dissertation addresses the influence of family support on the mental well-being of Chinese adolescents, with a particular focus on their coping

strategies during significant emergencies such as the COVID-19 pandemic (Chapter 2), as well as various psychological challenges including self-injury and suicidal ideation (Chapters 3 and 4, respectively).

Interpersonal Emotion Regulation

Research on emotional support has predominantly centered on its relationship with various psychological outcomes, including its effects on quality of life or depressive symptoms, as evidenced by relevant review papers (Gaspar et al., 2022; Shorey & Chua, 2023). Consequently, the psychological mechanisms underlying the effectiveness of emotional support have received comparatively less attention. Nonetheless, from both scientific and practical perspective, it remains important to understand more precisely how emotional support engenders psychological benefits. One promising avenue for exploring this question can be found in the literature on interpersonal emotion regulation (Niven, 2017; Zaki & Williams, 2013; Rimé, 2007).

Interpersonal emotion regulation involves more or less deliberate efforts to influence either one's own or another individual's emotional experiences through targeted social interactions (Zaki & Williams, 2013). Processes of interpersonal emotion regulation encompass a range of strategies, such as emotional expression (Gross & Cassidy, 2019), cognitive reappraisal (Clark, 2022), and selfdisclosure (Zhang et al., 2021). By studying interpersonal emotion regulation, valuable insights can be gained into the dynamics of social relationships, the mechanisms of emotional support and the pathways whereby emotional support impacts mental health. Given the significance of these issues, interpersonal emotion regulation is the focus of the second part of this dissertation.

A general theoretical framework for interpersonal emotion regulation can be found in the theory of Temporal Interpersonal Emotional Systems (TIES, Butler, 2011). TIES conceptualizes emotion as a dynamic latent state that produces two- or more-person interdependent emotional responses over time (Butler, 2011). Thus, within the TIES model, emotions are not static states but rather dynamic experiences that emerge, evolve, and eventually dissipate over time (Butler, 2011). This dynamic perspective acknowledges that emotions are influenced by both internal factors and interpersonal exchanges, which lead emotions to fluctuate in intensity and quality as people navigate different situations and contexts (Cole et al., 2004).

Other work related to the TIES framework has distinguished between three major patterns of interpersonal emotion regulation (Butler & Randall, 2013). The first major pattern of interpersonal emotion regulation is emotional contagion. Emotional contagion involves the transmission and reciprocation of emotional states between partners (Prochazkova & Kret, 2017). This phenomenon can lead to the amplification or alteration of emotional experiences for both individuals involved (Elfenbein, 2014). When one partner experiences an emotion, it can spread to the other partner, influencing their emotional state (Hatfield et al., 2011). This process operates in a morphogenic manner, meaning that emotional responses (Saxbe & Repetti 2010). This mechanism also highlights the interconnectedness of emotional states within the family system, underscoring the pivotal role of family functioning in either facilitating or mitigating the spread of emotions among its members. Effective family functioning can harness emotional contagion positively, promoting empathy and understanding, thereby influencing the overall emotional climate of the family (Elfenbein, 2014; Hatfield et al., 2011; Saxbe & Repetti 2010).

Distress buffering, a second major interpersonal emotion regulation pattern, aims to reduce emotional distress (Uchino, 2004) and may play a role in mitigating contagion of negative emotions. It's closely tied to traditional emotional support. This mechanism involves receiving personal attention and soothing remarks from others, which can help alleviate stress and foster feelings of safety and security (Jakubiak & Feeney, 2016). Indeed, merely being in the presents of supportive others may already reduce physiological and psychological responses to stressors (see the Social Baseline Theory, Coan & Maresh, 2014).

Finally, the third major pattern of interpersonal emotion regulation is emotional coregulation (Butler & Randall, 2013). Coregulation is a combination of contagion and distress buffering. It

involves bidirectional emotional interdependency between partners aimed at maintaining emotional and physiological balance. During emotional coregulation, relationship partners display oscillating patterns of emotional influence, in which partners mutually shape each other's emotional states in a manner that promotes stability and well-being (Butler & Randall, 2013). Unlike contagion and stress buffering, which operate either morphogenically or unidirectionally, coregulation integrates both processes to create a mutually supportive emotional environment within close relationships (Butler & Randall, 2013). In essence, coregulation represents a collaborative effort between partners to establish emotional harmony and balance, drawing upon elements of both contagion and stress buffering to promote overall relational health and well-being.

Although TIES (Butler, 2011) provides an important overarching framework for interpersonal emotion regulation, the theory remains rather abstract and somewhat detached from specific interpersonal behaviors. It is therefore useful to have mid-level theories, between the abstract TIES model and specific interpersonal behaviors, that address interpersonal dynamics in a more concrete sense. In what follows, I consider three such mid-level theories that are prominent in the literature: 1) Dyadic coping theory; 2) Emotional sharing theory; and 3) Interpersonal synchrony theory. These theories can be situated on a time scale from days or longer (dyadic coping), to minutes or longer (emotional sharing) and seconds or longer (interpersonal synchrony).

Dyadic Coping Approaches

The first set of mid-level theories of interpersonal emotion regulation has focused on dyadic coping (for an overview, see Falconier & Kuhn, 2019). Although strictly speaking, coping is a broader process than emotion regulation, there is considerable overlap between both processes, so that it often makes sense to treat coping and emotion regulation in a parallel manner (Compas et al., 2017). According to dyadic coping researchers, stressors often affect both partners of a close relationship, leading to a joint coping response that involves both partners (Berg & Upchurch, 2007; Falconier et al., 2015; Falconier & Kuhn, 2019; Lyons, 1998). Dyadic coping researchers have systematically examined the nature of such joint coping efforts, including the alignment of individual coping

strategies and relational approaches such as mutual responsiveness (Coyne & Smith, 1991; Kayser et al., 2007; Revenson, 1994).

By comparing various dyadic coping models, Falconier and Kuhn (2019) provided a comprehensive picture of the various processes by which couples collectively manage stress. They found that most dyadic coping models have been applied to medical stressors, especially cancer treatment (Traa et al., 2015). Dyadic coping revolves around several core principles aimed at managing stress within relationships (Falconier & Kuhn, 2019). This includes 1) evaluating stressors together and shaping coping responses collaboratively, 2) effective communication plays a pivotal role, facilitating understanding and mutual support during challenging times, 3) both individuals in the relationship are encouraged to adopt coping strategies suited to their own needs and circumstances, while also considering joint approaches where applicable, 4) recognizing the range of coping strategies, acknowledging both positive and negative ones without judgment and 5) relationship and contextual factors are taken into account, as they can significantly influence how stress is experienced and managed within the relationship.

The dyadic coping framework emphasizes the importance of emotional support in couple's coping with stress (Randall et al., 2016). Emotional support is a key dimension of the dyadic coping process, involving emotional communication and supportive behaviors between spouses (Levesque et al., 2014). In the dyadic coping model, emotional support can be manifested through positive communication, emotional resonance, and supportive actions (Landis et al., 2013). Emotional support helps to strengthen the emotional connection between spouses, increase emotional satisfaction with each other, and provide emotional support and comfort for coping with stress (Ledermann et al., 2010; Vedes et al., 2016). These positive relational outcomes contribute to improving mental health and promoting positive psychological well-being. Indeed, in a systematic review on the association of interpersonal emotion regulation and mental health in cancer survivors, conducted as part of this dissertation (Chapter 5), dyadic coping emerged as one of the research fields shedding light on interpersonal emotion regulation in couples with cancer. In our experimental

study on interpersonal emotion regulation in romantic partners (Chapter 6), dyadic coping is also investigated.

Emotional Sharing Theory

A second set of mid-level theories of interpersonal emotion regulation has highlighted the significance of communicative processes, including emotional expression (Pennebaker et al., 1988; Lepore & Revenson, 2007) and emotional sharing (Rimé, 2009). For conciseness, I refer to these perspectives jointly as 'emotional sharing theory'.

Whenever people experience an emotional episode, they often seek to share their emotional reactions with others. Rimé (2009) has proposed two modes of emotional sharing, which both seem highly relevant to emotional support. The first and primary mode of emotional sharing is the socio-affective mode, which focuses on fulfilling the narrator's socio-affective needs (Bowlby, 1969). In this mode, people seek responses such as help, support, comfort, consolation, legitimization, attention, bonding, and empathy through social sharing (Rimé, 2009). These responses serve to validate and address the emotional experience, providing a sense of connection and support (Stroebe & Stroebe, 1996). The second mode of emotional sharing is the cognitive mode, in which the emotional sharing prompts the emoting person to engage in cognitive work to develop a new understanding of the emotional events. The cognitive mode may include various kinds of cognitive processes such as the abandonment of frustrated goals, reorganization of hierarchy of motives, adjustment of models and schemas, recreation of meaning, and reframing or reappraisal of the experience (Rimé, 2009).

During emotional sharing, people may not always be capable of resolving an emotionally distressing situation. When the latter occurs, emotional sharing may end up promoting corumination, characterized by prolonged focus on problems and negative emotions in interactions. Co-rumination has mixed psychological effects, fostering positive friendship quality and social support but also correlating with depressive symptoms, likely due to its ruminative nature and lack of cognitive support (Bastin et al., 2014; Stone et al., 2019). The experimental study on dyadic coping, emotional sharing and interpersonal synchrony described in Chapter 6 was designed to investigate how co-rumination during emotional sharing affects interpersonal synchrony in romantic partners.

Interpersonal Synchrony Theory

A third and last set of mid-level theories of interpersonal emotion regulation has centered on interpersonal synchrony (Koole & Tschacher, 2016; Palumbo et al., 2017; Wood et al., 2021). Coordinated social interaction involves interconnected and synchronized processes occurring across different time frames (Mühlhoff, 2015). Synchrony refers to the dynamic and mutually responsive temporal interaction of emotional responses between individuals (Wood et al., 2021). Synchronization processes may conform to a mathematical model of oscillators, displaying periodic and predictable rhythms, or they may exhibit other kinds of patterns (Wood et al., 2021).

During interactions, people tend to spontaneously synchronize their neural, perceptual, affective, physiological, and behavioral responses (Koole & Tschacher, 2016; Repp & Su, 2013; Semin & Cacioppo, 2008). Movement synchrony, one of the most widely studied modalities in social interaction research, plays a crucial role in facilitating interpersonal coordination (Miles et al., 2017) and fostering a sense of unity among people (Au & Lo, 2020). Synchronous clapping during applause and coordinated walking side by side demonstrate movement synchrony, a widely observed phenomenon in various social contexts (van Ulzen et al., 2008).

Synchrony is a consistent phenomenon from early childhood (Feldman, 2007) to later developmental stages and has garnered significant interest, particularly within romantic relationships (Hove & Risen, 2009; Miles et al., 2009). Levenson and Gottman (1983) conducted seminal studies investigating sympathetic nervous system (SNS) synchrony in married couples during various social interaction tasks. With ongoing advancements in measurement and analysis techniques (Moulder et al., 2018), research on the forms and functions of interpersonal synchrony has rapidly expanded within psychology. A systematic review of 61 studies investigating interpersonal autonomic physiology revealed that physiological synchrony as a prevalent social phenomenon, occurring simultaneously with observable behaviors and linked to various psychosocial factors (Palumbo et al., 2017). Synchrony not only fosters feelings of similarity and closeness, thereby strengthening social bonds, but also promotes more efficient information processing (Wood et al., 2021).

While interpersonal synchrony has garnered attention across different disciplines, including movement science, psychophysiology, linguistics, social psychology, clinical psychology, and cognitive psychology, research findings and paradigms have often been developed in relative isolation from one another (Koole & Tschacher, 2016). The In-Sync model proposed by Koole and Tschacher (2016) considers different time scales (phasic timescale (milliseconds to about 10 seconds), tonic timescale (10 seconds to about an hour), and chronic timescale (several weeks to years) to link interpersonal synchronization and emotional sharing integration with interpersonal emotion regulation, while also proposing a promising direction for integrating the three theories. In the experimental study described in Chapter 6, we integrated these timescales by investigating the effect on co-rumination in social sharing not only on physiological synchrony (phasic time scale), but also on mood change (tonic timescale) and by relating these outcomes to dyadic coping and relationship quality (chronic time scale).

Gaps in Scientific Understanding

As we have seen, researchers have made significant advances in the investigation of emotional support and interpersonal emotion regulation. Nonetheless, several gaps remain in our scientific comprehension that require further theoretical and empirical attention.

1. Cross-cultural applicability: To date, most research has investigated interpersonal emotion regulation as a dyadic process (Bodenmann, 2005; Dixon-Gordon et al., 2015) that occurs within parent-child interactions or couples. Dyadic exchanges hold particular relevance in Western contexts where traditional social structures such as families, churches, and national affiliations have diminished in significance. However, outside of the West, emotional regulation from extra-dyadic relationships, especially the family system, remains highly significant and possibly even carries greater importance that ever before (Jankowiak, 2019). In traditional Chinese cultural paradigms, individuals are not perceived as independent entities but rather as integral parts of a familial system where the family serves as the fundamental unit. Here, family identity often holds equal, if not greater, importance compared to individual identity (Chen & Fan, 2010; Wright, 1962). Investigating emotional support within the family context may hold greater practical relevance for promoting mental health among Chinese people. Given that China's population makes up a quarter of the world's population (Patierno et al., 2019), it seems important to learn more about emotional support and interpersonal emotion regulation among Chinese people.

2. Clinical Relevance: The relevance of emotional support for mental health outcomes is increasingly acknowledged (Jeong et al., 2013). Yet, little is known about the mechanisms by which emotional support affects mental health disorders like depression, anxiety, and self-injury. Furthermore, there is a need for further research on how different types and sources of emotional support may have varying impacts on mental health outcomes across diverse populations. Additionally, emotional support is recognized as crucial for coping with the challenges of medical illnesses. Cancer survivors and individuals during the COVID-19 pandemic face unique stressors that significantly impact their mental health and well-being (Telles et al., 2023). For cancer survivors, the main stressors include coping with the physical and emotional aftermath of cancer and its treatments, fears of recurrence, changes in body image and self-esteem, and navigating the healthcare system (Costanzo et al., 2012). The COVID-19 pandemic introduced additional stressors such as fear of infection, especially for those with compromised immune systems, increased isolation due to social distancing measures, and disruptions to cancer care and support services (Massicotte et al., 2021). Thus, more work is needed to understand how emotional support influences coping strategies and health outcomes in people facing various medical challenges, such as cancer and the COVID-19 pandemic.

3. *Perspective of the Regulator:* A substantial body of research has predominantly focused on exploring the impact of perceived emotional support by the recipient on their mental health.

However, much less is known about the perspective of those providing emotional support, that is, caregivers or interpersonal emotion regulators. Over the long term, the well-being of caregivers significantly influences caregiving behaviors and through that the psychological development of the recipients of emotional support. A qualitative study involving 20 caregivers of COVID-19 patients in China revealed that factors such as family understanding, unit incentives, and policy support make important contributions to nurses' ability to provide care (Sun et al., 2020). Similarly, in the broader context of emotional support provision, such as in psychosocial oncology, it is helpful to recognize the significant role that caregivers play in providing emotional support to survivors (Steiner et al., 2008; Namkoong et al., 2013).

Caregivers often encounter significant challenges and experiences that compromise their ability to provide effective emotional support (Blum & Sherman, 2010). For instance, caregivers may fight with emotional fatigue from the constant emotional strain of supporting others (Lynch & Lobo, 2012). Such fatigue can lead to burnout and affect the quality of support that caregivers offer. However, the existing literature often overlooks the experiences and challenges faced by caregivers in providing emotional support in various contexts beyond cancer care. There is a lack of in-depth exploration into the psychological and emotional impacts of caregiving, as well as the coping strategies caregivers employ to address these challenges.

4. Theoretical Integration: In research on emotional support and interpersonal emotion regulation, there is a diversity of theoretical frameworks, including social support, coregulation, dyadic coping, emotional sharing, and synchrony. Despite their focus on similar topics and themes, these theories have largely been developed in isolation from one another, with limited interaction or integration. Although having multiple perspectives is enriching, the field would be able to achieve more progress if steps were made toward an integrative understanding of emotional support and interpersonal emotion regulation.

One way to integrate the various theories may be by relating them to different timescales (e.g., Koole & Tschacher, 2016, linking coregulation and synchrony theories), drawing upon Varela's (2005) psychological dimension of time. This framework posits that psychological phenomena unfold across multiple timescales, ranging from milliseconds to years (Varela, 2005). By relating each theory to a specific timescale or range of timescales, researchers can better understand how these theories intersect and influence one another over time (see also Chapter 6).

Overview of the Present Dissertation

In the present dissertation, I conducted a comprehensive exploration of the role of emotional support in mental health, ranging from interpersonal emotion regulation processes among families from the Eastern culture of China to couples in the Western culture of the Netherlands. This dissertation is divided into three main parts.

Part 1 of this dissertation is dedicated to three questionnaire-based studies investigating the impact of support from the family on mental health across diverse contextual scenarios. These studies were designed to provide a deeper understanding of how emotional support from family members influences mental health outcomes in various situations. Importantly, this first section of the dissertation draws its samples primarily from China, allowing for a cross-cultural broadening of the knowledge base on emotional support.

Chapter 2: During the 2019-2023 COVID-19 pandemic, global public health was severely impacted, leading to a surge in mental health issues, including heightened anxiety and depression worldwide (Arora & Grey, 2020; Torales et al., 2020). This crisis posed unique challenges, inducing widespread fears and disruptions in daily life, particularly affecting young adults, who exhibited higher susceptibility to psychological problems (Shanahan et al., 2022). The study described in Chapter 2 investigated the association between family functioning and mental health among Chinese college students during home quarantine. This study was conducted in Changsha, near the pandemic epicenter (Wuhan) and during China's Spring Festival in 2020. We hypothesized that better family functioning would correlate with improved mental health outcomes. Additionally, latent profile analysis was employed to explore diverse mental health clusters within the sample, which might need differential mental health care support. *Chapter 3:* Self-injury, also known as non-suicidal self-injury (NSSI), is a kind of intentional self-injury such as cutting, scraping, impacting, burning, and stabbing (Lloyd-Richardson et al., 2007). Non-suicidal self-injury is an important predictor of suicidal ideation in adolescents (Hawton et al., 2012). Previous research primarily focused on the child's perception of the parent-child relationship, often overlooking the perspective of the parent. To fill this void in the literature, I conducted a study to examine the effects of the parent-child relationship on adolescent self-injurious behaviors, incorporating both the parents' and children's viewpoints. This study also investigated child's experience of perceived stress and meaning in life as potential mediators and moderators of the relation between parent-child relationship and non-suicidal self-injury.

Chapter 4: Suicidal ideation involves the contemplation and formulation of thoughts regarding self-harm without the actual initiation of any concrete actions (Klonsky et al., 2016). It is notably prevalent among adolescents, with detection rates ranging from 19.3% to 39.4% in various countries including the United States and Germany (Becker & Correll, 2020), and from 11.7% to 23.6% over the past two decades in China (Zhang et al., 2019). Building on the foregoing studies, we carried out an extensive survey, involving more than 4,500 adolescents, to examine the ways in which family functioning impacts thoughts of suicidal ideation among adolescents. The study also explored how defeat and meaning in life serve as mediating and moderating factors in this context.

Part 2 of the dissertation has a focus on interpersonal emotion regulation among couples in the Netherlands and other Western populations. This section is composed of three chapters featuring, respectively, a systematic review, an experimental protocol, and a brief theoretical article.

Chapter 5: Cancer is not only physically harmful but also causes great psychological stress to survivors. Interpersonal emotion regulation has a significant impact on cancer survivors' mental health. Considering the many types of interpersonal emotion regulation, such as emotional support, emotional expression, and showing affection, we conducted a systematic review to investigate the effects of different types of interpersonal emotion regulation strategies on the psychological health of cancer survivors. Despite the growing body of research on interpersonal emotion regulation

among cancer survivors, systematic reviews integrating this evidence within the framework of interpersonal emotion regulation are notably lacking. Thus, the primary aim of our review was to systematically identify, evaluate, and synthesize evidence regarding the role of interpersonal emotion regulation in mental health of cancer survivors.

Chapter 6: Whereas the previous chapters have examined the connection between interpersonal emotion regulation and mental health through questionnaires and a review of the literature, this chapter takes an experimental approach. Specifically, Chapter 6 describes a laboratory experiment aimed at investigating the influence of emotional support from romantic partners on processes unfolding across three distinct timescales: 1) physiological movement and heart rate synchrony (phasic (i.e. up to 10 seconds)), 2) mood and appraisal changes (tonic (i.e. 10 seconds to 1 hour)), and 3) dyadic coping and relationship quality (chronic (i.e. up to years)). Through an emotional sharing task, emphasizing either co-rumination or natural sharing, the effects of these types of emotional sharing are examined. This study seeks empirical support for integrating various theories related to emotional support that can be situated on these various time scales.

Chapter 7: Existing research on interpersonal emotion regulation in cancer survivors has primarily concentrated on altruistic motivations and hedonistically oriented strategies aimed at enhancing survivor well-being. Chapter 7 shifts the focus towards possible counter-hedonic strategies and caregiver-centered motivations, such as invoking anxiety in the survivor to promote medical adherence or empathy fatigue. Specifically, the chapter provides a novel theoretical model of the complexities of caregiver-survivor interactions and their potential impacts on mental health outcomes. This analysis suggests that caregivers, despite altruistic intentions, may also engage in counter-hedonic and more self-serving interpersonal emotion regulation strategies.

Finally, Part 3 of this dissertation brings together the significant findings and observations from earlier chapters in a concluding chapter. It starts with a recap of each chapter. The discussion then extends to address the four scientific gaps outlined in the introductory chapter, specifically exploring cross-cultural applicability, clinical relevance, the viewpoints of the regulators of emotional

support, and the synthesis of various theoretical models. The chapter concludes by reflecting on the limitations encountered in these studies, recognizing the collective effort involved in this research, and suggesting potential directions for future investigations.

Final Remark

This dissertation investigates the intricate relationship between emotional support and mental health, highlighting the critical role of family and partner support in navigating life's challenges. From the ongoing struggles of cancer survivors to the widespread anxieties sparked by the COVID-19 pandemic, these research scenarios underscore the necessity of understanding and providing effective emotional support. Moreover, by highlighting the collective resilience of Chinese families with the intimate connections of Dutch couples, this work showcases the universal value and impact of emotional support across different cultures. It is my hope that this will not only foster further academic discourse but will also ignite public interest and understanding of the role of emotional support in promoting mental health and enhancing human well-being.

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Chapter 2

Chinese College Students' Mental Health During the First Three Months of the COVID-19 Pandemic: The Protective Role of Family Functioning

Zeng, Z., Holtmaat, K., Verdonck-de Leeuw, I. M., & Koole, S. L. (2024). Chinese college students' mental health during the first three months of the COVID-19 pandemic: the protective role of family functioning. *Frontiers in Public Health*, *12*, 1383399. https://doi.org/10.3389/fpubh.2024.1383399

Abstract

Background: Various psychological theories suggest that a supportive family environment protects the mental health of young adults during stressful life events. However, evidence is limited regarding the protective role of family support during a major public health crisis.

Objective: To examine the role of family functioning on mental health among Chinese college students during first stage of the COVID-19 pandemic.

Methods: Between January-March 2020, 1,555 college students (44% female; on average 19 years old) from five Chinese universities participated. Participants rated their family functioning on the Family APGAR Index and their mental health on the Psychological Questionnaires for Emergent Events of Public Health, measuring depression, neurasthenia, fear, obsessive-anxiety and hypochondriasis.

Results: Better family functioning was associated with having fewer psychological symptoms. In addition, we identified three mental health profiles related to the severity across the psychological symptoms: Low-level, medium-level and high-level symptom clusters. Latent profile analysis showed that as family function improved, students were respectively 16% to 24% more likely to be in the low-level symptom group, compared to being in the medium symptom group or the high-level symptom group.

Conclusion: These results support the notion that family support may act as a psychological buffer for young adults during a large-scale public health crisis like the COVID-19 pandemic.

The COVID-19 pandemic was a major public health emergency from 2019 to 2023, not only because of the virus' effects on physical health, but also because the psychological threat of the pandemic and its accompanying public health measures invoked high levels of chronic life stress. This, in turn, led to global increases in mental health problems, including increased prevalence of anxiety and depression disorders (Arora & Grey, 2020; Torales et al., 2020). Especially during the early stages of the pandemic, the eyes of the world were directed toward China, that the pandemic had started there. Given China's large population and the fact that China was the epicenter of the COVID-19 pandemic, understanding its public health situation at this moment in time is of particular significance. The purpose of the present study was to investigate Chinese college students' mental health during the first three months of the pandemic in China (January-March 2020) and to address the potential protective role of family functioning therein.

Life during the COVID-19 pandemic presented unique challenges for young adults worldwide, including Chinese college students. There were widespread concerns regarding the risk of contracting the virus and its potential impact on physical health (Chakraborty, 2020; Chung et al., 2023; Koole & Rothermund, 2022; Jardon & Choi, 2024). Additionally, daily routines were significantly disrupted by extensive public health measures aimed at curbing the spread of the virus, such as mask-wearing, social distancing, and the closure of public spaces like shops, schools, and restaurants. Adjusting to these changes was particularly stressful for the general population and young adults alike (Liu et al., 2020; Hawes et al., 2022). Young adults typically face elevated risks of psychological issues due to their lower levels of psychological maturity and distress tolerance (McKetta & Keyes, 2019). Furthermore, young adulthood represents a crucial developmental period characterized by rapid shifts in personality functioning (Bleidorn et al., 2022). Persistent challenges in coping with stress during young adulthood may therefore lead to enduring vulnerabilities to mental and physical health conditions throughout the lifespan (Fegert et al., 2020; Gruber et al., 2021). Several strands of evidence highlight the heightened coping challenges faced by young adults during the COVID-19 pandemic. In a systematic review and meta-analysis involving 13,247 nursing students, Mulyadi et al. (2021) found elevated rates of mental health issues, including depression (52%), fear (41%), anxiety (32%), stress (30%), and sleep disorders (27%) amidst the pandemic. Similarly, an international study encompassing over 134,000 college students across 28 countries revealed various COVID-19-related concerns among students, such as fear of virus transmission within their social circles, increased loneliness, reduced motivation, disrupted sleep patterns, and symptoms of anxiety and depression (Tasso et al., 2021). Furthermore, a survey examining the mental health status of 3,881 college students during the initial three months of the pandemic in Guangdong, China, documented incidence rates of clinical depression and anxiety at 21% and 26%, respectively (Chang, 2020).

Despite the pervasive challenges posed by the COVID-19 pandemic, it appears that certain young adults were adapting effectively to their new life situation. One key resource in this regard may be the social support network of young adults, particularly their family. Family functioning encompasses the social and structural aspects of the overall family environment, including interactions and relationships within the family (Lewandowski et al., 2010). Effective family functioning provides various psychological benefits, such as promoting secure attachment (Bögels & Brechman-Toussaint, 2006), enhancing a sense of belonging (Baumeister & Leary, 2017), and offering ample opportunities for social-emotional support (Eşkisu, 2014). Moreover, within Chinese culture, the family holds paramount importance as one of the foundational social institutions, with traditional Chinese philosophy emphasizing harmony within the family as a fundamental virtue (Cheung et al., 2020). Consequently, family functioning may exert a more pronounced influence on the mental health of Chinese adolescents (Shek, 1998).

In line with this perspective, a young adults' healthy development is closely linked to strong family functioning (Paavilainen et al., 2006; Skinner & Steinhauer, 2000; Cheng et al., 2017). Children

raised in well-functioning families are less prone to mental health issues compared to those from dysfunctional family environments (Wiegand-Grefe et al., 2019). Moreover, research involving 988 adolescents (aged 11-17 years) in Monteria public schools found that better family functioning was associated with improved mental and physical health outcomes (Lema-Gómez et al., 2021). Finally, a meta-analysis of 8,646 children revealed a negative association (r = -.22) between family function and post-traumatic stress disorder (Ye et al., 2023), suggesting that family function can protect children's mental health against excessive stress.

In view of the aforementioned findings, family functioning may have a protective role when people are dealing with major public health threats such as the COVID-19 pandemic. Generally speaking, in the aftermath of natural or human-made disasters, children tend to display better mental health when they are in a more (versus less) supportive family environment (Cobham et al., 2016). More directly to the point, research among a sample of 135 Latinx adolescents found that better family resilience was associated with improved mental and physical health outcomes during the COVID-19 pandemic (Stein et al., 2024). A study on Puerto Rican adolescents in the U.S. also found that family financial stress had an impact on COVID-19 pandemic related mental health (Capielo Rosario et al., 2024). Finally, a study of 1,254 Chinese university students in the Shanghai region (an 8-hour drive to Wuhan, where the pandemic started) observed that family cohesion was negatively associated with adverse stress consequences during the third month of the COVID-19 pandemic (Y. Zeng et al., 2021).

In the present study, we sought to gain more insight into the potentially protective role of family functioning for Chinese young adults during the initial stages of the COVID-19 pandemic. Specifically, we investigated family function among a sample of more than 1,500 Chinese university students: 1) During the first three months of the COVID-19 pandemic;2) In a Chinese region (Hunan) close (i.e., a 2-hour drive) to the region from where COVID-19 first broke out (Wuhan); and 3) Including a comprehensive and well-validated measure of mental health as our primary outcome variables. The present study thus goes beyond prior published studies (Yang et al., 2021; Y. Zeng et al., 2021) that were conducted somewhat later in time, in regions farther removed from the epicenter of the pandemic, and did not include direct measures of mental health. In line with prior research, we hypothesized that better (rather than worse) family functioning would be positively associated with mental health. A second, more exploratory, objective of the present study was to use latent profile analysis within a regression mixture model to identify mental health subgroups within the sample of Chinese college students (Williams & Kibowski, 2016).

Method

Design, Participants and Procedure

A cross-sectional study was conducted among students attending five different universities in China. These universities were randomly selected from Hunan Province (central China) and were all higher research universities. Participants could be included if they were (1) current university students, and (2) native Chinese speakers. All measurements were carried out with written informed consent from the universities and participants. The questionnaire was distributed to the students electronically, and all responses were anonymized to ensure confidentiality. During the COVID-19 pandemic the Hunan Agricultural University ethics committee conducted a fast-track ethical approval of studies related to the pandemic, including the present study. The study was conducted consistent with the principles of the Helsinki declaration regarding research with human subjects (Goodyear et al., 2007).

We used G-Power 3.1 software to identify the required sample size. To achieve a statistical power of 80%, a small effect size (0.01) and an alpha at 0.05, the required sample size was 1,199.

Instruments

Sociodemographic Questionnaire

We included sociodemographic variables that were found to be associated with mental health among college students in prior literature (Bitsko et al., 2016). We assessed sex, whether the participant was an only child, family location and monthly family income. Family location was categorized as *major city, medium city, county town* and *countryside*. Monthly family income was categorized from *below* \notin 400 to over \notin 2,500.

Mental Health

To evaluate participants' mental health, we employed the original Psychological Questionnaire for Emergent Events of Public Health (PQEEPH). Originally developed during the 2003 SARS epidemic (Editorial Board of Chinese Behavioral Medicine, 2007), this questionnaire has demonstrated strong reliability and validity in previous studies and is well-suited for assessing individuals' psychological responses to sudden public health crises (Q. Zhou et al., 2021; R. Zhou et al., 2021). The PQEEPH comprises five subscales: depression (e.g., less energy than before; six items), neurasthenia (e.g., very concerned about any symptoms you may have; five items), fear (e.g., fe ar that you and your family may be infected; six items), obsessive-anxiety (e.g., unable to control excessive fear and nervousness; five items), and hypochondriasis (e.g., symptoms associated with a sudden public health event cause you to that suspect you that have been infected, two items). Responses to items were scored on a four-point scale ranging from 0 ("never") to 3 ("always"). Subscale scores were calculated by summing relevant item scores and dividing by the number of items. In this study, the aggregate PQEEPH index exhibited high internal consistency, with a Cronbach's α of 0.91. For individual subscales, Cronbach's α values ranged from 0.67 to 0.87, indicating satisfactory reliability for scientific research purposes.

Family Functioning

The Family APGAR index, initially developed by Smilkstein (1978), underwent adaptation and translation into Chinese by Zhang (2005). Subsequent research demonstrated the scale's robust reliability and validity among Chinese college students (Huang et al., 2023; Li et al., 2021).

Comprising five items, the scale aims to assess various facets of family functioning, encompassing adaptation, partnership, growth, affectation, and resolve. Responses are recorded on a three-point scale ranging from 0 ("never") to 2 ("always"). In this study, the Cronbach's α coefficient for the Family APGAR index was calculated to be 0.90, indicating high internal consistency.

Statistical Analyses

Due to the reliance on self-reported data, there exists a potential concern regarding common method bias. To address this issue, we assessed common method bias using Harman's one-way method and confirmatory factor analysis, as recommended by Jordan and Troth (2020). Furthermore, we examined the association between family functioning and mental health using Pearson correlation coefficients.

Latent profile analysis identifies cohesive latent classes or subgroups within heterogeneous data samples. To evaluate the adequacy of the latent profile model, various statistical metrics were assessed. Firstly, entropy values were scrutinized, with a threshold of ≥0.80 indicating a 90% accuracy in assigning individuals to their respective clusters, while values < 0.65 suggested elevated classification errors (Lubke & Muthen, 2007). Secondly, the Bayesian Information Criterion (BIC) was utilized, with lower values indicating improved model fit as it promotes parsimony (Nylund et al., 2007). Akaike's Information Criterion (AIC) was also examined to support the chosen model. Additionally, the significance of the Lo-Mendeel-Rubin (LMR) and Bootstrap-Lo-Mendeel-Rubin (BLMR) values aided in determining the optimal number of latent classes, with these indices indicating that a solution with 'k' clusters significantly outperforms a 'k - 1' cluster model (Muthén & Muthén, 2010). Following the selection of the best-fitting model, an ANOVA was employed to assess potential differences among the mental health clusters identified in this model. In the final step of the regression mixture model, family functioning was examined in relation to the identified mental health clusters. Specifically, a logistic mixture model regression analysis was conducted to determine whether family functioning predicts membership in the clusters.

Statistical analyses were conducted using SPSS Version 27.0 (IBM, USA) and SPSS Amos

software Version 26.0 (IBM, USA). Latent Profile Analysis was performed using Mplus 7.0. A

significance level of p < .05 was utilized for all analyses.

Results

Study Population

In total, questionnaires of 1,555 students were collected. Sociodemographic characteristics of the study population are provided in Table 1.

Table 1

Sociodemographic Characteristics of Sample (N=1,555)

Characteristic	Category	Ν	%		
Age (M, SD)	18.98 (1.28) years old				
Gender	Male	870	55.9		
	Female	685	44.1		
Whether only child	Only child	497	32.0		
	Non-only child	1058	68.0		
Family location	Major city	122	7.8		
	Medium city	301	19.4		
	County town	485	31.2		
	Countryside	647	41.6		
Monthly family income	Below 3,000 yuan	316	20.6		
	3,000 - 5,000 yuan	494	31.8		
	5,000 - 8,000 yuan	345	22.2		
	8,000 - 10,000 yuan	211	13.6		
	10,000 - 15,000 yuan	113	7.3		
	15,000 - 2,000 yuan	40	2.6		
	Over 20,000 yuan	36	2.3		

Common Method Deviation Test

The principal component analysis revealed that six factors had eigenvalues exceeding 1, with the variance explained by the first factor amounting to 31.64%, falling below the critical index of 40%. Furthermore, the results of the confirmatory factor analysis indicated a poor model fit, with χ^2 = 9995.82, *df* = 464, CFI = 0.59, TLI = 0.57, RMSEA = 0.12, and SRMR = 0.10. Overall, these findings suggest that there was no significant common method bias present in the data.

Descriptive Statistics and Correlation Analysis

Table 2 displays the means, standard deviations, and intercorrelations among all study variables. Notably, family functioning exhibited negative correlations with each subscale of mental health problems.

Table 2

Variables	М	SD	1	2	3	4	5
1 Depression	1.39	0.50					
2 Neurasthenia	1.40	0.47	0.64**				
3 Fear	1.81	0.51	0.45**	0.59**			
4 Obsessive-Anxiety	1.15	0.31	0.63**	0.66**	0.41**		
5 Hypochondriasis	1.22	0.38	0.41**	0.60**	0.47**	0.65**	
6 Family functioning	5.86	2.50	-0.19**	-0.22**	-0.10**	-0.16**	-0.12**

Intercorrelations Among Study Variables

Note: **p* < 0.05, ***p* < 0.01, ****p* < 0.001, same below.

Effects of Sociodemographic Variables and Family Functioning on College Students' Mental Health

Table 3 presents the results of the regression analyses examining the influence of sociodemographic variables and family functioning on college students' mental health. The findings

reveal that family functioning significantly impacts students' mental health. Additionally, sex and family location are associated with fear, obsessive-anxiety, and hypochondriasis. Furthermore, monthly family income demonstrates an effect on all mental health symptoms.

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Table 3

Variables	Depression		Neurasthenia		Fear		Obsessive-Anxiety		hypochondriasis	
	β	t	β	t	β	t	β	t	β	t
Sex	-0.06	-1.25	0.05	1.17	0.33	6.83***	-0.16	-4.02***	-0.10	-2.26*
Only child	0.02	0.47	0.03	0.59	0.13	2.35*	-0.01	-0.24	0.11	2.08
Family location	-0.05	-1.93	-0.05	-1.73	-0.07	-2.65**	-0.04	-1.80	-0.06	-2.28*
Monthly family income	-0.04	-2.66**	-0.04	-2.66**	-0.03	-2.01*	-0.05	-3.26**	-0.04	-2.51*
family functioning	-0.18	-7.69***	-0.20	-8.77***	-0.10	-4.19***	-0.13	-6.21***	-0.10	-4.42***
R ²	0.04***		0.05***		0.05***		0.04***		0.02***	
F	14.02***		68.95***		16.39***		13.53***		7.29***	

Linear Regression Analysis of Sociodemographic Variables and Family Functioning on College Students' Mental Health

Note. Sex 1 indicates male, 2 indicates female. Only child 1 indicates only child 2 indicates not-only child. Family location 1 indicates major city, 2 indicates medium city, 3 indicates county town, 4 indicates countryside. Monthly family income 1 indicates below 3,000 yuan, 2 indicates 3,000 - 5,000 yuan, 3 indicates 5,000 - 8,000 yuan, 4 indicates 8,000 - 10,000 yuan, 5 indicates 10,000 - 15,000 yuan, 6 indicates 15,000 - 2,000 yuan, 7 indicates over 20,000 yuan.
Mental Health During the First Three Month of the Pandemic: A Latent Profile Analysis

Next, latent profile analysis was employed to explore distinct clusters in college students' mental health symptoms, as depicted in Table 4. Entropy values for all clusters exceeded 0.8, indicating high accuracy in assigning individuals to their respective clusters. Significance was observed in the results of the LMR and BLMR tests for Models 2, 3, and 4. Notably, Models 3 and 4 exhibited lower adjusted Bayesian Information Criterion (aBIC) values, with one cluster in Model 4 comprising only 1% of the total participants. Among the tested models, Model 3 demonstrated superior values for both AIC and BIC, along with adequate entropy, suggesting its superiority in capturing the underlying structure of the data.

Table 4

Latent Profile Fit Statistics for the Different Models of College Students' Mental Health Symptoms

Model	AIC	BIC	aBIC	Entropy	LMR BLMR		Probability of clusters
1	16100.05	16164.24	16126.12				
2	13075.62	13177.26	13116.90	0.96	499.149**	2980.485**	0.87, 0.13
3	11929.24	12068.32	11985.72	0.93	532.172 [*]	1138.259 [*]	0.75, 0.19, 0.06
4	11151.14	11327.66	11222.83	0.93	683.983 [*]	776.998 [*]	0.73, 0.18, 0.08, 0.01
5	9334.34	9334.34	9421.24	0.97	52397.128	1795.886	0.08, 0.60, 0.02, 0.08, 0.22

Table 5 illustrates a comparison among three distinct clusters characterized by varying levels of mental health symptoms. The first cluster comprises individuals exhibiting low-level symptoms (n = 1169, 75%), the second group manifests intermediate-level symptoms (n = 288, 19%), while the third group is characterized by high-level symptoms (n = 98, 6%), as shown in Figure 1. Single-factor ANOVA analysis revealed significant different in the mean scores of all mental health symptoms across each cluster.

Table 5

Mean Scores of Potential Clusters in Different Mental Health (Standard Deviations between

Brackets)

Project	Depression Neurastheni		Fear	Obsessive-	Hypochond
		а		anxiety	riasis
Total	1.39 (0.50)	1.40 (0.47)	1.81 (0.51)	1.15 (0.31)	1.22 (0.38)
Low symptom cluster	1.18 (0.28)	1.19 (0.23)	1.66 (0.43)	1.04 (0.10)	1.10 (0.22)
Medium symptom	1.88 (0.48)	1.92 (0.38)	2.26 (0.44)	1.28 (0.23)	1.40 (0.39)
cluster					
High symptom cluster	2.33 (0.49)	2.34 (0.44)	2.37 (0.44)	2.12 (0.39)	2.07 (0.53)
F-value	869.27***	1375.99***	313.79***	2107.81***	590.37***
Multiple comparisons	1<2<3	1 < 2 < 3	1 < 2 < 3	1 < 2 < 3	1 < 2 < 3

Figure 1



Mean Symptoms for the Three Profiles of College Students' Mental Health.

Note. The y-axis represents PQEEPH scores.

The Influence of Family Functioning on the Three Symptom Profiles: A Regression Mixture Model

The findings from the regression mixture model are presented in Table 6. Comparing against the high-level symptom cluster as the baseline, family functioning exhibited a significant association with the low-level symptom cluster (b = 0.24, SE = 0.04, p < .001), whereas no significant association was observed with the medium-level symptom cluster (b = 0.08, SE = 0.05, p > .05). To elaborate, for each incremental increase of one point in family functioning score, there was a corresponding 24% increase in the likelihood of being categorized into the low-level symptom cluster. Conversely, when the medium-level symptom cluster served as the reference group, family functioning displayed a significant association with the low-level symptom group (b = 0.16, SE = 0.03, p < .001). In this case,

with each one-point rise in family functioning score, there was a 16% rise in the probability

of being classified into the low-level symptom cluster.

Table 6

Regression Mixture Model of the Association Between Family Functioning and the Mental

Health Profiles

Predictor		Low-level cluster vs.	Low-level cluster	Medium-level	
		medium-level	vs. high-level	cluster vs. high-level	
		cluster	cluster	cluster	
Family	Intercept	0.48	1.19	0.71	
functioning	В	0.16	0.24	0.08	
	SE	0.03	0.04	0.05	
	Т	5.17***	5.88***	1.73	

Discussion

The present study examined the association between family functioning and pandemic-related mental health among Chinese college students' during the first three months of the COVID-19 pandemic. This period marked a unique phase in China's history, characterized by unprecedented public health challenges, such largescale home quarantine for the entire population. Our findings showed that, as expected, better family functioning was associated with lower pandemic-related psychological symptoms. Additionally, higher monthly income was associated with fewer symptoms. Moreover, the results indicated that for college students, each one-point increase in family functioning score corresponded to a respective 16% and 24% greater likelihood of belonging to the low-level mental health symptom cluster compared to the medium or high-level symptom clusters. Taken together, these findings support the idea that better family functioning buffers the psychological effects of a major public health crisis, in this case among Chinese college students impacted by the stress of the COVID-19 pandemic.

The observed protective effects of family functioning in the present study align with prior findings among Chinese young adults coping with the COVID-19 pandemic (Du et al., 2024; Yang et al., 2021; Y. Zeng et al., 2021) and the broader public health literature (Azoulay et al., 2024; Rong et al., 2024; Yaffe et al., 2024; Zhou et al., 2024). When facing a major public health crisis like the COVID-19 pandemic, people are likely to turn to their social networks for practical and emotional support. Among these networks, the family holds particular significance, perhaps especially in China, where it has traditionally occupied a central role in cultural life (Cheung et al., 2020). Notably, the present study was conducted during China's largest family-oriented holiday, the 'Spring Festival' (similar to the Western Christmas), so that family life was highly salient at the time of the study. Moreover, during periods of lockdown and amidst a public health crisis, the functioning of families may further gain in psychological significance. Thus, the family serves as a vital coping resource in navigating through public health emergencies.

Moreover, cultural nuances may shape how mental health symptoms are perceived and expressed. Stigma surrounding mental illness and help-seeking behaviors can vary across cultures, influencing individuals' willingness to disclose psychological distress and seek professional support (Őri et al., 2022). Additionally, an intervention study with Iranian college athletes indicated that COVID-19 had an impact on athletic performance (Ezdini et al., 2023), echoing findings from a separate large-scale international study that also highlighted effects on athletes' diet quality (Taheri et al., 2023). Considering the intricate nexus between mental and physical health (Navabinejad & Rostami, 2023), which becomes even more pronounced during stressful events like a global health crisis, our study emphasizes the influence that physical health difficulties during the COVID-19 pandemic may have on mental well-being, highlighting the critical role of family functioning in maintaining overall health.

In developing public health policies, it is useful to know whether a population is composed of different meaningful subgroups. Our latent profile analysis revealed three distinct clusters characterized by low, middle, and high levels of symptoms. These clusters hold significance as they may represent groups with varying psychological needs. Students in the high-level symptom cluster exhibited elevated scores across all symptoms, indicating a heightened need for social and emotional support or targeted psychological counseling during public health emergencies (Saltzman et al., 2020). The middle-level symptom cluster, being the largest group, warrants attention as individuals within this cluster may be susceptible to transitioning into the high-level symptom cluster. Providing timely guidance and support to students in this cluster may prevent such transitions, potentially leading to a shift towards the low-symptoms cluster. However, further research is required to validate this hypothesis. As expected, fear in response to the COVID-19 pandemic emerged as the highest-scoring symptom across all clusters compared to other symptoms. Studies have indicated that nearly half of college students reported experiencing some degree of fear during the COVID-19 pandemic (Mauer et al., 2022).

Amidst public health crises like the COVID-19 pandemic, a supportive family environment is particularly crucial as it serves as a psychological buffer against stress and challenges. Policymakers should consider developing and implementing policies that bolster family support systems, enhance awareness of the significance of family functioning through public health campaigns, and allocate resources to mental health services that ensure families have the necessary support to deal with stress. Educators can strengthen students' psychological resilience by incorporating family engagement strategies and mental health education into curricula, ensuring students and their families are informed about available mental health resources. Additionally, mental health professionals should adopt familycentered therapeutic approaches (Madsen, 2014) and develop targeted interventions that address the unique stressors of crises, focusing on strengthening family bonds and coping mechanisms. Overall, supporting students during crises requires a comprehensive approach that not only focuses on individual mental health but also values the well-being of the family as a key factor in mitigating the psychological impacts of such crises.

The current study inevitably has limitations. First, although the sample size of more than 1,500 participants was substantial, it was limited to college students from Hunan Province in China, potentially limiting the generalizability of the findings to other regions. Future research may include a broader and more varied geographic samples, longitudinal tracking, cross-cultural comparative analyses, and the adoption of mixed-methods for a comprehensive understanding. Second, the present study design was cross-sectional, precluding the testing of causal relationships between family functioning and pandemicrelated psychological symptoms. It is conceivable that the relationship between family functioning and symptoms is bidirectional, with better family functioning serving as a protective factor against symptoms, and less severe symptoms facilitating better family functioning (Erker et al., 2018; Limsuwan et al., 2022). Future research should test the causal impact of family functioning through longitudinal or experimental designs, including the investigation of family-based interventions (Feinberg et al., 2022). Third, given the present study's reliance on self-reported data, which is prone to biases like memory distortion and social desirability, future research could benefit from a multi-method approach that combines quantitative and qualitative data, including in-depth interviews or focus groups, to gain a deeper understanding of family functioning and mental health.

Despite these caveats, the present study contributes to the growing body of evidence indicating that family functioning provides psychological protection against the adverse effects of public health crises on mental health among young adults (Hussong et al., 2022; Peltz et al., 2021; Yang et al., 2021; Y. Zeng et al., 2021). The present findings provide a unique window into the mental health of young adults in China during the first three months of the COVID-19 pandemic, a time when young adults were largely living in quarantine with their family. When managing largescale public health crisis, policy makers will do well to consider the protective role of family functioning in mental health.

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Chapter 3

The Effect of Parent-child Relationship and Educational Involvement on Adolescent NSSI: The Role of Perceived Stress and Meaning in Life

Zeng, Z., Peng, L., Liu, S., He, Z., & Hu, Y. (2024). The effect of parent-child relationship and educational involvement on adolescent NSSI: the role of perceived stress and meaning in life. *Current Psychology*, 43, 13255–13266. https://doi.org/10.1007/s12144-023-05217-5

Abstract

This study explored the influence of parent-child relationship and parental educational involvement on adolescent NSSI. Based on ecosystem theory and the diathesis stress model, A follow-up survey was conducted with 771 adolescents (age = 15.24 ± 1.66 years) using questionnaire method (The Deliberate Self-Harm Inventory, the Parent-child Intimacy Questionnaire, The Primary School Students' Parents' Educational Involvement Behavior Scale, the Perceived Stress Scale and Chinese version of the Meaning in Life Questionnaire). The results showed that (1) Adolescents with a high parent-child relationship and high educational involvement had a lower level of perceived stress than those with a low parentchild relationship and low educational involvement. Compared to individuals with a low parent-child relationship and high educational involvement, individuals with a high parentchild relationship and low educational involvement showed a lower level of perceived stress. (2) Perceived stress partially mediated the relationship between the parent-child relationship and educational involvement and adolescent NSSI. (3) Meaning in life moderated the influence of perceived stress on adolescent NSSI. Specifically, with the increase in meaning in life, the influence of perceived stress on NSSI gradually decreased.

Keywords: adolescent NSSI, parent-child relationship, response surface analysis, polynomial regression, educational involvement, longitudinal study

Self-injury, also known as nonsuicidal self-injury (NSSI), is a kind of intentional selfinjury such as cutting, scraping, impacting, burning and stabbing (Lloyd-Richardson et al., 2007). NSSI is an important predictor of suicidal ideation in adolescents (Hawton et al., 2012). The results of two independent meta-analyses showed that the international lifetime detection rate of at least one NSSI among adolescents was 17.2-18.0% (Swannell et al., 2014). During the COVID-19 pandemic, there has been a notable upward trend in psychological health issues among adolescents, a finding supported by numerous research studies, these issues encompass symptoms of depression, anxiety, and NSSI (Choi et al., 2020; Gunnell et al., 2020). In this introduction, we begin by discussing the influence of parent-child relationship on adolescent NSSI, and then shift our focus to perceived stress and meaning in life as potential buffers for this influence. Then, we will present our empirical study on the role of parent-child relationship in adolescent NSSI.

The Impact of Parent-child Relationship on Adolescent NSSI

Environmental factors such as family and education play an important role in adolescent development. Ecosystem theory (Bronfenbrenner, 1979) emphasizes the role and significance of the environment in the process of individual development. The ecological environment system consists of four levels: the microsystem, which comprises the smallest ecological units that directly impact individuals; the mesosystem, which involves the direct connections and interactions between multiple microsystems; the exosystem, which encompasses larger social environments that have indirect effects on individuals; and the macrosystem, which encompasses the broadest environmental level, including cultural, historical, and institutional factors. The family – one of the innermost microsystems - plays a stronger role within child development. Previous studies have shown that compared with unhealthy and negative parent-child relationship, individuals with warm and positive parent-child relationship show high levels of emotional function and fewer mental health problems (Hazel et al., 2014).

Studies have shown that a stable and warm parent-child relationship is a protective factor and reduces stress (Cummings & Schatz, 2012). At the same time, the functional theory of NSSI (Nock, 2010) proposes that individuals who suffer social frustration may increase the attention and support of others by NSSI. In a study exploring the influence of parents on adolescent self-harm, Emery et al. (2017) found that adolescents who experienced less support from their parents had poorer emotional regulation and a higher risk of NSSI. In addition, cross-sectional and longitudinal studies have shown that parental alienation and criticism could also predict adolescent NSSI (Yates et al., 2008). Based on this, the current study suggests that the parent-child relationship affects adolescent NSSI.

The Impact of Parental Educational Involvement on Adolescent NSSI

Education has become an important part of the competition between different families (Liu et al., 2020). Parents often say "*You see how much I love you; everything is the best for you*". Parental educational involvement refers to the sum of various behaviors that parents engage in to promote their children's academic performance and psychological development. Numerous studies have shown that parental educational involvement reduces adolescent problem behaviors (Cheng Gang et al., 2019), and a low level of parental educational involvement is also associated with a lower level of mental health (Wang et al., 2019). Therefore, parental educational involvement can also affect adolescent NSSI. In a study exploring the impact of parental educational involvement on children's social creativity, Diarra et al. (2017) found that parents with a high level of educational involvement created a good education environment for their children; thus, their children had a high level of creativity and good learning habits.

Based on the literature evidence, the COVID-19 pandemic has had a notable effect on educational practices worldwide. During the pandemic, schools and educational institutions faced closures, and traditional classroom learning shifted to remote and online formats (Quezada et al., 2020). Several studies have suggested that this shift in educational delivery methods brought about increased parental involvement in their children's education (O'Connor Bones et al., 2022; Panaoura, 2021). The changes in the educational paradigm have led to parents playing a more significant role in their children's education, thereby exerting a greater impact on their children's cognitive and emotional development. However, the combined effect of the parent–child relationship and parental educational involvement on adolescent NSSI is not clear. Building on the discussed research, our first hypothesis states the following:

Hypothesis 1: The combined influence of the parent–child relationship and parental educational involvement affects adolescent NSSI.

In this study, we are examining four different ways in which children experience the parent-child relationship and parental educational involvement. The first two states are congruent: high parent-child relationship paired with high educational involvement and low parent-child relationship with low educational involvement. The other two states are incongruent: high parent-child relationship with low educational involvement and low parent-child relationship with high educational involvement. Our focus is to investigate whether these congruent and incongruent states have different effects on. To understand the complex relationship between these variables in detail, we will employ polynomial regression and response surface analysis, which are commonly used in organizational behavior and human resource management research but relatively new in psychology. Through this approach, we aim to explore the comprehensive influence of children's experiences with parent-child relationships and parental educational involvement.

The Mediating Role of Perceived Stress

Perceived stress refers to an individual's assessment of life events as uncontrollable or difficult to solve, which is essentially a feeling of subjective psychological stress (Cohen et al., 1983). As an important factor that affects the development of individual physical and mental health, perceived stress has received increasing attention in recent years (Herr et al., 2018; Whitehead, & Blaxton, 2021). The cognitive-relational theory of emotion and coping (Lazarus & Folkman, 1987) states that when individuals face stressful events, stable individual factors and external environmental factors jointly affect the cognitive assessment process of stress. It causes individuals to have subjective pressure feelings and mental response, which ultimately leads to depression, anxiety, NSSI and other psychological problems (Lazarus & Folkman, 1987). In a study exploring the correlation between physical injury and mental health, Heruti et al. (2018) found that individuals who had suffered physical injury reported a high level of perceived stress and lower subjective well-being.

In a study investigating the factors affecting suicidal ideation and NSSI among Mexican college students of sexual minorities, the results showed that sexual minorities would suffer higher perceived stress due to shame, thus leading to an increased risk of suicidal ideation and NSSI (Rentería et al., 2021). Moreover, a large number of studies have found that the parent–child relationship is correlated with adolescents' perceived stress. Individuals with warm and safe parent–child relationship show a low level of perceived stress, while adolescents who experience negative and bad parent–child relationship suffer more stress, leading to more serious mental health problems and disorders (Jiménez et al., 2019; Luo et al., 2021). Van Petegem et al. (2020) found in their research on adolescent behavior problems by investigating mother and child evaluation of maternal overprotection that the higher the scores of overprotection, the higher the risk of maladjustment and frustration among adolescents. Therefore, this study proposes the following:

Hypothesis 2: The parent–child relationship and parental educational involvement influence adolescent NSSI through perceived stress.

The Moderating Role of Meaning in Life

The diathesis-stress model was first proposed by Rosenthal (1963) to explain the pathogenesis of schizophrenia. According to this model, compared with individuals with "resilience" quality, individuals with "vulnerability" quality will have a significantly higher risk of related psychological disorders and diseases when they are stressed. Meaning in life refers to an individual's perception of his or her current life idea and value, as well as the pursuit of future life meaning and goals (Steger et al., 2008). As an important psychological resource, meaning in life is closely associated with physical and mental health (Czekierda et al., 2017; Kim et al., 2019). In the face of adversity, individuals can reduce the risk of psychological disorders by pursuing a sense of purpose in life (Du et al., 2017). In another study exploring

factors influencing suicidal ideation, Kleiman and Beaver (2013) found that the meaning in life functions as possible resilience factor capable of mitigating the adverse effects of stress (perceived burdensomeness and thwarted belongingness). Furthermore, Bartrés-Faz et al. (2018) regarded meaning in life as a psychological resilience factor beyond cognitive reserve, capable of influencing subjective psychological well-being levels.

In an intervention study on depression and anxiety among patients who quit smoking, the results showed that improving the individual's meaning in life could reduce depression and anxiety of patients who quit smoking and significantly improved their perceived social support (Steger et al., 2009). Furthermore, Pérez et al. (2014) found in a one-year follow-up study of NSSI in 80 patients diagnosed with borderline personality disorder (BPD) that patients with low level meaning in life had a higher risk of NSSI, depression, and hopelessness at baseline, and NSSI occurred more frequently during followup than participants with high level meaning in life. In view of this, this study proposes the following:

Hypothesis 3: Meaning in life moderates the latter half of the mediation model, that is, the impact of perceived stress on adolescent NSSI.

Current Study

In summary, this study will explore the occurrence and development mechanisms of adolescent NSSI and propose a moderated mediation model (as shown in Figure 1) to explore three hypotheses. First, polynomial regression and response surface analysis are used to explore the influence of the parent–child relationship (child's perspective) and parental educational involvement (a random parent's perspective) on perceived stress. The second is the mediating effect of perceived stress. Third, we examined whether meaning in life could moderate the effect of perceived stress on adolescent NSSI.

In our study, we asked for responses from one random parent, and this decision was based on practical considerations. We aimed to minimize response burden and potential participant fatigue, as well as to ensure a sufficient response rate by focusing on one parent per child. Additionally, the selection of the responding parent was based on the parent who was more involved in their child's education, as this perspective was most relevant to our research objectives. Regarding the consideration of both mothers and fathers, we acknowledge that investigating parental differences between mothers and fathers is valuable and could provide additional insights into the dynamics of parental educational involvement. However, the decision to focus on one parent was again guided by practical considerations, as it was challenging to obtain responses from both parents for all participants within the given timeframe and resource constraints.

Regarding monoparental and homoparental families, we recognize the importance of studying their unique dynamics in parental educational involvement. Unfortunately, due to limited resources and a relatively small sample size, we were unable to include a specific analysis of these family structures in the current study. We acknowledge this limitation and will address it in the limitations section of the revised manuscript. In summary, the decision to involve one random parent and not consider monoparental or homoparental families was primarily driven by practical limitations and the need to maintain an appropriate sample size and response rate.

Figure 1

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Method

Participants

Participants were from a randomly selected junior high school in Hunan (central China). Adolescents at this age are more likely to have psychological problems (Zhang & Wang, 2020). Due to the significant academic pressure experienced by students in Grade 9, we only surveyed students in Grade 7 and Grade 8. The whole group sampling was taken by class (21classes), and informed consent was obtained from the school, students and their parents. Subject inclusion criteria were (1) the junior high school students, and (2) native Chinese speakers. For a statistical power of 80%, a small effect size (0.01 - 0.02) and an alpha at 0.05, the required sample size was 602 - 1194. In total, 771 completed data were collected. Of the respondents (on average 15.24 ± 1.66 years old), 364(47.2%) were female and 407(52.8%) were male. There were 407(52.8%) only-child and 364(47.2%) non-only-child. The parental marital status was as follows: 645 (83.6%) were married, 35(4.5%) were

divorced, 31(4.1%) had remarried, and 60(7.8%) were other; Family economic level was as follows: 103(13.4%) were very good, 421(54.6%) were good, 213(27.6%) were average, 13(1.7%) were poor, and 21(2.7%) were very poor. This study was approved by the Ethics Committee of Hunan Normal University (20001).

Procedure

Wave I measured the T1 independent variable (children who experience the parentchild relationship and parental educational involvement) and TI dependent variable (adolescent NSSI) in May 2021. Students used paper questionnaire (in Chinese) to fill out in class and parents were sent a link (via QuestionStar, a Chinese online survey platform similar to Qualtrics) to complete the questionnaire. A total of 1020 students and 1089 parents participated in this investigation. After matching, 930 parent-child matching data were obtained, with a response rate (91.8%). Mediating variables (perceived stress), moderating variables (meaning in life) and T2 dependent variables (adolescent NSSI) were measured in November 2021 (Wave 2). After matching, a total of 771 completed data (two follow-up and parents' data, 14.64 (SD = 0.63) years old) were obtained, with an overall response rate (75.6%).

Statistical Analyses

In consistent research methods, the conventional difference fraction method and profile similarity index will mistakenly increase the positive results of the hypothesis (Humberg et al., 2019). In the current study, polynomial regression and response surface analysis was used to overcome this limitation. Moreover, the three-dimensional image can describe the effect of different matching relations between two variables on the dependent variable, making the conclusion more intuitive (Shanock et al., 2010). According to the model formula proposed by Edwards and Parry (1993), the model formula constructed in this study is:

Z(perceived stress) = b0 + b1(PR) + b2(EI) + b3(PR)2 + b4(PR)×(EI) + b5(EI)2 + e.

PR represents the children's experience of the parent-child relationship. EI represents the parental educational involvement. (PR)×(EI) is the interaction term and the square term of the two. b0 represents the intercept. b1 is the coefficient of PR, b2 is the coefficient of PI, b3 is the coefficient of PR², b4 is the coefficient of the interaction term, b5 is the coefficient of PI², and *e* is the error term. The scale centralization of PR and EI is firstly carried out, and then the regression of each item is carried out. The results are presented as a threedimensional image. In three dimensions, we mainly calculate the slope (a1 = b1 + b2) and curvature (a2 = b3 + b4 + b5) of the matching curve "PR = EI" and the slope (a3 = b1 - b2) and curvature (a4 = b3 - b4 + b5) of the mismatch curve "PR = -EI".

Second, as for the moderated mediation effect test, the above polynomial regression coefficients were used to construct block variables involved in parent–child relationship and parental educational (Block variable, Edwards & Cable, 2009). Then, block variables were used as independent variables to conduct the moderated mediation effect test. To investigate the influence of block variables (parent–child relationship and parental educational involvement) on adolescent NSSI, the moderated mediation model was analyzed using the PROCESS macro for SPSS (Model 15). The three equations were constructed. Equation 1: estimating the predictive value of the block variables on the dependent variable (adolescent NSSI); Equation 2: estimating the predictive value of the block variables on the mediating variable (perceived stress); Equation 3: estimating the moderating effect of meaning in life on the influence of perceived stress on adolescent NSSI and the residual effect of the block variables on adolescent NSSI.

Measures

Sociodemographic Questionnaire

In our previous literature review, we included sociodemographic questions related to junior high school students' mental health (Bitsko et al., 2016). These questions assessed age, gender, only-child status, parental marital status, and family economic status.

Adolescent NSSI

The Chinese version of Deliberate Self-Harm Inventory (DSHI, Gratz, 2001) measures adolescent NSSI and has good reliability and validity in Chinese adolescents (Lan et al., 2019). It is a one-dimensional scale with 9 items (*e.g., Penetrating the skin with sharp objects*) and a six-point scale ranging from 0 (*"never"*) to 5 (*"five times or more"*). Higher scores indicate more adolescent NSSI. Sijtsma (2009) demonstrated that Guttman's lambda coefficient had a better reliability estimation than Cronbach's lambda. In this study, Guttman's lambda coefficient was T1 = 0.84 and T2 = 0.87. The scale structure validity was good, and the fitting indices of the confirmative factor analysis were T1: χ 2 = 259.97, *df* = 27, CFI = 0.92, TLI = 0.89, RMSEA = 0.11, SRMR = 0.04. T2: χ 2 = 381.65, *df* = 27, CFI = 0.90, TLI = 0.87, RMSEA = 0.13, SRMR = 0.05.

Parent-Child Relationship

Children's experience of the parent-child relationship was measured by the Chinese version of Parent-child Intimacy Questionnaire (Buchanan et al, 1991; Xu et al., 2018), with 9 items (*e.g., You feel very close to your parent/mother*). It is scored on a five-point scale ranging from 1 (*"completely inconsistent"*) to 5 (*"completely consistent"*). The higher the score, the stronger the relationship between the children and their parents. Guttman's Lambda coefficient of the parent-child relationship in this study was 0.84. The scale structure validity was good, and the fitting indices of confirmatory factor analysis were: $\chi 2 = 152.05$, *df* = 27, CFI = 0.96, TLI = 0.94, RMSEA = 0.08, SRMR = 0.04.

Parental Educational Involvement

The Primary School Students' Parents' Educational Involvement Behavior Scale (in Chinese) compiled by Wu et al. (2013) was used to measure parental educational involvement. The scale has five dimensions and a total of 29 items (*e.g., 1 will help my children solve difficulties in learning*). The scale is graded by four points, ranging from 1 (*"never"*) to 4 (*"often"*). Higher scores indicate deeper parental educational involvement. Although the questionnaire was developed for the primary school students, the grade span of the participants in this study was relatively small. In this study, Guttman's lambda coefficient of parental educational involvement was 0.88, indicating good scale structure validity. The fitting indices of confirmatory factor analysis were as follows: $\chi 2 = 1259.23$, *df* = 367, CFI = 0.91, TLI = 0.91, RMSEA = 0.06, SRMR = 0.05. Since only one parent was required to answer, paired sample *t* test was conducted to prevent differences between parents. The score of maternal educational involvement was 3.06 ± 0.43 (n = 595), and that of father educational involvement was 3.00 ± 0.47 (n = 175), t = 1.33, p = 0.18. There was no significant difference in educational involvement scores between parents.

Perceived Stress

In this study, Yang and Huang (2003) revised the Chinese version of Perceived Stress Scale (Cohen, 1994) to measure perceived stress. The scale contains 14 items (*e.g., How often have you been upset because of something that happened unexpectedly?*), using a fivepoint scale, with 1 (*"never"*) and 5(*"always"*) ", to measure the perceived stress level. Higher scores indicate greater perceived stress. In this study, Guttman's lambda coefficient was 0.87, and the fitting indices of confirmatory factor analysis were as follows: $\chi 2 = 544.73$, df = 76, CFI = 0.93, TLI = 0.92, RMSEA = 0.09, SRMR = 0.06. The scale structure validity was good. *Meaning in life*

Meaning in life was measured by the Chinese version of the Meaning in Life Questionnaire (C-MLQ, Chan, 2014; Steger et al., 2006). The scale is divided into two dimensions and contains 10 questions (*e.g., I know my life meaning very well*). A seven-level score was adopted, with 1 (*"completely disagree"*) and 7 (*"completely agree"*). Higher scores indicate a greater sense of meaning in life. Guttman's Lambda coefficient of the questionnaire in this study was 0.79, and the scale structure validity was good. The fitting indices of the confirmative factor analysis were as follows: $\chi 2 = 201.57$, *df* = 34, CFI = 0.95, TLI = 0.95, RMSEA = 0.08, SRMR = 0.07.

Results

Sample Characteristics and Univariate Analysis

Sociodemographic characteristics for the 771 participants are presented in Table 1.

Table1

Variables	Category	N (771)	%
Age		15.24 (1.66) ye	ears old
Gender	Female	364	47.2
	male	407	52.8
Whether only child	Only child	407	52.8
	Non-only child	364	47.2
Parental marital status	Married	645	83.6
	Divorced	35	4.5
	Remarried	31	4.1
	Other	60	7.8
Family economic level	Very good	103	13.4
	Good	421	54.6
	Average	213	27.6
	Poor	13	1.7
	Very poor	21	2.7

Sociodemographic Characteristics of Sample

Common Method Deviation Test

Common method bias (CMB) happens when variations in responses are caused by the instrument rather than the actual predispositions of the respondents that the instrument attempts to uncover (Podsakoff et al., 2003). The Harman single-factor method was used to test it. The analysis results showed that there were seven factors with characteristic roots greater than 1, and the variance explanation rate of the first factor was 22.04% (lower than the critical index of 40%). Second, confirmatory factor analysis results of the single-factor model showed that the model fit was poor: $\chi 2 = 3370.42$, df = 54, CFI = 0.34, TLI = 0.20, RMSEA = 0.28, SRMR = 0.22, suggesting that common method bias was not a significant concern. Finally, the potential error variable controllable method was used to fit the fourfactor model well before the introduction of common method bias: $\chi^2 = 69.08$, df = 48, CFI = 0.99, TLI = 0.99, RMSEA = 0.02, SRMR = 0.03. After the introduction of common method bias, $\chi^2 = 36.38$, df = 36, CFI = 0.99, TLI = 0.99, RMSEA = 0.02, SRMR = 0.02, the difference was not significant. Therefore, there was no serious common method bias.

Descriptive Statistics and Correlation Analysis

Table 2 lists the mean, standard deviation and correlation matrix of each research variable. The results showed that educational involvement was only significantly correlated with the parent–child relationship, while other variables were significantly correlated. In addition, the detection rates of at least one NSSI among adolescents in this study were T1 = 40.2% and T2 = 32.2%. Compared to T1 adolescent NSSI, T2 adolescent NSSI were significantly, *t* = 2.24, *p* = .025.

Table 2

Variables	1	2	3	4	5	6
T1 Adolescent NSSI	1					
T2 Adolescent NSSI	0.50**	1				
T1 Parent-child relationship	-0.29**	-0.16**	1			
T1 Educational involvement	-0.05	-0.02	0.11**	1		
T2 Perceived stress	0.16**	0.29**	-0.28**	-0.03	1	
T2 Meaning in life	-0.15**	-0.20**	0.27**	0.06	-0.38**	1
Skewness	3.01	3.41	-0.37	-0.26	-0.37	-0.40
Kurtosis (-3)	10.59	13.15	-0.03	-0.15	0.39	1.63
M ± SD	3.42 ±	2.85 ±	30.51 ±	88.54 ±	38.25 ±	48.41 ±
	7.16	6.91	8.22	12.83	9.67	11.74

Means and Standard Deviations of the Major Variables Along with Their Correlations.

Notes.: 1 = T1 adolescent NSSI; 2 = T2 adolescent NSS; 3 = T1 Parent-child relationship; 4 = T1 Educational involvement; 5 = T2 Perceived stress; 6 = T2

Meaning in life. **p* < 0.05, ***p* < 0.01, ****p* < 0.001, same below.

The Influence of Parent-Child Relationship-Educational Involvement Matching on Adolescent Perceived Stress

Polynomial regression and response surface analysis were used to examine the influence of parent–child relationship (PR)-educational involvement (EI) matching on adolescents' perceived stress. We standardised and compared parent–child relationship and educational involvement (Edwards, 1994). Based on the standardised scores, 34.87% (n = 269), 30.12% (n = 232), and 35.01% (n = 270) of children reported higher, similar, and lower parent–child relationship compared with their parental educational involvement. The result meets the analysis requirements (categories are more than 10%).

Polynomial regression and response surface analysis results showed that along the consistent line (PR = EI), the slope (S) of the cross section was significant (S = -2.41, 95% CI= [-3.45, -1.45]), indicating that adolescents with a high parent–child relationship and high educational involvement had a lower level of perceived stress than those with a low parent–child relationship and low educational involvement. Along the inconsistent line (PR = -EI), the slope of the cross section was significant (S = -3.30, 95% CI= [-4.74, -1.99]), indicating that individuals with a high parent–child relationship and low educational involvement showed a lower level of perceived stress than adolescents with a low parent–child relationship and high educational involvement. In addition, the curvature of the consistent line (Curve, C) and inconsistent line were not significant (C1 = -0.04, 95% CI= [-0.75, 0.64]; C2 = -0.81, 95% CI= [-1.81, 0.11]), indicating a linear relationship between the parent–child relationship and educational involvement and adolescent perceived stress.

Effect of Parent-child Relationship and Educational Involvement on Adolescent Perceived



Stress: Polynomial Regression and Response Surface Analysis

Traditional regression analyses of interactions provide a two-dimensional view of the association between combinations of two predictor variables, whereas RSA facilitates a three-dimensional examination of the association between two predictor variables (e.g. Parent-child Relationship and Educational Involvement) and an outcome variable (e.g. perceived stress). With the parent–child relationship as the X-axis, educational involvement as the Y-axis, and adolescent perceived stress as the Z-axis, the three-dimensional image of the parent–child relationship, educational involvement and adolescent perceived stress was obtained (**Fig. 2**). In addition, the point-selection method was adopted, and four points were selected along the consistent line and nonconsistent line ± 1 SD: Z1 (1.29, 1.29, 34.93), Z2 (0.89, 0.89, 39.83), Z3 (1.29, 0.89, 33.52), and Z4 (0.89, 1.29, 40.22). Z-hat values were calculated. The difference between consistent lines Z1 and Z2 was -4.89, 95% CI = [-7.31, -

2.56], and the difference between inconsistent lines Z3 and Z4 was -6.70, 95% CI = [-9.77, -3.86], which also supported the above conclusion.

Testing the Moderated Mediation Model

On the basis of the above analysis, the influence of block variables (parent-child relationship and educational involvement) on adolescent NSSI, the mediating effect of perceived stress and the moderating effect of meaning in life were tested. In addition, many studies have found that gender, parents' marital status, and family economic level have impacts on NSSI (Rice et al., 2002), so they were included in the equation as a control variable in this study. All variables were standardized.

The results are shown in Table 3. Equation 1 showed that gender, family economic level and block variables could predict adolescent NSSI ($\beta = 0.33$, p < .001; $\beta = 0.10$, p = .048; $\beta = 0.15$, p < 0.001). The results of Equation 2 showed that gender, parents' marital status, family economic status and block variables affected perceived stress ($\beta = 0.29$, p < .001; $\beta = 0.10$, p = .03; $\beta = 0.15$, p = .002; $\beta = 0.28$, p < .001). Equation 3 showed that gender, perceived stress, meaning in life and interaction term predicted adolescent NSSI ($\beta = 0.28$, p < .001; $\beta = 0.22$, p < .001; $\beta = -0.10$, p = .01; $\beta = 0.15$, p < .001). The results indicated that block variables (parent–child relationship and parental educational involvement), perceived stress, adolescent NSSI and meaning in life constituted a moderated mediation model. Perceived stress played a partial mediating role, and meaning in life moderated the influence of perceived stress on adolescent NSSI in the latter half of the indirect path. In addition, Table 4 lists the mediating effect values of life meaning at the mean and ± 1 SD.

Table 3

Regression Results for the Moderated Mediation Model.

Variables	Model 1 (dependent variable: Y)			Model 2	Model 2 (dependent variable: M) Mod				del 3 (dependent variable: Y)			
	β	t	р	95% CI	β	t	p	95% CI	β	t	p	95% CI
1	0.33	4.43***	< .001	[0.28, 0.47]	0.29	4.16***	< .001	[0.15, 0.35]	0.28	3.90***	< .001	[0.14, 0.42]
2	0.06	0.86	0.39	[-0.07, 0.21]	0.01	0.13	0.90	[-0.13, 0.15]	0.03	0.46	0.65	[-0.11, 0.17]
3	0.08	1.57	0.12	[-0.01, 0.19]	0.10	2.13 [*]	0.03	[0.01, 0.19]	0.04	0.91	0.36	[-0.05, 0.13]
4	0.10	1.98 *	0.048	[-0.02, 0.25]	0.15	3.06**	0.002	[0.01, 0.19]	0.06	1.15	0.25	[-0.04, 0.15]
Х	0.15	3.88***	< .001	[0.07, 0.23]	0.28	7.73***	< .001	[0.21, 0.35]	0.06	1.57	0.12	[-0.01, 0.13]
М									0.22	5.59***	< .001	[0.14, 0.29]
W									-0.10	-2.54*	0.01	[-0.17, -0.02]
M*W									-0.15	-5.37***	< .001	[-0.21, -0.10]
R ²	0.06				0.12				0.15			
F	8.65***				19.3 6 [*]	***			16.42**	*		

PARENTAL INFLUENCES ON ADOLESCENT NSSI

Note: ¹0 = male and 1 = female. ²0 = only-child and 1 = non-only-child. ³1 = married, 2 = divorced, 3 = remarried and 4 = another type of relationship. ⁴1 =

very good, 2 = good, 3 = average, 4 = poor and 5 = very poor. X = block variable; M = perceived stress; W = meaning in life; M*W = interaction term; Y =

adolescent NSSI. Bolded font indicates significant.
Table 4

The moderator	Levels	Indirect effect	95% CI	Direct effect	95% CI	Proportion of Indirect effect
Perceived stress	-1 SD	0.10	[0.06, 0.16]			
	Mean	0.06	[0.03, 0.09]	0.06	[-0.01, 0.13]	50%
	1 <i>SD</i>	0.02	[-0.01, 0.05]			

Mediating Effects of Perceived Stress at Different Levels of Meaning in Life

To better understand the moderating effect, the simple slope test was used to investigate the role of meaning in life in the influence of perceived stress on adolescent NSSI. The Johnson-Neyman moderating effect diagram proposed by Hayes and Matthes (2009) better explains the moderating effect. The results of the Johnson-Neyman diagram showed that with the increase in meaning in life, the slope of perceived stress on adolescent NSSI gradually decreased. Moreover, when the meaning in life was between 0.85 SD and 2.43 SD, perceived stress did not affect adolescent NSSI. When meaning in life was greater than 2.43 SD, perceived stress had a negative effect on the prediction of adolescent NSSI. The study confirmed that meaning in life was a protective factor against adolescent NSSI.

Figure 3





Discussion

Adolescence is a critical period of individual development, but the gap between physical maturity and psychological development makes adolescents more prone to depression, anxiety and other emotional disorders (Salk et al., 2017) and have a high risk of self-injury and suicidal ideation (Brown & Plener, 2017; Swannell et al., 2014). In the current study, the detection rates of adolescents

with at least one NSSI were 40.2% and 32.2%, slightly higher than previous studies (Li et al., 2020). Moreover, the T2 adolescent NSSI decreased significantly, probably due to better psychological development of adolescents as they get older. In addition, this study, based on the ecosystem theory and diathesis-stress model, used polynomial regression and response surface analysis to investigate the influence of the parent–child relationship and parental educational involvement on adolescents' NSSI. The current study also explored the mediating effect of perceived stress and the moderating effect of meaning in life, thus providing supplementary evidence for relevant developmental theories of adolescent NSSI.

About the parent-child system, as an important part of the family system, previous studies have shown that close and harmonious parent-child relationship can improve children's subjective well-being (Jia et al., 2018), increase prosocial behavior (Kärtner et al., 2010), and make peer relationship and teacher-student relationship more harmonious (Chen et al., 1995). In a study on the influence of parent-adolescent matching on depressive symptoms, the results showed that adolescents had high scores on depressive symptoms when parents and adolescents agreed on family disorder, but, when adolescents' perception of family disorder was high and parents' perception was low, adolescents' score of depressive symptoms was the highest (Human et al., 2016). At the same time, there are many realities that support the result that high-achieving children (with good educational resources but bad parent- child relationship) are at higher risk for psychological disorders than average students. The results suggest that to prevent or solve psychological problems, compared with more educational resources, parents should pay more attention to the relationship with children. It is more important for children to experience a safe and warm environment (McQuaid et al., 2022; Tang et al., 2021).

This study included the important contents of the parent–child system (children experience parent–child relationship and parental educational involvement) to explore its influence on adolescent NSSI. The results showed that the block variable of the parent–child relationship and educational involvement could not only directly predict adolescents' NSSI but also found a mediating role of perceived stress. The mediating effect of perceived stress also suggests that stress events (e.g., low parent-child relationships and parental educational involvement) may cause related psychological problems and disorders by causing individual perceived stress experience, which is consistent with previous research results (Koch et al., 2020; Ong et al., 2018).

The diathesis-stress model posits that depression, anxiety, NSSI, suicide and other psychological problems are the result of external pressure and internal susceptibility quality. Meaning in life has an important influence on physical and mental health development (Czekierda et al., 2017). In a meta-analysis exploring the relationship between meaning in life and related psychiatric disorders such as depression, anxiety, addiction, despair, and suicide, Glaw et al. (2017) found that meaning in life could reduce symptoms and increase well-being and life satisfaction. Therefore, this study also investigated the influence of meaning in life on the indirect path. The results showed that meaning in life moderated the influence of perceived stress on adolescent NSSI. Specifically, with the increase in sense of meaning in life, the influence of perceived stress on adolescent NSSI gradually decreased. Marco et al. (2021) also found that thwarted belongingness and perceived burdensomeness significantly predict lifelong NSSI in Spanish adolescents. The results also support the findings of this study.

That educational involvement and parent-child relationship were interactively protective for adolescent mental health deserves consideration by education, health, and social service systems. Adopting upstream programs and policies that aim to narrow these disparities can be a critical target toward healthy youth development and, as our analysis suggests, serve mutually beneficial goals. For example, adolescent mental health systems could facilitate and incentivize interventions to improve parent-child relationship quality or connect adolescent to supportive adults. In particular, unlike families in Western countries, Chinese parents view their children's educational resources and environment as their first priority. Thus, improving the equity of educational resources could yield improvements in population mental health and functioning.

Limitations and Future Directions

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It should be pointed out that the research adopted a sample from a senior high school. Therefore, future researchers can adopt the research model and method in the context of other countries and/or cross-cultures, which could provide more promising findings. We also plan to use a larger sample size and multipoint tracking data to explore the development of adolescent mental health in future research. Second, the adolescent increased psychological distress might be due to biological changes (especially hormonal changes during adolescence), increased adverse life events (e.g., academic pressure increasing from primary to secondary school, interpersonal challenges with friends). Yet, this study cannot eliminate the possibility of residual confounding caused by these unmeasured variables. We also want to emphasize the importance of interpreting the findings with caution, considering the potential impact of using different perspectives. Also, the decision to involve one random parent and not consider monoparental or homoparental families was primarily driven by practical limitations and the need to maintain an appropriate sample size and response rate.

Furthermore, although this study verified the diathesis-stress model, a large number of studies have found that individual psychological problems are the result of the interaction of susceptibility genes and the external environment (Park et al., 2019; Zeng et al., 2021). Therefore, future research can adopt the genetic and environment research paradigm to explore the development mechanism of adolescent psychological problems. Finally, polynomial regression and response surface analysis were used in this study, but interaction terms and quadratic terms did not predict perceived stress, which may be due to the high data requirements of this method. Future research could investigate the parent-child relationship from both parent and child perspectives to explore its impact on adolescent mental health.

Conclusion

In conclusion, the results showed that (1) Adolescents with a high parent-child relationship and high educational involvement had a lower level of perceived stress than those with a low parent-child relationship and low educational involvement. Compared to individuals with a low parent-child relationship and high educational involvement, individuals with a high parent-child relationship and low educational involvement showed a lower level of perceived stress. (2) Perceived stress partially mediated the relationship between the parent–child relationship and educational involvement and adolescent NSSI. (3) Meaning in life moderated the influence of perceived stress on adolescent NSSI. Specifically, with the increase in meaning in life, the influence of perceived stress on NSSI gradually decreased.

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Chapter 4

The Relationship of Family Functioning and Suicidal Ideation among Adolescents: The Mediating Role of Defeat and the Moderating Role of Meaning in Life

Yang, Q., Hu, Y. Q., Zeng, Z. H., Liu, S. J., Wu, T., & Zhang, G. H. (2022). The relationship of family functioning and suicidal ideation among adolescents: The mediating role of defeat and the moderating role of meaning in life. *International journal of environmental research and public health*, 19(23), 15895. https://doi.org/10.3390/ijerph192315895

Abstract

Objective: To investigate the relationship between family functioning and suicidal ideation among adolescents. Method: A total of 4515 junior and senior high school students were assessed using the Family APGAR, the Depressive Symptom Index-Suicidality Subscale, the Defeat Scale, and the Chinese Meaning in Life Questionnaire. Results: This study found pairwise correlations between suicidal ideation, family functioning, defeat, and meaning in life. Specifically, family functioning was an influencing factor of adolescent suicidal ideation, and defeat was a mediator of the relationship between family functioning and adolescent suicidal ideation; meaning in life was found to be a moderator of the first half of the mediation process by defeat, that is, it moderated the influence of family functioning and adolescent suicidal ideation, as well as the influence of defeat and meaning in life on this relationship, constituted a moderated intermediary model. This finding has both theoretical and practical value for the implementation of a psychosocial model of adolescent suicide prevention and intervention.

Keywords: adolescents; family functioning; suicidal ideation; defeat; meaning in life

Suicidal ideation refers to the process in which individuals form thoughts and content about ending their own lives without taking concrete actions (Klonsky et al., 2016). It is more common among adolescents, with a reported detection rate of 19.3% to 39.4% in the United States, Germany, etc. (Becker & Correll, 2020), and 11.6% to 24.7% over the past 20 years in China (Zou et al., 2021). In the last two years, the global COVID-19 pandemic has also had an impact on the mental health of adolescents (Jones et al., 2021), resulting in an increased incidence of suicidal ideation and behaviors (Liu et al., 2008; Meherali et al., 2021). Suicidal ideation is an important indicator of mental health issues (Paashaus et al., 2019; O'Connor & Kirtley, 2018), as well as the most sensitive predictor of suicidal attempts and behaviors (O'Connor & Kirtley, 2018). Evidence has suggested that the development of suicidal ideation to attempts results from complex interactions between personal and environmental factors (O'connor et al., 2013). Therefore, a better understanding of the influencing factors (Joiner Jr et al., 2002) and the improvement of effects of intervention strategies are urgently needed to prevent adolescents' suicide, especially when the COVID-19 pandemic is predicted to become endemic (Conner et al., 2022).

The Relationship between Family Functioning and Suicidal Ideation

The Ecological System Theory (Bronfenbrenner & Morris, 2007) holds that individual development is affected by a series of interactive environmental systems, among which family was the most important microenvironmental system that affects adolescent social adaptation as well as physical development. Olson put forward the concept of family functioning, which reflects the characteristics of the family system (Dh, 1983). According to Olson, family functioning can serve as an important index in the evaluation of the operation, relationship between family members, family adaptation, and other aspects of the family system (Dh, 1983), reflecting the emotional bond between family members, family rules, communication within family, and the effectiveness of coping with external events (Dh, 1983). Thus, family functioning is an underlying variable that affects the social adaptation and psychological development of adolescents (Beavers & Hampson, 2000). Some recent studies (Dh, 1983; O'connor et al., 2013) revealed that better family functioning was

associated with higher levels of physical and mental health of family members, as well as better social adaptation (Beavers & Hampson, 2000; Shek, 2002), while family dysfunction was associated with more explicit and implicit problems in adolescents. For example, the literature has demonstrated a direct and negative correlation between family functioning and the incidence of depression, anxiety, suicidal ideation, etc., in adolescents (Paashaus et al., 2019). Furthermore, numerous studies have shown that parental rejection is associated with self-destructive thoughts and behaviors in adolescents (Cruz et al., 2014), lower levels of parental care were significantly associated with higher levels of suicidal ideation (Hardt et al., 2011), and parental rejection/neglect was associated with a higher risk of adolescents' suicidal attempts (Donath et al., 2014). Studies have also reported that poor family functioning was predictive of higher levels of suicidal ideation among junior high school students (Zhang & Wang, 2020), and that higher family closeness, adjustment, and support could reduce the incidence of suicidal ideation (Compton et al., 2005). A cross-sectional study of adolescents aged 11 to 18 years in two Chinese developed cities, Hong Kong and Shanghai, confirmed that family functioning significantly predicted suicidal ideation in this group (Leung et al., 2016), but the mechanism of how family functioning develops as a risk factor for suicidal ideation and behavior remains to be explored in greater depth (Zortea et al., 2019).

The Mediating Effect of Defeat

The Ecological System Theory emphasizes the interaction between systems and individuals as well as the effect of this interaction on individual development (Bronfenbrenner & Morris, 2007). Relevant studies supported that individual factors are also important variables affecting suicidal ideation. Some researchers have focused on the variable of defeat, defining it as the individual perception of failure in social competition, loss, and decline in social status (Gilbert & Allan, 1998). The Interpersonal Psychological Theory of Suicide (IPTS) (Joiner, 2005), the Schematic Appraisals Model of Suicide (SAMS) (Johnson et al., 2008), and the Integrated Suicide Model (Taylor et al., 2011) all suggest that defeat is an important risk variable for predicting individual suicidal ideation. model—the Integrated Motivational-Volitional Model of Suicidal Behavior (Díaz-Oliván et al., 2021) —integrates the theoretical perspectives and influential variables from various previous models.

The model conceptualizes suicide as a planned action performed by an individual rather than the result of a mental disorder (O'connor et al., 2013), and defeat is the core predictive variable in the stage of suicidal ideation formation (O'Connor & Kirtley, 2018). In the IMV Model, suicide is divided into the pre-motivational stage, motivational stage, and volitional stage. The premotivational stage is based on the diathesis-stress model, where diathesis refers to biological or genetic vulnerabilities, while stress consists mainly of environmental factors (e.g., deprivation) and negative life events (e.g., relationship breakdown). The motivational stage refers to the formation of suicidal ideation; during this stage, individuals with a psychological base and stressful life may experience defeat, which could result in entrapment and hopelessness if the sense of defeat is unrelieved or there is a lack of social support, and further predicts suicidal ideation as the solution of life's problems (Chang et al., 2017; Turecki & Brent, 2016). In the volitional stage, suicidal ideation develops into suicidal attempt or behaviors, with the suicidal ability and acquisition of tools being moderators. The theoretical hypothesis of this model has been supported by numerous studies. A meta-analysis by Taylor et al. showed that there is a stable and reliable correlation between defeat and suicidal ideation, with individuals experiencing high levels of defeat possessing higher levels of suicidal ideation over a 12-month period (Taylor et al., 2011). In a 4-year follow-up study on patients hospitalized after suicidal attempts (O'connor et al., 2013), defeat was found to be moderately associated with suicidal ideation and predictive of subsequent attempts. Multiple studies on college students with suicidal ideation (Tucker et al., 2016).), bipolar disorder (Owen et al., 2018), schizophrenia (Taylor et al., 2011), and post-traumatic stress disorder (Taylor et al., 2011) have concluded that defeat could predict suicidal ideation and explain the greater variation in suicide risk.

According to one of the theoretical foundations of the IMV model, the Interpersonal Theory of Suicide (Pollak et al., 2021), individuals perceiving themselves as burdensome to others and lacking social support will increase the possibility of individuals from defeat to entrapment and

suicidal thoughts. Attachment theory (Ainsworth & Bowlby, 1991; Van Orden et al., 2010) also believes that childhood exposure to destructive family environments (e.g., parental abuse, neglect, inconsistency, and ineffective parenting) can lead into the development of insecure attachment styles (i.e., anxiety and avoidance), as well as negative perceptions of themselves and others, such as feelings of being a burden to others, feelings of isolation, or lack of social support, which are associated with systemic interpersonal dysfunction throughout their lives (Bowlby, 1988). In addition, more studies have attested that stress in the early-life environment (such as parental neglect) can affect individuals' emotions and cognitive ability (Meagher et al., 2010; Mikulincer & Shaver, 2019) and determine the likelihood of them developing psychological disorders and mental crises. Studies also showed that stressors in the early-life environment (such as parental neglect) had a negative effect on individuals' emotions and cognitive abilities (Mikulincer & Shaver, 2019). Zortea et al. (2019) attested that poor parent-child attachment was associated with increased suicidal thoughts and behaviors through the mediation of feelings of defeat and entrapment, while being respected and cared for in the family could improve the resilience of individual psychological trauma. According to Van Petegem et al. (2020) higher levels of overprotective parenting as rated by adolescents were associated with a higher risk of their experiencing maladjustment. In the light of the above findings, defeat may be an important mediator of the effect of family functioning on adolescent suicidal ideation. In addition, with suicide being a social and cultural phenomenon, the adaptability of the IMV model to adolescents in more representative cities of Chinese adolescents also needs to be tested.

The Moderating Effect of Meaning in Life

With the rise of positive psychology in recent years, protective factors of suicidal ideation have gradually become the focus of research. As proposed by Frankl (2006), "Meaning in Life" has rapidly become a hot spot in the field of positive psychology. Meaning in life refers to the degree to which individuals comprehend, understand, and perceive the purpose, mission, and goal of their life (Steger et al., 2008). According to Frankl, meaning in life is a power to influence one's work, creation, and ability to endure hardship (Lantz, 2000). Studies have also shown that meaning in life is significantly but negatively associated with suicidal ideation (Bjerkeset et al., 2010), and can effectively reduce the risk of suicide among adolescents. Meaning in life was also found to be one of the protective factors against impulsive suicidal ideation or behaviors (Kleiman et al., 2013). According to the IMV Model theory, diathesis (e.g., personality traits and cognitive style) is an important influencing factor in the pre-suicide motivational stage; it makes individuals suffering from adverse situations or life events realize that there are other choices in life, which buffers the emergence of defeat and suicide thoughts and facilitates the production of positive thoughts about the future (Díaz-Oliván et al., 2021). It was found that greater meaning in life (and related construction) was associated with a better self-control of cognition and emotions among adolescents and adults, which was more conducive to a flexible response to adverse situations and reduces the occurrence of defeat. Moreover, a survey showed that the interaction between meaning in life and family intimacy was predictive of the mental health of individuals, and that the interaction between meaning in life and family functioning was predictive of the risk of suicide (Damon et al., 2019).

In addition, the theoretical perspective derived from Erikson suggested that developing a sense of meaning in life is an important task for adolescents (Erikson, 1994). The search for meaning in life could be a difficult period. However, once established, it can have a positive and lasting impact on all aspects of their lives. However, few studies have examined this issue so far. Therefore, under the theoretical framework of the IMV Model, when adolescents encounter a dysfunctional family situation, it needs to be explored whether a higher level of meaning in life can function as a resource for adolescents to strengthen their self-control and regulation (Erikson, 1994) and serve as a buffering factor against the emergence of defeat, thereby reducing risks of suicide motivation.

Research Hypotheses

By introducing defeat as a mediating variable and meaning in life as a moderating variable, this study aimed to investigate the relationship between family functioning and suicidal ideation in Chinese adolescents. The research hypotheses were as follows:

H1. Family functioning might be a significant predictor of adolescent suicidal ideation.

H2. Defeat might not only directly affect adolescent suicidal ideation, but also plays a mediating role between family functioning and suicidal ideation in adolescents.

H3. Meaning in life might not only directly moderate the relationship between family functioning and suicidal ideation, but also the first half of the intermediary path of "family functioning \rightarrow defeat \rightarrow suicidal ideation".

Method

Participants and Measures

Participants

The data of this study came from a large-scale domestic epidemic survey, and the subjects were junior and senior high school students in Hunan, Guangdong, Jiangxi, and Anhui Province in China. The survey was conducted from March to July 2022 and administered in class settings. Informed consent was obtained from all the subjects' teachers and parents before the investigation initiated. The main examiners were graduate students majoring in psychology from Hunan Normal University, and they received training beforehand to ensure consistency. During the survey, the students (i.e., participants) were informed that they could submit the questionnaire at any time if feeling unwell. The whole questionnaire took about 40~60 min to complete. All the information was kept confidential. All materials and procedures of this investigation were approved by the ethics review committee of the university. A total of 5000 questionnaires were distributed, and 4515 valid questionnaires were returned after excluding invalid responses, a recovery efficiency of 90.3%. Among the participants who submitted valid responses, there were 2268 boys (50.2%) and 2247 girls (49.8%), with a mean age of 15.24 years (SD = 1.66); 1070 (23.7%) were junior high school grade 1 students, 963 (21.3%) were junior high school grade 2 students, 1370 (30.3%) were senior high

school grade 1 students, and 1112 (24.6%) were senior high school grade 2 students. Students in the third year (i.e., the final year) of junior and senior high school were not selected as participants, as they were facing the High School Entrance Exam and College Entrance Exam.

Measures

The Depressive Symptom Index-Suicidality Subscale (DSI-SS)

The Depressive Symptom Index-Suicidality Subscale (DSI-SS), developed by Joiner, Pfaff, and Acres, is used to investigate the frequency and intensity of suicidal ideation and impulse over a twoweek period as a brief screening device for suicide ideation in general health settings. The scale has been shown to be effective in the assessment of the severity of suicidal ideation among adolescents (Aggarwal et al., 2022; Li et al., 2019; Stanley et al., 2021). The scale consists of 4 items, and the score of each item ranges from 0 to 3 (e.g., from "I have no suicidal thoughts" to "I always have suicidal thoughts"), and the total score ranges from 0 to 12, with higher scores indicating a higher tendency of suicidal ideation. In clinical practice, 2 points are often used as the lowest cut-off point for suicidal ideation in demographic samples (von Glischinski et al., 2016). Before the use of the scale, a doctoral student majoring in English was invited to translate it into Chinese, and an English teacher was asked to proofread the translated manuscript.

The Family APGAR

The Family APGAR was compiled by Smilkstein (1978). It is a tool to measure individual satisfaction with their family functioning in a subjective way. The questionnaire includes aspects of family adaptation, partnership, growth, affection, and resolve. Each item was rated on a 3-point scale (0 = almost rarely, 1 = sometimes, and 2 = often), and the total score of the five items ranged from 0 to 10. The scores of 0–3 indicated severe family dysfunction, 4–6 indicated moderate family dysfunction, and 7–10 indicated good family functioning. The Cronbach's α coefficient of the scale was 0.866 in this study.

The Defeat Scale

The Defeat Scale (DS), compiled by Gilbert and Allan (1998), was used to assess individual views on social status decline and failure in competitions in the past week. The scale consists of 16 items, and each item was rated on a 5-point scale, with 1 indicating "never" and 5 indicating "always"; higher total scores indicated a stronger sense of defeat. The Cronbach's α coefficient of the scale was 0.885 in this study.

Chinese Meaning in Life Questionnaire

The Meaning in Life Questionnaire (MLQ) was compiled by Steger et al. (2008). There are 10 items in total, including 2 factors, i.e., Presence of Meaning (PM, the degree of feelings about whether one's life is meaningful, emphasizing the result) and Search of Meaning (SM, the degree of active pursuit of the meaning in life, emphasizing the process). Each item was rated on a 7-point Likert scale (from 1 to 7). It was demonstrated that the scale had good reliability and validity. Steger et al. (2008) showed that there was a high correlation between the two subscales in Asian countries (such as Japan and China) under the cultural background of collectivism, so this study used the method of packaging to calculate the total score, namely the higher the total score, the higher the overall level of meaning in life. The Cronbach's α coefficient of the scale was 0.813 in this study.

Statistical Analysis

SPSS 26.0 was used for descriptive and correlation analyses, and the PROCESS3.5 macro program plug-in developed by Hayes (2017) was used to evaluate the moderated mediation effect model. All variables were standardized, while gender and school year were encoded using virtual variables. The data were tested for significance of effects using a bias-corrected percentile bootstrap method with repeated sampling for 5000 times and 95% confidence intervals calculated, in order to obtain standard errors of parameter estimates (Hayes, 2017). In addition, the data in this study were self-reported by participants; thus, common method biases could not be all-together avoided. Therefore, 5 items of family functioning, 4 items of suicidal ideation, 16 items of defeat, and 10 items of meaning in life were packaged. Exploratory factor analysis was performed using the Harman single factor test, and unrotated principal component factor analysis was used for the test. The characteristic root of 6 factors was greater than 1, and the explained variance ratio of the first factor was 26.94% (lower than the critical value of 40%), suggesting no serious common method biases.

Results

Descriptive Statistics and Correlation Analysis

Based on a score of two or more for SI [60], 1767 adolescents with suicidal ideation in the past two weeks were detected, accounting for 39.1% of the total number. Comparing means and t-tests showed a significant difference in scores of suicidal ideations between boys and girls (t = -7.14, p < 0.001); girls' (2.48 ± 3.20) were significantly higher than boys' (1.83 ± 2.88). In addition, grade differences were extremely significant (t = 9.57, p < 0.001), with the junior high school group (2.64 ± 3.41) significantly higher than the senior high school group (1.76 ± 2.72). Correlation analysis (see Table 1) showed that suicidal ideation was negatively correlated with family functioning and meaning in life (p < 0.001), and positively correlated with defeat (p < 0.001); family functioning was found negatively correlated with defeat (p < 0.001) and positively correlated with meaning in life (p < 0.001); defeat was found negatively correlated with meaning in life.

Table 1

Descriptive Statistics and Correlation Analysis Results with Regard to Family Functioning, Defeat, Meaning in Life, and Suicidal Ideation.

Category	М	SD	1	2	3	4	5	6
1.Family functioning	5.71	2.84						
2.Defeat	35.11	10.94	-0.365 ***					
3.Meaning in life	47.62	10.68	0.193 **	-0.200 ***				
4.Suicidal ideation	2.16	3.08	-0.336 ***	-0.431 ***	-0.131 ***			
5.Gender	0.50	0.50						
6.Grade	0.45	0.50						

Note: n = 4515; Gender: male = 1, female = 0; Grade: junior high school group = 1, senior high school group = 0; ** p < 0.01, *** p < 0.001.

Family Functioning and Suicidal Ideation in Adolescents: A Moderated Mediating Effect Test

The mediating effect of defeat was first tested (see Table 2, Model 1 and Model 2). The results showed that family functioning had a direct negative effect on suicidal ideation (β = -0.34, p < 0.001). After adding the mediating variable, defeat, family functioning was found to have a direct negative effect on defeat (β = -0.33, p < 0.001), and defeat was shown to have a direct positive effect on suicidal ideation (β = 0.38, p < 0.001), while family functioning still had a significant and negative effect on suicidal ideation (β = -0.20, p < 0.001). The findings demonstrated that defeat played an intermediary role in the relationship between family functioning and adolescent suicidal ideation, which supported hypotheses 1 and 2 of this study. The Bootstrap test for bias correction showed that the indirect effect value of the mediating effect was -0.14, accounting for 41.2% of the total effect (-0.34), and the direct effect value was -0.20, accounting for 58.8% of the total effect (-0.34).

Further analysis of the moderating effect of meaning in life showed that the interaction between meaning in life and family functioning only had a significant effect on defeat (β = 0.07, p < 0.001; see Table 2, Model 2), but not on suicidal ideation (β = 0.02, p > 0.05; see Table 2, Model 3). In addition, the indirect effect of family functioning on suicidal ideation also gradually diminished at three different levels of meaning in life (p < 0.001, see Table 3). This suggested that, compared with adolescents with greater meaning in life, the mediating effect of defeat of adolescents with low meaning in life on the relationship between family functioning and suicidal ideation significantly reduced, i.e., meaning in life regulated the mediating effect. Thus, the moderated mediation model was established (Index = 0.03, SE = 0.01, 95%CI = [0.02, 0.04], see Table 3). The above findings suggested that the mediating effect of meaning in life on the relationship of defeat on family functioning and suicidal ideation occurred in the first half of the model, rather than the direct path. It could be inferred that there were significant moderated mediating effects in the model, so part of hypothesis 3 of this study was supported.

Table 2

Testing of the Moderated Mediating Effect.

	Model			Model 2				Model 3				
Variable	(Dependent Variable: Y)				(Dependent Variable: M)				(Cependent Variable: Y)			
	β	SE	t	95%CI	β	SE	Т	95%CI	β	SE	t	95%CI
Gender	0.21	0.03	7.62 ***	[0.16, 0.26]	0.17	0.03	0.61	[-0.04, 0.07]	0.21	0.03	8.16 ***	[0.16, 0.23]
Grade	0.33	0.03	11.98 ***	[0.28, 0.39]	-0.23	0.03	-8.54 ***	[-0.29, -0.18]	0.42	0.03	16.22 ***	[0.37, 0.47]
х	-0.34	0.01	-24.68 ***	[-0.37, -0.31]	-0.33	0.01	-23.98 ***	[-0.36, -0.31]	-0.20	0.01	-14.54 ***	[-0.23, -0.17]
W					-0.13	0.01	-9.39 ***	[-0.16, -0.10]	-0.02	0.01	-1.58	[-0.05, 0.01]
X×W					0.07	0.01	6.19 ***	[0.05, 0.09]	0.02	0.01	1.60	[-0.00, 0.04]
М									0.38	0.01	27.20 ***	[0.35, 0.41]
M×W												
R2	0.15				0.17				0.28			
F	262.85	***			184.08	***			285.76	***		

Note: Gender: male = 1, female = 0; Grade: junior high school group = 1, high school group = 0; X = family functioning; M = defeat; W = meaning in life; Y = suicidal ideation. *** *p* < 0.001.

Table 3

Type of Effect	Meaning in Life	В	BootSE	BootLL95%CI	BootUL95%CI	
	M – 1SD	-0.22	0.02	-0.25	-0.18	
The direct effect	Μ	-0.20	0.01	-0.23	-0.17	
	M + 1SD	-0.18	0.02	-0.22	-0.15	
	M – 1SD	-0.15	0.01	-0.18	-0.13	
The mediating effect of defeat	М	-0.13	0.01	-0.14	-0.11	
	M + 1SD	-0.10	0.01	-0.12	-0.08	
	Index	0.03	0.01	0.02	0.04	

Direct and Mediating Effects at Different Levels of Meaning in Life.

In addition, we used simple slope analysis to further understand the regulatory mechanisms of meaning in life (see Figure 1). The results showed that the difference of adolescent defeat with different levels of family functioning was more significant when the level of meaning in life was low (β simple = -0.40, *t* = -22.26, *p* < 0.001), while this difference was slightly lower at a high level of meaning in life (β simple = -0.26, *t* = -14.52, *p* < 0.001). The results of the analysis showed that the predictive effect of family functioning on defeat decreased significantly as the level of meaning in life increased. Therefore, the amount of the mediated effect of defeat tended to decrease (Table 3), that is, as the level of meaning in life increased, family functioning was less likely to directly induce adolescent defeat. In conclusion, this model supported a moderated mediation model in which meaning in life was a moderator of family functioning, affecting adolescent suicidal ideation through defeat.

Figure 1

Simple Slope Trajectory of the Moderating Role of Meaning in Life on The Relationship Between Family Functioning and Adolescent Defeat.



Discussions

Current Status of Suicidal Ideation among Adolescents

Adolescence is a time of "storm and stress", when the personality has not yet matured and the level of suicidal ideation and behaviors can be relatively high under extreme stress (Russell et al., 2019); thus, adolescents have been intensively studied in suicide research. Surveys in some Western countries have suggested that the prevalence of suicidal ideation was approximately 15–30.8% among individuals under the age of 18 (Kokkevi et al., 2012), which decreased sharply to 3.7–14.3% after they became adults. This study, based on a multi-provincial large-scale survey, also showed that the detection rate of suicidal ideation among adolescents in secondary schools was as high as 39.1%, higher than previous findings. To some extent, these results reflected an elevated risk of psychological crisis among adolescents in secondary schools when the COVID-19 pandemic occurred (Brown & Plener, 2017; Swannell et al., 2014). In addition, the suicidal ideation of girls and junior high school students was significantly higher than that of boys and high school students, which was consistent with the conclusions of some domestic studies (Zhang et al., 2022). In junior high schools, boys and girls are both in adolescence going though rapid physical and mental development, but girls bear more pressure from physical development, school adaptation, and other aspects of pressure than boys, adding to the susceptibility characteristics of girls themselves, making them more susceptible to such risks, which can lead to negative emotions such as depression and suicidal ideation. In addition, the subjects in this study were all from key junior high schools, with a heavier academic burden and higher expectations from parents than ordinary schools, which can also lead to fatigue, aggravation of mental health problems, and a sharp increase in the risk of related psychological crises such as self-injury and suicidal ideation (Brown & Plener, 2017). For example, studies have found that the mental health of Chinese junior high school students was deteriorating, especially in the central and western regions, which necessitates special attention from schools and families.

Relationship between Family Functioning and Adolescent Suicidal Ideation

This study found that family functioning was not only correlated with adolescent suicidal ideation, but also negatively affected suicidal ideation. A study involving 3178 Hispanic adolescents

in grades 9–12 found that teenagers brought up in a disharmonious family and lacking parental love and care were 2.6–5 times more likely to have suicidal ideation (Garcia et al., 2008). Previous studies also demonstrated that the occurrence of suicidal ideation was positively correlated with family discord, poor family environment, family rigidity, family conflicts, and poor adaptability (Esposito & Clum, 2003), and negatively associated with family intimacy, emotional expression, and organization. Low levels of family cohesion and support and high levels of parent-adolescent conflict increased the risk of adolescent depression and suicidal ideation (Sun & Hui, 2007), whereas higher levels of family closeness, adjustment, cohesion, and family support reduced adolescent suicidal ideation. Our study further corroborated the above findings. According to the Ecological System Theory, family is the most important microenvironment system and the first "protective barrier" for the physical and mental health of adolescents. As adolescents are in a critical period of physical and mental development and are faced with a variety of adaptive challenges, their families are important in supporting their physical and mental health (Anastasia et al., 2015). As collectivistic cultures (e.g., Chinese) lend more emphasis to interpersonal relationships, poor family functioning may be more closely linked to suicidal ideation in such cultures than in individualistic ones (e.g., Western). Meanwhile, collectivism attaches great importance to family relations. Families with a harmonious atmosphere, high-quality communication, and mutual concern can better emotionally support, guide, and help, which all play important roles in preventing adolescent suicidal ideation (Kwok 2011; Reis et al., 2000).

The Mediating Role of Defeat

This study also examined the influence of defeat on the relation between family functioning and adolescent suicidal ideation. The results showed that defeat not only positively affected adolescent suicidal ideation, but also played an intermediary role in the relation between family functioning and adolescent suicidal ideation; this demonstrated that defeat might be a risk factor for adolescent suicidal ideation and that adolescents with poor family functioning, weak parent-child emotional connection, and less support from families were more likely to feel defeated, which increased the risk of suicidal ideation. A study involving 1239 junior high school students in China also demonstrated that defeat was predictive of suicidal ideation, directly and indirectly, through the feelings of entrapment. A study on 730 adults found that defeat played an intermediary role in negative educational styles and suicidal ideation. Both the diathesis-stress model and integrated motivational-volitional model suggest that psychological disorders (e.g., depression, anxiety, selfinjury, and suicide) and obstacles are the results of the joint effect of external pressure and internal "susceptibility". These findings indicated that adverse environmental factors (poor family functioning) could contribute to adolescent suicidal ideation through individual cognitive factors (defeat experience), which was consistent with the conclusion of previous studies (Taylor et al., 2011) and supported the stage theory of suicide in the MIV model, which stated that suicide was a consciously planned and implemented behavior based on the individual condition and the environment.

The Moderating Effect of Meaning in Life

Studies have demonstrated that meaning in life not only enhanced happiness, but also helped individuals cope with psychological risks in particular stages of human development. Pursuing a sense of purpose in life could help reduce the negative impact of stressful situations, enhance the quality and value of life, and reduce the risk of psychological disorders and crises such as suicide (Dulaney et al., 2018). A study showed that college students with a good family atmosphere and functioning were more likely to actively pursue a meaning in life and constantly accept and improve themselves, which contributed to their higher sense of meaning in life and a lower risk of suicide (Kokkevi et al., 2012). Through examining the influence of meaning in life on middle and high school students by including it as a regulatory variable, this study showed that meaning in life had a significant regulatory effect on the first half of the mediating model of the effect of defeat on the relation between family functioning and suicidal ideation. The result further supported the role of meaning in life as an important psychological resource in buffering the influence of poor family functioning on adolescents' feelings of defeat. The impact family functioning had on defeat decreases with the pursuit of meaning in life, suggesting that meaning in life was a protective factor, especially for adolescents with poor family functioning. The result also corroborated the theoretical framework of the IMV Model. The pursuit of meaning in life enabled adolescents to maintain their goals and beliefs and cherish the value of life, which helped buffer the influence of poor family functioning on defeat and subsequently reduced the occurrence of suicidal ideation (O'Connor & Kirtley, 2018).

Practical Significance

Based on the Ecological System Theory and the IMV Model, this study confirmed the research hypothesis that the influence of family functioning on adolescent suicidal ideation was a moderated mediation model, adding evidence to the application of the IMV model among Chinese adolescents. As the study data were obtained from a large prevalence survey across four provinces and cities in China, the finding is representative and has certain implications for a systematic understanding of how family functioning affects adolescent suicidal ideation, and for the development of effective suicide prevention measures for Chinese adolescents by educational authorities and mental health agencies.

First, this study further supports that a comprehensive focus on psychosocial risk factors is critical for the early prevention of adolescent suicidal behavior. For example, adolescents who have poor family functioning and experience high levels of defeat may be highly susceptible to suicide attempts, and external adverse environments can increase adolescents' risk of suicidal crisis through individual cognitive factors. Suicide is a complex phenomenon involving many risk factors and synergistic effects among all relevant variables may be important. Hence, suicide prevention efforts for adolescents support an integrated approach that strengthens adolescent family functioning and promotes positive self-perceptions among adolescents, rather than focusing only on high-risk adolescent groups and their single risk factors. This also provides a reference mechanism for the education sector and health care providers. A study has shown that adolescents hospitalized for suicide attempts benefitted from tailored preventive measures based on psychosocial factors (Fitzpatrick, 2009). According to Calear et al. (2010) 86% of individual and parent/family intervention approaches were significantly effective in the management of suicidal ideation and attempts in adolescents. In particular, the characteristic of Chinese culture is family-centered. Family intervention should be included as a special measure in the overall intervention program, so that families can reduce adverse effects and play a protective role in the process of adolescent suicide prevention.

In addition, this study also confirms that meaning in life would be an important protective factor in adolescent suicide prevention. Given that adolescence is a critical period in identity development, adolescents with healthy worldviews and emotions (e.g., positive meaning in life) were likely to have a positive evaluation of themselves and a better perception of meaning in life, which could serve as a favorable entry point into adolescents (Bartoli et al., 2020). It can guide adolescents to tap into sustainable, transcendent meaning to fill an inner void, enabling them to see themselves in a new and positive light, as well as to pursue life in a responsible, purposeful, and hopeful way. Meanwhile, authentic and therapeutic relationships (e.g., positive parent–child relationships and teacher–student relationships) can help adolescents increase their sense of connection and belonging to others and society, thus effectively preventing their risk of depression and suicide, and promoting essential changes in them.

Limitations and Future Implications

This study has several drawbacks. First, the study is cross-sectional, which precluded us from examining the causal relationship between independent and dependent variables; longitudinal investigations and cross-lagged analyses can be conducted in future works. Secondly, only gender and grade were included as controlled variables, with no in-depth discussion of their influence on the relation between independent and dependent variables; thus, demographic factors such as gender, grade, age, family structure, and household economic status can be used in future studies as regulatory variables to explore their roles. Thirdly, data collected in this study were mostly selfreported, making common method biases unavoidable despite the multiple-source and large-scale data collection. Thus, in future studies, measurement control needs to be bettered, e.g., using the Implicit Association test or adding social desirability variables. Finally, given that the core variables of the motivational stage in the IMV Model also included entrapment and hopelessness, future studies can incorporate them as mediating variables to further validate their role and mechanism in the developmental pathway of suicide among Chinese adolescents.

Conclusions

In conclusion, this study demonstrated that the relationship between family functioning and adolescent suicidal ideation, as well as the influence of defeat and meaning in life on this relationship, constituted a moderated intermediary model. This finding has both theoretical and practical value for the implementation of a psychosocial model of adolescent suicide prevention and intervention.

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Chapter 5

Interpersonal Emotion Regulation and Mental Health among Cancer Survivors: A Systematic Review

Zeng, Z., Karen Holtmaat., Jia, X., George L. Burchell., Sander L. Koole & Irma M. Verdonck-de Leeuw (2024).
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Abstract

Cancer and its treatment often evoke emotional distress and adversely affect mental health. Interpersonal emotion regulation is a social-psychological process in which people manage each other's emotions. The current study reviews the evidence on the associations between interpersonal emotion regulation and mental health among cancer survivors, along with the theoretical models used in this evidence. PubMed, Embase, Web of Science, and Scopus databases were systematically searched for relevant studies. Out of 6,928 identified studies, 86 studies with a total of 67,592 cancer survivors met the inclusion criteria. The included studies assessed various facets of interpersonal emotion regulation (i.e., emotional support, social constraints, emotional expression, affectionate support, family support and dyadic coping) and various indicators of mental health (e.g., distress, anxiety, depression, quality of life, well-being). Statistically significant, small-to-moderate associations were found between almost all measures of interpersonal emotion regulation and all measures of mental health. Less than a third of the studies mentioned a theoretical model, including the social-cognitive processing model (7 studies), the stress buffering hypothesis and conceptual model of posttraumatic growth (3 studies), and twelve other models (each in 1 or 2 studies). Future prospective studies, integrated in a theoretical framework, are needed to further advance our understanding of the role of interpersonal emotion regulation in mental health among cancer survivors.

Keywords: Social support, emotional support, emotional expression, ambivalence over emotional expression, social constraints, family support
Cancer and its treatment often have adverse impacts on the mental health of cancer survivors (Bazilainsky et al., 2023). One mitigating factor against such adverse impacts is formed by the emotional support that cancer survivors receive from their interpersonal relations such as their partner, family and friends (Fong et al., 2017; Harms et al., 2019; Li et al., 2018). Interpersonal emotion regulation theory states that people may engage in various activities to regulate their emotions in interpersonal contexts, such as emotional expression, sharing emotions, and corumination (Zaki & Williams, 2013; Koole & Tschacher, 2016; Rimé, 2009).

The study of interpersonal emotion regulation has emerged as a distinct domain of scientific inquiry relatively recently, over the past two decades (Butler & Randall, 2012; Dixon-Gordon et al., 2015; Niven, 2017; Rimé, 2007; Zaki & Williams, 2013). Theoretically, interpersonal emotion regulation is a general process that operates across existing constructs, such as social support, emotional sharing, and dyadic coping. Social support theory (Cohen & Wills, 1985; Lakey & Cohen, 2000), posits that perceived social support may buffer the effects of stress on physical and psychological health. Emotional sharing research has investigated how people talk about emotional experiences with others, for social validation (Koudenburg et al., 2014) or to gain new insights in their problems (Rimé, 2009; Pennebaker & Francis, 1996). Dyadic coping has examined how people within close relationships jointly deal with stressful conditions, which often involve emotional distress. For instance, relationship partners may align their emotional regulation strategies and fostering mutual responsiveness (Bodenmann, 1997; Lyons & Lee, 2018). Related approaches have addressed emotional coregulation (Butler & Randell, 2013) and the synchronization of emotional responses among individuals over time (Butler & Randall, 2013; Koole & Tschacher, 2016).

As a construct that cuts across the preceding constructs, interpersonal emotion regulation includes all the myriad ways in which people influence their emotions in the context of interpersonal relationships. Social support, such as support from one's family, is closely related to interpersonal emotion regulation. However, social support is a broader construct because it also includes nonemotional forms of support such as information support and tangible support (Cohen & Wills, 1985; Lakey & Cohen, 2000). Emotional sharing is an important activity that may contribute to interpersonal emotion regulation (Rimé, 2007). However, emotional sharing is verbal, whereas interpersonal emotion regulation encompasses nonverbal expressions such as interpersonal touch (Suvilehto et al., 2023; Sin & Koole, 2013). Finally, coregulation dynamics within dyads are a vital part of interpersonal emotion regulation (Butler & Randall, 2013; Koole & Tschacher, 2016), but interpersonal emotion regulation may also be analysed from the perspective of individual persons, such as 'regulators,' who provide such regulation (Niven, 2017), and the 'regulated,' who are the recipients of this regulation (Levy-Gigi & Shamay-Tsoory, 2017). The study of interpersonal emotion regulation thus helps to uncover general patterns that were previously studied in isolation from another.

Over the last few decades, a growing number of studies has investigated aspects of interpersonal emotion regulation on outcomes such as quality of life (Moura et al., 2021), well-being (Strayhorn et al., 2021), and psychological symptoms of distress (Fagundes et al., 2012) and depression (Darabos et al., 2022) among cancer survivors. Lepore and Revenson (2007) explored social constraints, such as expected criticism on disclosing cancer-related thoughts and feelings, examining their influence on coping behaviours, and psychological adjustment. Other researchers investigated dyadic coping in couples affected by cancer, such as open communication (Regan et al., 2015).

In conclusion, interpersonal emotion regulation is a new integrative construct that highlights general patterns in emotional functioning that that appear to be vital to the mental health of cancer survivors. To our knowledge, studies investigating associations between interpersonal emotion regulation and mental health among cancer survivors have so far not been systematically reviewed. Our primary aim in this article is hence to systematically identify, evaluate, and synthesize evidence on the associations between interpersonal emotion regulation and mental health among cancer survivors. As a secondary aim, we took note of the theoretical models that were used in studying interpersonal emotion regulation in relation to mental health among cancer survivors to obtain more insight into the theoretical background of the evidence in this field.

Method

We conducted a systematic review of studies investigating associations between interpersonal emotion regulation and mental health among cancer survivors. The study was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines (*See Appendix 1 PRISMA_2020_checklist,* Moher et al., 2009) and preregistered in PROSPERO (registration no.: CRD42023370318).

Inclusion and Exclusion Criteria

We included studies on associations between interpersonal emotion regulation and mental health in cancer survivors. Cancer survivorship was defined as having completed active treatment with curative intent (i.e. surgery, radiotherapy, and/or chemotherapy). Cross-sectional studies, longitudinal studies, randomized controlled trails and qualitative studies reporting on original data were all included. Exclusion criteria were: (1) non-English-language articles; (2) articles that were not specific to cancer survivors; and (3) literature reviews, systematic reviews, meta-analyses, books, unpublished articles, doctoral theses, commentaries, abstracts of conferences and congresses, and case-reports. Because of our focus on interpersonal emotion regulation, we did not include research on general social support (e.g. studies that did not separate emotional support from practical or financial support). We also included support that indicated a specific source (partner, family, and friend support).

Search Strategy

An information specialist conducted title/abstract/keyword-based searches in PubMed, Embase, Web of Science, and Scopus databases. Keywords related to cancer (e.g., cancer* or neoplas* or oncolog*) and survivor (e.g., "cancer survivors" or surviv*) were combined with keywords related to interpersonal emotion regulation (e.g., empath* or "social support" OR "emotional expression"). Mental health was broadly defined including psychiatric diagnoses (e.g., depressive disorder, anxiety disorder, obsessive–compulsive and related disorders, and trauma- and stressor-related disorders), as well as symptoms of psychiatric disorders and mental health problems (e.g., psychological problems, psychosocial problems, distress). The full search string is shown in the *Appendix 1*. The first searches were conducted for the period from the earliest time available until November 11th 2022. Then we did a search update on September 25th 2023 and a final search on April 18th 2024.

Title, Abstract and Full Text Screening

The information specialist (GB) removed duplicates using Covidence (Covidence systematic review software, 2020) and three authors (ZZ, SLK, IV) conducted title and abstract screening using Rayyan for Systematic Reviews (Ouzzani et al., 2016). ZZ scanned all records, SLK, and IV each scanned half of them ensuring that all records were independently evaluated by two authors. Full texts of the remaining references were evaluated by two authors (ZZ, IV) and reasons for exclusion were registered. Then, ZZ and Xiaoyi Zhang (XZ) performed the title, abstract and full text screening of the search update. Disagreements in title and abstract screening and full text screening were discussed with a third author (KH) until consensus was reached.

Data Extraction

Data regarding study characteristics were extracted by two authors (ZZ and XJ) and checked by a third author (KH). When two or more studies reported data on the same study population, we extracted data from the study with the largest sample size, or if equal, the one providing more detailed outcome information. Studies were coded according to a priori–specified characteristics, comprising of (1) study characteristics: author, year of publication, country and study design; (2) study population characteristics: sample size, age (mean (SD) years), sex, type of cancer, time since diagnosis, time since treatment; (3) study outcomes: a) type of interpersonal emotion regulation, including its measure, Cronbach's α , mean, and standard deviation; b) type of mental health outcome, measure, Cronbach's α , mean and standard deviation, and c) correlation coefficient between the measured type of interpersonal emotion regulation and the mental health outcome reported in the study. If instead of a correlation coefficient another statistic was reported (i.e. regression coefficient or odds ratio) only the significance (yes, no) and direction (positive, negative) of that statistic was extracted. For qualitative studies only the direction of the association was extracted.

Data on the theories or models of interpersonal emotion regulation in relation to mental health used in the included articles were extracted and analyzed by two authors (ZZ and XJ).

Quality Assessment

Study quality was assessed by two authors (ZZ and XJ), using Joanna Briggs Institute critical appraisal tools (checklists for cross-sectional and qualitative studies) (Lockwood et al., 2020). Three levels were used to assess the strength of the evidence and the degree to which findings can be considered reliable. Level 1 evidence is considered the highest quality of evidence and is often used to inform clinical guidelines and decision-making (e.g., high quality randomized controlled trials (RCTs) or meta-analyses). Level 2 evidence is generally considered to be of moderate quality (e.g. well-designed cohort studies and case-control studies). Level 3 evidence is considered the lowest quality of evidence. It includes opinion-based evidence, cross-sectional studies and reviews that do not follow a systematic methodology. The checklist comprised 8 items for cross-sectional studies and 10 items for qualitative research (*see the Appendix 2*). A scoring system was used: "yes" to a question from the checklist scored 2, "unclear" scored 1 and "no" or "not applicable" scored 0. Each score was then converted into an overall percentage to harmonize the scoring system (Jud et al., 2020). A higher percentage indicates a higher study quality and less risk of bias.

Data Analysis

We provided a general summary of the characteristics of the included studies, the study populations, the types of interpersonal emotion regulation, mental health outcomes and their association, risk of bias, and the theoretical models that were reported in the included studies. In the synthesis of evidence regarding the role of interpersonal emotion regulation on mental health of cancer survivors, data from qualitative and quantitative studies were integrated.

Results

Selection of Studies

A total of 13,358 records were identified by searching the four selected databases. After the removal of duplicates, title and abstract were screened of 6,928 records. Out of these, 6,430 were excluded, according to the inclusion and exclusion criteria. The remaining 443 papers qualified for full text screening. After exclusion of a further 357 articles for not meeting the criteria, 86 studies were included in this review (see Fig. 2). The included papers and their main characteristics are presented in Table 1.

Figure 2

The PRISMA Flow Diagram and the Total Number of Studies after Identification, Screening and Final Inclusion.



Table 1

Overview of study characteristics

	First author Year Country	Study design Sample size	Sex Mean age Cancer type	Interpersonal emotion regulation types (Questionnaire)	Mental health outcome (Questionnaire)	Statistically significant association (direction) in case of no reported correlation	Correlation coefficient	Quality appraisal	Theory/Model
1	Acquati 2019 USA	Cross- sectional N = 86	Female Breast cancer	Dyadic coping (DCS)	Quality of Life (FACT) Relational Mutuality (MPDQ)	Yes (pos) Yes (pos)	-	93.80%	-
2	Acquati 2020 USA	Cross- sectional N = 96	Female 54 Breast cancer	Social constraints (SCS)	Posttraumatic stress symptoms (PSS-SR) Mental component summary (MOS)		0.56 -0.47	89.60%	-
3	Agarwal 2010 USA	Cross- sectional N = 50	16 female 34 male 63 Head and neck cancer	Coping 1 others there for me 2 helping others 3 others distract me 4 church family upport 5 being strong for	Quality of life (SF-12)		0.16 0.12 -0.18 -0.02 -0.10	85.40%	-
4	Altschuler 2009 USA	Qualitative N = 30	Female Colorectal cancer	Husbands' or partners' support	Psychosocial adjustment	Yes (pos)	-	86.70%	-
5	Arthur 2024 USA	Cross- sectional N = 9,807	Female 65 Breast cancer	Social limitation	Quality of life (MCS)	Yes (neg)	-	95.83%	-
6	Bellur 2018 Turkey	Cross- sectional N = 134	Female 45 Breast cancer	Dyadic coping (RDA)	Posttraumatic growth (PTGI)		0.19	83.30%	Model of posttraumatic growth (Calhoun & Tedeschi, 2014)
7	Best 2021 USA	Cross- sectional N = 7.543	4,155 female 3,388 male 66	Negative caregiver response (PRCI)	Quality of life (SF-36) Spirituality (FACIT-SP)	Yes (pos) Yes (pos)	-	91.70%	-
8	Boinon 2014 France	Longitudinal N = 102	Female 52 Breast cancer	Emotional expression (SSM) Emotional support (SSQ-6)	Depressive symptoms (BDI) Cancer-related psychological distress (IES)	Yes (all neg)	-	93.80%	-
9	Bourdeau 2024	Longitudinal N = 92	45 female 47 male	Expression suppression (EAC)	Well-being (WHO-5)	Yes (neg)	-	95.83%	-

	Canada		24						
	Callaua		24 Homotologic						
			cancor						
10	Corportor	Cross	Eomolo	Family support (BSS Fa)	Cancor specific traumatic		0.16	07 0.0%	Strocc hufforing
10	2010	cross-	Feiliale	Failing support (F35-Fa)	cancel-specific traditiatic		0.10	97.90%	bypothosis
	2010		Gunaocologic		Doprossivo symptoms		0.07		(Cohon & Wills
	USA	N = 200	Gynaecologic				-0.07		
			cancer	Friend support (DCC Fr)	(CES-D)		0.25		1985)
				Friend support (PSS-Fr)	cancer-specific traumatic		-0.25		
					stress		0.0		
					Depressive symptoms		-0.3		
11	Chu	Cross-	Female	Social constraints (SCS)	PISD symptoms (PSS-SR)		0.58	93.80%	Stress buffering
	2021	sectional	57	Affectionate support (MOS)			-0.52		hypothesis
	China	N = 136	Breast cancer						(Cohen &
	a 115								Wills, 1985),
12	Clifton	Mixed	58 female	Social constraints (PROMIS)	Loneliness (UCLA)	Yes (pos)	-	93.80%	Model of
	2022	methods	42 male						loneliness
	USA	N = 100	74						(Cacioppo et al.,
			Mixed cancer						2006)
13	Cohee	Cross-	Female	Social constraints (SCS)	Depression (CES-D)		0.40	83.30%	-
	2021	sectional	57		Anxiety (STAI-S)		0.41		
	USA	N = 1,127	Breast cancer		Avoidant coping (COPE)		0.43		
					Fear of recurrence (CARS)		0.32		
					Attention function (AFI)		-0.29		
14	Coleman	Mixed	44 female	Emotional support (I have someone who	Fatigue (PROMIS)	Yes (neg)	-	93.80%	-
	2022	methods	53 male	will listen to me when I need to talk)					
	USA	N = 103	Cervical cancer						
15	Darabos	Cross-	57 female	Social isolation (PROMIS)	Depressive symptoms	Yes (pos)	-	83.30%	Social-cognitive
	2022	sectional	2 male		(CES-D)				processing
	USA	N = 59	35						theory (Lepore,
			Mixed cancer						2001)
16	Dědová	Cross-	463 female	Family support (MSPSS)	Pain (WBFPRS)		-0.10	100%	-
	2023	sectional	233 male	Friends support (MSPSS)			-0.10		
	Slovakia	N = 696	53						
			Mixed cancer						
17	Doran	Longitudinal	328 female	Emotional support (ELSA)	Quality of life (CASP-19)	Yes (pos)	-	81.30%	-
	2019	N = 533	205 male						
	UK		66						
18	Ernst	Longitudinal	82 female	Dyadic coping (DCI)	Quality of life (SF-12)	Yes (pos)	-	95.80%	-
	2017	N = 217	135 male	, , , ,		, , , , , , , , , , , , , , , , , , ,			
	Germany		57						
			Hematologic						
			cancer						
19	Escalera	Cross-	Female	Emotional support (MOS)	Intrusive thoughts (ITS)	Yes (all neg)	-	91.70%	Stress buffering
	2019	sectional	50	Affectionate support (MOS)	Psychological distress (BSI)				hypothesis
	USA	N = 151	Breast cancer	Positive social interaction (MOS)	,				(Cohen & Wills
	* -	·							1985)
20	Fagundes	Cross-	Female	Emotional support (ISEL)	Psychological distress (IES)	Yes (neg)	-	93.80%	-
	2012	sectional	51		Quality of life (FACT)	Yes (pos)			
						(p)			

		N = 122	Broast cancer						
21	USA	N = 132	Breast cancer	Emerathy (ODDT)			0.20	02.00%	
21		Cross-	Female	Empathy (ODPT)	Depression (CES-D)		-0.36	93.80%	-
	2015	sectional	48						
	laiwan	N = 151	Breast cancer		5		0.05	05 000/	
22	Feng	Cross-	Female	Family support (MSPSS)	Post-traumatic growth		0.25	95.83%	Model of post-
	2024	sectional	49	Friend support (MSPSS)	(PIGI)		0.19		traumatic growth
	China	N = //1	Gynecological cancer						(ledeschi et al., 2004)
23	Goldblatt	Qualitative	Female	Emotional expression	Quality of life	Yes (pos)	-	93.30%	Emotional-
	2016	N = 40	43-61		-				motivational life-
	Israel		Breast cancer						span
									development
									theory (Scheibe
									& Carstensen,
									2010)
24	Gonzales	Longitudinal	Female	Emotional support (MOS)	Fatalism (PFI)		-0.24	95.80%	-
	2016	N = 150	50		Acceptance (BFS)		0.30		
	USA		Breast cancer		Emotional well-being		0.23		
					(FACT)				
25	Gonzalez-Saenz	Longitudinal	344 female	Affective support (FSSQ)	Anxiety (EORTC)	Yes (neg)	-	93.80%	-
	2017	N = 947	603 male		Depression (EORTC)	Yes (neg)			
	Spain		67						
			Colorectal cancer						
26	Greinacher	Cross-	72 female	Positive support (ISSS)	Quality of life (EORTC)	Yes (pos)	-	95.83%	-
	2023	sectional	54 male	Detrimental interaction (ISSS)		Yes (neg)			
	Germany	N = 126	64						
			Multiple						
			myeloma						
27	Gu	Cross-	Female	Social constraints (SCS)	Depression (SDS)		0.38	95.83%	Social-cognitive
	2023	sectional	Breast cancer						processing model
	China	N = 522							(Lepore, 2001)
28	Gudina	Cross-	14,255 female	Emotional support	Quality of life	Yes (pos)	-	95.80%	-
	2021	sectional	9,684 male						
	USA	N = 23,939	60						
				5				77 400/	
29	Haviland	Longitudinal	40% female	Emotional support (MOS)	Quality of life (EQ-5D)	res (all pos)	-	//.10%	-
	2017	N = 756	60% male	Affectionate support (MOS)	Well-being (PWI-A)	Yes (all pos)			
	UK		68	Positive social interaction (MOS)	Anxiety (STAI)	Yes (all neg)			
20		<u> </u>	Colorectal cancer		Depression (CES-D)	Yes (all neg)		00.000	
30	Holzner	Cross-	Female	Emotional support (F-SOZU)	Fatigue (MFI-20)	Yes (neg)	-	89.60%	-
	2003	sectional	5/		Quality of life (FACT)	Yes (pos)			
	Austria	N = 98	ovarian cancer		Anxiety (EORIC)	Yes (neg)			
					Depression (EORIC)	Yes (neg)			
					Mental adjustment				
		<u>.</u>	- I	5 ··· · · · · · · (1400)	(MAC)	Yes (neg)	0.40	100.000	
31	Hurtado-de-Mendoza	Cross-	remale	Emotional support (MOS)	well-being (FACT)		0.42	100.00%	-
	2021	sectional	Breast cancer						
	USA	N = 545							

22	1:	Cross	Ferrels	Ambivelence ever emotional	A puriety (CAC)		0.20	05.00%	
32	JI 2010	Cross-	Female	Ambivalence over emotional	Anxiety (SAS)		0.26	95.80%	-
	2019 China	sectional	49 Droot concor	expression (AEQ)			0.23		
	China	N = 327	Breast cancer		(SDS)		0.24		
22	territe at	C	E	Franklin and (MACDCC)	Quality of life (FACT)		-0.34	04 670/	
33	Joulael	Cross-	Female	Family support (MSPSS)	Depression (DASS-21)	Yes (all neg)	-	91.67%	-
	2024	sectional	52	Friend support (MSPSS)	Anxiety (DASS-21)				
24	Iran Katawa di	N = 311	Breast cancer	Family and the second sec	Stress (DASS-21)			05 400/	The same of four the
34	катароді	Cross-	Female	Family support (Open communication)	Anxiety	Yes (neg)	-	85.40%	i neory of family
	2018	sectional	51		Depression	Yes (neg)			systems in
	Switzerland	N = 310	Breast cancer		Fear of cancer	res (neg)			genetic liness
					recurrence (CARS)				(Rolland &
25	Kautaal	6	E	Considered and the inter (CCC)	Self-efficacy	Yes (pos)	0.02	00 60%	Williams, 2005)
35	Koutrouli	Cross-	Female	Social constraints (SCS)	Posttraumatic growth		0.02	89.60%	IVIODEI OT
	2016	sectional	60 Durant ann an		(PIGI) Develo al a si cal distance		0.55		posttraumatic
	Greece	N = 202	Breast cancer				0.55		growth (Calhoun
					(MHI)				& ledeschi,
26	Kroonko	Cross	Fomalo	Affectionate support (MOS)	Quality of life (EACT)	Voc (poc)		97 E0%	2014)
50	2012	cross-	Proact concor	Affectionate support (MOS)	Quality of file (FACT)	tes (pos)	-	87.50%	-
	2015		Diedst Calicel						
37		In = 3,139	Female	Affectionate support (MOS)	Depressive symptoms	Vec (neg)	_	89 60%	_
57	2011	N - 296	17	Affectionate support (MOS)	(SDS)	ies (iieg)	-	89.00%	-
	South Koroa	N - 200	47 Proast cancor		Quality of life (EQPTC)	Voc (poc)			
20		Cross-	08 female	Self-disclosure (SS)	Well-being (EACT)	Ves (pos)	_	05 83%	Disclosure
50	2022	sectional	261 male	Sell-disclosure (55)	Weil-being (IACI)	ies (pos)	-	33.8370	process model
	South Korea	N - 250	13						(Chaudoir &
	South Korea	N - 555	4J Mived cancer						Eicher 2010)
20	Leung	Longitudinal	Female	Affectionate support (MOS)	Quality of life (SE-36)	Ves (nos)		81 30%	-
55	2014	N = 412	Breast cancer	, meetionate support (mos)	Quality of file (SF 50)	103 (p03)		01.50%	
	Australia	11 - 412	Breast cancer						
40	Levine 2017	Longitudinal	Female	Affectionate support (MOS)	Well-being (FACT)		0.35	83,30%	-
	USA	N = 116	57				0100	0010070	
			Breast cancer						
41	Lim	Mixed	Female	Family communication (FACES IV)	Quality of life (SF-36)		0.40	85.40%	-
	2014	methods	55		(1) (1)				
	USA	N = 189	Breast cancer						
42	Lim	Cross-	Female	Family communication (FACES IV)	Quality of life (MCS)	Yes (pos)	-	95.80%	-
	2013	sectional	53-55		(
	USA	N = 157	Breast cancer						
43	Lim	Cross-	33 female	Family coping (F-COPES)	Psychological distress (BSI)		-0.29	93.80%	-
	2014	sectional	58 male	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Resilience (BRS)		-0.36		
	USA	N = 91	64		, -,				
44	Lu	Cross-	Female	Ambivalence over emotional expression	PTSS—arousal (PSS-SR)		0.46	93.80%	-
	2017	sectional	54	(AEQ)	PTSS—avoidance (PSS-SR)		0.41		
	USA	N = 118	Breast cancer						
45	Lu	Longitudinal	Female	Ambivalence over emotional	Quality of life (FACT)		-0.39	85.40%	-
	2018	N = 103	58	expression (AEQ)					
	USA		Breast cancer						

_									
46	Lu	Cross-	Female	Ambivalence over emotional expression	Depression (BSI)		0.45	93.80%	-
	2015	sectional	54	(AEQ)	Intrusive thoughts (IES)		0.44		
	USA	N = 118	Breast cancer						
47	Lvon	Cross-	34 female	Active engagement (DCM)	Depressive symptoms	Yes (neg)	-	97.90%	Theory of dyadic
	2022	sectional	15 male	Protective buffering (DCM)	(CES-D)	Yes (neg)			illness
	1154	N = 40	12 11010	Hoteetive building (beivi)	(625 0)	ics (iicg)			management
	USA	N = 49	45						management
			Mixed cancer						(Lyons & Lee,
									2018)
48	Manne	Cross-	Male	Self-disclosure	Distress (BSI)		-0.16	93.80%	-
	2010	sectional	59						
	USA	N = 75	Prostate cancer						
49	Margolis	Cross-	154 female	Emotional support (SSE)	Psychiatric distress (BSI)		- 0.24	95.80%	Social support
	2019	sectional	121 male		-,				effectiveness
	1150	N - 275	54						framework
	034	N - 275	J4 Homotologic						(Closen et al
			Heimatologic						
			cancer						2008)
50	Marroquin	Longitudinal	Female	Explicit emotional expression (EAC)	Depressive symptoms	Yes (neg)	-	97.90%	-
	2016	N = 390	57	Implicit emotional expression (LIWC)	(CES-D)	Yes (neg)			
	USA		Breast cancer						
51	Martin	Cross-	Female	Social constraints (SCS)	Fear of recurrence (CARS)		0.51	93.80%	Social-cognitive
	2020	sectional	57						processing
	USA	N = 64	Breast cancer						theory (Lepore.
									2007)
52	Matsui	Cross-	76 female	Peer support	Posttraumatic growth	Yes (nos)	-	93 80%	-
52	2023	sectional	236 male		(PGI)	105 (p05)		55.6676	
	2023		230 male		(FGI)				
	Japan	N = 212	wixed cancer	5		<i></i>		07 500/	
53	Matulonis	Cross-	Female	Emotional support (MOS)	Quality of life (EORTC)	Yes (pos)	-	87.50%	-
	2008	sectional	56		Mental health (MHI)				
	USA	N = 58	Ovarian cancer		Fears of cancer recurrence	Yes (pos)			
					(FRRS)	Yes (neg)			
					Posttraumatic stress				
					disorder (PCL-C)	Yes (neg)			
					Posttraumatic growth				
					(PTGI)	Yes (nos)			
					Spirituality (FACT)	100 (000)			
						Vec (noc)			
F 4	Mashar	Creas	07 famala	Capiel constraints (CCC)	Distance (DCI)	Ves (pluses)		01 700/	Control on antitive
54	Wosher	Cross-	97 lemale		Distress (BSI)	res (all pos)	-	91.70%	Social-cognitive
	2012	sectional	98 male	Emotional support (PNSES)	Intrusive thoughts and	Yes (all neg)			processing
	USA	N = 195	54		avoidance (IES)				theory (Lepore,
			Hematologic		Loneliness (UCIA)				2001)
			cancer						
55	Nakamura	Longitudinal	Female	Affectionate support (MOS)	Depressive symptoms	Yes (neg)	-	95.83%	-
	2023	N = 272	68		(CES-D)				
	USA	-	Breast cancer		/				
56	Nepova	Cross-	26 female	Emotional support (PPCI)	Posttraumatic growth		0.30	95 80%	Social-cognitivo
50	2012	coctional	20 ieiliaie 22 malo		(DTCI)		0.50	55.0070	processing model
	2013	Sectional	25 IIIdle				0.22		(Leners 2001)
	USA	N = 49	49		Distress (PISD)		-0.22		(Lepore, 2001)
				Social constraints (SCS)	Posttraumatic growth		-0.12		

			the second all a site		Distance		0.24		
			Hematologic		Distress		0.34		
57	Dong	Cross	cancer	Emotional support (MOS)	Emotional boalth		0.27	100%	Social support
5/	reng	Cross-	253 iemale	emotional support (MOS)	Emotional nealth		0.37	100%	social support
	2025 China	Sectional N = E17	204 maie						(Kann,
EQ	Cillid Dini	IN = 517	40-71 147 fomalo	Social potwork orientation (NOS)	Quality of life (EACT)		0.24	02 80%	19/9)
50	RIIII 2016		147 lellidle	Social network onentation (NOS)	Quality of file (FACT)		0.24	95.60%	-
	2016	N = 255	108 maie						
	USA		54 Homotologic						
FO	Pizalar	Crocc	Eomalo	Emotional support (C SSSS)	Revehological distross		0.08	75.00%	
39	2014	cross-	Feilidie				-0.08	73.00%	-
	ZU14 Turkey		JZ Breast cancer		(FAIS)				
60	Salonen	l ongitudinal	Fomalo	Emotional support (SNSSN)	Quality of life	No	_	70 20%	Social support
00	2013	N – 70	Breast cancer		Quality of file	NO	-	79.20%	theory (Kahn
	Einland	N = 75	Diedst cancer						1070)
61	Sawma	Cross-	Female	Family support (FACES IV)	Fear of cancer recurrence	Yes (neg)	_	81 30%	-
51	2022	sectional	51		(FCBI)	100 (110B)		01.00/0	
	Lebanon	N = 62	Breast cancer		()				
62	Schnoll	Cross-	83 female	Emotional support (COPE)	Adjustment (PAIS)	Yes (all pos)	-	93.80%	Stress-illness
02	2002	sectional	26 male	Social support-companionship (ISEL)	Meaning in life (PIL)	100 (un p00)		5010070	vulnerability
	USA	N = 109	60		Optimism (LOT)				theory (Holahan
	00/1	11 200			0,0000				& Moos, 1994)
63	Song	Cross-	Female	Self-disclosure (DDI)	Posttraumatic growth		0.63	95.80%	Systemic-
	2022	sectional	47		(PTGI)				transactional
	China	N = 400	Gynecological		Intrusive rumination (ERRI)		-0.05		model
			cancer		Deliberate rumination				(Bodenmann,
					(ERRI)		0.30		1997)
64	Stinesen	Longitudinal	Male	Social constraints (SCS)	Well-being	Yes (neg)	-	93.80%	-
	2018	N = 3,478	63						
	Switzerland		Prostate cancer						
65	Strayhorn	Cross-	Female	Positive support (HRSPLBPLQ)	Well-being (SF-12)	Yes (pos)	-	91.70%	-
	2021	sectional	66	Negative support (HRSPLBPLQ)		Yes (neg)			
	USA	N = 100	Breast cancer						
66	Su	Cross-	Female	Family support (APGAR)	Depressive symptoms	Yes (neg)	-	83.30%	-
	2017	sectional	48		(MINI)				
	Taiwan	N = 300	Breast cancer						
67	Sutton	Qualitative	Female	Mutual dyad support	Quality of Life	Yes (pos)	-	88.30%	-
	2006	N = 31	49						
	USA		Breast cancer						
68	Swartzman	Cross-	39% female	Family constraints (SCS)	Posttraumatic stress (PCL-		0.62	87.50%	-
	2017	sectional	60% male		C)				
	UK	N = 205	71		Family identification (GIS)		-0.39		
			Colorectal cancer						
69	Тао	Cross-	Female	Self-disclosure (DDI)	Well-being (FACT)		0.50	91.67%	Adult attachment
	2024	sectional	Breast cancer						theory (Hazan &
	China	N = 341							Shaver, 2017)
70	Tsai	Cross-	Female	Ambivalence over emotional expression	Quality of life (FACT)		-0.39	85.40%	-
	2019	sectional	58	(AEQ)					

	USA	N = 112	Breast cancer						
71	Tsai	Cross-	Female	Ambivalence over emotional expression	Depressive symptoms		0.35	91.70%	-
	2017	sectional	54	(AEQ)	(CES-D)				
	USA	N = 96	Breast cancer		Quality of life (FACT)		-0.35		
72	Tsai	Cross-	Female	Ambivalence over emotional expression	Depressive symptoms		0.51	95.80%	-
	2019	sectional	54	(AEQ)	(CES-D)				
	USA	N = 112	Breast cancer	x - 7	. ,				
73	Tsai	Longitudinal	Female	Ambivalence over emotional experience	Quality of Life (FACT)		-0.31	87.50%	-
	2018	N = 96	54	(AEQ)					
	USA		Breast cancer						
74	Tulk	Cross-	333 female	Emotional support (MOS)	Distress (KPDS-10)		-0.21 for rural	87.50%	-
	2023	sectional	45 male		, , , , , , , , , , , , , , , , , , ,		-0.33 for urban		
	Canada	N = 379	32	Affectionate support (MOS)			-0.19 for rural		
			Mixed cancer				-0.16 for urban		
75	Utlev	Cross-	Female	Emotional support (MOS)	Mental health composite		-0.05	93.80%	-
	2022	sectional	73		score (RAND-36)				
	USA	N = 173							
76	Wells	Longitudinal	101 female	Appraisal (ISEL)	Depression (CES-D)		-0.25	91,70%	-
	2009	N = 212	113 male	· · · · · · · · · · · · · · · · · · ·	Anxiety (STAI)		-0.21		
	USA		51	Belonging (ISEL)	Depression		-0.25		
	00.1		Hematologic	50101.5.1.8 (1022)	Anxiety		-0.24		
			cancer		, indeely		0.24		
77	White	Qualitative	Female	Female partners' support	Stress	Yes (neg)	-	83.30%	-
	2012	N = 15	52		011000	100 (1108)		0010070	
		11 - 15	Breast cancer						
78	Wong	Cross-	Female	Affectionate support (MOS)	Well-being (FACT)		0.37	93 80%	
70	2017	sectional	54	Anectionate support (MOS)	Well being (rAer)		0.57	55.0070	
	1150	N - 123	Breast cancer						
70	Wong	Cross-	Female	Social constraints (SCS)	Depressive symptoms		0.45	81 30%	Social-cognitive
15	2018	sectional	54	Ambivalence over emotional expression	(CES-D)		0.45	81.50%	nrocessing model
	1150	N - 96	Breast cancer				0.57		(Lenore 2001)
00	Voung	Cross	Eomolo	(ALQ) Social constraints (SCS)	Ecor of recurrence		0.21	9E 40%	Social cognitivo
80	2022	cross-	Feilidie 57	Social constraints (SCS)	Solf stigma (SSS SE)		0.31	85.40%	processing model
	2022	N = 126	Broast cancor	Ambivalance over emotional expression	East of recurrence		0.30		(Lonoro 2001)
	USA	N - 150	Diedst Calicel		Self-stigma		0.40		(Lepore, 2001)
01	Xaa	Cross	952 fomalo	Affectionate support (ESSO)		Voc (nog)	0.42	80 60%	
01	2017	sectional	966 male	Allectionate support (F35Q)		ies (iieg)	-	89.00%	-
	South Koroa		500 male		(FIIQ-9) Quality of life (EOPTC)	Voc (poc)			
07	You	N = 1,010	Eomalo	Social constraints (SCS)	Intrucivo thoughts (IES)	1es (pos)	0.27	02 80%	
02	2014	cross-	Feilidie	Social constraints (SCS)	Desitive and		0.37	95.80%	-
	2014	N = 120	D4 Broact cancor		Positive affect (DANAS)		-0.24		
	USA	N = 120	Diedst Calicer		Quality of life (FACT)		0.47		
02	Mar.	Creas	Famala	Secial constraints (SCS)	Quality of file (FACT)		0.57	01 700/	Dianayahaaaaial
83	100	Cross-	Female	Social constraints (SCS)	Weil-being (FACT)	res (neg)	-	91.70%	Biopsychosocial
	2010		J4 Broast cancer						Stowart 2010)
01	Vou	N = 90	Fomalo	Affectionate support (MOS)	Depressive symptoms		0.66	01 67%	Stewart, 2010)
ŏ4	100	Cross-	remaie	Anectionate support (MOS)	CEC D		-0.00	91.07%	
	2U23	Sectional	SU Dragat as non-				0.52		
	China	N = 202	Breast cancer		Anxtley (BSI)		-0.52		

85	Yu 2023 China	Cross- sectional N = 232	43 female 189 male 74 Bladder cancer	Family support (CD-RISC) Friends support (CD-RISC)	Quality of life (COH)	Yes (pos) Yes (pos)	-	95.80%	Stress social networks theory (Gottlieb & Bergen, 2010)
86	Zamanian 2021 Iran	Cross- sectional N = 221	Female 47 Breast cancer	Affectionate support (MOS)	Depression (DASS-21) Anxiety (DASS-21)		-0.35 -0.26	85.40%	-

Note. Relevant information not presented indicates that it was not reported in the article, and "-" also indicates that it was not reported. Emotional Expressivity Questionnaire (AEQ); Center for Epidemiologic Studies Depression Scale (CES-D); PTSD Symptom Scale- Self-Report (PSS-SR); Patient-Reported Outcomes Measurement Information System (PROMIS): Medical Outcomes Study Social Support Survey (MOS): Duke-UNC Functional Social Support Questionnaire (FSSQ); Social Support Questionnaire Short Form (SSQ6); The Interpersonal Support Evaluation List (ISEL); Impact of Events Scale (IES); The Family Adaptability and Cohesion Evaluation Scale IV—Family Communication Scale (FACES IV); Medical Outcome Study SF-36 (SF-36); Short Form 12 Health Survey Questionnaire (SF-12); Psychological Adjustment to Illness Scale (PAIS); Purpose in Life Test (PIL); The Life Orientation Test (LOT); The Perceived Social Support from Family (PSS-Fa), Friends (PSS-Fr); State-Trait Anxiety Inventory–State Anxiety Subscale (STAI); Benefit Finding Scale (BFS); Dyadic Coping Inventory (DCI); Functional Assessment of Cancer Therapy (FACT); Mutual Psychological Development Questionnaire (MPDQ); The Distress Disclosure Index (DDI); The Posttraumatic Growth Inventory (PTGI); The Event Related Rumination Inventory (ERRI); The Cancer-Specific Social Support Scale (C-SSSS); Ferrans and Powers Quality of Life Index (QLI-CV); the European Organisation for Research and Treatment of Cancer Quality of Life Group Core Quality of life questionnaire the EORTC QLQ Breast Cancer Module (EORTC); Brief Symptom Inventory (BSI); Social Constraintss Scale (SCS); subscale of Mental Health Inventory (MHI); Social support questionnaire (F-SOZU); Multidimensional Fatigue Inventory (MFI-20); Hospital Anxiety and Depression Scale (HADS); Mental Adjustment to Cancer Scale (MAC); Network Orientation Scale (NOS); Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being Scale (FACIT-Sp); Emotional Approach Coping scales (EAC); Linguistic Inquiry and Word Count (LIWC); Emotion Regulation Questionnaire (ERQ); Mental

Component Summary (MCS); The Revised Dyadic Adjustment scale (RDA); Patient Health Questionnaire (PHQ-9); Depression, Anxiety and Stress Scales (DASS-21); Partner Responses to Cancer Inventory (PRCI); Concerns About Recurrence Scale (CARS); Self-Stigma Scale-Short Form (SSS-SF); Positive and Negative Affect Schedule (PANAS); Intrusive Thoughts Scale (ITS); Personal Wellbeing Index—Adult (PWI-A); RAND 36-Item Health Survey (RAND-36); Selfrating Anxiety Scale (SAS); Self-rating Depression Scale (SDS); Family Crisis Oriented Personal Evaluation Scales (F-COPES); Brief Resilience Scale (BRS); Fear of Cancer Recurrence Inventory (FCRI); Attentional Function Index (AFI); Other Dyadic Perspective-Taking scale (ODPT); Health and Retirement Study Psychosocial Leave-Behind Participant Lifestyle Questionnaires (HRSPLBPLQ); Post-Traumatic Stress Checklist (PCL-C); Group Identification Scale (GIS); Dyadic Coping Measure (DCM); Social sharing measurement (SSM); Beck Depression Inventory (BDI); Quality of Life Instrument (QLI); Dyadic Coping Scale (DCS): Social Network and Social Support from Nurses scales (SNSSN): 25-item Social Support Effectiveness–Questionnaire (SSE): Fear of Relapse or Recurrence Scale (FRRS); Positive and Negative Social Exchanges Scale (PNSES), UCLA Loneliness Scale (UCLALS), The Patient-Reported Outcomes Measurement Information System (PROMIS), multidimensional scale of perceived social support (MSPSS), Wong–Baker faces pain rating scale (WBFPRS), The Kessler Psychological Distress Scale-10 (KPDS-10), 10-item Connor–Davidson Resilience Scale (CD-RISC), City of Hope Quality of Life Ostomy Questionnaire (COH); The World's Health Organization Well-Being Index (WHO-5); Illness-specific Social Support Scale (ISSS); The Self-disclosure Scale (SS).

Study Characteristics

Of the 86 included studies, 79 were quantitative, of which 61 had a cross-sectional design and 18 a longitudinal design. 4 studies were qualitative, and 3 had mixed-methods. Most studies focused on emotional support (n = 19), social constraints (n = 17), (ambivalence over) emotional expression (n = 14) and affectionate support (n = 14). Some studies specifically focused on family support (n = 11), while others focussed on dyadic coping (n = 7). Other interpersonal emotion regulation strategies included support from friends (n = 5), self-disclosure (n = 3), positive social interaction (n = 2), appraisal and belonging (n = 1), social network orientation (i.e. a person's attitudes, beliefs and perceived value of his or her social connections) (n = 1), negative caregiver response (n = 1), positive support (n = 1), detrimental interaction (n = 1)

Of the 86 studies, 49 originated from the USA, nine from China, three from UK and South Korea, two from Taiwan, Turkey, Switzerland, Iran, Canada and Germany, one study each from Spain, Lebanon, Israel, Greece, France, Finland, Austria, Japan, Slovakia, and Australia. The studies included a total of 67,592 cancer survivors. Sample sizes ranged from 15 to 23,939, with a median of 151. Mean age ranged from 24 to 74 years, with a median of 54 years old. Sixty-five studies included only women, 28 studies both sexes and 3 studies only men. Cancer types included breast cancer (n = 49), hematologic cancer (n = 7), colorectal cancer (n = 4), gynecologic cancer (n = 3), prostate cancer (n = 2), ovarian cancer (n = 2), bladder cancer (n = 1), cervical cancer (n = 1), head and neck cancer (n = 1), multiple myeloma (n = 1) and mixed cancer types (n = 7) or not reported (n = 8).

Risk of Bias

The percentages representing the risk of bias score of each study are shown in Table 1 and further details about the quality appraisal can be found in *Appendix 2*. This systematic review only included cross-sectional, longitudinal, and qualitative studies. All evidence in this study was categorized as Level 3 (e.g. cross-sectional studies, studies with methodological limitations). There were 82 quantitative studies with an average score 91% (range 75%–100%). The qualitative studies (n = 4) had an average score of 88% (range 83% - 93%).

Evidence Synthesis

We performed the evidence synthesis separately for the seven types of interpersonal emotion regulation that were studied in the included studies: 1) emotional support, 2) social constraints, 3) (ambivalence over) emotional expression, 4) affectionate support, 5) family support, 6) dyadic coping and 7) other strategies. Table 2 provides a summary of the main types of interpersonal emotion regulation and their correlations with mental health outcomes. We ranked the frequencies of the seven types of interpersonal emotion regulation, and conducted a narrative review for each type's association with mental health outcomes. Within each section, our discussion starts with the most frequently researched mental health outcome and proceeds with successively less studied mental health outcomes, accompanied by provided correlation coefficients (*e.g. rs ranging from .15 to .42*; if not reported, marked as "*not reported*"), number of participants (*e.g., n* = 1,383), and study identifiers (*e.g. [15, 18, 23]*).

Table 2

Correlations Between Aspects of Interpersonal Emotion Regulation and Mental Health Outcomes

Mental health outcome		Ке	y types of interpersonal	emotion regulation (r)		
	Emotional	Social constraints	(Ambivalence over)	Affectionate	Family support	Dyadic coping
	support		emotional expression	support		
Depression	Yes (neg)	.40 to .45	.23 to .51	66 to35	07	36
Quality of life	Yes (pos)	57	39 to31	.35 to .54	.40	Yes (pos)
Distress	33 to08	.34 to .55	Yes (pos)		Yes (neg)	Yes (pos)
Anxiety	Yes (neg)	.41		52 to26	Yes (neg)	
Fear of recurrence		.31 to .51	.40		Yes (neg)	
Posttraumatic stress symptoms		.56 to .62	.41 to .46	52		
Posttraumatic growth	.30	.02 to12			.25	.19
Intrusive thoughts and avoidance	04 to .03 (<i>ns</i>)	.37	.44			
Well-being	.15 to .42	Yes (neg)	Yes (neg)			
Loneliness	42 to39	Yes (pos)				
Self-stigma		.36	.42			
Fatalism	24					

Acceptance	.30		
Mental health composite score	05 (<i>ns</i>)		
Adjustment	Yes (pos)		
Meaning in life	Yes (pos)		
Optimism	Yes (pos)		
Emotional health	.37		
Pain		10	10
Family identification		39	
Positive affect		24	
Negative affect		.47	
Resilience			

Note. 'Yes (pos/neg)' means that the positive/negative association was investigated in studies, but no correlation coefficients were reported. '*ns*' means non-significant.

Emotional Support

Emotional support refers to providing assistance to others by expressing compassion, concern, sympathy, respect, and active listening (Cohen & Wills, 1985). Nineteen studies with a total of 28,443 participants investigated the association between emotional support and mental health [8, 14, 17, 19, 20, 24, 28, 29, 30, 31, 49, 53, 54, 56, 57, 59, 62, 74, 75]. The most frequently used measure of emotional support was the MOS (Sherbourne & Stewart, 1991), which was used in 8 studies (40%). All other validated measurement instruments were used only once, and two studies used an ad hoc questionnaire.

Seven studies reported that emotional support had a significant positive association with quality of life (*rs* not reported, n = 25,595) [17, 20, 28, 29, 30, 53, 60]. Seven studies found that emotional support had a small to moderate negative association with distress (*rs* ranging from -.33 to -.08, n = 1,383) [8, 19, 20, 54, 56, 59, 74]. Two studies observed that emotional support had a significant positive association with well-being (*rs* from .15 to .42, n = 1,372) [24, 29]. Cancer survivors with more emotional support had a lower risk of anxiety and depression (*r* not reported, n = 854) [29, 30] and less depressive symptoms (*rs* not reported, n = 102) [8]. In addition, emotional support was negatively associated with fatalism (*r* = -.24, n = 351) [14, 24, 30] and positively associated with acceptance (*r* = 0.30, n = 150) [24], posttraumatic growth (*r* = 0.30, n = 107) [53, 56], but had no association with a mental health composite score (*r* = -.05 n = 173) [75]. One study found that emotional support from a partner and family/friends was negatively associated with loneliness (*rs* = -.39, -.42, n = 195) [54] but not with intrusive thoughts and avoidance (*rs* = -.04, .03, n = 195) [54]. Another study similarly found that seeking emotional social support was associated with adjustment, meaning in life, optimism (*rs* not reported, n = 109) [62]. Finally, one study found that emotional support was associated with emotional health (*r* = 0.37, n = 517) [57].

Taken together, small-to-moderate positive associations between emotional support and indicators of mental health, such as quality of life and resilience. Conversely, small-to-moderate

negative associations were found between emotional support and mental health problems, including distress, fatigue, depressive symptoms, and loneliness.

Social Constraints

Social constraints relate to both objective and subjective social conditions that lead individuals to refrain from or modify their disclosure of stress- and trauma-related thoughts, feelings, or concerns (Lepore & Revenson, 2007). According to the social-cognitive processing model (Lepore, 2001), emotional self-disclosure (e.g., disclosure of cancer-related thoughts, concerns and feelings) is likely to improve psychological adjustment to cancer, but only in the context of a receptive social environment. When cancer survivors face social constraints, such as others' criticism, denial or withdrawal, cancer survivors' willingness and ability to communicate with others are likely to be affected, which can lead to more negative outcomes (Lepore & Revenson, 2007). In the present review, we found 17 studies [2, 5, 11, 12, 13, 15, 27, 35, 51, 54, 56, 64, 68, 79, 80, 82, 83] with a total of 16,479 participants that investigated the association between social constraints and mental health. Almost all studies (15 out of the 17 studies) used the 15-item SCS (Lepore & Ituarte, 1999).

Three studies reported a significant negative association between social constraints and quality of life (r = -.57, n = 9,927) [5, 73] and psychological well-being (r not reported, n = 3,574) [64, 83]. Significant positive associations between social constraints and depressive symptoms (rs from .38 to .45, n = 1,947) [13, 15, 27, 79], distress (rs ranging from .34 to .55, n = 447) [35, 54, 56] and fear of recurrence (rs from .31 to .51, n = 1,327) [13, 51, 80 respectively] were reported. Similarly, three studies found that social constraints had a sizable positive association with posttraumatic stress symptoms (rs from .56 to .62, n = 437) [2, 11, 68]. Two additional studies reported that social constraints had a small association with posttraumatic growth (rs ranging from .02 to -.12, n = 251) [35, 56]. Two studies found a significant positive association between social constraints and intrusive thoughts (rs = .37, n = 315) [54, 82]. Significant positive association were observed between social constraints and, on the other hand, self-stigma (r = .36, n = 136) [80], loneliness (r not reported, n = 295) [12, 54] and anxiety (r = .41, n = 1127) [13]. One study showed

that higher social constraints were associated with lower family identification (r = -.39, n = 205) [68]. Another study reported a significant association between social constraints and positive affect (r = -.24) and negative affect (r = .47) (n = 120) [82].

In sum, small to moderate positive associations were observed between social constraints and depressive symptoms and distress, stigma, loneliness, anxiety, and intrusive thoughts. (Ambivalence Over) Emotional Expression

In emotional expression, a person overtly expresses their experienced emotions to one or more others, through verbal statements and/or nonverbal behaviour such as facial expressions, vocal pitch, posture, and/or gestures (Charles & Carstensen, 2007). Psychologists generally believe that emotional expression has beneficial effects, in the same vein that social constraints have negative effects for mental health. Controlled experiments with healthy volunteers have shown rather mixed effects of talking about one's emotions on emotional wellbeing (Rimé, 2009). Still, it seems plausible that cancer survivors would have an enhanced need for emotional expression compared to the general population. Consistent with this, a qualitative study among breast cancer survivors emphasized that emotional expression improved quality of life (r not reported, n = 132) [9, 23]. In a related vein, one study reported a negative relationship between emotional expression and cancerrelated psychological distress (r not reported, n = 102) [8] and depressive symptoms (r not reported, n = 492) [8, 50].

In the general population, people high (rather than low) in ambivalence over emotional expression generally respond more intensely to emotional events and to take longer to recover from emotional events (King, 1998). Ambivalence over emotional expression refers to the internal conflict and hesitation individuals experience when considering whether to express their true emotions (King, 1998). Ten studies investigated the association between ambivalence over emotional expression and mental health among cancer survivors [32, 44, 45, 46, 70, 71, 72, 73, 79, 80; n= 1,314]. The studies used four different instruments for measuring ambivalence over emotional expression. All studies reported measure was AEQ (King & Emmons, 1990; n = 10 studies).

Five studies reported a significant positive association between ambivalence over emotional expression and depressive symptoms (*rs* ranging from .23 to .51, n = 749) [32, 46, 71, 72, 79]. Moreover, four studies found that ambivalence over emotional expression had a moderate to large negative association with quality of life (*rs* ranging from -.39 to -.31; n = 638) [32, 45, 70, 73]. A study observed that breast cancer survivors who are highly ambivalent about emotional expression had higher posttraumatic stress symptoms (*r* = .41 for posttraumatic stress symptoms-avoidance, .46 for posttraumatic stress symptoms-arousal, n = 118) [44]. In addition, ambivalence over emotional expression had moderate positive associations with fear of recurrence and self-stigma (*rs* = .42, n = 136) [80]. Similarly, ambivalence over emotional expression was positively related to intrusive thoughts (*r* = .44, n = 118) [46].

In sum, small-to-moderate positive associations were observed between ambivalence over emotional expression and depressive symptoms, fear of cancer recurrence, self-stigma, intrusive thoughts, posttraumatic stress, and lower quality of life.

Affectionate Support

Affectionate support involves receiving support from others through physical demonstrations of love and affection (Peter et al., 2016). People with higher levels of affectionate support feel that they have someone who shows affection and love and provides them with a feeling of being wanted (Laugen et al., 2016). This more embodied orientation can be contrasted with cognitive and verbal processes in interpersonal emotion regulation (Dixon-Gordon et al., 2015; Rimé, 2009). In the present review, we found 14 studies [11, 19, 25, 29, 36, 37, 39, 40, 55, 74, 78, 81, 84, 86] with a total of 8,579 participants that investigated the relationship between affectionate support and mental health. The most frequently used measure was the MOS (Sherbourne & Stewart, 1991; n = 11 studies; 78.6%).

Seven studies reported a positive association between affectionate support and quality of life (*rs* ranging .35 to .54, n= 6,650) [29, 36, 37, 39, 40, 69, 72]. Moreover, eight studies found that affective support had a negative association with depressive symptoms (*r* ranging from -.66 to -.35 n

= 4,587) [17, 22, 24, 31, 55, 72, 76, 84]. Also, five studies found that affective support was significantly negatively related to anxiety (*r* ranging from -.52 to -.26, n = 2,277) [17, 22, 24, 76, 84]. Finally, one study showed that breast cancer survivors who experience more affective support tend to have lower posttraumatic stress symptoms (r = -.52, n = 136) [9].

Small-to-moderate positive associations were found between affectionate support and quality of life, lower depressive symptoms, lower anxiety, and fewer posttraumatic stress symptoms. *Family Support*

Family support is when family members care for each other and provide one another with emotional support and practical assistance (Chambers et al., 2001). All previously examined types of interpersonal emotion regulation can play a role in the context of a family. In this review, 11 studies [4, 10, 16, 22, 33, 34, 41, 42, 61, 66, 85] with a total of 3,318 participants investigated the relationship between family support and mental health. The most often used measure of family support was the MSPSS (n = 3).

Four studies reported a significant positive association between family support and quality of life (r = .40, n = 638) [4, 41, 42, 85]. A negative relationship was reported between family support and depressive symptoms (r = -.07, n =1,181) [10, 33, 34, 66], fear of recurrence (r not reported, n = 372) [34, 61], distress (r not reported, n = 311) [33], and pain (r = -.10, n = 696) [16]. Moreover, one study showed that family support was associated with greater self-efficacy managing breast cancer and reduced risk of anxiety (r not reported, n = 621) [33, 34]. A study reported a positive relationship between family support and post-traumatic growth (r = .25, n = 771) [22].

In sum, the construct of family support captures how interpersonal emotion regulation extends beyond dyadic relationships. Small-to-moderate positive associations were observed between family support and quality of life post-traumatic growth, lower depressive symptoms and anxiety, lower fear of recurrence, less pain, and less distress.

Dyadic Coping

During dyadic coping, partners within a close relationship cope with stress jointly as a dyad, invoking shared coping resources, common concerns, and relationship maintenance (Randall & Bodenmann, 2009). When one partner has dealt with cancer, a couple may adopt various dyadic coping strategies to reduce the impact of the stressful event, such as empathic responding or emotional support (Falconier & Kuhn, 2019). Our literature search identified 7 studies (n = 647) [1, 6, 18, 21, 43, 47, 67] investigating the relationship between dyadic coping and mental health. Dyadic coping was assessed with various measures in these studies.

Three studies found that constructive dyadic coping strategies -such as stress communication and common coping- were positively associated with quality of life (*r* not reported, n = 334) [1, 18, 67]. Two studies observed that three different dyadic coping strategies (perceived partner empathy (*r* = -.36), active engagement and protective buffering (*r* not reported, n = 97)) were associated with reduced depressive symptoms [21, 47]. Similarly, a study found that enhancing cancer survivors' and partners' positive thoughts and available external resources was associated with more resilience and reduced psychological distress (*rs* not reported, n = 91) [43]. Finally, one study reported a significant positive association between dyadic adjustment and posttraumatic growth (*r* = .19, n = 134) [6].

In sum, small-to-moderate positive associations were observed between constructive dyadic coping strategies and quality of life, less depressive symptoms, resilience, reduced psychological distress, and post-traumatic growth.

Other Aspects of Interpersonal Emotion Regulation

Sixteen studies [3, 7, 10, 19, 22, 26, 29, 33, 38, 48, 58, 62, 63, 69, 76, 85, n = 11,987] investigated the association between various other aspects of interpersonal emotion regulation strategies. A cross-sectional study found that having emotional support, being strong and self-reliant, and engaging in distracting activities with family and friends was positively associated with quality of life (*rs* not reported, n = 50) [3]. Significant positive relationships between social supportcompanionship and adjustment, meaning in life, and optimism were reported in another study (*r* not reported, n = 109) [62]. Also, a significant negative relationship between friend support and cancerspecific traumatic stress (rs = -.25, n = 571) [10, 33], depressive symptoms (rs = -.30, n = 571) [10, 33] and anxiety (r not reported, n = 311) [33] was reported

Three studies reported a significant association between friend support and pain (r = -.10, n = 696 [16], posttraumatic growth (rs = .19, n = 983) [22, 52], and quality of life (r not reported, n = 232) [85]. Another study (n = 212) [76] reported that a survivor's positive appraisal of support and belonging was related to decreased anxiety (rs = -.21, -.24) and depression (r = -.25). A significant relationship between positive support study (r not reported, n = 126) [26] and detrimental interaction (r not reported, n = 126) [26] and quality of life was reported. Also, a study found that positive support was associated with better mental well-being, while negative support was associated with worse mental well-being, albeit weaker (r not reported, n = 100) [65]. Significant relationships between self-disclosure and well-being (rs = .50, n = 700) [38, 69], distress (r = .16, n = 75) [48], posttraumatic growth (r = .63, n = 400) [63], intrusive rumination (r = .05, n = 400) [63] and deliberate rumination (r = .30, n = 400) [63] were observed. Two studies reported significant associations between positive social interaction and intrusive thoughts, psychological distress, quality of life, well-being, anxiety and depression (rs not reported, n = 907) [19, 29]. A study showed that more negative social network orientation (It involves a person's attitudes, beliefs, and perceived value of their social connections in providing support, information, and resources.) was associated with worse quality of life (r = -.24, n = 255) [58]. Finally, one study reported that survivors who rated their caregiver's response to their cancer diagnosis more negatively reported worse physical and mental health (r not reported, n = 7,543) [7].

In sum, small-to-moderate positive associations were observed between this miscellaneous group of interpersonal emotion regulation (friend support, positive appraisal, belonging, positive support, self-disclosure, social interaction, social network orientation and caregiver's response) and positive indicators of mental health. Small-to-moderate negative associations were observed between this miscellaneous group of interpersonal emotion regulation (negative support) and negative indicators of mental health.

Theories and Models

Less than one out of three studies (30.2%, 26 studies) [6, 10, 11, 12, 15, 19, 22, 23, 27, 34,

35, 38, 47, 49, 51, 54, 56, 57, 60, 62, 63, 69, 79, 80, 83, 85] explicitly mentioned the theoretical

framework that guided the research: 9 studies on social support [10, 11, 19, 49, 57, 60, 62, 83, 85], 8

studies on social constraints[12, 15, 27, 51, 54, 56, 79, 80], 4 studies on emotional expression and

family support [23, 34, 38, 69], 3 studies [6, 22, 35] on the developmental mechanisms of

posttraumatic growth and 2 studies on dyadic coping [47, 63]. An overview of the used theories and

studies is provided in Table 3.

Table 3

Overview of Theories Used in the Studies on Interpersonal Emotion Regulation among Cancer Survivors.

Theories	Number of studies [study identifier]
Social-cognitive processing model	7 [15, 27, 51, 54, 56, 79, 80]
Stress buffering hypothesis	3 [10, 11, 19]
Model of posttraumatic growth	3 [6, 22, 35]
Theories of social support	2 [57, 60]
Adult attachment theory	1 [69]
Biopsychosocial model	1 [83]
Disclosure process model	1 [38]
Emotional-motivational life-span development	1 [23]
theory	
Model of loneliness	1 [12]
Social support effectiveness framework	1 [49]
Stress social networks theory	1 [85]
Stress-illness vulnerability theory	1 [62]
Systemic-transactional model	1 [63]
Theory of dyadic illness management	1 [47]
Theory of family systems in genetic illness	1 [34]

The social-cognitive processing model (Lepore, 2001) [15, 27, 51, 54, 56, 79, 80], emerged as the most frequently mentioned theory in studying interpersonal emotion regulation among cancer survivors. The theory was used in all studies exploring the role of social constraints in coping among cancer survivors. According to this model, emotional distress associated with a traumatic experience, largely emerges from the discrepancy between people's mental representations of themselves and the world and the meaning inherent in the trauma (Lepore, 2001). Engaging in supportive social interactions, such as empathetic listening and encouraging acceptance, is likely to enhance cognitive processing of cancer experiences and adaptation. Social constraints can affect adjustment to cancer by inhibiting supportive social interactions. These constrains thereby alter how people feel about themselves (e.g., self-worth, self-identity). Social constraints were also investigated within other theoretical contexts. One study [12] investigated social constraints within a model of loneliness and another study [83] approached social constraints from the background of the biopsychosocial model.

Theories on social support were originally developed as an extension of the traditional model of stress and coping (Folkman & Lazarus, 1985). A theory of social support was mentioned by only two study in this review [57, 60], but many studies seemed to use this theory tacitly, without explicitly referring to it. According to theories on social support, people derive benefits not only from the tangible help they receive but also from their perception of the support available to them (Lakey & Cohen, 2000). Within this general theory of social support, various more specific theories were reported. The stress-buffering hypothesis [10, 11, 19] holds that social support protects people from the pathogenic effects in of stress. The disclosure process model [38] examines when and why self-disclosure may benefit well-being (Chaudoir & Fisher, 2010). Moreover, stress social networks theories [85] focus on structural properties of an individual's social network, such as number of connections, their strength, or number of different roles within a network. The social support effectiveness framework [49] states that social support enhances relationship closeness, but that an imbalance, in which one receives more support than one can return, leads to distress.

The model of posttraumatic growth (Tedeschi & Calhoun, 2014) [6, 22, 35] and the stressillness vulnerability theory (Holahan & Moos, 1994) [62] extend the traditional model of stress and coping (Lazarus & Folkman, 1984) to the context of coping with trauma and illness. Posttraumatic growth is defined as the experience of positive change that occurs as a result of the struggle with a highly challenging life crisis (Tedeschi & Calhoun, 2014). According to the model of posttraumatic growth [6, 22, 35] self-disclosure and social support play an essential role in perceiving positive changes. The illness-stress vulnerability theory emphasizes the role of social and personality variables in adjustment to cancer survivorship. The theory of family systems in genetic illness (Rolland & Williams, 2005) [34] assists healthcare providers to help women with a risk of genetic cancer balance their personal and family responsibilities, taking into account the degree of genetic risk the illness has, its potential severity, age of clinical onset and whether treatment can alter the onset or course of the disease.

The theory of dyadic illness management (Lyons & Lee, 2018) [47] and the systemictransactional model (Bodenmann, 1997) [63] move beyond an individual perspective of, in this case a cancer survivor, to the couple as the unit of focus. The theory of dyadic illness management approaches the dyad as an interdependent team. In the same vein, the systemic-transactional model focusses on the reciprocal and dynamic interplay between the stress signals of one partner and the coping reactions of the other.

Finally, the adult attachment theory (Hazan & Shaver, 2017) [69] and the emotional– motivational life-span development theory (Scheibe & Carstensen, 2010) [23] take a lifespan perspective. The adult attachment theory holds that attachment styles of adults are guided by childhood attachment styles and influence adult interpersonal behaviors, such as self-disclosure. The emotional–motivational life-span development theory (Scheibe & Carstensen, 2010) [23] assumes that people with a limited future time perspective, such as the elderly and people with cancer, become more motivated to focus on emotional satisfaction in the present moment.

Discussion

In this systematic review, we examined the association between various aspects of interpersonal emotion regulation and mental health among cancer survivors. Our literature search identified 86 relevant studies with a combined total of 67,592 cancer survivors. Indicators of interpersonal emotion regulation were generally found to be associated with markers of better mental health among cancer survivors. The strength of this association was, statistically speaking, in the small-to-moderate range. The studies in the present review investigated various aspects of interpersonal emotion regulation, including emotional support, ambivalence over emotional expression, social constraints, affectionate support, family support and dyadic coping. Emotional support was most often studied, but a lot of attention was given to social constraints and ambivalence over emotional expression in cancer survivors. Affectionate support, a more embodied form of interpersonal emotion regulation, was also often examined. Some studies particularly focused on the family as a source of support and others took dyads as the unit of investigation. We also searched for less studied but potentially transformative aspects of interpersonal emotion regulation, such as co-reappraisal and corumination, but these subtle forms of emotional communication have not received much attention yet. Moreover, the included studies assessed a wide range of aspects of mental health, including distress, anxiety, depression, fear of recurrence, quality of life, and well-being.

One striking aspect of the evidence on the association between interpersonal emotion regulation and mental health is its consistency and generality. Each indicator of interpersonal emotion regulation was reliably positively associated with an indicator of better mental health in every study. This generality across different indicators of interpersonal emotion regulation fits with the notion of interpersonal emotion regulation as a process that involves patterns of emotional responding that cut across specific relationships. The generality of our findings across different indicators of mental health and be seen as further support for the universal human significance of interpersonal relationships (Leary & Baumeister, 1995; Seeman, 1996; Uchino, 2006). Alternatively, it may reflect the added significance of interpersonal emotion regulation for cancer survivors. Surviving cancer and its aftermath puts great emotional burdens on cancer survivors. It thus stands to reason that cancer survivors stand to gain considerably -perhaps, like few other groups- from the emotionregulatory functions of interpersonal relationships.

Strengths and Limitations

The overall body of research identified in the present systematic review is sizable, spanning 86 studies and tens of thousands of cancer survivors. However, it should be kept in mind that the

evidence is limited in important ways. Among the included studies, the methodological quality was mostly low. Moreover, 79 out of the 86 studies (85%) had a correlational and/or cross-sectional design, which cannot speak to the causal impact of interpersonal emotion regulation on mental health or vice versa. Although there are many RCT intervention studies on social support (Zhang et al., 2017), these studies were not included in the research because they did not report specific data on interpersonal emotion regulation. Additionally, support was frequently measured based on general perceptions, but specific sources such as partners, family members, or friends were sometimes explicitly identified, underscoring the variety in research methodologies.

Future research should address this limitation by using more longitudinal and experimental designs. In longitudinal research, researchers can determine whether an interpersonal emotion regulation process predicts subsequent changes in mental health. For instance, one study among 164 breast cancer survivors observed that perceived social support predicted changes in quality of life 6 months later (Salonen et al., 2013). Yet stronger causal conclusions can be drawn from experimental studies, where cancer survivors are randomly assigned to different types of interpersonal emotion regulation interventions. For instance, a systematic review of spousal couple-based intervention studies for couples coping with cancer found that these interventions can improve communication, dyadic coping and quality of life in both patients and partners (Li & Loke, 2014). Conducting more experimental studies would enhance the scientific understanding of interpersonal emotion regulation among cancer survivors.

A second limitation is that the observed statistical associations between interpersonal emotion regulation and mental health among cancer survivors were statistically in the small-tomedium range. Notably, statistical effect size should not be equated with clinical relevance (Cuijpers et al., 2014). Because processes of interpersonal emotion regulation are pervasive and recurring on a daily basis, even a statistically small effect may translate into meaningful real-life benefits for cancer survivors. Still, more work is needed to determine the minimally important differences that processes of interpersonal emotion regulation make for cancer survivors and the reliable clinical change that enhancing interpersonal emotion regulation in a therapeutic setting may bring (see Mouelhi et al., 2020; Revicki et al., 2008).

A third limitation is that the value of the evidence identified in the present review is hampered by some methodological shortcomings. Aside from 24 studies with larger samples (*Ns* between 300 and 23,939), most studies used relatively small samples (*Ns* between 15 and 286), which means they had insufficient statistical power to detect statistically small effects. Moreover, the available studies employed diverse (mostly self-report) outcome measures, which makes it difficult to compare findings between studies. For example, many studies used instruments that did not distinguish between emotional support and affectionate support.

A fourth and last limitation is that the present systematic review only included peer-reviewed articles published in English, which predominantly had Western populations as participants. The present findings may hence may not be applicable to interpersonal emotion regulation among cancer survivors in other cultural spheres. For instance, expressive suppression, which has generally negative effects among Western populations, has in some studies been found to reduce depressive feelings and related physiological activity among Chinese people (Yuan et al., 2014). Notably, the nature of these cultural differences is such that interpersonal emotion regulation appears to be equally, if not more, important within non-Western cultures. Still, the forms that interpersonal emotion regulation takes in non-Western cultures may differ from those in Western cultures. An important agenda for future research lies hence in collecting more evidence on interpersonal emotion regulation among cancer survivors to non-Western cultures.

Theories of Interpersonal Emotion Regulation Among Cancer Survivors

In the present systematic review, we explored which theories were used in studies on interpersonal emotion regulation and mental health. Perhaps surprisingly, over two-thirds of the examined studies did not mention any specific theoretical framework. The lack of explicit theory mentions does not necessarily mean that most research in this field is atheoretical. Instead, it seems plausible that many researchers rely on theoretical assumptions that are widely held, so that researchers do not feel the need to refer to a specific model or framework. In particular, it appears that much research is guided by the general idea that social-emotional support has a protective influence on mental health. In one way or another, this notion emerges in various theoretical models, such as the social-cognitive processing model (Lepore, 2011) and the stress-buffering hypothesis (Cohen & Wills, 1985).

Although it is understandable that researchers do not always engage in explicit theorizing, we would still encourage more efforts toward explicit theory development. The latter involves identifying specific pathways, mediating factors, and moderating variables that influence the relationship between interpersonal emotion regulation and mental health. Such theoretical work provides a roadmap for designs that optimize interpersonal emotion regulation for cancer survivors. More specifically, the field of psycho-oncology may be enriched by various notions in interpersonal emotion regulation regulation regulation regulation regulation regulation seearch. For instance, recent work has seen a push toward formal mathematical models, such as a system of differential equations developed for dyadic research, that model the dynamics of interpersonal emotion regulation (Ferrer & Helm, 2013; Sels et al., 2018). Likewise, recent theoretical work suggests that interpersonal emotion regulation is not always driven by empathy, but may also originate from more self-serving motives, such as empathy fatigue or the wish not to be confronted with the survivor's distress (Zaki, 2020). These self-serving motives seems potentially relevant to interpersonal emotion regulation among caregivers of cancer survivors (Zeng et al., 2024).

Conversely, theories developed in the domain of psycho-oncology may inform more general theories of interpersonal emotion regulation. For instance, the present research revealed that psycho-oncological research has devoted considerable attention to psychological impediments to emotion expression, such as ambivalence over emotional expression (e.g., Lu et al., 2015) and social constraints (Lepore & Revenson, 2007). Similar kinds of impediments are likely to be influential in many other real-life contexts, where they have received much less theoretical attention. These and

other insights from psycho-oncological research may enrich the understanding of interpersonal emotion regulation.

Concluding Remarks

The current systematic review revealed a sizable body of evidence converging on the notion that interpersonal emotion regulation is meaningfully associated with the mental health of cancer survivors. Much remains unknown about the mechanisms where interpersonal emotion regulation becomes connected with cancer survivors' mental health. Future research should therefore aim to develop more standardized methods, more integrative theorizing, and evidence-based interventions. Despite these challenges, the present article highlights the importance of interpersonal emotion regulation for cancer survivors.

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Chapter 6

From Dyadic Coping to Emotional Sharing and Multimodal Interpersonal Synchrony: Protocol for a Laboratory Experiment

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Abstract

During interpersonal emotion regulation, relationship partners mutually regulate each other's emotional states. Interpersonal emotion regulation occurs at three main timescales: phasic (from several hundred milliseconds to about 10s), tonic (from 10s to 1 hour), and chronic (from weeks to months and years). Prior research has examined interpersonal emotion regulation at only one or two timescales simultaneously. The proposed research will examine variables relating to interpersonal emotion regulation in close relationships across all three timescales. A total of 150 romantic couples will engage in an emotional sharing task (Nils & Rimé, 2012), in which they will be instructed to either engage in natural sharing or co-rumination. At the phasic timescale, the study will assess interpersonal synchrony in movements and cardiovascular responses throughout the sharing task. At the tonic timescale, the study will assess changes in mood and emotional appraisals pre- and postsharing. At the chronic timescale, the study will assess personality dispositions (e.g., alexithymia, attachment styles, empathy) and relationship qualities (e.g. relationship satisfaction, dyadic coping styles). Our general expectation is that phasic patterns in interpersonal emotion regulation will be meaningfully related to tonic patterns, which, in turn, will be meaningfully related to chronic patterns. More differentiated hypotheses and exploratory analyses are detailed in the protocol. The results of this research will contribute to the integration of interpersonal emotion regulation theories.

Keywords: Movement, Cardiovascular, Phasic, Tonic, Chronic, Close Relationships, Emotional Support, Social Support Within close relationships, partners regulate each other's emotional states. Such interpersonal emotion regulation is of vital significance for the health and wellbeing of the individual relationship partners, as well as for the quality of the relationship (Butler, 2011; Pietromonaco & Collins, 2017; Saxbe & Repetti, 2010). It thus seems important to learn more about the processes that underlie interpersonal emotion regulation within close relationships.

One fundamental aspect of interpersonal emotion regulation is that it unfolds dynamically over time (Butler, 2011, 2017). Prior work has distinguished between three main timescales of interpersonal emotion regulation (Koole & Tschacher, 2016; see also Hollenstein, 2015, for a similar conceptualization). First, the phasic timescale runs from several hundreds of milliseconds to about 10 seconds. Interpersonal emotion regulation at the phasic timescale is mostly nonverbal, and occurs in exchanges of facial expressions, eye gaze, breathing patterns, or whole-body movements (e.g., Galbusera et al., 2019). Second, the tonic timescale runs from about 10 seconds to roughly one hour. Interpersonal emotion regulation at the tonic timescale consists of socially meaningful, often verbal exchanges, such as emotional sharing (Rimé, 2009), for example during a casual encounter or a psychotherapy session (Ramseyer & Tschacher, 2011). Third and last, the chronic timescale runs from several weeks to months and years. Interpersonal emotion regulation at the chronic timescale consists of more or less stable patterns of behaviour, which may be driven by personal dispositions (e.g., chronic attachment style; Mikulincer & Shaver, 2019) and/or stable relationship characteristics (e.g., dyadic coping styles; Bodenmann, 2005).

At any given moment, the functioning of a close relationship is characterized by phasic, tonic, and chronic processes, along with the interplay of these processes. To date, however, research has examined variables relating to interpersonal emotion regulation at only one, or at most two timeframes. In the proposed experiment, we seek to obtain a more comprehensive picture of interpersonal emotion regulation, by examining variables relating to interpersonal emotion regulation in close relationships across all three of the chronic, tonic, and phasic timeframes.

Proposed Experiment and Hypotheses

In the proposed experiment, a sample of couples (i.e., romantic partners) will engage in an emotional sharing task (Nils & Rimé, 2012). In this task, we ask each of the relationship partners twice to share a negative emotional experience and provide each other with emotional support. By means of verbal instructions, we will manipulate whether the couple engages in natural sharing or co-rumination. Co-rumination is characterized by a prolonged focus on problems and negative emotions. It has a twofold impact: it fosters companionship, social support and positive relationship quality, to a greater extent than natural sharing. After a single episode of co-rumination, sharers may feel better, due to their experience of bonding with the supporter. However, individuals that frequently engage in co-rumination seem to experience more negative emotions in the long run. This is likely due to the ruminative nature of co-rumination, in which little cognitive changes, solutions or new insights occur (Bastin et al., 2014; Stone et al., 2019). Therefore, we expect that the co-rumination, versus natural sharing, will be associated with stronger movement and cardiovascular synchrony, a better mood and less appraisal change.

Compared to the effects of the co-rumination manipulation on synchrony, mood and appraisal change, we expect that couples' relationship quality and their dyadic coping strategies have a much stronger effect. Couples with a high relationship quality and constructive dyadic coping strategies will already have employed a range of interpersonal emotion regulation and coping strategies to deal with the problem they are discussing, and therefore these brief episodes of corumination or natural sharing will minimally affect their synchrony, mood and appraisal changes. In contrast, for couples with a poorer relationship or dyadic coping strategies, the manipulation to engage in extensively discussing the sharers problems and negative emotions, will have a greater effect on their synchrony and positive mood changes, but will still result in minimal appraisal changes.

Prior to the task, we will measure a set of variables related to the chronic timescale: individual traits (e.g., empathy) and stable relationship patterns (e.g., dyadic coping). During the emotional sharing task itself, we will assess both phasic and tonic processes. We will measure phasic processes in the form of movement synchrony (Koole & Tschacher, 2016) and cardiovascular synchrony (Palumbo et al., 2017). Finally, we will measure tonic processes in the form of mood changes and changes in emotional appraisals before and after emotional sharing.

The proposed experiment has both confirmatory and exploratory parts. The confirmatory part is based on hypotheses that were explicitly derived from the literature on interpersonal emotion regulation. Because of the complexity of the study, we have grouped our hypotheses according to their respective timescales (see the **Table 1**). More detailed information can be found in *Appendix 4*.

Table 1

Timescale	Hypotheses
Phasic	1. Relationship partners will display significant levels of movement and
	cardiovascular synchrony during the experiment, relative to a relevant
	baseline level of randomized pseudo-interactions.
	2. Co-rumination (vs natural sharing) will amplify sharing-induced movement
	synchrony and cardiovascular synchrony.
Tonic	3. Emotional sharing will generally make sharers and supporters feel better,
	leading them to report positive mood changes.
	4. Emotional sharing will generally help sharers to reappraise their feelings,
	leading them to report changes in emotional appraisals.
	5. After co-rumination (vs natural sharing) participants will have a better
	mood.
	6. Co-rumination (vs natural sharing) will weaken sharing-induced changes in
	emotional appraisals.
Chronic	7. Higher relationship quality and more constructive dyadic coping strategies
	will be associated with effects of emotional sharing on both phasic and tonic

Main Confirmatory Hypotheses for the Three Timescales

timescales, specifically on 1) movement synchrony; 2) cardiovascular
synchrony; 3) positive mood changes; 4) emotional appraisal changes.
8. Higher relationship quality and more constructive dyadic coping strategies
will be associated with weaker effects of co-rumination (vs natural sharing) on
1) movement synchrony; 2) cardiovascular synchrony; 3) positive mood
changes; and 4) positive emotional appraisal changes.

Moreover, we will conduct a series of exploratory analyses to further inform our understanding of interpersonal emotion regulation within close relationships. These exploratory analyses will probe the intricate connections between verbal and nonverbal communication, physiological responses, and chronic individual and relational factors. More specifically, our exploratory analysis will be looking at: 1) linguistic synchrony; 2) vocal synchrony; 3) facial synchrony. These exploratory analyses are elaborated in *Appendix 4*.

Methods and Statistical Analysis

Design

This study has a mixed factorial-experimental nested design. In total, each couple engages four times in the emotional sharing task, twice in the co-rumination and twice in the natural sharing condition. Each participant will twice share a distressing experience and will twice act as supporter. Both aspects will be experimentally manipulated between participants. Measures of mood and appraisal will be nested within participants, while movement and cardiovascular synchrony will be nested within dyads. The chronic variables (i.e., dyadic coping and relationship variables) will be used correlational.

Participants

Couples aged 18 to 65 in a romantic relationship of at least 4 months will be eligible for participation. Participants also must be proficient in the Dutch language. Exclusion criteria are the use of psychoactive medications and a history of neurological conditions.

Sample Size Determination

We determined the sample size based on a priori power analysis (G*Power; Faul et al., 2007). For a power of at least 80% to compare the means of two independent groups, a minimum sample size of 128 dyads is required to detect medium effects (0.5) at α < .05 for two-tailed comparisons. A minimum sample size of 59-114 dyads is required to detect small to medium effects (0.1-0.2) at α < .05 for linear multiple regression. We aim to recruit a sample size of 150 dyads for our study, so that we will be able to accommodate potential exclusions of participants due to unforeseen accidents. Compared to other studies on synchrony (Coutinho et al., 2021; Lakens, 2010), our study features a large sample size.

Procedure

Participants will be recruited partly through a recruitment agency and partly by research assistants spreading flyers on the university campus, making announcements to the participant pool of the psychology program at the Vrije Universiteit Amsterdam and by recruiting from their social networks. Interested individuals will be asked to complete a brief online questionnaire to assess their eligibility. To reduce random error in psychophysiological responses an email will be sent to the participants two days before the experimental session, with the request to refrain from alcohol consumption and intense physical activity 24 hours before the session, and caffeine consumption 2 hours before the session.

Participants will arrive as a couple and will be personally greeted by a research assistant at the building entrance and escorted to the laboratory. A diagram of the laboratory is shown in Figure 1a and a photograph of the lab space is shown in Figure 1b. Upon arrival at the lab, the couple will be greeted by a second research assistant. Each participant will be led to their individual workspace. Next, the experimental procedures will be explained to the participants by the research assistants and written informed consent will be obtained. After these explanations, participants will verify their compliance with the behavioural instructions. Divergences of the behavioural instructions will be noted and included as covariates to control for their effects. To do so, we will record participants' alcohol consumption (yes or no), their physical activity intensity (5-point score, from 'none' to 'very

strong') and caffeine digestion (1 mug to 5 mugs).

SYNCHRONY AND COREGULATION IN COUPLES

Figure 1a

Diagram of the Interaction Laboratory and Observation Room.



SYNCHRONY AND COREGULATION IN COUPLES

Photograph of the Emotional Sharing Space and One Individual Workspace.



In the first phase of the experiment, participants will be asked to rate their mood on the mood adjective checklist (BEF, Kuhl & Kazén, 2013). Then they will be instructed to generate two personal negative experiences using the Experience-Generation Questionnaire (EGQ, Cohen et al., 2018). Subsequently, the Experience Scales (ES, Scherer, 2001) will be used to tap into their appraisal of these two experiences. Next, participants will be fitted with the sensors of the Vrije Universiteit - Ambulatory Monitoring System (VU-AMS). After setting up the VU-AMS, participants will be asked to complete the pre-sharing survey.

Subsequently, participants will be provided with instructions for the emotional sharing task, consisting of four dialogues. Upon completion of the entire emotional sharing task, participants will complete a post-sharing survey and the ECG device will be removed. Finally, participants will be debriefed, rewarded, and thanked. Figure 2 shows the whole experimental session. In total, the experiment takes approximately 2 hours, with task instructions taking 10 minutes, device fitting taking 15 minutes, the pre-sharing survey taking 15 minutes, the emotional sharing task lasting 60 minutes, the post-sharing survey taking 15 minutes, and the device removal and closure taking 5 minutes.

Experiences Generation Task

In the emotional sharing tasks, participants will be asked to talk about two negative experiences from their own life. To illustrate what is meant by negative experiences, the ERQ lists seven negative experiences, such as having an argument with a close friend or family member. Participants will be asked to write down two negative experiences they are currently facing. By focusing on personal experiences, we ensure that the study has high personal relevance for the participants.

Emotional Sharing Task

The emotional sharing task, which is modelled after Nils & Rimé (2009), involves a structured procedure make participants share their emotions in a controlled experimental setting. Participants will be having a total of four eight-minutes episodes with their partner to share the two experiences

they each wrote down in the experience generation task. During each episode, one participant will act as a sharer (to discuss the problem) and the other participant will act as a supporter (to listen and respond to the sharer). The roles of sharer and supporter will be randomly alternated so that each participant will be a sharer and a supporter twice. In both conditions, the participants will receive digital instructions and physical cards to remind them of their role and the associated instructions. Before the first sharing episode, participants will be taken by their experimenter to the emotional sharing space with the two armchairs (see Figure 1b), so that they can familiarize themselves with this space.

Before the start of the first sharing episode, participants will be informed about the first experience to address and be asked to "collect their thoughts" for two minutes in their private space. Following this, each participant will be taken to the emotional sharing space. Participants will then engage in their first round of emotional sharing on the selected experience. After completing the first emotional sharing episode, the participants will go back to the private space and complete the postdialogue survey about their sharing experience. After completing the first role, the roles of the sharer and supporter will be reversed, and the same procedure will be repeated for the second, third, and fourth sharing episodes.

Co-rumination Manipulation

We will experimentally manipulate the instructions of the emotional sharing task, following a validated procedure developed by Lin et al. (2023). For half of the sharing episodes, the supporter will receive instructions that promote co-rumination, which involves focusing on a topic, repeatedly discussing the issues, speculating about the antecedents and consequences of the issues, and exploring and unearthing negative emotions. For the other sharing episodes, the supporter will be instructed to respond in a natural way to the sharer. The order of the co-rumination versus natural response will be counterbalanced. Each member of the couple will be instructed once to engage in co-rumination and once to engage naturally with the sharer.

SYNCHRONY AND COREGULATION IN COUPLES

Figure 2

Experimental Session



Ethical Considerations

The protocol obtained approval from the Scientific and Ethical Review Board, Vrije Universiteit Amsterdam (protocol number VCWE-S-23-00154). All participants will provide written informed consent. During the data collection process, all study-related documents (data and informed consent forms) will be securely stored in Yoda (Your Data is a cloud storage at SURF and suitable for storing large-scale and sensitive datasets). After completion of the study, final storage and archiving of the electronic data will take place in a dedicated archive at Vrije Universiteit Amsterdam and will be processed in compliance with the General Data Protection Regulation (GDPR). In accordance with legal regulations from the European Union, the data will be stored for a period of 10 years.

Measurement

Table 2 provides a comprehensive overview of the tools and objectives for the measurement employed in this study. More detailed information can be found in Appendix 4.

Table 2

Overview of the Measurement Tools, Objectives and Measurement Period

Timescale	Name	Measurement objectives	Measurement period
Phasic	VRMS	Movement synchrony	Emotional sharing episodes
	CMS	Cardiovascular synchrony	Emotional sharing episodes
Tonic	BEF	Mood (e.g. "Helplessness.")	Pre-sharing survey and post-dialogue surveys
	ES	Emotional Appraisal (e.g. "How intense were the negative emotions that you had during this experience?")	Pre-sharing survey and post-dialogue surveys
	IOSS	How close the respondent feels with another person (seven images)	Pre-sharing survey and post-dialogue surveys
	SOE	The experiences of partners in conversation (e.g. "I felt completely like myself during the conversation.")	Post-dialogue surveys
	PPR	Individuals' perceptions of their partners' responsiveness (e.g. "My partner understood me.")	Post-dialogue surveys
	IER-DSFP	Different interpersonal emotion regulation strategies from partner (e.g. "My partner tried to get me to talk over and over about what is bothering me.")	Post-dialogue surveys
	RQ-ASSC	Relationship quality (e.g. "My partner and I agreed on how I could best approach the problem.")	Post-dialogue surveys
Chronic	TAS-20	Alexithymia (e.g. "I am often confused about what emotion I am feeling.")	Pre-sharing survey
	PQ-SF	Quality of romantic relationships (e.g. "He/she takes me in his arms.")	Pre-sharing survey
	PSAS-SF	Attachment styles (e.g. "It helps to turn to my partner in times of need.")	Pre-sharing survey
	DCI	Dyadic coping strategies (e.g. "I tell my partner that it is not that bad and help him/her to see the situation in a different light.")	Pre-sharing survey
	OSRS	Participants' perception of emotion regulation (e.g. "I gave someone helpful advice to try to make them feel better.")	Pre-sharing survey
	SSL	Perceived social support received (e.g. "Did you ask for help or advice?")	Pre-sharing survey
	SV	Sociodemographic variables (e.g. "How old are you.")	Post-sharing survey
	UCLA-LS	Loneliness (e.g. "I lack companionship.")	Post-sharing survey

	IRI	Empathy (e.g. "I sometimes find it difficult to see things from the other person's	Post-sharing survey
		perspective.")	
	DDI	Distress disclosure (e.g. "When I feel upset, I usually confide in my friends")	Post-sharing survey
	BSRI	Sex role (e.g. " Assess the extent to which the following characteristics apply to you:	Post-sharing survey
		loving")	
	MHC	Total mental health (one item " <i>How happy are you?</i> "))	Post-sharing survey
/			

Note: Video recordings and movement synchrony (VRMS), Cardiovascular measurement and synchrony (CMS), Mood adjective checklist (BEF), Experience scales (ES), Inclusion of other in the self scale (IOSS), Shearer/supporter' own experience (SOE), Perceived partner responsiveness (PPR), Interpersonal emotion regulation with different strategies from partner (IER-DSFP), Relationship quality: agreement, support, self-disclosure, closeness (RQ-ASSC), The Toronto alexithymia-20 scale (TA-20), Partnership questionnaire—short form (PQ-SF), Partner-specific attachment security short form (PSAS-SF), Dyadic coping inventory (DCI), The others and self-emotion regulation scale (OSRS), Social support list (SSL), University Of California, Los Angeles (UCLA) Loneliness Scale (UCIA-LS), Interpersonal reactivity index (IRI), Distress disclosure index (DDI), Bem sex role inventory (BSRI), mental health continuum (MHC)

Data Analysis Plan

Phasic Timescale

Video Recordings and Movement Synchrony

Video recordings of all sharing episodes will be made using three fixed cameras at a frame rate of 25 frames per second. One camera will capture the entire scene of emotional sharing, while the other two will be placed in front of the participants, and their feeds will be connected through split-screen. Before initiating the Motion Energy Analysis (MEA), the split-screen video will allow an independent analysis of each individual to derive objective motion quantification.

The MEA program (Ramseyer, 2020) employs a frame-differencing algorithm, which requires both a static camera-position as well as a stable background setting. Under these conditions, the difference in grayscale pixels between consecutive video frames reflects the bodily movements of participants, which is then quantified into time series of movement. The areas for this kind of quantification can be defined in the program, and we will use a singular region of interest (ROI) encompassing the entire head and upper body of each participant. Based on one ROI per participant, the MEA program will process the video images and generate one CSV file per video containing the time series of raw pixel variations within the designated ROIs. Adjustments for minimal thresholds of movement will be processed in the MEA program according to the criteria suggested by the creator of the program (Ramseyer, 2020). Following the generation of raw movement data, the rMEA package in R Studio will be employed for further analysis (Kleinbub & Ramseyer, 2021).

We will follow the standard pre-processing steps as outlined by Ramseyer and Tschacher (2014) and Tschacher et al. (2014). Initially, a 0.5-second moving average filter will be applied to smooth the time series, reducing fluctuations caused by signal distortions present in the video data. To account for varying sizes of the ROI, the data will be z-transformed, and extreme outliers will be eliminated. Here, we will use the default threshold provided by the authors of rMEA, thereby excluding extreme values higher than 10 times the standard deviation. Data thus filtered and corrected are then subjected to lagged cross-correlation analyses for the quantification of nonverbal synchrony.

Specifically, in each 8-minute dialogue, the motion energies of both participants will be cross-correlated in non-overlapping window segments of 30 seconds. The choice of a 30-second window size is to account for the shorter turn-taking latencies in question-centered discussions, consistent with previous work (Tschacher et al., 2014). Lagged cross-correlation of up to 5 seconds of positive and negative time lags will be computed with a step size of 0.1 seconds, achieved by progressively shifting one time series relative to the other (Ramseyer & Tschacher, 2011). The resulting matrix of cross-correlations will then be transformed using Fisher's r-to-Z transformation, and their absolute values will be aggregated over the entire 8-minute interval of the dialogue, resulting in a shared global value of nonverbal synchrony for every sharing episode (Ramseyer & Tschacher, 2011).

To ascertain whether the synchrony detected via MEA exceeded what might occur by chance (i.e. pseudosynchrony), we will engage a specific RMEA function designed for generating pseudointeractions through automated surrogate algorithms. This function shuffles the data, calculating all potential motion energy interactions between couples in the dataset. Subsequently, it dissociates the original pairings, followed by the extraction of a predefined amount of unique MEA datasets, each selected just once to avoid duplication.

To test hypothesis 1, we will employ Welch's independent samples *t*-test within R, utilizing the R stats package (R Core Team, 2022), for the statistical comparison between movement synchrony and pseudosynchrony. To test hypothesis 2, we will employ Welch's independent samples t-test to compare movement synchrony in the co-rumination versus the natural sharing condition. *Cardiovascular Measurement and Synchrony*

To collect electrocardiography data, the VU-AMS 7 from Vrije Universiteit Amsterdam will be used. This instrument consists of five non-invasive electrodes placed on the participant's chest and back. First, by employing automated and visual data cleansing techniques, potentially anomalous R- wave peaks will undergo manual rectification or will be marked as artifacts to ensure the integrity of the inter-beat interval (IBI) series. IBI is defined as the time (in ms) between two consecutive R-peaks in the ECG signal and is automatically scored by the VU-AMS 7 software. Subsequently, the IBI time series will be resampled at a frequency of 10 Hz, and samples will be divided into epochs of 2000 ms with fixed onset and offset to achieve accurate temporal alignment of IBI values within dyads. The selection of a 2000 ms epoch length is based on the minimum time required for reliable estimation of heart rate (Wilson et al., 2018). For each epoch, the average IBI will be calculated, resulting in a time series of epoch-averaged values for each participant.

For each 2000 ms epoch time series, a second-order polynomial regression will be calculated to remove linear and quadratic trends from the data (Suveg et al., 2016). To eliminate the autocorrelation properties of the signal, the partial autocorrelation function (PACF) of the detrended IBI time series, (i.e. the residuals after polynomial fitting) will be plotted and analysed. First, the autoregressive integrated moving average (ARIMA) model will be applied to the residuals of the polynomial regression, incorporating one autoregressive term, one moving average term, integrated noise, and the residuals obtained from the analysis as inputs into the cross-correlation calculation. Finally, the resulting IBI time series will be then further processed in Matlab (The MathWorks, Inc., Natick, MA). Specifically, we will use the Matlab functions 'parcorr' for the PACFs, 'armax' for ARIMA modelling and 'xcorr' (with zero-time lag) for the calculation of the cross-correlations. It is important to note that the two measurement methods used to compute IBI synchrony do not measure the distance at which individual heartbeats occur within the dyad simultaneously. Instead, they assess how the heart rate variability between consecutive 2000 milliseconds epochs co-fluctuate across the entire dyad.

To ascertain whether the synchrony detected what might occur by chance (i.e. movement pseudosynchrony), drawing on insights from Feldman et al., (2011), we will employ Welch's independent samples *t*-test within R, utilizing the R stats package (R Core Team, 2022), for the statistical comparison the cross-correlation of real couples and cross-correlation of random couples

to determine if the observed distribution significantly exceeds what would be expected by chance. To test hypothesis 2, we will employ Welch's independent samples t-test to compare the level of cardiovascular synchrony in the co-rumination versus the natural sharing condition.

Tonic Timescale

Mood Changes Analysis

To assess changes in mood over time, for sharers and supporters separately, we will use linear mixed model analyses with a random intercept for participants, including the measure of a particular mood before the emotional sharing task and after the two episodes in which a participant was either sharer or supporter as a fixed factor (*Hypothesis* 3). Additionally, we plan to utilize independent sample's *t*-tests to compare post-dialogue mood in the co-rumination condition versus the natural sharing condition (*Hypothesis* 5).

Emotional Appraisals Analysis

To investigate the change in emotional appraisals we will compare the appraisal of the selected negative experience by the sharer reported in the pre-survey, with the appraisal reported in the post-dialogue assessment of the episode in which that problem was shared, using paired samples t-tests (*Hypothesis* 4). Furthermore, to examine the effects of the type of sharing (co-rumination vs natural sharing) we will calculate appraisal change scores by subtracting the appraisal of the problem in the pre-survey assessment from the appraisal after sharing. Subsequently, we will apply independent samples t-test to compare the appraisal changes in both conditions (*Hypothesis* 6).

Chronic Timescale

Dyadic Coping and Relationship Quality Analysis

We will employ regression analysis to examine the associations between dyadic coping strategies and the relationship quality and movement and cardiovascular synchrony (*Hypothesis 7.1 and 7.2*). Additionally, to analyse whether dyadic coping and relationship quality are associated with mood changes we will add these variables as fixed factors to the linear mixed models built for testing

hypothesis (*Hypothesis 7.3*). Pearson correlations will also be used to assess whether dyadic coping and relationship quality are related to emotional appraisal change (*Hypothesis 7.4*).

To assess whether co-rumination (vs natural sharing) influences the relationship between higher relationship quality and more constructive dyadic coping and movement and cardiovascular synchrony moderated regression analyses will be used (Hypotheses 8.1 and 8.2). To analyse whether the associations between dyadic coping and relationship quality with mood change are associated with effects of co-rumination (vs natural sharing) we will extend the linear mixed models used for testing hypothesis 7.3 with the condition as fixed factor and all two- and three-way interactions (*Hypothesis 8.3*). Linear regression analyses will be used to assess whether dyadic coping and relationship quality are associated with weaker effects of the co-rumination condition (vs natural sharing) on emotional appraisal change (*Hypothesis 8.4*).

The hypotheses presented in Table 2 and the data analysis techniques utilized constitute the core elements of our research. Additionally, we have identified certain variables that could potentially influence these hypotheses. Our aim is to incorporate these variables as covariates in the analyses to enhance our understanding of the findings. Furthermore, we are contemplating the investigation of the main effects of these variables and will revise our research protocol accordingly should we decide to proceed with further analysis. For all statistical tests $\alpha \leq 0.05$ (two-tailed) will be applied. Given the wide range of statistical tests performed, there is a concern regarding multiple comparisons. Therefore, to reduce the likelihood of Type I errors, we will apply the Bonferroni correction to all previously mentioned test results.

Exploratory Analyses Summary

In our study, we plan to conduct exploratory analyses to investigate the nuances of interpersonal communications and emotional expressions:

1. Verbal expressions and word use: We will analyze the frequency and context of specific words used during emotional sharing to see how they correlate with mood and personality changes, and relationship quality.

2. Vocal arousal coding: Vocal characteristics such as arousal and pitch variations will be examined to understand their correlations with emotional states and personality traits during interactions.

3. Facial expression coding: We will employ facial expression coding to study the emotional responses visible during the sharing tasks, assessing their relationship with mood change and personality traits.

Discussion

The planned research seeks to comprehensively evaluate interpersonal emotion regulation across phasic, tonic, and chronic time scales concurrently. This research design will allow for the examination of three leading theories of interpersonal emotion regulation—namely, synchrony, emotional sharing, and dyadic coping. These theoretical frameworks and associated processes have so far not been studied within a single design. By so doing, the planned research will this allow us to examine how moment-to-moment (phasic) processes in interpersonal emotion regulation are related to specific episodes (tonic) of interpersonal emotion regulation, and how these, in turn, are related to more enduring (chronic) patterns in interpersonal emotion regulation.

The planned study -like all research- has limitations. First, the study's generalizability may be limited due to its inclusion of only Dutch-speaking participants with a limited age range and relationship duration. Replicating the planned study with more diverse samples will be important to test the external validity of the findings. Second, the present study contains an experimental manipulation of one tonic process (i.e., co-rumination), but not of phasic processes (movement synchrony and cardiovascular synchrony) or chronic processes, which are both merely measured. Thus, the present study cannot draw causal conclusions about the role of phasic and chronic processes in interpersonal emotion regulation. Third, the present study will assess chronic processes (personality and relationship patterns) through momentary, retrospective self-report only. Future work using longitudinal designs will be required to conduct more direct tests of processes at the chronic timescale. Despite these caveats, the proposed study will be the first to study processes of interpersonal emotion regulation jointly across phasic, tonic, and chronic time scales. We hope that this study will facilitate the development of an integrated theoretical framework for understanding interpersonal emotion regulation.

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Chapter 7

Psychological Care for Cancer Survivors:

A 2 x 2 Model of Interpersonal Emotion Regulation by Caregivers

Zeng, Z., Holtmaat, K., & Koole, S. L. (2024). Psychological Care for Cancer Survivors: A 2 x 2 Model of Interpersonal Emotion Regulation by Caregivers. *Frontiers in psychology*. Accepted.

Caregivers make a vital contribution to the emotional well-being of cancer survivors (Fong et al., 2017; Harms et al., 2019; Li et al., 2018). A recent systematic review comprising 86 studies with over 69,000 cancer survivors revealed that various forms of interpersonal emotion regulation by caregivers, such as providing emotional support or giving a warm embrace, are positively correlated with a broad spectrum of mental health indicators, including less distress, anxiety, and depression, along with better quality of life, and overall well-being (Zeng et al., submitted). Though this is a sizable body of evidence, it tacitly adopts the cancer survivor's perspective as the recipient of socialemotional support. Consequently, the perspective of caregivers in regulating survivors' and their own emotions seems understudied. Just like survivors, caregivers have to cope with fear and uncertainty about the future, they may be confronted with complicated caregiving tasks and long-lasting role changes in the relationship (LeSeure & Chongkham-Ang, 2015). In the present article, we address some of the psychological complexities in interpersonal emotion regulation by caregivers of cancer survivors.

2 x 2 Model of Interpersonal Emotion Regulation by Caregivers to Cancer Survivors

Improving the well-being of cancer survivors is a central concern for caregivers, often achieved by fostering pleasant, or hedonic, emotions—relieving the cancer survivor's suffering and enhancing their good spirits. However, there are situations where promoting others' broader wellbeing may be accompanied by momentary discomfort (Niven et al., 2009). In such cases, caregivers may intentionally lead the survivor to feel worse. Zaki (2020) has characterized the latter form of interpersonal emotion regulation as paternalistic, because regulators assume they know what is best for the person whose emotions they are trying to influence.

Zaki (2020) has further distinguished empathically based, altruistic motives, often accompanied by feelings of love or companionship, as drivers of interpersonal emotion regulation. Although altruism is an important source of motivation in caring for cancer survivors, caregivers also have needs themselves. The task of caring for a cancer survivor is emotionally taxing and often carried out over years (Kent et al., 2016; Kim & Given, 2008; Üzar-Özcetin & Dursun, 2020). Additionally, caregivers often have to grapple with their own emotional vulnerabilities, such as sadness or existential fears. Such self-serving motivations can be legitimate, but nonetheless may conflict with the immediate interests of cancer survivors. The latter, paternalistic and self-centric aspects of interpersonal emotion regulation have so far received little attention in research on care for cancer survivors.

Figure 1

2 x 2 Model of Interpersonal Emotion Regulation by Caregivers to Cancer Survivors

		Caregiver's motivation		
		Survivor-centric	Caregiver-centric	
Survivor's target emotional state	Hedonic Counter- Hedonic	Supportive	Instrumental * Avoid witnessing distress	
		* Affectionate support	* Drotoctive buffering	
		* Anectionate support	* Protective buttering	
		Paternalistic		
		* Invoking war metaphors to carry	Assertive	
		on despite discomfort	* Empathy avoidance	
		* Invoking anxiety to promote medical adherence	* Blaming and guilting behaviors	

Note: Examples of each type of interpersonal emotion regulation are marked by an asterisk (*)

Similar to survivor-centric (altruistic) motivations for interpersonal emotion regulation, caregiver-centric (self-serving) motivations may target both hedonic and counter-hedonic emotional states of cancer survivors. To serve their own emotional needs, caregivers sometimes evoke positive and sometimes negative emotions in cancer survivors. When we combine caregivers' motivations with the target emotions of cancer survivors, four caregiver orientations emerge. The resulting model of interpersonal emotion regulation by caregivers for cancer survivors is summarized in Figure 1. Notably, these orientations are ideal types that are separated only for analytical purposes. In reallife situations, altruistic and self-serving motives can be expected to co-occur, and changes situational demands may prompt caregivers to shift between hedonic and counter-hedonic regulation. In everyday life, caregivers' behaviour is thus likely to be a blend of these different orientations.

Applying the 2 x 2 Model

The 2 x 2 model of interpersonal emotion regulation depicted in Figure 1 is novel and thus must await systematic empirical testing. Nonetheless, in what follows, we aim to show how the model already be used as an integrative framework for existing research findings. Note that our review focuses on empirical studies that clearly illustrate the key principles of the 2 x 2 model. Moreover, for each study, our discussion concentrates on those aspects that are directly relevant for the model. Thus, our review of the literature is selective rather than exhaustive.

Survivor-Centric Regulation: Supportive and Paternalistic Ideal Types

Survivor-centric interpersonal emotion regulation is often aimed at making cancer survivors feel better. This form of supportive regulation has so far been the main focus of research on interpersonal emotion regulation among cancer survivors (Zeng et al., submitted). As shown in the top left quadrant of Figure 1, examples include offering companionship (Thomas et al., 2002) and affectionate support, i.e., physical demonstrations of love and care (Alison Payne et al., 2008). Although these supportive strategies are important and highly meaningful, not all survivor-centric interpersonal emotion regulation are aimed at promoting more positive hedonic states in cancer survivors.

More specifically, the paternalistic type of interpersonal emotion regulation seeks to evoke more negative emotions. Caregivers do not do this because their want to make cancer survivors suffer, but rather because they believe that certain negative emotion may have instrumental benefits for cancer survivors. As depicted in the bottom left quadrant of Figure 1, one negative emotion that caregivers may strive to promote in cancer survivors is anger. For instance, it is well-documented that many caregivers use war metaphors to describe living and coping with cancer (Penson et al., 2004; Semino et al., 2018). In order to carry on, caregivers may encourage survivors to disregard inconveniences in the present and to firmly focus on fighting and getting through this period. While cancer survivors often are put off by war metaphors (Semino et al., 2018), caregivers might still want to use them because they believe that anger and aggressiveness can mobilize survivors' energies in facing challenges.

Another negative emotion that caregivers may sometimes seek to induce in cancer survivors is (mild) anxiety. Anxiety is known to promote watchfulness (Derakshan & Eysenck, 2009). Consequently, when cancer survivors are not sufficiently watchful, caregivers might try to instil mild levels of anxiety in cancer survivors to ensure that the latter engage in necessary preventive behaviours, such as regular check-ups and medication adherence (Oliveria et al., 2013; Seibel et al., 2023). A qualitative study among 25 German survivors after curative lung cancer treatment and 17 caregivers on cancer follow-up perceptions revealed that many caregivers encourage cancer survivors to undergo regular health checks, even when these evoke 'Scanxiety' among cancer survivors (Seibel et al., 2023). Overall, though research on these topics is scarce, there is some initial evidence that caregivers engage in paternalistic forms of interpersonal emotion regulation.

Caregiver-Centric Regulation: Instrumental and Assertive Ideal Types

There is a large body of research on caregiver burdens (Liu et al., 2020). Nonetheless, caregiver-centric motives for interpersonal emotion regulation have so far not received much attention. In general, well-adjusted relationships always involve a joint consideration of own and others' interests (Helgeson & Fritz, 2000; Oakley, 2013). It is in the best interest of both the survivors and caregiver, particularly in the long run, that caregivers to appropriately attend to their own emotional needs (Girgis et al., 2013; Lambert et al., 2012; Sklenarova et al., 2015). Addressing caregiver-centric motivations is hence potentially useful in maintaining high-quality care for cancer survivors.

Caregiver-centric interpersonal emotion regulation may be aimed at enhancing positive emotions in cancer survivors. For instance, caregivers may sometimes find it hard to witness cancer survivors' emotional distress and may hence, at least from time to time, want to avoid being confronted with it. The self-serving motivation to escape survivors' distress is psychologically distinct from the altruistic motive to alleviate another person's suffering (Batson et al., 1987). Caregivers may thus seek to provide emotional comfort to cancer survivors in order to feel better themselves. As noted in the lower right quadrant of Figure 1, one example of such instrumental regulation is protective buffering, defined as 'withholding or denying cancer-related thoughts and concerns from one's partner, hiding dispiriting information, and acquiescing to avoid conflict' (Langer et al., 2009, p. 4312). Although protective buffering might superficially appear altruistic, it is often used by caregivers to protect themselves from personal negative feelings from upsetting the cancer survivor (Langer et al., 2009). Unfortunately, this instrumental form of interpersonal emotion regulation may unintentionally increase the psychological distance between the caregiver and cancer survivor (Winterheld, 2017).

Finally, the assertive type of interpersonal emotion regulation aims to induce counterhedonic emotional states in cancer survivors to enhance the feelings of the caregiver. Because it may cause emotional discomfort among cancer survivors, the assertive type is probably the most controversial form of interpersonal emotion regulation. However, there are situations where assertive regulation is at least somewhat legitimate. Caring for cancer survivors imposes significant burdens on caregivers, especially when this responsibility extends over an extended period of time, which is increasingly common (Guerra-Martín et al., 2023; Kim & Given, 2008). To be able to carry these burdens, it is necessary for caregivers to address their own needs, even if, at least in the short run, this causes emotional discomfort for cancer survivors. Two illustrative examples of the assertive type are shown in the lower right side of Figure 1.

One form of assertive interpersonal emotion regulation may be empathy fatigue, a phenomenon in which caregivers experience a gradual decline in empathy towards cancer survivors (Shi et al., 2022; see also Cavanagh et al., 2020). A study of 117 cancer healthcare professionals in Ireland indicates that over a quarter of cancer care professionals report a level of empathy fatigue (Hunt et al., 2019). Empathy fatigue may be a protective mechanism that prevents emotional exhaustion in caregivers (Lelorain et al., 2012; see also Tops et al., 2015). Another instance of assertive interpersonal emotion regulation may occur when caregivers engage in guilting and blaming behaviors toward cancer survivors. A study involving 304 Canadian dyads of lung cancer survivors and caregivers observed that caregivers were more inclined to blame survivors, especially if they continued to smoke (Lobchuk et al., 2012). Such blaming tendencies may have a negative impact on the quality of caregiving, but may still serve an adaptive role, perhaps by allowing caregivers and cancer survivors to achieve a more balanced give-and-take in their relationship (Taurisano et al., 2022).

Future Directions

Caring for cancer survivors is a complex task with multiple psychological facets. In this article, we have proposed a 2 x 2 model of interpersonal emotion regulation by caregivers for cancer survivors. The model considers how caregivers may not only seek to make cancer survivors feel better, but also at times may actively strive to make cancer survivors feel worse, even when caregivers have cancer survivors' best interests at heart. Moreover, caregivers may sometimes regulate cancer survivors' emotional states for reasons that are at least somewhat self-serving rather than being purely altruistic. Interpersonal emotion regulation by caregivers can thus be supportive (survivor-centric hedonic), paternalistic (survivor-centric counter-hedonic), instrumental (caregiver-centric hedonic), or assertive (survivor-centric counter-hedonic).

Each of these four types of interpersonal emotion regulation entails trade-offs between specific psychological costs and benefits. For instance, the supportive type may allow cancer survivors to feel better but may also create undesirable emotional dependencies (Helgeson & Fritz, 2000). The paternalistic type may promote cancer survivors' long-term interests, but may also lead cancer survivors to experience some amount of emotional discomfort (Seibel et al., 2023). The instrumental type may prevent immediate emotional distress in cancer survivors, but often creates more psychological distance between cancer survivors and caregivers (Langer et al., 2009). And, finally, the assertive type may prevent exhaustion among caregivers, but tends to come at the expense of cancer survivors' immediate emotional needs (Chen et al., 2021). These trade-offs merit
attention in future research. Furthermore, it would be insightful to know whether and how caregivers can flexibly switch between or combine the four types of interpersonal emotion regulation. Such flexibility may be vital for the mental health and wellbeing of caregiver and cancer survivors (Kashdan & Rottenberg, 2010).

Finally, it is important to keep in mind that the empirical studies that we reviewed in this article were not specifically designed to test the 2 x 2 model. The contribution of the present article is hence primarily conceptual. Future research is needed to explicitly test the 2 x 2 model across diverse caregiving contexts and cultural backgrounds to verify its applicability and robustness.

Conclusions

Psychological care for cancer survivors is challenging. To meet this challenge, it is vital to consider not only the perspective of survivors but also that of caregivers. Addressing both perspectives may promote understanding between caregivers and cancer survivors, fostering the development of more mutually beneficial relationships.

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Chapter 8

General Discussion

"Home is a haven from the storms; in times of turbulence, it is our strongest support." -

Yu Hua, To Live

In keeping with the words of Yu Hua, one of the most celebrated authors in China today, the present dissertation highlights the significance of emotional support for mental health. The preceding chapters documented a wide range of interpersonal emotion regulation processes among various populations, from Chines families to Western couples. In this final chapter, I reflect on the main findings of this dissertation, consider how these may fit into the literature, identify limitations of the work, and point to directions for future research. I end with the main thoughts that I hope that readers will take away from this work.

Main Findings of this Dissertation

In Part 1 of this dissertation, I examined the role of emotional support from the family in mental health across various Chinese samples. More specifically, Part 1 featured three cross-sectional survey studies on the impact of support from the family on pandemic-related psychological symptoms among Chinese college students (Chapter 2), non-suicidal self-injury among Chinese children (Chapter 3) and suicidal ideation among Chinese adolescents (Chapter 4).

More specifically, Chapter 2 described a study conducted among 1,555 Chinese students during the first three months of the COVID-19 pandemic in 2020. This unique historical period was highly stressful for the students, given that little was yet known about COVID-19 and there were no vaccines to protect against the virus. The results showed that better family functioning was associated with fewer psychological symptoms for the Chinese college students. These findings suggest that family support acted as a psychological buffer for young adults during the large-scale public health crisis of the COVID-19 pandemic. The study described in Chapter 3 was conducted among 771 Chinese adolescents. The results showed that adolescents experiencing strong parentchild relationships reported less perceived stress compared to their peers with weaker familial bonds and less educational support. The study also observed that perceived stress acted as a mediator in the link between the parent-child relationship plus educational involvement and non-suicidal selfinjury among adolescents. Finally, the study described in Chapter 4 was conducted among 4,515 Chinese high school students. The results showed that better family functioning was associated with less suicidal ideation, and this effect was most pronounced among students who perceived less meaning in life.

Overall, the studies described in Part 1 found converging evidence that family support is associated with various indicators of mental health and wellbeing during the formative stages of adolescence and early adulthood. These findings are consistent with the idea that family support protects the mental health of young adults and adolescents. In Part 2 of this dissertation turned to some of the processes of interpersonal emotion regulation that presumably underlie emotional support. This work extends the work described in Part 1 in several ways, by adopting a more processoriented approach, examining different interpersonal relationships (especially couples), and by using different methods, including a systematic literature review, an experimental study, and theoretical analysis.

Chapter 5 describes a systematic review on the importance of interpersonal emotion regulation for mental health of cancer survivors. We identified 6,928 potentially relevant studies, of which 86 studies with a total of 67,592 cancer survivors met the inclusion criteria. Our findings indicated that various forms of interpersonal emotion regulation were consistently associated with a range of better mental health outcomes among cancer survivors. Chapter 6 describes a planned experiment aiming to comprehensively investigate the differential outcomes of emotional sharing within close relationships on cognitive and affect outcomes across diverse phasic, tonic, and chronic timescales. Finally, Chapter 7 presents a new theoretical model of interpersonal emotion regulation by caregivers to cancer survivors. This highlights some of the psychological complexities involved in caregiving relationship, by considering how caregivers may not only be driven by the altruistic motivation to make cancer survivors feel better, but also by more self-serving motivations, including some that may actually make cancer survivors feel worse.

Taken together, Parts 1 and 2 offer complementary perspectives on the role of emotional

support in mental health. Part 1 highlights emotional support from the family and its association with mental health in field settings, using cross-sectional surveys that were administered among relatively large samples of Chinese adolescents and young adults. Part 2 highlights emotional support from caregivers and close relationship partners in the context of surviving cancer and emotional sharing, using a mix of different methods consisting of systematic literature review, experimental methods, and theoretical analysis.

What this Dissertation Adds to the Existing Literature

In the introductory chapter, I identified four important gaps in the literature, namely, crosscultural applicability, clinical relevance, perspective of the support provider and theoretical integration. In what follows, I consider how the work described in this dissertation may help to close each of these gaps.

Cross-cultural Applicability

Emotional support is an integral part of all meaningful interpersonal relationships. To date, however, relatively little is known about emotional support in nonwestern cultures. This is mainly because most modern psychological research has been conducted in Western cultures (Henrich et al., 2010). The present dissertation helps to fill this gap in the literature by studying emotional support and mental health across both Chinese and Western contexts. It should be noted that my research in China and research in the West had different aims and methodologies. Thus, the work was not specifically designed to conduct cross-cultural comparisons. Despite this caveat, it is still possible to derive some tentative ideas regarding potential cross-cultural differences and similarities.

At a general level, it appears that various forms of emotional support are helpful in alleviating stress and enhancing quality of life across both Chinese and Western cultural contexts. Although this conclusion may seem obvious, it is noteworthy because it suggests that research on emotional support and mental health may be generalizable across cultures to an important degree. The latter notion fits with prior cross-cultural studies. For instance, one study among 555 adolescents from India, Indian migrants, and English revealed similar rates of emotional sharing for **GENERAL DISCUSSION**

the different cultural groups (Singh-Manoux & Finkenauer, 2001). The psychological significance of emotional support thus seems to have cross-cultural generality. Theoretically, this may be because people have an innate need to belong with others (Baumeister & Leary, 1995), which endows socialemotional support with universal benefits for psychological health.

Despite this generality, it seems undeniable that cultures differ in their emotional support systems. These differences were not explicitly tested in my research. Nonetheless, I can offer some tentative observations at this point, which remain in need of empirical testing. In Chinese contexts, emotional support seems to be more implicit and centered around familial duties. The emphasis on family harmony and collective well-being in Chinese culture likely enhances the protective role of family functioning, which was examined in Chapters 2-4 of this dissertation. In Western contexts, emotional support often involves more direct communication and often includes explicit sharing of personal experiences and emotions (Johar, 2015). This Western approach to emotional support was more the focus in Chapters 5-6, where I examined interpersonal emotion regulation between cancer survivors and caregivers, and emotional sharing among close relationship partners.

In sum, this dissertation enhances cross-cultural understanding of emotional support and its relationship with mental health in Chinese and Western contexts. Despite the many differences in the studies, which make direct comparisons challenging, the findings converge by highlighting the crucial role of emotional support in both cultures. Cultural differences in emotional communication and support networks are likely meaningful and warrant further research.

Clinical Relevance

The clinical-psychological relevance of this dissertation is of personal interest to me because, in addition to my academic education as a psychological scientist, I received multiple trainings as a psychotherapist from 2018 to 2022. During this time, I gained clinical experience, including conducting psychological intakes at the Second Xiangya Hospital of Central South University, working as a counselor at a middle school in Hunan where I supported numerous adolescents with psychological issues in 2020, and conducting in-depth interviews with suicidal children in 2021. The research presented in this dissertation was primarily conducted with psychologically healthy samples, except for Chapter 5, which focused on a clinical group of cancer survivors in our systematic review. Therefore, caution should be exercised when suggesting clinical applications of this dissertation. Nonetheless, I believe that several of our findings could hold significant implications for clinical psychologists.

Recent work indicates that the present generation of young adults, also known as 'Generation Z' suffers from higher levels of mental health problems, including affective disorders and increased suicide rates, compared with prior generations (Haidt, 2024). The findings of Chapters 2-4 seem noteworthy in this respect. In Chapter 2, we found that Chinese college students during the first three months of the COVID-19 pandemic had fewer psychological symptoms when their family functioned better. This finding suggests that robust family support may serve as a protective factor against mental health issues in young adults. However, our study had a correlational design, so it could not demonstrate that enhancing family functioning directly leads to improvements in adolescent mental health. Future randomized controlled trials (RCTs) focusing on family functioning interventions to improve adolescent mental health could provide more robust support for this study's conclusions. Our findings could also be used in guiding clinical prevention efforts, which may be targeted at strengthening resources for families to support college students. Additionally, family functioning assessments might be utilized as screening tools to help counselors identify college students who are at higher risk of developing mental health problems. Similar preventive measures could be applied to adolescents dealing with non-suicidal self-injury (as discussed in Chapter 3) and suicidal ideation (as outlined in Chapter 4).

The research described in Chapters 5 and 7 could have some clinical relevance for cancer survivors and their caregivers. The systematic review described in Chapter 5 confirms the importance of emotional support for this vulnerable group. The large amount of scientific evidence for the importance of emotional support for cancer survivors—86 studies with a total of 67,592 cancer survivors—attests to the robustness of this relationship. While certain forms of interpersonal

emotion regulation are beneficial, others, such as social constraints and ambivalence over emotional expression, are not. Effectively addressing these issues in psychotherapy could yield significant benefits. At the same time, the statistical strength of the effects of emotional support is in the smallto-medium range, which is consistent with most findings in behavioral science. This indicates that, although the effects of emotional support are significant and reliable, they should not be overestimated. Cancer survivors face significant challenges, and although emotional support can offer valuable assistance, it may not be enough to fully address all their difficulties.

Finally, the theoretical analysis offered in Chapter 7 might help clinicians in creating more room for the perspective of caregivers. It may be helpful to attend closely to caregivers, because they have their own emotional needs and are often provide care over an extended period of time. Addressing caregivers' needs may allow them to provide better care for cancer survivors.

Perspective of the Support Provider

In the first chapter of this dissertation, I noted that emotional support research has mostly focused on the recipients of emotional support. Thus, there has been a lack of theoretical attention to the providers of emotional support. In Chapter 7, we have taken a first step toward overcoming this neglect, by proposing a new theoretical model that explicitly addresses interpersonal emotion regulation from the perspective of support providers.

Our 2x2 model of interpersonal emotion regulation categorizes support provider motivations and their targeted emotional states into four distinct types: supportive, paternalistic, instrumental, and assertive. Supportive regulation involves actions aimed at improving the recipient's emotional state through positive reinforcement, such as offering companionship and affectionate support, which enhances immediate well-being but can create emotional dependencies (Jakubiak & Feeney, 2017). This dynamic may be seen in parental relationships as well. During my tenure as a psychotherapist at the Second Xiangya Hospital, one memorable incident involved a mother who brought her child to see a psychologist. The child had a severe outburst, throwing their backpack and phone to the ground before storming out. The mother, feeling helpless and unable to intervene, quietly picked up the items and followed her child.

Paternalistic regulation involves invoking negative emotions, like using war metaphors to instill determination or anxiety to ensure medical adherence, promoting long-term health behaviors at the cost of immediate comfort (Flusberg et al., 2018). Instrumental regulation focuses on improving the support provider's emotional state by avoiding distress in interaction with the patient. This reduces the emotional burden at the moment, but not sharing distressing experiences between partners may increase psychological distance between them over time. Assertive regulation involves inducing negative emotions in the recipient to address the support provider's needs. Blaming behaviors, for example, may help the regulator to manage their own fears, but this negatively impacts the recipient's well-being.

The 2x2 model of interpersonal emotion regulation presented in Chapter 7 was developed with an eye on cancer care contexts. Nevertheless, it has potentially broader applicability to interpersonal emotional regulation in other contexts. For instance, in Chapter 3, we saw that parentchild relationships, examining both the child's (typically the recipient) and the parent's (typically the support provider) are relevant to understanding the child's non-suicidal self-injury behavior. In addition, the emotion-sharing experiment Chapter 6 investigated both the support received by the recipient and the support and emotions expressed by the supporter. Finally, the 2x2 model provides a fresh perspective on the psychological dynamics within supportive relationships, paving the way for future empirical research and encouraging balanced care by recognizing the emotional needs of support providers. By highlighting the needs of support providers, the model enhances the quality of the supportive relationship, ultimately benefiting both the recipients and provider.

Theoretical Integration

Finally, a fourth gap in the existing literature that I noted in the introductory chapter is a lack of theoretical integration. The empirical study of family functioning and meaning in life theories in Part 1 of the dissertation offers practical insights into the impact of interpersonal emotion regulation on mental health. This study demonstrates how family functioning and meaning in life mediate and regulate the effects of emotional support, providing a concrete example of how theoretical integration can enhance our understanding of these processes.

Theoretical integration is further addressed in Part 2 of the dissertation. First, in Chapter 5, we conducted a systematic review that paid special attention to existing theories related to interpersonal emotion regulation. By evaluating 86 research papers involving 67,592 cancer survivors, we synthesized findings across different theoretical frameworks, highlighting the pervasive impact of interpersonal emotion regulation on mental health outcomes. This review emphasizes the need for more robust theoretical integration, fostering a more comprehensive understanding of how various theories related to interpersonal emotion regulation shed light on various aspects of dyadic coping, personality, and personal development in various phases of the cancer trajectory.

In Chapter 6, we propose that organizing interpersonal emotion regulation theories by different timescales—phasic, tonic, and chronic—through the lens of emotional sharing tasks can provide a cohesive framework. This ideal provides a meaningful framework for connecting diverse theories, clarifying how interpersonal emotion regulation processes develop over time and influence both personal and relational health outcomes. By examining interpersonal synchrony in movements, mood variations, and personality traits, we aim to connect these processes across different timescales, thereby enhancing theoretical integration within the field of interpersonal emotion regulation.

Finally, in Chapter 7, we extended Zaki's (2020) model to develop a new 2x 2 model of interpersonal emotion regulation by caregivers, specifically focusing on cancer survivors. This model incorporates survivor-centric hedonic interpersonal emotion regulation, which connects with prior research by addressing both the supportive and challenging aspects of caregiving. By including motivations and emotional states of both recipients and support providers, the 2x2 model provides a new framework for understanding the psychological dynamics of caregiving relationships.

Limitations and Future Directions

The research described in this dissertation is inevitably subject to limitations. First, all

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research on family support in China was limited to questionnaire-based studies, which were predominantly cross-sectional in nature. These studies have primarily focused on assessing broad support variables, neglecting to explore more nuanced interpersonal emotion regulation strategies like emotion sharing and co-rumination. Although Part 2 of this dissertation includes a more diverse range of study types, I was not able to collect new data during my stay at the Vrije Universiteit Amsterdam. It thus remains important for future research to use a broader array of methodological approaches, such as laboratory studies (King et al., 2017) and longitudinal cohort studies (LeCloux et al., 2017), to gain a more comprehensive understanding of the complex relationship of family support and interpersonal emotion regulation within the different contexts.

Second, the research in the present dissertation did not explicitly compare interpersonal emotion regulation in family relationships versus that in close relationships. Part 1 of the dissertation primarily focuses on family relationships, while Part 2 centers on dyadic relationships, such as partnerships and caregiver-survivor interactions. However, the potential similarities and differences in emotion regulation strategies between these contexts were not systematically investigated. As Paley and Hajal (2022) indicates, the types and mechanisms of emotional support within family units, such as between spouses, parents and children, and siblings, can vary significantly. This suggests that interpersonal emotion regulation in family settings might operate differently compared to intimate relationships. Future research should investigate these differences to improve our understanding of how emotional support functions across various relational contexts.

Third, it is important to recognize that the studies in this dissertation were conducted within two culturally distinct frameworks. However, the absence of a direct cross-cultural comparisons means that, caution must be exercised in generalizing the results across broader cultural boundaries (Kowitt et al., 2015). Furthermore, while investigating emotional support within families, romantic couples and cancer survivor-caregiver dyads, it becomes evident that there is a significant gap in understanding how interpersonal emotional regulation interacts with and influences mental health. This raises important questions about the extent to which couple emotional regulation strategies

spill over into family interactions and vice versa, and how this relationship may differ across cultural contexts. Therefore, there is a pressing need for further theoretical development and empirical investigation to explore the complex interplay between couple emotional regulation and its effects on family, and overall well-being (Paley & Hajal, 2022).

Concluding Remarks

Despite these caveats, this dissertation emphasizes the vital contributions of emotional support and interpersonal emotion regulation for mental health. Our findings suggest that the benefits of emotional support extend across different cultures, different types of adverse situations, and age groups, underscoring its universal importance. Furthermore, our work fits with the general idea that emotion regulation cannot be understand solely as an individual endeavor. Rather, it appears that emotion regulation as a process is deeply embedded in people's social networks and interpersonal relationships. Effective emotional support and interpersonal emotion regulation are thus critical not only for people well-being but also for fostering a supportive and resilient social environment.

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Summary

In times of hardship and stress, people often rely on others for emotional support. Over the last four decades, emotional support has been a major focus of research within the psychology of coping and mental health. However, several aspects of the psychology of emotional support have remained unexplored. This doctoral dissertation investigates the interplay between emotional support, interpersonal emotion regulation, and mental health, examining these elements across cultural contexts, with a particular focus on populations in China and the Netherlands. This dissertation highlights the critical importance of family support in navigating crises such as the COVID-19 pandemic and addressing mental health challenges faced by Chinese youth. Additionally, the dissertation explores the important role of partner support in Western cultures, with a special emphasis on partners of cancer survivors. The dissertation used a diversity of methods, including field studies, systematic literature review, experimental research, and theoretical analysis to advance our understanding of the psychology of emotional support.

Chapter 1 provides a general introduction to this dissertation. In this chapter, I outline the main objectives of the work reported in the dissertation which focus on the impact of emotional support on mental health and the role of interpersonal emotion regulation. I also provide a discussion of key concepts such as emotional support, interpersonal emotion regulation, and mental health. This chapter discusses the development of related theoretical frameworks and identifies four significant gaps in the existing research: 1) Cross-cultural applicability of emotional support, or how these concepts are interpreted and applied differently across cultures; 2) Clinical relevance, or the importance of emotional support in therapeutic settings and its potential to improve cancer survivors' outcomes; 3) Perspective of the regulator, or the motivations and impacts on those who provide emotional support, adding complexity to the understanding of interpersonal relationship; and 4) Theoretical integration, or the need to combine diverse theoretical perspectives to develop a comprehensive framework that accommodates various findings. These identified gaps set the stage for the subsequent chapters, which will investigate these areas to offer a deeper understanding of

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the complex relationships between emotional support mechanisms and mental health across different cultural contexts.

Chapters 2-4 examine the family as a source of social-emotional support among Chinese adolescents and young adults. More specifically, Chapter 2 reports an empirical study of the influence of family functioning on the mental health of 1,555 Chinese university students during the early stages of the COVID-19 outbreak (Zeng et al., 2024). In the analysis of the data, we were able to identify three mental health profiles related to the severity of psychological symptoms. Adopting a regression mixture model approach, we observed that as family function improved, students were respectively 16% to 24% more likely to be in the low-level symptom group, compared to being in the medium symptom group or the high-level symptom group. These results support the notion that family support may act as a psychological buffer for young adults during a large-scale public health crisis like the COVID-19 pandemic.

Chapter 3 reports a questionnaire study among 771 Chinese adolescents to examine the roles of parent-child relationship and parental educational involvement in shaping mental health (Zeng et al., 2023). Using response surface analysis and moderated mediation model, the findings indicated that adolescents experiencing strong parent-child relationships coupled with significant educational involvement reported less perceived stress compared to their peers with weaker familial bonds and less educational support. Furthermore, adolescents with strong parent-child connections but less educational involvement also experienced lower stress levels than those with high educational involvement but poor family relationships. The study also observed that perceived stress acted as a mediator in the link between the parent-child relationship plus educational involvement and non-suicidal self-injury among adolescents. Finally, an increase in meaning in life was found to moderate the negative effects of perceived stress on nonsuicidal self-injury, effectively reducing its impact as the adolescents' perceived meaning in life grew. These results underscore the potential of familial support in mitigating nonsuicidal self-injury among adolescents.

Chapter 4 reports a study on the relation between family functioning and suicidal ideation

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among a large sample of 4,515 Chinese adolescents. A cross-sectional questionnaire survey was used in this study. Utilizing a moderated mediation model, the study found that defeat mediated the relationship between family functioning and suicidal ideation. Additionally, meaning in life moderated the impact of family functioning on defeat, with increases in meaning in life being linked to a reduction in the effect of family functioning on defeat. These results highlight the role of family functioning in protecting against adolescent suicidality, along with the mediating roles played by defeat and meaning in life in this protective relationship.

Chapters 5-7 shift the theoretical focus on processes of interpersonal emotion regulation as they occur in close relationships among predominantly Western samples. Chapter 5 reports a systematic literature review of the connections between interpersonal emotion regulation and mental health in cancer survivors, alongside the theoretical frameworks employed in these studies. From an initial collection of 6,928 potentially relevant studies, 86 research papers involving a total of 67,592 cancer survivors were selected based on meeting specific inclusion criteria. These studies explored various aspects of interpersonal emotion regulation, such as emotional support, social constraints, emotional expression, affectionate support, family support, and dyadic coping, alongside different mental health outcomes including distress, anxiety, depression, quality of life, and well-being. We observed consistently small-to-moderate significant correlations across nearly all facets of interpersonal emotion regulation and all mental health metrics. Less than a third of these studies referenced a theoretical model, suggesting a potential need for more explicit theory testing in this domain. This systematic review highlights the pervasive impact of interpersonal emotion regulation on the mental health of cancer survivors and emphasizes the need for more robust theoretical integration in future studies.

Chapter 6 delineates the design of a planned experimental study that will investigate interpersonal emotion regulation within close relationships across three distinct timescales: phasic, tonic, and chronic. The study is to include 150 romantic couples, who will participate in an emotional sharing task, where they will either naturally share their feelings or engage in co-rumination (co-

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rumination refers to the repetitive discussion of problems within a close relationship, focusing intensely on negative emotions and potential causes and consequences of these issues) or natural condition. At the phasic level, the study aims to measure interpersonal synchrony in movements and cardiovascular reactions during the task. At the tonic level, it will evaluate changes in mood and emotional appraisals before and after the sharing session. At the chronic level, the research will examine aspects of personality and relationship dynamics. This study will enrich our understanding of how interpersonal emotion regulation operates over different timescales and contribute to theoretical integration within this field.

Chapter 7 presents a new 2 x 2 model of interpersonal emotion regulation for psychological care of cancer survivors, highlighting the role of caregivers. The model recognizes that caregivers' efforts in regulating the emotions of cancer survivors are not solely concerned with providing comfort. Caregivers may also intentionally induce distress in survivors if it serves a beneficial purpose, even when these actions are rooted in the survivors' best interests. Furthermore, the emotional regulation provided by caregivers might at times serve their own needs, incorporating a mix of self-serving motives along with altruistic intentions. As a result, the model categorizes caregiver strategies into four types: supportive (survivor-centric hedonic), paternalistic (survivor-centric counter-hedonic), instrumental (caregiver-centric hedonic), or assertive (survivor-centric counter-hedonic). The 2 x 2 model highlights the complex nature of caregiving in cancer recovery, emphasizing the dual-focus on both survivor-centric and caregiver-centric motivations in emotion regulation.

Finally, Chapter 8 of the dissertation offers a narrative integration of the main conclusions of all the preceding chapters. The chapter starts with a review of the main findings of each chapter. The discussion then moves on to consider how the present dissertation helps to fill the four scientific gaps that were identified in the introductory chapter. Chapter 8 recognizes several limitations this dissertation including the predominance of cross-sectional studies, lack of representative samples, and absence of direct cross-cultural comparisons. In response to these issues, the dissertation

suggests future research should include longitudinal and experimental studies with a more diverse array of participants. Despite these limitations, the dissertation underscores the critical role of emotional support and interpersonal emotion regulation in mental health.

Dutch summary-Samenvatting

CRediT Authorship Contribution Statement

Chapter 2: Zihao Zeng participated in conceived of the study, data collection, data analysis, and drafted the manuscript; **Karen Holtmaat** participated in its data analysis, helped draft the manuscript and provided reviews; **Sander L. Koole** and **Irma M. Verdonck-de Leeuw** conceived of the study, provided reviews and funds. All authors read and approved the final manuscript.

Chapter 3: Zihao Zeng participated in design, data collection, data analysis, and drafted the manuscript; **Liyi Peng and Shuangjin Liu** participated in its data analysis, helped draft the manuscript and provided reviews; **Zhen He** participated in data collection and analysis; **Yiqiu Hu** conceived of the study, provided reviews and funds. All authors read and approved the final manuscript.

Chapter 4: Qin Yang participated in design, data collection, data analysis, and drafted the manuscript; Zihao Zeng and Shuangjin Liu participated in its data analysis, helped draft the manuscript and provided reviews; Tong Wu participated in data collection and analysis; Yiqiu Hu and Guanghuang Zhang conceived of the study, provided reviews and funds. All authors read and approved the final manuscript.

Chapter 5: Zihao Zeng participated in design, data screening, evaluation, and drafted the manuscript;
Karen Holtmaat participated in its data screening, helped draft the manuscript and provided reviews;
Xihan Jia participated in data screening and evaluation; George L. Burchell helped search; Sander L.
Koole and Irma M. Verdonck-de Leeuw conceived of the study, provided reviews and funds. All authors read and approved the final manuscript.

Chapter 6: Zihao Zeng participated in design and drafted the manuscript; Karen Holtmaat helped draft the manuscript and provided reviews; Xihan Jia, Annet Kleiboer, Francesca Rhighetti, Anne-Marie Brouwer, Fabian Ramseyer provided reviews; Sander L. Koole conceived of the study,

provided reviews and funds. All authors read and approved the final manuscript.

Chapter 7: Zihao Zeng participated in design and drafted the manuscript; **Karen Holtmaat** helped draft the manuscript and provided reviews; **Sander L. Koole** conceived of the study, provided reviews and funds. All authors read and approved the final manuscript.

AI Statement

AI was used as a tool to translate and edit texts. The ideas and substantive contents presented in this

dissertation were solely proposed by the authors.

APPENDIX

Appendix

Appendix 1 Checklist for Quantitative Studies for Systematic Review

Study number	Were the criteria for inclusion in the sample clearly defined?	Were the study subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	LΧ	ZZ	Total
1	3	3	3	3	3	3	3	3	87.600%	100.00%	93.80%
2	3	3	2	3	3	3	3	3	83.367%	95.83%	89.60%
3 <mark>4</mark>	3	3	2	3	3	3	3	3	74.967%	95.83%	85.40%
5	3	3	3	2	3	3	3	3	95.827%	95.83%	0.9583
6	3	3	2	3	3	3	3	3	70.767%	95.83%	83.30%
7	3	3	2	3	3	3	3	3	87.567%	95.83%	91.70%
8	3	2	3	3	3	3	3	3	91.767%	95.83%	93.80%
9	3	3	2	3	3	3	3	3	95.827%	95.83%	0.9583
10	3	3	3	2	3	3	3	3	99.967%	95.83%	97.90%
11	3	3	2	3	3	3	3	3	91.767%	95.83%	93.80%
12	3	3	2	3	3	3	3	3	91.767%	95.83%	93.80%
13	3	3	3	3	2	3	3	3	70.767%	95.83%	83.30%
14	3	3	3	2	3	3	3	3	91.767%	95.83%	93.80%
15	3	2	3	3	3	3	3	3	70.767%	95.83%	83.30%
16	3	3	2	3	3	3	3	3	104.167%	95.83%	100%
17	3	3	3	2	3	3	3	3	66.767%	95.83%	81.30%
18	3	3	2	3	3	3	3	3	95.767%	95.83%	95.80%
19	3	3	3	2	3	3	3	3	87.567%	95.83%	91.70%
20	3	2	3	3	3	2	3	3	95.933%	91.67%	93.80%
21	3	3	3	3	3	3	3	3	87.600%	100.00%	93.80%
22 <mark>23</mark>	3	3	3	3	3	2	3	3	95.827%	95.83%	0.9583
24	3	3	2	3	3	3	3	3	95.767%	95.83%	95.80%
25	3	3	2	3	3	3	3	3	91.767%	95.83%	93.80%
26	3	3	2	3	3	3	3	3	95.827%	95.83%	0.9583
27	3	2	3	3	3	3	3	3	95.827%	95.83%	0.9583
28	3	3	2	3	2	3	3	3	99.933%	91.67%	95.80%
29	3	3	3	1	3	3	3	3	62.533%	91.67%	77.10%
30	3	3	1	3	3	3	3	3	87.533%	91.67%	89.60%
31	3	3	2	3	3	3	3	3	104.167%	95.83%	100.00%
32	3	3	3	2	3	3	3	3	95.767%	95.83%	95.80%
33	3	3	3	3	1	3	3	3	91.673%	91.67%	0.9167
34	3	3	3	3	1	3	2	3	83.300%	87.50%	85.40%

35	3	3	3	3	1	3	3	3	87.533%	91.67%	89.60%
36	3	3	1	3	3	3	3	3	83.333%	91.67%	87.50%
37	3	3	3	2	3	3	3	3	83.367%	95.83%	89.60%
38	3	3	3	3	2	3	3	3	95.827%	95.83%	0.9583
39	3	3	3	1	3	3	3	3	70.933%	91.67%	81.30%
40	3	3	3	2	3	3	3	3	70.767%	95.83%	83.30%
41	3	3	1	3	3	3	3	3	79.133%	91.67%	85.40%
42	3	3	2	3	3	3	3	3	95.767%	95.83%	95.80%
43	3	3	3	3	3	3	2	3	91.767%	95.83%	93.80%
44	3	3	3	3	3	2	3	3	91.767%	95.83%	93.80%
45	3	3	1	3	2	3	3	3	83.300%	87.50%	85.40%
46	3	3	3	2	3	3	3	3	91.767%	95.83%	93.80%
47	3	3	1	3	3	3	3	3	104.133%	91.67%	97.90%
48	3	3	3	2	3	3	3	3	91.767%	95.83%	93.80%
49	3	3	3	3	2	3	3	3	95.767%	95.83%	95.80%
50	3	3	3	3	3	2	3	3	99.967%	95.83%	97.90%
51	3	3	3	2	3	3	3	3	91.767%	95.83%	93.80%
52	3	2	3	3	3	3	3	3	91.767%	95.83%	93.80%
53	3	3	3	2	3	3	3	3	79.167%	95.83%	87.50%
54	3	3	3	3	3	2	3	3	87.567%	95.83%	91.70%
55	3	3	3	3	2	3	3	3	95.827%	95.83%	0.9583
56	3	3	3	1	3	3	3	3	99,933%	91.67%	95.80%
57	3	3	3	3	2	3	3	3	104,167%	95.83%	100%
58	3	3	3	2	3	3	3	3	91 767%	95.83%	93.80%
59	3	3	1	2	3	3	3	3	58 333%	91 67%	75.00%
60	3	3	1	3	3	3	3	3	66 733%	91.67%	79.20%
61	3	3	3	2	3	3	3	3	66 767%	95.83%	81 30%
62	3	3	3	2	1	3	3	3	95 933%	91 67%	93.80%
63	3	3	3	1	3	3	3	3	99 933%	91.67%	95.80%
64	3	3	3	3	2	3	3	3	91 767%	95.83%	93.80%
65	3	3	3	3	1	3	3	3	91 733%	91 67%	91 70%
66	3	3	3	2	3	3	3	3	70 767%	95.83%	83 30%
67 67	5	5	5	2	5	5	5	5	/0./0//0	55.0570	05.50%
68	3	3	3	1	3	3	3	3	83 333%	91 67%	87 50%
60	3	3	1	3	3	3	3	3	03.555% 01.673%	91.67%	0.9167
70	3	3	2	3	3	3	3	3	74 967%	95.83%	85 40%
70	2	3	2	2	2	2	3	3	74.307% 82.400%	100 00%	01 70%
71	3	3	3	1	3	3	3	3	00 0220/	01 67%	91.70%
72	2	2	5	1	2	2	2	2	99.955% 02.2220/	91.07%	93.60%
75	с С	с С	1	5	5	2	5	3	03.333 <i>%</i>	91.07%	87.50%
74	5	5	5	2	5	5	5	5	79.107%	95.65%	07.50%
75	3	3	1	3	3	3	3	3	95.933%	91.67%	93.80%
70 77	3	3	1	3	3	3	3	3	91./33%	91.07%	91.70%
<mark>//</mark> 70	2	2	1	2	2	2	2	2	05 0000	01 (70/	02.00%
/8 70	3	3	1	3	3	3	3	3	95.933%	91.67%	93.80%
/9	3	3	3	1	3	3	3	3	/0.933%	91.6/%	81.30%

80	3	3	3	1	3	3	3	3	79.133%	91.67%	85.40%
81	3	3	2	3	3	3	3	3	83.367%	95.83%	89.60%
82	3	3	1	3	3	3	3	3	95.933%	91.67%	93.80%
83	3	3	1	3	3	3	3	3	91.733%	91.67%	91.70%
84	3	1	3	3	3	3	3	3	91.673%	91.67%	0.9167
85	3	3	1	3	3	3	3	3	99.933%	91.67%	95.80%
86	3	3	3	1	3	3	3	3	79.133%	91.67%	85.40%

Checklist for Quantitative Studies

Number	Is there congruity between the stated philosophical perspective and the research methodology?	Is there congruity between the research methodology and the research question or objectives?	Is there congruity between the research methodology and the methods used to collect data?	Is there congruity between the research methodology and the representation and analysis of data?	Is there congruity between the research methodology and the interpretation of results?	Is there a statement locating the researcher culturally or theoretically?	Is the influence of the researcher on the research, and vice- versa, addressed?	Are participants, and their voices, adequately represented?	Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?	Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?	LX	ZZ	Total
4	3	3	1	3	3	2	3	3	3	3	90.00%	83.400%	86.70%
23	3	3	3	1	3	1	3	3	3	3	86.67%	99.933%	93.30%
67	3	3	1	3	1	3	3	3	3	3	86.67%	89.933%	88.30%
77	3	3	3	3	1	3	3	3	3	3	93.33%	73.267%	83.30%

Appendix 2 Searcher Result

METHODS SECTION

A systematic search was performed in the databases: PubMed, Embase.com, Clarivate Analytics/Web of Science Core Collection and Scopus. The timeframe within the databases was from inception to 18th April 2024 and conducted by GLB. The search included keywords and free text terms for (synonyms of) 'empathy' or 'social support' combined with (synonyms of) 'cancer' or 'neoplasm' combined with (synonyms of) 'cancer survivors'. A full overview of the search terms per database can be found in the supplementary information (see appendix B). No limitations on date or language were applied in the search.

PubMed (1,986)

Search	Query	Results
#4	Search: #1 AND #2 AND #3	1,986
#3	Search: Empath*[tiab] OR "Social support"[tiab] OR "Emotion expression"[tiab] OR "Emotional expression"[tiab] OR "Emotion sharing"[tiab] OR "Emotional sharing"[tiab] OR "Prosocial behavior"[tiab] OR "Prosocial behaviour"[tiab] OR "Social sharing"[tiab] OR Synchrony[tiab] OR Self- disclosure[tiab] OR Selfdisclosure[tiab] OR "Dyadic coping"[tiab] OR "Interpersonal emotion regulation"[tiab] OR "Interpersonal emotional regulation"[tiab] OR Co-regulation[tiab] OR Coregulation[tiab] OR Co- rumination[tiab] OR "Corumination"[tiab] OR Co-brooding[tiab] OR Cobrooding[tiab]	107,117
#2	Search: "Neoplasms"[Mesh] OR "cancer"[sb] OR cancer*[tiab] OR neoplas*[tiab] OR oncolog*[tiab] OR metasta*[tiab] OR malignan*[tiab] OR adenoma*[tiab] OR tumor*[tiab] OR tumour*[tiab] OR adenocarcinoma*[tiab] OR blastoma*[tiab] OR carcinogen*[tiab] OR carcinom*[tiab] OR carcinosarcoma*[tiab] OR chordoma*[tiab] OR germinoma*[tiab] OR gonadoblastoma*[tiab] OR hepatoblastoma*[tiab] OR hodgkin*[tiab] OR leukemi*[tiab] OR lymphangioma*[tiab] OR lymphangiomyoma*[tiab] OR lymphangiosarcoma*[tiab] OR lymphom*[tiab] OR melanom*[tiab] OR meningioma*[tiab] OR mesenchymoma*[tiab] OR mesonephroma*[tiab] OR neuroma*[tiab] OR nsclc[tiab] OR oncogen*[tiab] OR paraneoplastic*[tiab] OR plasmacytoma*[tiab] OR precancerous*[tiab] OR	5,488,417

Search	Query	Results
	nephroblastoma*[tiab] OR nefroblastoma*[tiab] OR retinoblastoma*[tiab] OR rhabdomyosarcoma*[tiab] OR osteosarcoma*[tiab] OR neuroblastoma*[tiab]	
#1	Search: "Cancer Survivors"[Mesh] OR Surviv*[tiab]	1,487,901

Embase(2034)

Search	Query	Results
#5	#4 AND ('article'/it OR 'article in press'/it OR 'review'/it)	2,034
#4	#1 AND #2 AND #3	3,309
#3	(Empath* OR 'Social support' OR 'Emotion expression' OR 'Emotional expression' OR 'Emotion sharing' OR 'Emotional sharing' OR 'Prosocial behavior' OR 'Prosocial behaviour' OR 'Social sharing' OR Synchrony OR Self- disclosure OR Selfdisclosure OR 'Dyadic coping' OR 'Interpersonal emotion regulation' OR 'Interpersonal emotional regulation' OR Co-regulation OR Coregulation OR Co-rumination OR 'Corumination' OR Co-brooding OR Cobrooding):ti,ab,kw	130,846
#2	'neoplasm'/exp OR (cancer* OR neoplas* OR oncolog* OR metasta* OR malignan* OR adenoma* OR tumor* OR tumour* OR adenocarcinoma* OR blastoma* OR carcinogen* OR carcinom* OR carcinosarcoma* OR chordoma* OR germinoma* OR gonadoblastoma* OR hepatoblastoma* OR hodgkin* OR leukemi* OR lymphangioma* OR lymphangiomyoma* OR lymphangiosarcoma* OR lymphom* OR melanom* OR meningioma* OR mesenchymoma* OR mesonephroma* OR neuroma* OR nsclc OR oncogen* OR paraneoplastic* OR plasmacytoma* OR precancerous* OR sarcoma* OR teratocarcinoma* OR teratoma* OR nephroblastoma* OR nefroblastoma* OR retinoblastoma* OR rhabdomyosarcoma* OR osteosarcoma* OR neuroblastoma*):ti,ab,kw	7,657,682
#1	'cancer survivor'/exp OR (Surviv*):ti,ab,kw	2,186000

Web of science (4050)

Search	Query	Results
#5	#1 AND #2 AND #3 and Article or Review Article or Early Access (Document Types)	4050
#4	#1 AND #2 AND #3	4183
#3	TS=(Empath* OR "Social support" OR "Emotion expression" OR "Emotional expression" OR "Emotion sharing" OR "Emotional sharing" OR "Prosocial behavior" OR "Prosocial behaviour" OR "Social sharing" OR Synchrony OR Self-disclosure OR Selfdisclosure OR "Dyadic coping" OR "Interpersonal emotion regulation" OR "Interpersonal emotional regulation" OR Co- regulation OR Coregulation OR Co-rumination OR "Corumination" OR Co- brooding OR Cobrooding)	204,173
#2	TS=(cancer* OR neoplas* OR oncolog* OR metasta* OR malignan* OR adenoma* OR tumor* OR tumour* OR adenocarcinoma* OR blastoma* OR carcinogen* OR carcinom* OR carcinosarcoma* OR chordoma* OR germinoma* OR gonadoblastoma* OR hepatoblastoma* OR hodgkin* OR leukemi* OR lymphangioma* OR lymphangiomyoma* OR lymphangiosarcoma* OR lymphom* OR melanom* OR meningioma* OR mesenchymoma* OR mesonephroma* OR neuroma* OR nsclc OR oncogen* OR paraneoplastic* OR plasmacytoma* OR precancerous* OR sarcoma* OR teratocarcinoma* OR teratoma* OR nephroblastoma* OR nefroblastoma* OR neuroblastoma* OR rhabdomyosarcoma* OR osteosarcoma* OR neuroblastoma*)	5,960,311
#1	TS=(Surviv*)	1,953,624

Scopus (4,533)

Search	Query	Results
#5	#1 AND #2 AND #3 and Article or Review Article or Early Access (Document Types)	4,533
#4	#1 AND #2 AND #3	4,955
#3	TITLE-ABS-KEY (Empath* OR "Social support" OR "Emotion expression" OR "Emotional expression" OR "Emotion sharing" OR "Emotional sharing" OR "Prosocial behavior" OR "Prosocial behaviour" OR "Social sharing" OR Synchrony OR Self-disclosure OR Selfdisclosure OR "Dyadic coping" OR "Interpersonal emotion regulation" OR "Interpersonal emotional regulation" OR Co-regulation OR Coregulation OR Co-rumination OR "Corumination" OR Co-brooding OR Cobrooding) TITLE-ABS-KEY (cancer* OR neoplas* OR oncolog* OR metasta* OR malignan*	311,054 7,174,487
	OR adenoma* OR tumor* OR tumour* OR adenocarcinoma* OR blastoma* OR carcinogen* OR carcinom* OR carcinosarcoma* OR chordoma* OR germinoma* OR gonadoblastoma* OR hepatoblastoma* OR hodgkin* OR leukemi* OR lymphangioma* OR lymphangiomyoma* OR lymphangiosarcoma* OR lymphom* OR melanom* OR meningioma* OR mesenchymoma* OR mesonephroma* OR neuroma* OR nsclc OR oncogen* OR paraneoplastic* OR plasmacytoma* OR precancerous* OR sarcoma* OR teratocarcinoma* OR teratoma* OR nephroblastoma* OR nefroblastoma* OR retinoblastoma* OR rhabdomyosarcoma* OR osteosarcoma* OR neuroblastoma*)	
#1	TITLE-ABS-KEY (Surviv*)	2,563,119

Appendix 3: Proposed Experiment and Hypotheses

Main Hypotheses

At the *phasic timescale*, we will examine the emergence of spontaneous synchronization in relationship partners' a) movements (Koole & Tschacher, 2016) and a) cardiovascular responding (Palumbo et al., 2017). Movement synchrony indexes fluency of interaction and bonding (Scheidt et al., 2021). Accordingly, we predict that relationship partners will display statistically significant levels of movement synchrony during the experiment, relative to a relevant baseline of randomized pseudo-interactions (Refs to Ramseer & Tschacher). Cardiovascular synchrony indexes mutual regulation of emotional arousal (Palumbo et al., 2017). More specifically, our cardiovascular assessment allows us to assess Pre-Ejection Period (PEP) as a marker of sympathetic nervous activity and Respiratory Sinus Arrhythmia (RSA) as a marker of parasympathetic nervous activity. Across both sympathetic and parasympathetic markers, we predict that relationship partners will display statistically significant levels of cardiovascular synchrony during the experiment, relative to a relevant baseline of randomized pseudo-interactions (Refs of Cardiovascular Synchrony during the experiment, a relative to a relevant baseline of sympathetic nervous activity. Across both sympathetic and parasympathetic markers, we predict that relationship partners will display statistically significant levels of cardiovascular synchrony during the experiment, relative to a relevant baseline of randomized pseudo-interactions (Ramseyer & Tschacher, 2010).

At the *tonic timescale*, we predict that emotional sharing will generally lead sharers to feel somewhat better, leading to positive mood changes, and to a somewhat better understanding of their negative experiences leading to sharing-induced changes in emotional appraisals. We further predict that the effects of emotional sharing will be moderated by instructed co-rumination (versus natural sharing. More specifically, we predict that instructed co-rumination will make the sharers feel better, leading them to report positive mood changes. At the same time, we predict that corumination will interfere with considering new perspectives on the emotion-eliciting situation. Thus, we predict that instructed co-rumination will lead to less sharing-induced changes in emotional appraisals. We further predict that instructed co-rumination will have systematic effects on interpersonal synchronization processes. First, we predict that engaging in emotional sharing will lead to increases in movement synchrony and cardiovascular synchrony (across both sympathetic and parasympathetic markers). Second, we predict that these increases will be bolstered by co-

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rumination. Thus, sharing-induced increases in movement synchrony and cardiovascular synchrony are expected to be greater when participants are instructed to engage in co-rumination versus natural sharing.

At the *chronic timescale*, our general expectation is that chronic individual dispositions and relationship patterns will display meaningful associations with phasic and tonic processes during the emotional sharing task. We predict that superior and positive dyadic coping strategies, coupled with higher relationship quality between partners, will give rise to increased levels of movement and cardiovascular synchrony (across both sympathetic and parasympathetic markers).

Exploratory Analyses

Because of the innovative nature of the planned study, there are many new things that we hope to learn from it in a more exploratory manner, without have a strong rationale from the existing literature in interpersonal emotion regulation. In what follows, we outline our main plans for these exploratory analyses. It's expected that these plans may undergo revisions as we gain further insights into the project.

1) Linguistic Synchrony: We intend to conduct a detailed analysis of the content of participants' conversations. Coding will include an examination of the frequency and nature of specific words used during emotional sharing, with a focus on identifying patterns associated with co-rumination and chronic variables. Of particular interest are the use of insight words and linguistic synchrony.

Prior work on written emotional disclosure has found that changes in words suggestive of causal and insightful thinking were linked to positive health change (Pennebaker & Francis, 1996). Causal thinking involves considering the cause-and-effect relationships between events or emotions and insightful thinking also involves gaining a deeper, more perceptive understanding of one's emotions or experiences. Therefore, individuals who demonstrated shifts in their language towards more causal and insightful thinking during the process of emotional disclosure experienced positive changes in their health. we predict that a greater use of vocabulary implying causal relationships or

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insight during the emotional sharing process will be associated with more significant changes in emotion and appraisal, with a stronger correlation in co-rumination situations.

Prior research has found evidence for spontaneous matching of words in face-to-face interaction, a phenomenon known as linguistic synchrony (Doré & Morris, 2018; Ireland & Pennebaker, 2010; Ireland et al., 2011; Tay & Qiu, 2022). linguistic synchrony refers to the coordination and alignment of language, particularly verbal communication, between individuals engaged in an emotional sharing task within close relationships. As evidenced in the field of psychotherapy, we predict that higher levels of linguistic coordination and alignment are associated with greater emotional changes, potentially influencing chronic processes (personal dispositions and relationship patterns).

2) Vocal synchrony: Vocal expressions can convey emotional arousal and intensity during interpersonal interactions (Reich et al., 2014; Schoenherr et al., 2021). We will code vocalizations for signs of arousal, pitch variations, and other acoustic features that may be indicative of emotional states. Exploring the relationship between vocal arousal and other measures (e.g., movement synchrony, cardiovascular synchrony) will contribute to a more comprehensive understanding of emotional expression and regulation within close relationships.

3) Facial Synchrony: Research indicates that the social context of sharing emotions between individuals exhibits features of neural, autonomic, and facial synchrony (Altmann et al., 2021; Butler, 2015; Golland et al., 2015). It is well-established that people mimic the facial expressions of others, a behavior that can facilitate the understanding of others' feelings and emotional contagion (Hess & Fischer, 2014; Prochazkova & Kret, 2017). A recent study showed that co-present individuals often become synchronized in facial dynamics, and this facial synchrony is associated with emotional similarity (Golland et al., 2019).

We will employ facial expression coding to analyze emotional expressions displayed by participants during the emotional sharing task. This analysis will help identify the emotional

dynamics at play during the task, and we will explore whether facial expressions align with other

measures of emotional sharing, such as movement synchrony and cardiovascular synchrony.

Appendix 4: Measurement for Protocol

Questionnaires Measures

Tonic Timescale

The questionnaires for the tonic timescale will assess several aspects of participants' experience before, during, and after the emotional sharing task.

The Mood Adjective Checklist (BEF)

The BEF is an extended version of the Positive and Negative Affect Schedule (PANAS; see Watson, Clark, & Tellegen, 1988). The items are assessed using 4-point Likert scales, ranging from 0 (not at all) to 3 (completely). The inventory consists of seven subscales: 1) Pleasantness, 2) Activation, 3) Relaxation, 4) Helplessness, 5) Distress, 6) Listlessness, and 7) Anger. We will combine the pleasantness, activation, relaxation scales into a measure of positive affect, and we will combine the helplessness, distress, listlessness, and anger scales into a measure of negative affect.

Experience Questionnaire (EQ)

The ES assesses participants' emotional appraisal of the negative experiences that constitute the focal topics of the emotional sharing task. The EQ has two parts: The first part inquiries about the emotions evoked by the experiences, such as sadness, shame, guilt etc. The second part involves a modified version of the general appraisal questionnaire (GAQ, Scherer, 2001), primarily assessing three key domains: 1) Intensity and duration of negative emotions (e.g., How intense were the negative emotions that you had during this experience? Four items); 2) To what extent do you think that one or more of the following factors led you to have the experience? (e.g., The behavior of one or more other person, to what extent did they cause it intentionally? Three items); 3) With regard to the actual or potential consequences of the event, (To what extent have these already been felt by you? Nine items).

Inclusion of Other in the Self Scale (IOSS)

The inclusion of other in the self scale (Aron et al., 1992) will be used to assess how close the respondent feels with another person. The individual items of the IOS scale consist of seven images,
each depicting two overlapping circles. These images, progressing from the first to the seventh, represent a gradual increase in the degree of overlap between the two circles. Respondents intuitively perceive the degree of overlap as an indicator of the closeness of the relationship between the themes depicted within the circles, such as the relationship between the respondent and the "other" identified within the circles; a higher degree of overlap signifies a closer relationship. Participants are instructed to identify which of the seven images best represented their relationship with the "other".

Sharer/Listener' Own Experience (SOE)

After each sharing episode, the experiences of both the sharer and the listener in emotionsharing conversation will be individually assessed. The wording of the six items, ranging from 1 (total disagreement) to 7 (total agreement), is such that they form parallel questions for the sharer and the listener. For instance, the sharer will be asked to rate the item, " I felt completely like myself during the conversation", whereas the listener will be asked to rate the item, " My partner felt completely like himself during the conversation.".

Perceived Partner Responsiveness (PPR)

Each participant's perception of their partner's responsiveness will be assessed using three items adapted from Reis (2012), rated on a scale from 1 (total disagreement) to 7 (total agreement). These items include statements like 'My partner understood me,' 'My partner cared for me,' and 'My partner appreciated who I really am.' Similarly, the listener's perception of their partner's responsiveness will be measured using three items, also rated on a scale from 1 to 7, including statements such as 'I understood my partner,' 'I cared for my partner,' and 'I appreciated who my partner really is.' Total scores are computed by summing the ratings for each item, with higher scores indicating a stronger perception of partner responsiveness.

Interpersonal emotion regulation with different strategies from partner (IER-DSFP)

Following each sharing episode, both the sharer and the listener will evaluate various interpersonal emotion regulation strategies (such as co-rumination, distraction, acceptance, ignoring)

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using a set of seven parallel items. Each item will be rated on a scale from 1 (strongly disagree) to 7 (strongly agree), allowing for comparative assessments between the sharer and the listener. For example, the sharer will rate the item, "My partner tried to get me to talk over and over about what is bothering me," while the listener will rate the item, "I tried to get my partner to talk over and over about what is bothering them."

Sharing Quality (RQ)

Four items will be used to measure different aspects of the perceived quality of emotional sharing. Specifically, the items will assess: 1) Agreement: 'My partner and I agreed on how I could best approach the problem.', from 1 (total disagreement) to 7 (total agreement); 2) Support: 'How much did you feel supported by your partner?', from 1 (Not at all) to 7 (Very Much); 3) Self-disclosure: 'I could openly share and disclose all my thoughts and feelings with my partner', from 1 (total disagreement) to 7 (total agreement) to 7 (total agreement); 4) Closeness: 'How close you felt to your partner at this moment?', from 1 (not close at all) to 7 (very close).

Chronic Timescale

The questionnaires for the chronic timescale will assess participants' personality dispositions and various psychological dimensions of their close relationship.

Toronto Alexithymia-20 Scale (TAS-20)

The TAS-20 is the most widely used self-report measurement of alexithymia. It generally has good psychometric properties and validity (Bagby et al., 2020). The TAS-20 consists of 20 items rated on a 5-point scale from strongly disagree to strongly agree. It has three subscales: Difficulties in identifying feelings (DIF), e.g., "I am often confused about what emotion I am feeling"; Difficulties in describing feelings (DDF), e.g., "It is difficult for me to find the right words for my feelings"; and Externally oriented thinking (EOT), e.g., "I prefer to just let things happen rather than to understand why they turned out that way". Both the complete scale and the subscales will be used in the analyses. We will use the Dutch version of the questionnaire (Kooiman, Spinhoven, & Trijsburg, 2002).

Partnership Questionnaire—Short Form (PQ-SF)

The nine-item partnership questionnaire—short form (Kliem et al., 2012) is a reliable tool used to measure the quality of romantic relationships through three subscales: quarreling, tenderness, and togetherness/communication. Each of the three items in each subscale is rated on a four-point Likert scale (0 = never/very seldom to 3 = very often). The scores from each subscale can be combined to generate a total score ranging from 0 to 27, where higher scores indicate higher satisfaction.

Partner-Specific Attachment Security Short Form (PSAS-SF)

The partner-specific attachment security short form consists of 12 items (e.g., "It helps to turn to my partner in times of need") and primarily focused on adult attachment styles in the context of intimate relationships. All items are rated on a 7-point scale, ranging from 1 (strongly disagree) to 7 (strongly agree). The ECR-S contains two subscales assessing avoidant attachment and attachment anxiety (Wei et al., 2007).

Dyadic Coping Inventory (DCI)

The 41-item dyadic coping inventory measures the behaviors of one or both partners when they experience stress. The DCI has four subscales: 1) self-coping behavior (16 items, e.g., "I tell my partner that it is not that bad and help him/her to see the situation in a different light."), 2) partner's coping behavior (16 items, e.g., " My partner takes on things that I normally do in order to help me out."), 3) common dyadic coping behavior (7 items, e.g., " We try to cope with the problem together and search for practical solutions"), and 4) overall satisfaction with dyadic coping (2 items, e.g., " I am satisfied with the support I receive from my partner and the way we deal with stress together."). All items use 4-point Likert scale (0 = never; 4 = very often). Bodenmann, 2008; Austin & Falconier, 2013).

The Others and Self-Emotion Regulation Scale (OSRS)

The 20-item others and self-emotion regulation scale will be utilized to assess participants' perception of emotion regulation (Niven et al., 2011). Participants are asked to assess how they

handle the emotions of others (10 items, e.g., "I gave someone helpful advice to try to improve how my felt") and their own emotions (10 items, e.g., "I looked for problems in my current situation to make myself feel worse"). All items are rated on a 5-point scale, ranging from 0 (not at all) to 5 (great deal).

Support Support List (SSL)

The 12-item Social Support List (SSL-12) will be used to assess the level of perceived social support received, with response options ranging from 1 (seldom or never) to 4 (very often) The SSL-12 consists of three subscales: daily support, esteem support and support in problem situations. Higher scores indicate a higher perceived level of support (Kempen & Van Eijk 1995).

Loneliness Scale (UCLA-LS)

The 20-items University of California, Los Angeles (UCLA) loneliness scale (Russell, 1996) will be used to measure participants' subjective loneliness. The scale comprises 20 items, with 10 items worded positively and 10 items worded negatively, for instance, 'I lack companionship' or 'There are people I can talk to'. These items reflect satisfaction and dissatisfaction with social relationships. Participants are required to rate the frequency of several experiences on a 5-point scale, ranging from 1 (total disagreement) to 5 (total agreement).

Interpersonal Reactivity Index (IRI)

The 28-item interpersonal reactivity index (Davis et al., 1983) will be employed to measure various dimensions of empathy. The IRI ranges from 1 (does not describe me well) to 5 (describes me very well), designed to assess cognitive and emotional dimensions of empathy. This scale comprises four subscales, each containing 7 items, with each subscale pertaining to a specific aspect of the overall concept of empathy. The cognitive dimensions are assessed using the perspective taking (PT, e.g., "I sometimes find it difficult to see things from the other person's perspective.") and fantasy subscales (FS, e.g., "I regularly daydream and fantasize about things that could happen to me."), while the emotional dimensions are measured through the empathic concern (EC, e.g., "I am often

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very moved by things I see happen.") and personal distress (PD, e.g., "I tend to lose control in emergency situations.") subscales. Total scores for each subscale can range from 0 to 28. *Distress Disclosure Index (DDI)*

The study will utilize the 12-item distress disclosure index (Kahn & Hessling, 2001) to assess participants' propensity to share personal distressing information. The DDI comprises items evaluating disclosure behaviors (e.g., " When I feel upset, I usually confide in my friends") and concealment behaviors (e.g., "I prefer not to talk about my problems"). Participants will rate their agreement level for each item on a scale ranging from 1 (strongly disagree) to 5 (strongly agree). Given that disclosure and concealment may occur simultaneously, reverse scoring will be applied to six concealment items, and scores will be aggregated, with higher scores indicating a greater inclination toward disclosure (Kahn & Hessling, 2001).

Bem Sex Role Inventory (BSRI)

The 20-item Bem sex role inventory (BSRI) is employed to assess individuals' identification with stereotypical masculine traits (BSRI-m, such as "assertive," "forceful," and "aggressive") and stereotypical feminine traits (BSRI-f, such as "gentle," "sympathetic," and "loves children"). Participants are required to provide answers on a 7-point scale, ranging from "almost never or never true" to "almost always true."

Sociodemographic Variables

The following sociodemographic variables will be collected: age, sex assigned at birth (female/male), gender identity (female/male), residential environment (very urban, moderately urban, and little to non-urban) and educational level (primary education, lower /preparatory vocational education, general secondary education, secondary vocational education, higher general secondary education, preparatory scientific education, higher professional education, academic education, and other).

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About the Author

Zihao Zeng was born on September 12, 1996, in Hunan, China. He completed his bachelor's degree in psychology at Hunan Agricultural University in 2018 and his Master's degree in Health Psychology at Hunan Normal University in 2021, graduating with honors. In the same year, he began his doctoral research at Hunan Normal University and in 2022, he pursued a Ph.D. at Vrije Universiteit Amsterdam in the Netherlands, supported by a Chinese Scholarship Council (202206720004) scholarship.

His primary research area involves the role of interpersonal emotion regulation in individual development and adolescent mental health. His research methods include experimental studies and surveys, supplemented by emerging technologies such as electrocardiography (ECG) and genetic analysis. Zihao also engages in related clinical counseling and group guidance work, aspiring to combine research with psychological counseling and practice in the future. Zihao is passionate about sports, including cycling, basketball, and fitness, and he approaches most things in life with enthusiasm.

List of publications

- Zihao Zeng*, Karen Holtmaat, Xihan Jia, George L. Burchell, and Irma M. Verdonck-de Leeuw, Sander
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