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Maternal eating disorders and the family system – Transgenerational transmission, dyadic development and mother-child communication

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AN	Anorexia nervosa
BED	Binge eating disorder
BMI	Body mass index
BN	Bulimia nervosa
DSM-5	Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition
ED	Eating disorder
EDE-I	Eating disorder examination interview
EDE-Q	Eating disorder examination questionnaire
EDNOS	Eating disorder not otherwise specified
fMEG	Fetal magnetoencephalography
HC	Healthy control
ICD-11	International Classification of Diseases, 11th Revision
ML	Machine Learning
MoBa	Norwegian Mother and Child Cohort Study
OSFED	Other specified feeding and eating disorder
PRISMA	Preferred reporting items for systematic reviews and meta-analyses

1. Theoretical background

The family typically constitutes the initial social environment in which individuals develop relationships, and within this context, personal character traits and corresponding behavioral patterns are acquired and reinforced. The family systems theory considers the family as a unit where individual problem behavior is connected to the total family interaction (Johnson & Ray, 2016). This might be problematic in families affected by mental disorders, such as eating disorders (EDs). EDs are serious mental disorders that impose significant burden on both, the affected individual and their families (Zipfel et al., 2015). Families with an ED patient report about negative affection of the whole family by the illness (Gustafsson et al., 2021) and impaired family functioning compared to control families (Holtom-Viesel & Allan, 2014). Maternal EDs are further associated with adverse health outcomes in their children (Martini et al., 2020) and increase the risk for the development of an ED in the next generation (Bould et al., 2015; Ziobrowski et al., 2019). Despite growing interest, the mechanisms underlying the transgenerational transmission of EDs remain largely unknown. Communication has been proposed as one potential interaction mechanism through which EDs are transmitted across generations (Arroyo et al., 2017), however, research in this area remains limited. Likewise, studies investigating the emergence of EDs and their relational impact within the couple context are still scarce. Qualitative studies involving partners of individuals with EDs consistently reveal overwhelming emotions and significant psychosocial distress (Batchelor et al., 2022; Linville et al., 2016; O'Connor et al., 2019; Schmit & Bell, 2015). These challenges might be exacerbated during the transition to parenthood, a time associated with various changes and difficulties.

The present dissertation aims to advance the understanding of the impact of maternal EDs on the family system by examining communication as a potential mechanism of transgenerational transmission of EDs. Moreover, this thesis seeks to illuminate mental health and lived experiences of male partners of women with EDs during the transition to parenthood. Thereby this work contributes to an area of research that has historically marginalized men within both ED research and parenthood literature.

1.1. Eating disorders

EDs are serious mental disorders that significantly compromise both physical health and psychosocial functioning (American Psychiatric Association, 2015). They are characterized by disturbed eating or abnormal weight-control behaviors (Treasure et al., 2020). EDs are strongly familial, with relatives of ED patients having an increased risk of developing an ED themselves (Bould et al., 2015; Mazzeo & Bulik, 2009). The etiology of EDs is complex, with social, psychological, and biological factors interacting and contributing to the development of the disorder (Habermas, 2024; Treasure et al., 2020). Individuals with EDs frequently present with co-occurring psychiatric comorbidities (Treasure et al., 2020). EDs are one of the most common chronic mental disorders, with an onset predominantly in adolescence and early adulthood (Solmi et al., 2022). Three common disorders that typically develop during adolescence or adulthood are anorexia nervosa (AN), bulimia nervosa (BN), and binge-eating disorder (BED) (American Psychiatric Association, 2015).

1.1.1. Anorexia nervosa

AN is marked by a persistent limitation of energy intake, causing severe underweight and malnutrition that frequently progresses to a cachectic condition in affected individuals. This is accompanied by a pronounced fear of gaining weight or becoming overweight, or persistent behaviors that actively impede weight gain (de Zwaan, 2025; Jacobi & Beintner, 2021; Teufel et al., 2024). Based on the behavioral patterns used for reaching and maintaining the low body weight, namely restricting food intake or binging and purging behavior, AN is further classified into the restrictive type and the binge-eating/purging type (Teufel et al., 2024). Persons affected suffer from a perceptual disturbance related to their body image with an undue influence of body shape and weight on self-evaluation (Teufel et al., 2024). The inadequate providence of energy entails detrimental effects on physical as well as on the psychosocial level (Zipfel et al., 2015). Disturbed cognitive and emotional functioning as well as serious medical complications and psychiatric comorbidity are associated with this disorder (Zipfel et al., 2015). Individuals with AN often exhibit a diminished capacity to recognize the severity of their condition which contributes to a profound ambivalence toward treatment (Deutsche Gesellschaft für Psychosomatische Medizin und Ärztliche Psychotherapie et al., 2020).

AN also has the highest long-term mortality rate among all psychiatric disorders (American Psychiatric Association, 2015).

1.1.2. Bulimia nervosa

The primary characteristic of BN is the occurrence of recurrent binge-eating episodes, during which individuals consume large quantities of food accompanied by a loss of control over their eating behavior (Treasure et al., 2020). These binge-eating episodes are subsequently followed by compensatory behaviors, such as purging or excessive exercise, with self-induced vomiting being the most frequently employed behavior (Wade, 2019). Similarly to AN, persons with BN over evaluate the importance of weight and/or shape. The diagnosis can be made after a once-weekly occurrence of binge eating episodes and compensatory behaviors (Gradl-Dietsch et al., 2024). Contrary to AN, BN normally occurs at normal or elevated weight (Wade, 2019).

1.1.3. Binge eating disorder

Similarly to BN, BED is characterized by recurrent episodes of binge eating occurring at least once per week over a period of three months, during which large quantities of food are consumed, accompanied by a loss of control over eating (American Psychiatric Association, 2015). In addition, to meet the diagnostic criteria for BED, at least three out of five additional characteristics must be present. Those include eating significantly more rapidly than usual, eating until uncomfortably full, consuming large quantities of food without physical hunger, eating alone due to embarrassment about the amount consumed, and experiences feelings of self-disgust, depression, or intense guilt afterward (American Psychiatric Association, 2015). Individuals affected by BED experience considerable suffering related to the binge eating (American Psychiatric Association, 2015). Contrary to BN, these episodes are not followed by regular compensatory behaviors aimed at preventing weight gain (Hilbert, 2019). Hence, BED is frequently associated with, or can result in obesity and related metabolic conditions (Treasure et al., 2020).

1.1.4. Other specified feeding and eating disorder

OSFED are “atypical” forms of the aforementioned EDs and lead to clinically significant distress or functional impairment in social domains, despite not meeting the full diagnostic criteria for typical EDs (Galmiche et al., 2019). The term OSFED encompasses

a heterogeneous group of disorders, including atypical AN, subthreshold BN and BED, purging disorder and night eating syndrome (Mitchison et al., 2020).

1.2. Prevalence of eating disorders in the general population

Prevalence rates of EDs vary widely across studies, depending on the diagnostic criteria they are based on or the used assessment methods (Jacobi & Beintner, 2021). A systematic review examining the prevalence of DSM-5 EDs among individuals aged 30 years and younger, conducted between 2013 to 2022, reported combined lifetime prevalence rates ranging from 5.5% to 17.9% for women and 0.6% to 2.4% for men (Silén & Keski-Rahkonen, 2022). Specifically, the lifetime prevalence of AN among women ranged from 0.8% to 6.3%, with point prevalence estimates between 0.0% to 3.2%. For BN, lifetime prevalence ranged from 0.8% to 2.6%, and point prevalence from 0.0% to 8.7% among young adult females. The lifetime prevalence of BED in young women ranged from 0.6% to 6.1%, with current prevalence estimated between 0.6% to 4.1%. OSFED lifetime prevalence ranged from 0.6% to 11.5% among females, and point prevalence of 0.3% to 14.5%. Men appeared to be less frequently affected by ED, demonstrating lower lifetime prevalence rates across diagnosis: AN: 0.1%-0.3%, BN: 0.1%-0.2%, BED: 0.3%-0.7% and OSFED: 0.2 to 0.3%. Similarly, point prevalence rates in men were lower: AN: 0.0%-1.6%, BN: 0.0%-1.8%, BED: 0.2-1.2% and OSFED: 0.0 to 8.5% (Silén & Keski-Rahkonen, 2022). It is worth noting though that these prevalences are primarily derived from studies conducted prior to the COVID-19 pandemic; therefore, the current prevalence of ED may be underestimated (Silén & Keski-Rahkonen, 2022).

1.3. Eating disorders during pregnancy and postpartum

Given that EDs typically manifest during adolescence or early adulthood (Solmi et al., 2022), they frequently impact women during their reproductive years. EDs during pregnancy are more prevalent than often assumed, but frequently go undetected (Bye et al., 2020; Easter et al., 2013). Women affected attempt to conceal their symptoms from partners and healthcare providers in order to avoid stigmatization and negative reactions (Bye et al., 2020; Easter et al., 2013). A lack of awareness or training among healthcare professionals to recognize EDs, combined with affected women's fear of stigmatization and desire to handle their disorder independently, have been identified as factors to the

concealment of the illness (Bye et al., 2020). In addition to these barriers, pregnancy itself may further hinder the detection of EDs. For instance, self-induced vomiting can be misattributed to common pregnancy-related symptoms, while BED may be obscured by the socially accepted or even desired weight gain during pregnancy (Easter et al., 2013). Furthermore, adequate screening instruments for the antenatal period are missing, thereby complicating accurate identification (Dörsam et al., 2022). In a recent meta-analysis, aiming to systematically analyze the occurrence of prevalence of EDs in pregnant women worldwide, prevalence was 4.3%, although a high degree of variability was noted between studies (Çiçekoğlu Öztürk & Taştekin Ouyaba, 2024). Relative to pre-pregnancy levels, a statistically significant increase in the prevalence of AN and BED during pregnancy was reported, while the prevalence of BN declined (Çiçekoğlu Öztürk & Taştekin Ouyaba, 2024). Findings from the Norwegian Mother and Child Cohort Study (MoBa) indicate a general trend toward remission during pregnancy for BN and eating disorders not otherwise specified (EDNOS), whereas BED exhibited moderate remission rates alongside a notable incidence of new-onset cases (Bulik et al., 2007). Especially the first 20 weeks of pregnancy appear to be a high-risk period for ED relapse (Sollid et al., 2021). During pregnancy, women with EDs often experience an inner conflict between the desire to meet the needs of their unborn child and the persistence of ED behaviors (Fogarty et al., 2018). Conversely, for some women, pregnancy represents a valuable opportunity to develop a renewed appreciation and acceptance of their body (Fogarty et al., 2018). EDs in pregnancy are associated with adverse short- and long-term outcomes for both, mother and child (Arnold et al., 2019; Sebastiani et al., 2020), and they further exacerbate the psychological and practical challenges typically experienced during the transition to parenthood (Sadeh-Sharvit et al., 2020). The postpartum period poses a high risk for the recurrence of disordered eating behaviors for women with ED history, even if symptoms improved during pregnancy (Astrachan-Fletcher et al., 2008; Fogarty et al., 2018). While women with EDs might accept the physical changes that occur during pregnancy as necessary for the unborn child's development, these changes could provoke negative feelings during the postpartum period (Fogarty et al., 2018). Moreover, profound alterations in hormonal and emotional status during the postpartum period (Brunton & Russell, 2008) constitute significant risk factors for the recurrence or exacerbation of mental health disorders, including EDs.

1.4. Eating disorders and the family system

The impact of an ED extends beyond the individual affected. Families with an ED patient report negative effects on the entire family (Gustafsson et al., 2021) and experience impaired family functioning compared to control families (Holtom-Viesel & Allan, 2014). Further, adverse effects of maternal EDs on child outcomes including feeding and eating difficulties have been described (Martini et al., 2020).

1.4.1. Partnership and eating disorders

The social support system of individuals with EDs has a major impact on the course of the illness and the outcome (Hannah et al., 2022; Linville et al., 2016). To date, most research has focused on parents or siblings as primary caregivers in ED research (Anastasiadou et al., 2014; Pehlivan et al., 2024), while research regarding dyadic influences in romantic relationships within the context of ED history remains scarce. Nevertheless, many individuals with EDs maintain intimate relationships at rates comparable to those observed in healthy populations (Maxwell et al., 2011), and romantic partners often serve as one of the most important sources of social support for individuals with EDs (Marcos & Cantero, 2009). Being in a committed romantic relationship with a supportive partner can play an important role in the recovery process (Bussolotti et al., 2002; Linville et al., 2016), but having a partnership has also been associated with more severe ED symptomatology and greater psychopathology among individuals with AN and BN (Bussolotti et al., 2002). Simultaneously, EDs can negatively affect various aspects of the partnership, such as communication, sexual functioning, and challenges with relational boundaries (Dick et al., 2013). For instance, Whisman et al. (2012) found lower levels of marital satisfaction and higher levels of negative interaction in women with BED compared to women with other or no current disorder. Conversely, providing primary care and support to an individual affected by an ED can be challenging and may have negative consequences for the nonaffected partner (Huke & Slade, 2006; Linville et al., 2016). Being regularly confronted with ED-specific behaviors, such as food refusal and purging, and the need to cope with relapse and the chronic nature of the disorder (Bulik et al., 2012), might in turn lead to mental health difficulties in the partners. Partners often experience considerable distress related to their loved one's condition, feel confused about the disorder and tend to assume responsible for monitoring their partner's eating

behavior (Linville et al., 2016; Schmit & Bell, 2015). Feelings of helplessness, worthlessness, and self-blame were also reported (Batchelor et al., 2022). Partners of individuals with BN reported feeling powerless regarding their partner's ED and struggled to accept secrecy and deception in the context of their relationship (Huke & Slade, 2006). However, they also expressed a wish to support their partner and found ways of accepting and living with the disorder (Huke & Slade, 2006). Some partners even described that the ED brought them closer together and strengthened their relationship (Linville et al., 2016). Despite the importance of support and information for partners being highlighted in various studies (Batchelor et al., 2022; Huke & Slade, 2006; O'Connor et al., 2019; Tesselaar et al., 2023), options for providing support and educational recourses to partners remain limited (O'Connor et al., 2019).

1.4.2. Parenthood in couples with eating disorders

The transition to parenthood is a special time in the life of couples. This period represents a profound experience accompanied by considerable stress potential, which can exert reciprocal effects within the couple dyad (Seefeld et al., 2022). Exposure to chronic dyadic stress may increase the risk of developing mental health disorders and adversely impact the relationship (Seefeld et al., 2022). Conversely, the resources of each partner can be shared and extended to the other, fostering positive outcomes for the partnership (Seefeld et al., 2022). Transition to parenthood is also associated with changes in parental eating behavior, due to individual (e.g. health consciousness), interpersonal (e.g. social influence) and environmental factors (e.g. home food availability) (Versele et al., 2021). Together with reported declines in relationship functioning after childbirth (Doss & Rhoades, 2017), these factors may increase the risk of mental health difficulties. These challenges related to parenthood may concern all parents, however, may be intensified in the presence of a parental ED history (Sadeh-Sharvit et al., 2020). A considerable proportion of women affected by EDs become pregnant (Çiçekoğlu Öztürk & Taştekin Ouyaba, 2024) despite the association of these disorders with fertility impairments (Freizinger et al., 2010; Hecht et al., 2022), which give rise to distinct challenges in the parenting role. Previous studies suggest that parents with EDs experience higher levels of parenting stress (Chapman et al., 2021), and face challenges to their self-identify postpartum (Patel et al., 2005). Additionally, maternal EDs are associated with negative experiences and emotional problems during breastfeeding (Kaß et al., 2021), difficult

interactive patterns during feeding (Squires et al., 2014) and an impaired adjustment to motherhood (Koubaa et al., 2008). Mothers with EDs have also been found to exhibit higher levels of depression and anxiety during pregnancy and the postpartum period, compared to mothers without EDs (Kimmel et al., 2016). Therefore, the transition to parenthood can be challenging for parents in general and especially for those with EDs, potentially leading to adverse short- and long-term effects on their offspring.

1.4.3. Children of mothers with eating disorders

Recent large population-based cohort studies have indicated associations between maternal EDs and adverse pregnancy and neonatal outcomes (Eik-Nes et al., 2018; Mantel et al., 2020; Watson et al., 2017). Maternal ED was associated with preterm birth, abnormal birth weight and length, and an increased risk of delivering neonates with microcephaly (Mantel et al., 2020; Watson et al., 2017). The impact of maternal EDs on the offspring expands beyond the peripartal period and may have long-term implications on child outcomes. Children of mothers with EDs have been reported to exhibit psychosocial and socioemotional difficulties, present with difficult temperament and impairments in cognitive development (Martini et al., 2020). Moreover, they have been reported to have a higher risk to develop an ED themselves (Bould et al., 2015; Ziobrowski et al., 2019). Data from a Swedish cohort study examining 158 697 children found evidence that EDs in parents are associated with EDs in their children (Bould et al., 2015). Data form the Growing Up Today Study showed that girls of mothers with ED history had nearly twice the odds of meeting criteria for an ED themselves (Ziobrowski et al., 2019). Despite this evidence, questions regarding the mechanisms underlying the transmission of EDs from parent to child remain unanswered.

1.4.4. Transgenerational transmission of eating disorders

The transmission of mental health disorders across generations is among the leading causes of psychiatric morbidity (Hosman et al., 2009) and is proposed to be a multifaceted process, involving genetic and non-genetic factors (Branje et al., 2020). The concept of gene-environment correlation posits that in families with a genetic predisposition for developing specific traits or behavior, the environment also contributes to increasing the likelihood that the underlying risk genotype will be expressed (Branje et al., 2020). Hosman et al. (2009) developed a theoretical model of the transgenerational transmission

of psychopathology and proposed a variety of mechanisms through which transgenerational risk is transmitted. These mechanisms include, in addition to genetic, prenatal, and external social influences, also family processes and conditions, as well as parent-child interaction (Hosman et al., 2009). The social learning theory suggests that transmission might result from modelling processes, whereby children adopt new behavior patterns either through direct experience or by observing and imitating their parent's behavior (Bandura & Walters, 1977). In the context of EDs, impaired parent-child interactions may serve as specific risk factors contributing to the equifinality observed in the transgenerational transmission of these disorders.

Parent-child interaction in families with eating disorders

A growing body of research suggests that parental EDs may negatively affect the quality of various dimensions of parent-child interactions. Mothers with a lifetime history of EDs have been found to exhibit lower levels of sensitivity and structuring, while simultaneously displaying more controlling and hostile (Sadeh-Sharvit et al., 2016) as well as intrusive behaviors (Sadeh-Sharvit et al., 2016; Stein et al., 1994) during interactions with their children in comparison to healthy controls. Since eating is a core aspect of EDs (Treasure et al., 2012), mealtimes may represent particularly significant contexts in which maladaptive parent-child interactions contribute to the transmission of these disorders. Former studies indicate that mealtime interactions in families with EDs are characterized by increased feeding difficulties and heightened levels of conflict, in comparison to families without EDs (Chapman et al., 2021). Furthermore, parents with BED exhibited a greater number of maladaptive relational exchanges with their offspring during feeding (Cimino et al., 2016). These interactional difficulties may be further reflected in the parental communication style.

Parental communication as potential mechanism for the transgenerational transmission

Various studies have indicated an association between parental EDs and disparities in parent-child communication. Women with an ED during the postnatal year demonstrated a higher frequency of controlling statements (Stein et al., 1994) and displayed a greater extent of strong verbal control statements (Stein et al., 2001) during play interactions with their children. Moreover, maternal AN has been linked to distinct and emotionally unmatched-flat dialogues, as well as lower levels of sensitive guidance during

conversation concerning emotional events in the communication between mothers and their children aged 8- to 9-year (Cimino et al., 2020). Furthermore, mothers with an ED during the postnatal year expressed more negative emotions toward their children (Stein et al., 1994) and made significantly fewer positive comments about food and eating than control mothers (Waugh & Bulik, 1999) during mealtimes. A recent systematic review linked the development of children's eating behavior to parental food communication, suggesting that parental encouragement of dieting and the dissemination of moralizing messages may exacerbate the risk of disordered eating in the offspring (Norton et al., 2022). Collectively, these findings indicate that disrupted patterns of parental communication constitute a potential mechanism underlying the transgenerational transmission of EDs. This notion is further substantiated by the theoretical model of Arroyo et al. (2017), which identified family communication in general as a mechanism mediating the elevated risk of children of women with disordered eating to develop similar psychopathology. Direct and indirect maternal communication was found to have significant effects on mother-daughter dyads through mother's modeling of weight-related behavior and mother's comments about weight and size were associated with disordered eating in the daughters (Arroyo et al., 2017). Additionally, higher recall of restrictive or critical messages from caregivers about their eating behavior has been associated with their own problematic eating behavior in adult women (Oliveira et al., 2019), and maternal encouragement to lose weight was linked to daughters' restrained eating (Francis & Birch, 2005). Not only does maternal communication appear to play a role, but paternal communication also seems to exert an influence on the development of EDs in children (Dahill et al., 2023; Treasure, 2018). A longitudinal study with adolescents found that negative paternal comments regarding eating behaviors were associated with an increase in ED cognitions in the youths (Dahill et al., 2023). Nevertheless, a recent observational study involving mothers and their ten-month old infants reported contradictory results. Mothers in the control group made negative comments about their infant's food intake more frequently than mothers with ED history during feeding interactions (Doersam et al., 2024). This highlights the need for further research into the role of communication in the transgenerational transmission of ED.

2. Aim of the present work and data source

The overarching aim of this dissertation is to examine the impact of maternal ED history on early family functioning, with a particular emphasis on dyadic psychopathology and adjustment to parenthood and parental communication as potential mechanism underlying the transgenerational transmission of EDs. Four studies are conducted to comprehensively address this aim (see figure 1):

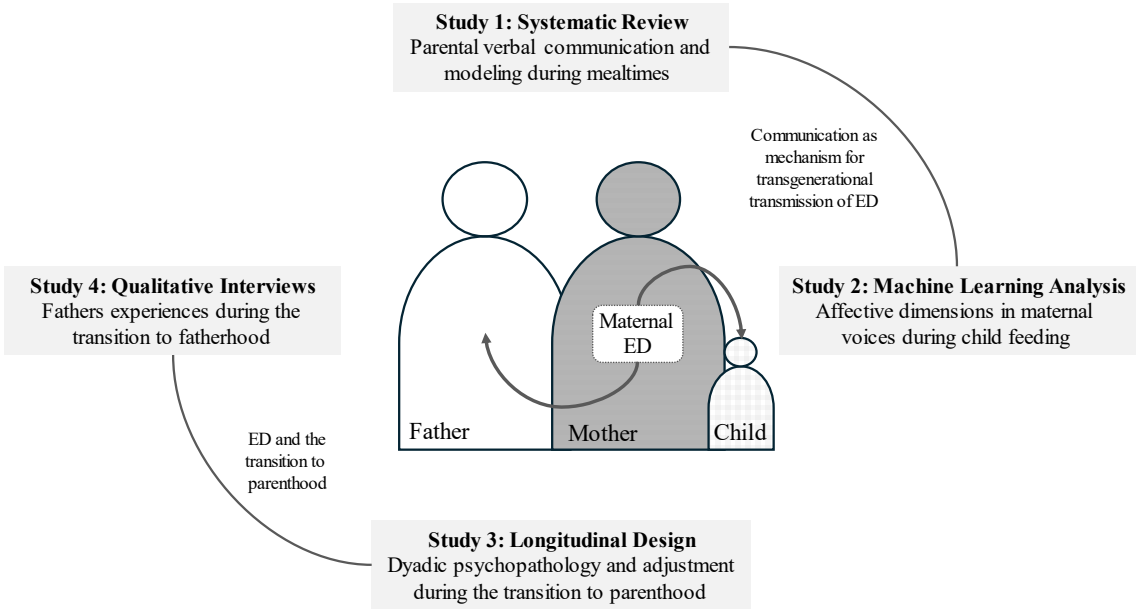

Figure 1: Overview of the studies included in this dissertation

In Study 1, a systematic review is performed to investigate parental verbal communication and modeling behavior with their children during mealtimes, with a particular emphasis on differences between families with and without an ED history.

This is further explored in Study 2, which examines differences in vocalized affective dimensions during mother-child feeding interactions between mothers with and without a history of EDs. Machine learning (ML) techniques are employed to potentially detect subtle speech differences, that may remain undetected by traditional analysis methods.

Study 3 concentrates on the parent dyad and is a longitudinal investigation of parental health and partnership in families with and without maternal ED history. Data on eating behavior, depressive symptoms, and adjustment to parenthood of mothers and fathers in

the first year postpartum are assessed and associations between maternal and paternal psychopathology examined.

Study 4 further explores paternal experiences throughout the pre- and postnatal period as well as the potential impact of maternal EDs on these experiences, using qualitative interviews.

2.1. Data source – The EMKIE study

The data utilized in this dissertation were collected as part of the EMKIE study, a prospective, longitudinal, multi-method family study conducted at the Department of Psychosomatic Medicine and Psychotherapy at the Medical University Hospital Tübingen. The EMKIE study examines the impact of maternal ED history on pregnancy and child outcomes from late pregnancy to 30–42 months postpartum.

Recruitment of pregnant women with and without ED history took place between 2018 and 2022 within the general population. In addition, women previously treated for EDs at the University Hospital Tübingen were invited to participate. A total of n = 57 women, their male partner and their child born during the study course were included in the study. Among them, n = 24 women had an ED history according to the DSM-5 criteria (ED-group), whereas n = 33 women without history of mental illness or severe somatic disorder constituted the healthy control group (HC-group). Inclusion criteria comprised an age between 18 and 40 years and a nonsuspicious singleton pregnancy. Insufficient proficiency of the German language, a chronic medical condition, perinatal complications including birth asphyxia as well as preterm birth or multiple birth were defined as exclusion criteria.

The EMKIE study comprises four assessment points from pregnancy to three years postpartum (figure 2).

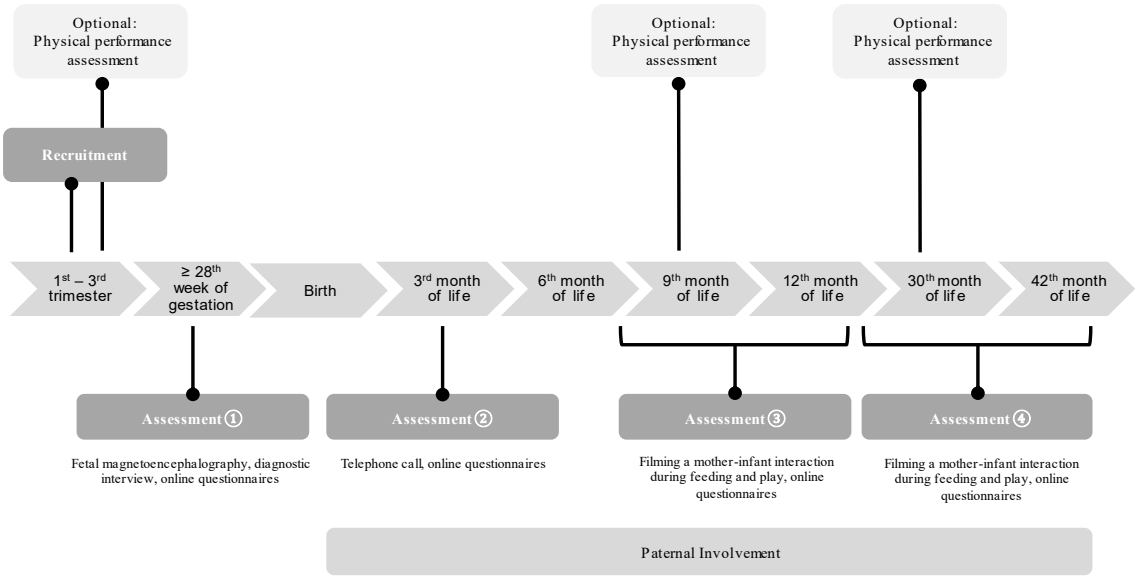

Figure 2: EMKIE study procedure (Doersam et al., 2024)

This thesis focuses on data from the first three assessment points, which are detailed below.

The first assessment took place beginning at 28 weeks of gestation. This assessment included a fetal magnetoencephalography (fMEG) measurement to evaluate fetal brain activity and fetal heart activity. The Eating Disorder Examination Interview (EDE-I) (Hilbert & Tuschen-Caffier, 2016) was administered to assess specific psychopathology related to active or past ED, including AN, BN, BED, and OSFED. Pregnancy related information and basic health characteristics of the mothers were collected from the maternity log. Self-report online questionnaires were used to assess the women's food intake and eating behavior, maternal general well-being, as well as depression and stress.

The second assessment took place three months postpartum. Participants were contacted by telephone to collect data on birth experience, maternal well-being, and eating behavior. Self-report online questionnaires were applied to evaluate the child's eating and sleep patterns, development, and temperament. Mothers also provided information on perceived stress levels, depressive symptomatology, sleep quality, and adjustment to motherhood. Fathers were included at this stage and completed analogous assessments addressing their food intake and eating behavior, psychological well-being, depressive symptoms, stress and parental adjustment.

At the end of the child's first year of life, assessment 3 was conducted. Study personnel visited the families at home to video-record mother-infant mealtime and play interaction. A comprehensive parental interview was administered to collect detailed information on the child's eating and feeding history. Both parents again completed online-questionnaires on food intake, eating behavior, depressive symptoms, stress, and parental adjustment, consistent with previous assessments.

The qualitative interviews with the fathers were conducted independently of the individual study course after the third or fourth study appointment.

Ethical approval for the EMKIE-project was obtained from the ethics committee of the medical faculty of the Eberhard-Karls-University and the University Hospital Tübingen (219/2018BO1; 859/2021BO2; 826/2023BO2). All study participants provided written informed consent.

3. Results and discussion

Overall, this dissertation project comprises four studies investigating the impact of EDs on the family system. A detailed description of each study, accompanied by a summary of the primary findings and a discussion is presented below.

3.1. Study 1: Parental verbal communication and modeling during mealtimes in families with and without eating disorder history (Throm et al., 2024)

Full citation: *Throm, J. K., Schilling, D., Löchner, J., Micali, N., Dörsam, A. F., & Giel, K. E. (2024). Parental verbal communication and modeling behavior during mealtimes shape offspring eating behavior–a systematic review with a focus on clinical implications for eating disorders. Appetite, 107584.*

Parental communication about food and nutrition is associated with children's eating behavior (Norton et al., 2022) and is considered to be a potential mechanism for the transmission of EDs (Arroyo et al., 2017). However, no structured review of the existing literature has systematically examined verbal communication and modeling behaviors of parents with and without ED history during mealtime interactions with their children. Therefore, a systematic review according to the 'Preferred reporting items for systematic reviews and meta-analysis' (PRISMA) guidelines (Page et al., 2021) was performed with the objective of synthesizing the existing literature on parental verbal communication and modeling behavior with their children in mealtime situations. This review further aimed to identify potential differences between parents with and without ED history with respect to this subject. The electronic databases PsychInfo, PubMed and PubPsych were searched in January 2023 and an initial number of 6312 studies were found.

A total of 54 studies were deemed eligible for study inclusion, of which three analyzed mealtime communication in families with ED history (Stein et al., 1994; Stein et al., 2001; Waugh & Bulik, 1999). The results were divided into the subgroups quantitative language characteristics, qualitative language characteristics and modeling with the results for the families with ED history being reported separately. Parents generally used a wide range of total utterances, total amount of words and total amount of different words during mealtimes. Furthermore, the results indicated that, compared to fathers, mothers tend to

communicate more frequently, use more complex language, and employ a greater variety of vocabulary when interacting with their children during mealtimes. Additionally, mothers engage in a higher average number of total verbal parenting strategies during these interactions. The intention and style of communication varied widely across the different studies. Generally, parents appeared to encourage their children to eat, especially in situations where the children encounter unfamiliar foods. Thereby, autonomy-supportive prompts were used more frequently than coercive-controlling prompts. Parents seemed to regulate their younger children more often than their older ones, primarily focusing on regulating the children's physical activity. They used an instructional framework more often than an interactional one and mostly employed arguments related to quantity and quality. Maternal encouragement to eat were more frequent than discouragements or restriction, and utterances were mainly aimed at promoting or maintaining communication with the child. While non-aversive verbal behavior was more prevalent than aversive verbal behavior among mothers, verbal pressure was also frequently used. In total, verbal interactions about topics other than food and eating were much more prevalent than food- and eating-related communication during mother-child mealtime interactions. With regard to paternal communication, positive statements were more prevalent than negative ones during mealtimes, however, this finding is based on only one study. Verbal modeling and eating together were commonly observed behaviors, whereas unconscious modeling was rarely reported. Communication patterns in families with a history of ED have been examined in only a few studies. However, mothers with EDs made fewer positive comments about food and nutrition (Waugh & Bulik, 1999) and expressed negative emotions more frequently (Stein et al., 1994) during mealtimes compared to mothers without EDs.

In conclusion, parents seem to engage in different forms of communication during mealtimes, varying in intention and frequency, and with notable differences between mothers and fathers. Although research on communication within families affected by ED remains limited, existing findings suggest that communication during mealtimes in families with ED history may be impaired and thereby potentially serving as a mechanism for the transgenerational transmission of ED. This review revealed a major research gap regarding communication in families with ED. Concurrently, our synthesis identifies key domains of parent-child communication and modeling behaviors around family meals

that warrant further investigation and incorporation into models of intergenerational transmission of eating behavior and disordered eating.

3.2. Study 2: Affective dimensions in maternal voice during child feeding in families with and without eating disorder history (Throm, Milling, et al., 2025)

Full citation: *Throm, J. K., Milling, M., Triantafyllopoulos, A., Kathan, A., Dörsam, A. F., Löchner, J., Schuller, B. & Giel, K. E. (2025). Affective Dimensions in Maternal Voice During Child Feeding in Mothers With and Without Eating Disorder History—Findings From a Machine Learning Analysis of Speech Data. European Eating Disorders Review.*

Study 1 identified a significant research gap regarding communication in families with EDs. However, the limited number of existing studies suggest a negative impact of the disorder on maternal communication. Building on these findings, Study 2 aimed to examine whether mothers with ED history can be distinguished from mothers without ED history based on their voice recordings during child feeding interactions. Compared to previous studies, which are mostly based on simple counting or rating procedures and therefore bear a risk of subjective judgement, Machine Learning was employed to potentially detect subtle speech differences, that may remain undetected by traditional analysis methods.

Videos of 44 mother child dyads (ED: n = 17, HC: n = 27) filmed at home during mealtime were part of the analysis. Various ML models that analyzed maternal voices including the dimensions of valence, arousal and dominance, were exploratively evaluated to assess their applicability and performance in analyzing maternal voice data.

Although ML models did not predict group allocation based on maternal speech features, the affective dimensions arousal, valence, and dominance were consistently expressed stronger in the voices of mothers with ED history over the course of the feeding. However, the arousal levels in the ED group maintained in a neutral state, while the HC group demonstrated a tendency toward inactivity. At the same time, valence levels in both groups tended to an overall negative valence. All three affective variables peaked in the middle of the feeding interaction, with a more pronounced peak observed in the ED group.

Taken together, the results suggest that mothers in the ED group perceive the feeding situation as more pleasant and positive than those in the control group, although they still perceive the situation as uncomfortable. However, the heightened levels of arousal and valence may also be attributed to a heightened degree of overall emotional engagement exhibited by these mothers in the situation. Although the ML models did not distinguish both groups based on speech characteristics, differences in the affective dimensions of maternal voices were identified between mothers with and without ED history. This highlights the importance of investigating maternal communication in affected families and should be further investigated in future studies, as it may represent a potential interaction mechanism for the transgenerational transmission of EDs.

3.3. Study 3: Dyadic psychopathology and adjustment during the transition to parenthood in families with and without eating disorder history (Throm, Dörsam, et al., 2025)

Full citation: *Throm, J. K., Dörsam, A. F., Micali, N., Preissl, H., & Giel, K. E. (2025). Dyadic Psychopathology and Adjustment to Parenthood in Families With and Without Eating Disorder History – Findings From a Longitudinal Study. International Journal of Eating Disorders, 58(2), 452-458.*

The transition into the parenting role comes along with deep stretching changes concerning several aspects of life (Doss & Rhoades, 2017; Smythe et al., 2022; Versele et al., 2021), which might be impeded in light of an ED in the family (Sadeh-Sharvit et al., 2020). In this study, we assessed longitudinal data of parental mental health and partnership in 57 families with (n = 24) and without (n = 33) maternal ED history from pregnancy to the end of the first year postpartum. Data on eating behavior, depressive symptoms, and adjustment to parenthood of mothers and fathers was assessed and associations between maternal and paternal psychopathology examined.

ED psychopathology and depressive symptomatology was more severe in mothers with ED history compared to women without ED history over the complete study course, and an increase of ED psychopathology was observed in both groups from pregnancy to the postpartum period, indicating the vulnerability of women during this time. Furthermore, mothers with ED history exhibited worse attitudes toward their body throughout the study and showed worse attitudes and adjustment regarding their baby later postpartum.

Although mothers without ED reported a significant decline in the subscale *Marital Relationship* from three months postpartum to the end of the first postpartum year, their scores remained higher than those of the ED group. Partners of women with ED history showed no differences in ED psychopathology, depressive symptomatology and adjustment to parenthood, however, an increase in ED psychopathology was observed over time in the ED group. Moreover, in the ED group, a negative correlation was observed between maternal ED severity and paternal attitudes toward pregnancy and baby three months after birth.

The results indicate that an ED history is associated with mental health deterioration and adjustment difficulties in mothers after childbirth, while fathers experience challenges in adjusting to parenthood when their partner is affected by severe ED symptoms. These findings underscore the importance of close monitoring and consistent care for women with EDs during the transition to parenthood, as well as the need for further research to enhance understanding of paternal experiences during this critical period. At the same time, healthy fathers may serve in a protective way within the family system by acting as role models for healthy eating behaviors for their children.

3.4. Study 4: Fathers experiences during the transition to fatherhood in families with and without eating disorder history (Throm et al., under Review)

Full citation: *Throm, J. K., Schilling, D., Dörsam, A. F., Gödecke, C., & Giel, K. E. How do fathers experience the pre- and postpartum period depending on maternal ED? - Findings from a qualitative interview study.* ***Under review*** *at Journal of Eating Disorders.*

The aim of Study 4 was to enhance the understanding of dyadic influences in couples with EDs during the transition to parenthood by complementing the quantitative research design of Study 3 with a qualitative approach. It explored paternal experiences throughout the pre- and postpartum periods and investigated how maternal EDs may influence these experiences.

Six qualitative interviews were conducted with partners of women with and without EDs (n = 3 respectively) during pregnancy about their thoughts and experiences regarding their parental role, their mental health and eating behavior as well as the impact of the ED on

their partner relationship. Data analysis was based on the qualitative content analysis of Mayring and Fenzl (2019).

The thematic analysis resulted in the identification of six overarching themes, which were deductively derived from the interview guide, namely 1) parental role considerations, 2) prepartum expectations on the impact of childbirth on the individual general well-being, 3) challenges after birth, 4) change of eating behavior after birth, 5) postpartum experiences of the individual general well-being and 6) influence of EDs on the couple relationship. Our analysis revealed many similarities in the experiences of fathers in both groups, however, some differences also emerged. For example, all fathers in the ED group reported that they had not thoroughly contemplated their parental role before birth, whereas this was not reported by fathers in the HC group. Simultaneously, all fathers in the HC group reported that the adjusted their cooking behavior to the needs of the child, which was not mentioned at all in the ED group. Furthermore, all partners of women with EDs reported an impact of the disorder on their partnership, which was reflected, for example, in their urge to support the affected partner and in their emotional reaction to ED-related symptoms.

Overall, the results are consistent with former research and seem to reflect common experiences of fathers during the pre- and postpartum period, irrespective of the presence of an ED diagnosis in the family. However, a number of differences in the experiences were reported, as well as an ongoing impact of the ED on the partner relationship. Therefore, our results demonstrate that an ED diagnosis in the family affects the family environment and underline the importance of including fathers in the research concerning ED and the transition to parenthood. The findings can further be implemented in the development of interventions to support couples in the transition to parenthood.

4. Discussion

This dissertation investigated the impact of maternal ED history on early family functioning, with a particular emphasis on psychopathology in the couple dyad and parental adjustment during the transition to parenthood as well as parental communication as potential mechanism underlying the transgenerational transmission of EDs. It provides an overview of parental communication strategies and modeling behaviors in mealtime situations in general and revealed a major research gap regarding communication in families with ED history (Study 1). Study 2 contributes to this research gap and identified differences in affective dimensions in maternal voices during feeding situations. While mothers with a history of EDs experienced mental health deterioration and had difficulties to adjust to motherhood, partners of women with ED history did not differ from partners of women without ED history in terms of psychopathology after childbirth. However, paternal adjustment was negatively influenced by the severity of the maternal ED (Study 3). These findings served as the foundation for the conduction of qualitative interviews with fathers in families with maternal EDs (Study 4), where some group specific topics regarding the experiences during the transition to parenthood emerged. In summary, all studies included in this dissertation project suggest that a maternal ED diagnosis is affecting the whole family system and impacts the early family functioning.

4.1. Synthesis and interpretation of results

Parental communication is considered to be a potential mechanism for transgenerational transmission of disordered eating (Arroyo et al., 2017; Dahill et al., 2023). Study 1 provides an overview of parental communication strategies and modelling behaviors during mealtimes in healthy populations and uncovered a major research gap regarding families with ED history. Our findings suggest that parents' communication in general varies with respect to types of speech and intentions and reveal differences in the communication of mothers and fathers. Encouragement to eat was a common parental communication strategy, especially in novel food situations (Ellis et al., 2018; Norton et al., 2022). The effects of parental encouragements vary depending on the style employed. For instance, promoting a healthy diet has been reported to reduce picky eating (Ellis et al., 2018), whereas an authoritarian style can lead to a decrease in fruit and vegetable

intake in the toddler age range (Norton et al., 2022). Parental verbal restriction during mealtimes has been scarcely investigated, however, when reported, it has been observed only at low levels. Given that higher levels of body dissatisfaction have been linked to restrictive feeding practices in general (Blissett & Haycraft, 2011), the low levels of verbal restriction observed in the studies can be interpreted as a positive finding. Modeling in form of co-eating and verbal modeling were common behaviors exhibited by parents during mealtimes with modeling occurring especially when children were introduced to unfamiliar foods. Our review also revealed differences in communication patterns between mothers and fathers, with maternal communication showing greater complexity, a higher overall amount of communication and more variation. This is consistent with findings from interaction contexts outside of mealtimes. During play situations, mothers communicated more verbally than fathers, but only in a dyadic context (Morelli et al., 2023). In the triadic context no differences regarding mothers' and fathers' communication were found, which led the authors to the conclusion that parents establish a coordination leading them to align with the kind of communication provided to the infant (Morelli et al., 2023). Furthermore, previous research has reported differences in parenting styles between mothers and fathers (Yaffe, 2023), which is partly reflected in the findings of the present review. Besides outlining major fields of parent-child communication and modeling behavior around family meals in healthy populations, Study 1 highlighted a strong need for further research in the field of mealtime communication within families with a history of EDs, as existing studies are limited, outdated and mainly based on mother-child dyads. However, indications were found that EDs may adversely affect maternal mealtime communication, reflected in a higher frequency of expressed negative emotions, fewer positive remarks, and a descriptive trend toward increased strong verbal control in mothers with EDs compared to those without. Building on the findings of a previous review that broadly examined parenting in families affected by EDs and documented a negative impact of EDs on parent-child mealtime interactions (Chapman et al., 2021), as well as the fact that maternal commentary about weight and the modeling of disordered eating and weight control behaviors were identified as potential facilitators for disordered eating (Arroyo et al., 2017), our findings further support the notion that communication may serve as a potential mechanism in the transgenerational transmission of EDs.

The findings of Study 2 strengthen the impression that communication of mothers with ED history might be impacted by the disease. ML techniques were employed to examine maternal voice data and more particular affective dimensions in the speech of mothers with and without ED history during mealtimes with their children. Despite the inability to classify the groups based on speech characteristics, the affective dimensions arousal, valence and dominance were higher in the voices of mothers from the ED group throughout the feeding situations, indicating heightened emotionality. The higher levels of arousal alongside higher levels of valence in the voices of mothers with ED history suggest a more positive and pleasant atmosphere during feeding compared to the control group. Although this finding was unexpected, it aligns with the observations reported by Doersam et al. (2024), who identified no significant differences in the quality of mother-infant interaction during feeding at 10 months between dyads with and without a maternal ED history. However, control mothers exhibited a higher frequency of negative comments regarding the infant's food intake and experienced more struggle for control during child feeding (Doersam et al., 2024). This was explained by a potential maternal fear of passing on their disordered eating behavior to their children and therefore overcompensate their urge for control during feeding (Doersam et al., 2024). Notably, despite observed differences between groups, arousal levels in the ED group remained within a neutral range, whereas the control group demonstrated a tendency toward inactivity. Furthermore, a propensity for negative valence was observed in both groups, which was especially pronounced among mothers in the control group. This led to the suggestion that despite demonstrating higher valence levels in comparison to those without ED, mothers in the ED group nevertheless perceived the situation as uncomfortable. Another tentative explanation for the elevated levels of arousal and valence might be the increased emotional engagement of mothers with ED history in the feeding context. Given the central role of eating in EDs (Treasure et al., 2012), mealtime interactions may evoke intense emotions in those affected, both past and present, whereas mothers without EDs may experience these situations with lower emotional burden. The emotional hotspots observed in the middle of the feeding independent of ED diagnosis might be explained by a habituation to the situation. The findings related to dominance were not interpreted, as the analysis revealed a strong correlation with arousal, indicating that the model lacks the ability to distinguish between these two variables. The integration

of ML techniques into ED research holds potential to broaden the scope and enhance the effectiveness of conventional analytical approaches and warrants further investigation in future studies.

Taken together, Study 1 and 2 both revealed differences in parental communication in families with ED history during mealtime situations, thereby corroborating prior research that implicates communication as mechanism for the intergenerational transmission of EDs (Arroyo et al., 2017). Nevertheless, the current body of research remains limited, underscoring the necessity for further empirical research in this domain. The results reported in this dissertation thus constitute a substantive foundation for future investigations into the association between family communication and EDs.

Study 3 revealed significant differences between mothers with and without EDs from late pregnancy to the postpartum period, with higher ED pathology, depressive symptoms and worse adjustment to parenthood in the former one. Furthermore, an increase in ED psychopathology from late pregnancy to the end of the third year postpartum in both groups was observed. Hence, the results support previous work (Baskin et al., 2021; Koubaa et al., 2008) and emphasize the general vulnerability of women during this period and for women with ED history in particular. Widespread social pressure on women to quickly regain a slim figure after childbirth (Roth et al., 2012), along with persisting pregnancy-related physical changes (e.g. weight gain) may contribute to the worsening of ED symptoms in the postpartum period (Thompson, 2020), particularly in women with ED history. The observed differences in the Maternal Adjustment and Maternal Attitudes Questionnaire (Kumar et al., 1984) reflect stronger struggles related to body image among women with ED history compared to mothers in the control group, and corroborate the findings of Koubaa et al. (2008), who reported less positive attitudes toward pregnancy and the baby among these women. Although women without EDs reported a decline in marital relationship satisfaction during the first year postpartum, their average subscale scores remained higher than those reported by the ED group. While no time effects emerged in either group with regard to depressive symptomatology, women with ED history exhibited significantly higher scores across all measurement points. These findings underscore the various challenges experienced by women with ED in the vulnerable postpartum period.

Contrary to previous research (Batchelor et al., 2022; Linville et al., 2016), fathers in both groups in our study showed no significant differences in ED psychopathology, depressive symptoms, or adjustment to fatherhood in the postpartum period. A possible explanation for the absence of differences between the groups in our study regarding eating behavior might be the relatively low levels of ED symptoms in general, depicted by a mean EDE-Q total score in the ED group below the cut-off value of 2.3 across all measurement points. Furthermore, traditional masculinity norms embedded in society may have contributed to the low levels of reported psychological distress by the men in our study (Gough & Novikova, 2020). However, although no significant differences between the groups were observed, a significant increase in ED psychopathology from early to later postpartum period was found in the ED group, and a negative correlation between paternal adjustment and maternal ED psychopathology three months after birth was revealed. Hence, the difficulties adapting to their paternal role after childbirth in fathers whose partners exhibit greater severity of ED psychopathology indicate a particular challenge within families affected by an ED history. Conversely, fathers' self-reports of low ED symptoms and depressive symptoms as well as the lack of differences compared to fathers from the control group may be interpreted as a positive sign and may help alleviate some pressure on affected families. Fathers who exemplify healthy eating behaviors may function as protective role models in families with maternal ED history (Savage et al., 2007), thereby potentially mitigating adverse developmental outcomes in their children.

Study 4 was conceptualized to expand the insights of Study 3 on the experiences of fathers in the pre- and postpartum period. A total of six broad thematic areas emerged, encompassing aspects of individual behavior and experiences, as well as insights into partnership and family life. Many of the topics raised by the fathers correspond with findings from previous research, such as thoughts about meeting the expectations of fatherhood and reflections on their anticipated role and identity as fathers (Baldwin et al., 2018; St John et al., 2005; White & Jarvis, 2024) . These themes were brought up in both groups and are therefore not necessarily associated with an ED diagnosis in the family. The fathers reported having no specific expectation regarding the impact of childbirth on their well-being, a finding that was consistent across both groups. This may be explained by the findings of Gemayel et al. (2022), who found that antenatal fathers had limited

awareness of the responsibilities awaiting them. Given that the interview questions focused specifically on the period surrounding the birth of their first child, and that the forthcoming challenges may be difficult to anticipate, this may account for the low expectations reported by the fathers in our study. The fathers reported some minor changes in eating behavior after the birth of their child which mostly persisted for a limited time period. Thereby, our study supports earlier findings, observing no significant differences in the eating behavior of fathers from pregnancy to the postpartum period (Lo et al., 2021; Versele et al., 2023). When comparing partners of women in the ED and HC group, a notable difference emerged as fathers in the ED group reported less reflection on their paternal role and different experiences concerning their eating behavior, potentially indicating a more distant or disengaged relationship with the concept of fatherhood. This would align with a finding of Throm, Dörsam, et al. (2025), who observed a significant negative association between maternal ED severity and the subscale "attitudes towards pregnancy and baby" of the Paternal Adjustment and Paternal Attitudes questionnaire (Pinto et al., 2017), indicating a negatively impacted adjustment. Challenges were less frequently reported in the ED group, and attribution to the ED came alight only when directly asked for. However, reported influence of the ED aligns with previous research regarding perceived pressure to monitor the partners' eating behavior, the ED as source of conflict and decreased intimacy (Linville et al., 2016). Furthermore, this study highlights the unconscious entanglement of children within affected families in ED related dynamics, which may have detrimental psychological and behavioral consequences. Potential changes in paternal behavior concerning the child's nutrition in order to prevent transgenerational transmission or the children's direct involvement in ED related situations may influence their development trajectory.

In summary, the findings of Study 3 and 4 corroborate previous research by underscoring the vulnerability of mothers, particularly those with ED history, during the transition to parenthood. Additionally, the qualitative results indicate notable differences in paternal experiences between partners of women with and without ED history during this period. Although these differences did not necessarily result in psychological distress, they nevertheless highlight the need to systematically adopt a dyadic perspective in research on EDs during the perinatal period.

4.2. Strengths and limitations of the thesis

A major strength of this dissertation lies in the employment of diverse methodological approaches to address the research questions. The application of artificial intelligence to speech data for the automated identification of diseases has advanced rapidly in recent years (Berardi et al., 2023; Milling et al., 2022), offering the potential for objective, real-time evaluation that minimizes the risk of subjective bias. Furthermore, videotaped mealtime observations were employed to capture more authentic and spontaneous communication than written texts could provide. By conducting home visits around the child's typical mealtime and minimizing researcher presence during feeding, the setting aimed to approximate a naturalistic mealtime environment as closely as possible. The extension of the quantitative research design of Study 3 through qualitative interviews in Study 4 allowed to gain a more comprehensive insight into the experiences of fathers in families with and without ED history during the transition to parenthood.

Another strength of this dissertation is the longitudinal design of Study 3. Longitudinal assessments of psychopathology in mothers with and without ED history and their partners during the transition to parenthood are scarce, but necessary to detect changes in psychological well-being and adjustment difficulties during this vulnerable period.

This points to another methodological strength of the project, the involvement of the fathers. Fathers are commonly overlooked in research regarding the early and late postpartum period, and our studies provided new insights that had previously not been assessed.

Despite its strengths, this study is subject to certain limitations that should be considered when interpreting the findings.

With regards to Study 1, the highly heterogenous aspects of communication analyzed in the studies included in the review, although already restricted to verbal utterances and modeling behaviors, often resulted in single findings that require replication. Further, only a minority of the included studies made use of validated assessment tools or rating schemes, impeding interpretability and comparability as well as limiting reliability.

While the use of ML approaches in ED research offers promising new perspectives the ML technique exhibits certain downsides worth mentioning. First of all, the interpretation of the data remains tentative, as the variables are neither annotated by human raters nor

self-reported by the subject, but rather represent predictions generated by a ML model trained on such data from a single dataset (Wagner et al., 2023). Accordingly, this model is vulnerable to biases present in the training data, which might be reflected in the subsequent analysis carried out in Study 2. Moreover, as the valence predictions are based on linguistic information (Triantafyllopoulos et al., 2022) and the underlying model was trained on English-language data, the reliability of the results in our German dataset is constrained.

A general limitation of the studies in this dissertation project are the small sample sizes in Study 2, Study 3 and Study 4 and the unequally distributed ED diagnoses in the index group. In Study 4, only partners of women with AN were interviewed, further limiting the transferability of the findings to other ED diagnosis. The participants of the EMKIE study were predominantly highly educated and had a comparatively high socioeconomic status (Doersam et al., 2024; Throm, Dörsam, et al., 2025). Furthermore, the interviews conducted in Study 4 occurred on average three years postpartum, thereby potentially increasing the risk of recall bias.

4.3. Practical implications

Regarding practical implications, several conclusions can be drawn from the results of this dissertation. First, as previously emphasized, the current understanding of familial mealtime communication patterns in families with ED history remains limited. However, our findings suggest that differences in parental communication do exist between families with and without ED history. Consequently, intervention programs targeting these families may be beneficial by providing parents with information about healthy eating and offering strategies to promote positive communication, as has been recommended for the general population (Maor & Cwikel, 2016).

Secondly, we recommend that healthcare providers remain sensitive to the heightened vulnerability of women during the postpartum period, particularly those with a history of ED. Since the postpartum period poses a high risk for the exacerbation of ED symptomatology, increased vigilance is essential. Although the importance of assessing disordered eating during pregnancy has been well established (Bannatyne et al., 2018), the current lack of validated screening tools for antenatal populations (Dörsam et al., 2022) presents a significant barrier to early identification and intervention. This

underscores the need to educate healthcare providers on how to address EDs during pregnancy within the context of routine antenatal care, while also ensuring continued support throughout the transition to motherhood (Fogarty et al., 2018).

The development of targeted preventive interventions focusing on expectant mothers with EDs and their children, who constitute particularly vulnerable groups at risk for the emergence of mental health difficulties, is highly recommended. Within this context, greater involvement of partners in postpartum care may also prove beneficial. Providing them with appropriate support and educational resources should receive increased attention in both clinical practice and future research.

4.4. Conclusions and further directions

Overall, the present dissertation project advances the field by examining how maternal ED history affects early family functioning.

The systematic review synthesized current evidence on parent-child communication and interaction during mealtimes, highlighting relevant quantitative and qualitative aspects that may inform future research directions and theoretical models concerning family influences on the regulation of eating behavior. Despite revealing a major research gap, the review identified indications of impaired communication in families with ED history. Together with the findings of Study 2, which showed that mothers with ED history consistently exhibited stronger arousal, valence and dominance in their voices during feeding situations with their children, and thus might be more emotionally involved, this potentially points to an interaction mechanism involved in the transgenerational transmission of ED. Further research into parental communication within families with a history of ED is urgently needed to elucidate potential influences and to alleviate the family burden associated with EDs. Thereby, the integration of ML techniques may expand conventional analytical approaches and enhance the possibilities for analyzing speech data.

An encouraging finding of this dissertation is that partners of women with and without EDs did not differ regarding ED psychopathology, depressive symptoms and adjustment after childbirth. Therefore, fathers may serve a protective function in families with maternal ED history by acting as role models for healthy eating behaviors for their children (Savage et al., 2007). However, higher levels of psychopathological distress and

difficulties in adjustment were observed in mothers with EDs compared to those without ED history. Moreover, a negative correlation between the severity of maternal EDs and paternal adjustment was found, even though this did not necessarily manifest as psychological distress. These findings highlight the importance of close monitoring and consistent care of affected women during this vulnerable phase, as well as the need to address the adjustment needs faced by their partners. The qualitative research included in this project allowed to gain further insights into the experiences of fathers in the pre- and postpartum period. The group-specific themes identified, along with the many common themes raised by the fathers and the reported impact of the ED on the partnership, suggest that the disorder affects the entire family and highlight the importance of incorporating paternal perspectives in research on EDs during the transition to parenthood. This may contribute to a deeper understanding of family dynamics and help design tailored interventions for the entire family.

5. Summary

Eating disorders (ED) affect the entire family, being associated with an increased risk of ED development in the next generation, as well as impairments in the parental mental health and partnership. The present dissertation project aims to enhance the understanding of the impact of maternal EDs on the family system through four sub-projects. Two of these investigate parental communication as a potential mechanism for the transgenerational transmission of EDs, while the other two focus on parental mental health and the lived experiences of male partners of women with EDs during the transition to parenthood.

Study 1 provides a systematic review of parental communication and modeling behaviors during mealtimes in families with and without EDs. Study 2 employs machine learning (ML) techniques to analyze features of maternal speech during child feeding interactions. The third study uses a longitudinal design to examine trajectories of parental mental health and partnership functioning during the transition to parenthood in dyads affected and unaffected by ED. Finally, Study 4 uses qualitative methods to explore paternal experiences during this transition period.

Results from Study 1 and 2 provide evidence that EDs in the family may affect parental communication during mealtimes. Despite revealing a significant research gap, indications of a negative impact of EDs on maternal communication were found, as mothers with EDs expressed negative emotions more frequently and made fewer positive remarks. Furthermore, the application of ML to audio recordings of mother-child mealtime interactions reinforced the impression that maternal communication is affected by the disorder, revealing higher levels of arousal, valence and dominance in the voices of mothers with EDs compared to those without. Furthermore, mothers with ED history exhibited significantly greater severity of ED psychopathology and elevated depression scores, alongside lower levels of adjustment to motherhood in comparison the control group from pregnancy to postpartum, with significant increases of ED psychopathology over time. Although partners of women with EDs did not differ from partners of women without EDs in psychological distress, a negative correlation was observed between the severity of maternal ED and paternal adjustment. Group-specific themes concerning

paternal experiences during the transition to parenthood were identified in the interviews, thereby further elucidating the disorder's impact on the entire family system.

Overall, this dissertation provides new insights into the impact of EDs on the family system. It identifies relevant communication aspects that may inform future research directions and theoretical models concerning family influences on the regulation of eating behavior. The findings also emphasize the importance of incorporating paternal perspectives in ED research during the transition to parenthood, which may contribute to the development of tailored interventions for the entire family.

6. Zusammenfassung

Essstörungen (ES) beeinflussen die gesamte Familie und werden mit einem erhöhten Risiko für die Entwicklung von ES in der nächsten Generation sowie mit Beeinträchtigungen in der Partnerschaft in Verbindung gebracht. Das vorliegende Dissertationsprojekt leistet mit vier Teilprojekten einen Beitrag zum besseren Verständnis der Auswirkungen mütterlicher ES auf das Familiensystem. Zwei dieser Teilprojekte untersuchen elterliche Kommunikation als möglichen Mechanismus für die transgenerationalen Übertragung von ES, während die anderen beiden die psychische Gesundheit der Eltern und die Erfahrungen männlicher Partner von Frauen mit ES während des Übergangs zur Elternschaft beleuchten.

Studie 1 umfasst eine systematische Übersicht über elterliche Kommunikation und Modellverhalten während der Mahlzeiten in Familien mit und ohne ES. Studie 2 verwendet maschinelles Lernen (ML) um Merkmale der mütterlichen Sprache während des Mahlzeiteninteraktionen mit ihren Kindern zu analysieren. Die dritte Studie untersucht in einem Längsschnittdesign die Entwicklung der psychischen Gesundheit der Eltern und die Partnerschaft während des Übergangs zur Elternschaft bei Paaren mit und ohne ES. Letztlich nutzt Studie 4 qualitative Methoden, um die Erfahrungen der Väter in dieser Übergangsphase zu untersuchen.

Die Ergebnisse von Studie 1 und Studie 2 deuten darauf hin, dass ES in der Familie die elterliche Kommunikation während der Mahlzeiten beeinflussen können. Trotz einer großen Forschungslücke fanden sich Hinweise auf einen negativen Einfluss der ES auf die mütterliche Kommunikation in der existierenden Literatur: Mütter mit ES äußerten häufiger negative Emotionen und machten weniger positive Bemerkungen während der Mahlzeiten. Die Anwendung von ML auf Audioaufnahmen von Mutter-Kind-Interaktionen während der Mahlzeiten bestätigten den Eindruck, dass ES die Kommunikation beeinflussen können: Die Stimmen von Müttern mit ES zeigten im Vergleich zu Müttern ohne ES höher Werte bei Erregung, Valenz und Dominanz. Außerdem zeigten Mütter mit ES-Vorgeschichte im Vergleich zur Kontrollgruppe von der Schwangerschaft bis zehn Monate nach der Geburt eine deutlich schwerere ES-Psychopathologie und erhöhte Depressionswerte sowie eine geringere Anpassung and die Mutterrolle. Bei diesen Frauen zeigte sich zusätzlich eine signifikante Zunahme der ES-

Symptomatik im Verlauf der Zeit. Die Partner von Frauen mit und ohne ES unterscheiden sich nicht hinsichtlich psychischer Belastung, jedoch bestand eine negative Korrelation zwischen der Schwere der mütterlichen ES und der Anpassung der Väter an die Elternrolle. Gruppenspezifische Themen zu den väterlichen Erfahrungen während des Übergangs wurden in den Interviews identifiziert, wodurch die Auswirkungen der Erkrankung auf das gesamte Familiensystem weiter verdeutlicht wurden.

Insgesamt liefert die Dissertation neue Erkenntnisse zum Einfluss von ES auf das Familiensystem. Relevante Aspekte elterlicher Kommunikation, die möglicherweise eine Rolle bei der transgenerationalen Übertragung von ES spielen, wurden benannt, wodurch zukünftige Forschungsansätze und theoretische Modelle zu familiären Einflüssen auf die Regulation des Essverhaltens bereichert werden können. Zudem unterstreichen die Ergebnisse die Bedeutung, die Perspektiven von Vätern in die Forschung zu ES und beim Übergang zur Elternschaft stärker einzubeziehen, um so die Entwicklung gezielter Interventionen für die gesamte Familie zu fördern.

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Statement of Contributions

This dissertation was conducted at the Department of Psychosomatic Medicine and Psychotherapy at the Medical University Hospital Tübingen under supervision of Prof. Dr. Katrin Giel.

As part of this dissertation, publications and submitted manuscripts have resulted. These are listed below, specifying the author's individual contributions as well as the contributions made by co-authors.

Study 1: Parent-child communication during mealtimes

Throm, J. K., Schilling, D., Löchner, J., Micali, N., Dörsam, A. F., & Giel, K. E. (2024). Parental verbal communication and modeling behavior during mealtimes shape offspring eating behavior–a systematic review with a focus on clinical implications for eating disorders. *Appetite*, 107584.

Contribution: This study was designed by *JKT* and KEG with contributions of JL. *JKT* searched for studies, screened, and rated the search results, collected data from the studies, generated figures and tables and drafted the manuscript. DS was the second screener and rater. KEG served as third rater in case of discrepancies. DS, JL, NM, AKD and KEG edited and approved the drafts of the manuscript. KEG was the supervisor of the project.

Study 2: Affective dimensions in maternal voice during child feeding

Throm, J. K., Milling, M., Triantafyllopoulos, A., Kathan, A., Dörsam, A. F., Löchner, J., Schuller, B. & Giel, K. E. (2025). Affective Dimensions in Maternal Voice During Child Feeding in Mothers With and Without Eating Disorder History—Findings From a Machine Learning Analysis of Speech Data. *European Eating Disorders Review.*

Contribution: This project was conducted as a collaborative project between the Department of Psychosomatic Medicine of the Medical university Hospital Tübingen and the chair for Health Informatics of the Technical University of Munich. *JKT*, MM, AK, AT, JL, BS and KEG conceptualized the study. *JKT* and AFD assessed the data. MM, AK, AT and BS were responsible for conducting the

machine learning analysis, whereas *JKT* performed all other analyses. ***JKT*****,** MM, AK and AT drafted the initial manuscript and generated the figures and tables. *JKT*, MM, AK, AT, AFD, JL, BS and KEG edited and approved the drafts of the manuscript. ***JKT*****,** AFD and KEG were responsible for project administration, and AFD and KEG obtained funding for the project. BS and KEG were supervisors of the project.

Study 3: Psychopathology and adjustment to parenthood in families with eating disorder history

Throm, J. K., Dörsam, A. F., Micali, N., Preissl, H., & Giel, K. E. (2025). Dyadic Psychopathology and Adjustment to Parenthood in Families With and Without Eating Disorder History - Findings From a Longitudinal Study. *International Journal of Eating Disorders*, *58*(2), 452-458.

Contribution: The study was conceptualized by ***JKT*****,** AFD, NM, HP and KEG. Data assessment was conducted by *JKT* and AFD. *JKT* carried out the analyses, generated the figures and tables and drafted the initial manuscript. AFD, NM, HP and KEG edited and approved the drafts of the manuscript. AFD, NM, HP and KEG obtained funding for the project. KEG supervised the project.

Study 4: Experiences of fathers in the pre- and postpartum period

Throm, J. K., Schilling, D., Dörsam, A. F., Gödecke, C., Giel, K. E. How do fathers experience the pre- and postpartum period depending on maternal ED? - Findings from a qualitative interview study. ***Under review*** *at Journal of Eating Disorders.*

Contribution: The study was conceptualized by *JKT* and KEG. Data assessment was conducted by *JKT. JKT* and DS carried out the analyses, with support and counseling provided by CG. *JKT* generated the figures and tables and drafted the initial manuscript. DS, AFD, CG and KEG edited and approved the drafts of the manuscript. KEG supervised the project.

ChatGPT and DeepL were utilized for translations as well as for grammar, spelling, and stylistic enhancements. I hereby confirm that I have carefully reviewed the output generated by the AI tools before incorporating it into the manuscript.

I further confirm that I have independently written the manuscript and have used no sources other than those cited.

Tübingen, 15.10.2025

Jana Katharina Throm

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Parental verbal communication and modeling behavior during mealtimes shape offspring eating behavior – A systematic review with a focus on clinical implications for eating disorders

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ABSTRACT

Objective: The aim of this review is to provide an overview of parental communication patterns during mealtimes, with a special emphasis being placed on the differences between families with and without a history of eating disorders.
Methods: The systematic review was conducted according to the PRISMA statement. A systematic literature search was carried out in PubMed, PubPsych and PsycINFO and the results were assessed for eligibility by two independent raters using the PICOS criteria. Only studies that included a mealtime observation were considered suitable for analysis of both explicit and implicit parental communication.
Results: The results of the review suggest that mothers communicate more, with more complexity, and with a greater variety of words with their children during mealtimes compared to fathers. The intention and type of communication is diverse and heterogeneous. In general, parents often tried to encourage their children to eat. Verbal modeling and co-eating appeared to be common behaviors. Mothers with a history of eating disorders expressed more negative emotions during eating than mothers without eating disorders. Findings regarding the use of positive comments and controlling speech are contradicting.
Discussion: The review outlines major fields of parent-child communication and modeling behavior around family meals which might be relevant to investigate and integrate into models of intergenerational transmission of eating behavior and disordered eating.

1. Introduction

The development of eating behavior takes place in the first years of life in order to provide optimal health and growth for the individual (Savage et al., 2007). Genetic influences and environmental factors play an important role in the formation of the child's nutrition, both of which are primarily influenced by the parents (Savage et al., 2007). The experience of eating and the observation of others' eating behaviors are crucial pathways for the direct shaping of children's nutritional habits (Dallacker et al., 2018). Therefore, regular shared mealtimes provide an ideal opportunity to influence children's relationship to food and eating (Norton et al., 2022). Importantly, these parental influences can either foster or hamper the child's regulation of eating behaviors. For instance, in families with a history of eating disorders (EDs), parent-child interactions during mealtimes are described to be problematic and conflictual (Chapman et al., 2021), with less sensitive maternal behavior and more stressed and less cheerful infants (Squires et al., 2014). In a recent systematic review, the development of children's eating behavior

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was reported to be associated with parental food communication. More specifically, parental encouragement of dieting and moralizing messages may reinforce disordered eating in children (Norton et al., 2022). With regard to the often distressing and anxiety provoking nature of mealtimes for patients with EDs and their higher concern about their children's appearance (Chapman et al., 2021), parent-child communication may be negatively affected in families with EDs and might represent a potential mechanism for the transgenerational transmission of EDs.

Parent-child interaction has been proposed as a potential transgenerational mechanism by which psychopathology is transmitted (Hosman et al., 2009), based on the principles of social learning theory (Bandura & Walters, 1977). Dysfunctional modeling and coping behaviors displayed by parents to their children over a longer period of time may lead to similar behaviors in the offspring (Bandura & Walters, 1977). Furthermore, negative parent-child interactions may be revealed in their communication style. In regards to EDs, parental communication during mealtimes may be a specific risk factor leading to equifinality of the transgenerational transmission. Arroyo et al. (2017) proposed in their model that both direct and indirect maternal communication may be a potential mechanism for the intergenerational transmission of disordered eating. The authors tested their model by analyzing data of 242 grandmother-mother-daughter triads from the community in the US. All participants provided self-reported data regarding their own current disordered eating behaviors as well as any weight related behaviors they perceived their mothers engaging in whilst they were residing in the same home. The results supported the model by showing a significant intergenerational transmission effect of disordered eating from mother to daughter, however, no such effect was found from grandmother to mother. Furthermore, significant indirect effects through perceived maternal modeling were seen from grandmother to mother, and mother to daughter. Similarly, perceived maternal commentaries led to significant indirect effects for both grandmother-mother and mother-daughter dyads. These results are supported by other studies investigating parental communication and the influence on children's eating behavior (Francis & Birch, 2005; Oliveira et al., 2019). Importantly, the working model by Arroyo et al. (2017) focuses on intergenerational communication in a broader sense, while the present review will concentrate on communication specifically during mealtime situations.

Although not considered in the model of Arroyo et al. (2017), paternal communication also seems to play a role in the development of ED in children (Dahill et al., 2023; Treasure, 2018). For example, significant associations have been reported between paternal negative comments regarding eating behaviors and an increase of eating disorder cognitions in a longitudinal study with adolescents (Dahill et al., 2023). Despite a steady increase in the inclusion of fathers in research in the recent years, the majority of studies regarding parent-child communication during mealtimes continues to be based on mother-child rather than father-child interactions, thereby emphasizing the need to involve fathers in further research.

The term "communication" is a broad and complex construct for which there is no consensus or universal definition (Krauss & Fussell, 1996, pp. 655–701). The categorization used in this review is closely related to the working model by Arroyo et al. (2017), who differentiated between maternal commentaries as direct and maternal modeling as indirect communication. However, in contrast to Arroyo et al. (2017), this review does not restrict direct communication to comments about weight and size but rather all parental verbal utterances occurring during mealtimes. Furthermore, modeling refers to mealtime specific behavior, e.g. eating in front of the child or the mimicry of mouth movements.

Though considered to be a potential mechanism for the transmission of EDs (Arroyo et al., 2017), no structured review of available literature examining verbal communication and modeling behavior of parents with and without ED history with their children during mealtime situations exists. A recent review provided an overview over the association of parental food communication and children's eating behaviors, however, most of the studies included in this review focused on domains of food parenting practices rather than specific messages which parents were using in their communication (Norton et al., 2022). In a further review, Chapman et al. (2021) provided a comprehensive overview of parenting practices, including parenting attitudes, behaviors, and parent-child interactions of parents with and without Eds. However, this review did not investigate the communication of mothers without eating disorders as a comparison, which did not allow them to distinguish between common communication mechanisms, and in particular those that may be related to the development of EDs. Therefore, this systematic review aims to synthesize parental verbal communication and modeling behavior with their children in mealtime situations and to identify potential differences between parents with and without an ED history in order to answer the following research questions.

a. How do parents communicate verbally and through modeling with their children during eating situations?
b. Do parents with a history of ED communicate differently with their children during eating situations than parents without a history of ED?

2. Method

The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines (Page et al., 2021) were applied in the reporting of this review. The review protocol was registered on the PROSPERO platform (Review ID: CRD42023436840).

2.1. Data sources and search strategy

A systematic literature search was conducted in the electronic databases PsycInfo, PubMed and PubPsych in January 2023. In order to identify all studies investigating parental communication during mealtime situations a broad search strategy was applied. No limitations regarding publication date were applied. The search terms used included a combination of keywords regarding the communication of parents with their children in a mealtime situation.

- PubMed: ((“communication"[MeSH Terms] OR communicat*[Title/Abstract] OR comment*[Title/Abstract] OR modelling[Title/Abstract] OR modeling[Title/Abstract] OR statement*[Title/Abstract] OR verbal*[Title/Abstract] OR interaction*[Title/Abstract]) AND (“parents"[MeSH Terms] OR parent*[Title/Abstract] OR father*[Title/Abstract] OR paternal[Title/Abstract] OR mother*[Title/Abstract] OR maternal[Title/Abstract]) AND (“meals"[MeSH Terms] OR meal*[Title/Abstract] OR feeding[Title/Abstract]) AND (“child"[MeSH Terms] OR child*[Title/Abstract] OR infant*[Title/Abstract] OR adolescen*[Title/Abstract]))
- PsycInfo: (MA communication OR AB communicat* OR AB comment* OR AB modelling OR AB modeling OR AB statement* OR AB verbal* OR AB interaction*) AND (MA parents OR AB parent* OR AB father* OR AB paternal OR AB mother* OR AB maternal) AND (MA meals OR AB meal* OR AB feeding) AND (MA child OR AB child* OR AB infant* OR AB adolescen*)
- PubPsych: (communicat* OR comment* OR modelling OR modeling OR statement* OR verbal* OR interaction*) AND (parent* OR father* OR paternal OR mother* OR maternal) AND (meal* OR feeding) AND (child* OR infant* OR adolescen*)

2.2. Inclusion/exclusion criteria

Studies were identified as eligible according to the PICOS-criteria: Participants, Interventions, Comparators, Outcome and Study Design (McKenzie et al., 2019).

2.2.1. Participants

Studies were included provided they investigated mothers and fathers of any age, with and without an ED history, as well as their healthy children aged 0–18 years. Studies including parents suffering from mental or physical diseases other than EDs were excluded. Studies which specifically reported examining parents with overweight or underweight independent of an ED diagnosis were excluded. However, if studies also reported on data from healthy controls, then only the data from healthy control subjects was included. Likewise, studies with premature infants or infants with comorbidities, including overweight or underweight, if specifically reported, were excluded.

2.2.2. Interventions

Studies involving communication interventions or manipulations were excluded to ensure the analysis of naturalistic communication. Baseline data from intervention studies was included.

2.2.3. Comparators

Studies were not required to provide a control group. However, studies providing data on a healthy control group were included.

2.2.4. Outcome

Studies were included provided they assessed parental verbal communication and modeling behaviors of mothers or fathers during an eating situation. The results had to be reported quantitatively.

2.2.5. Study design

In order to be able to analyze implicit and explicit communication, a mealtime observation had to be conducted, either via direct observation, audio-recording or video-recording. Publications in the form of literature reviews, systematic reviews, meta-analysis, dissertations, study protocols, case-reports and book chapters as well as studies published in any language other than English or German were excluded.

2.3. Study selection and data analysis

Findings of the initial search of the databases were imported to Endnote. After the removal of duplicates, screening of titles and abstracts of the remaining studies according to the inclusion and exclusion criteria was conducted by the first author. In the next step, two independent raters performed an examination of the full texts of the remaining papers. In cases of discrepancies, a third rater was included and consensus was reached by discussion.

Information from each eligible study regarding the following aspects were extracted by the first author: first author and year of publication, country, sample size, analyzed family member, age and sex of the children, existing parental ED diagnosis (if applicable), mealtime duration, and study design, as well as quantitative and qualitative communication aspects and parental modeling behaviors observed during mealtimes. Furthermore, information about the assessment of communication as well as the setting in which communication was analyzed was extracted.

All included studies were grouped according to which aspect of parental communication was reported. For instance, all studies reporting quantitative language characteristics were combined in one group, whereby studies reporting parental modeling were combined into another group. If a study reported more than one aspect, it was listed separately in all eligible groups.

2.4. Quality assessment

The assessment of the methodological quality of the included studies was conducted independently by the first and second author using an adapted version of the Quality Assessment Tool for Quantitative Studies developed by the Effective Public Health Practice Project (EPHPP) (Mackenbach et al., 2014). Eight key domains consisting of: 1) study design, 2) blinding, 3) representativeness regarding selection bias, 4) representativeness regarding withdrawals and drop outs, 5) confounders, 6) data collection, 7) data analysis and 8) reporting were evaluated individually and then integrated into an overall quality assessment of the paper. Each domain is scored as either 1 (Strong), 2 (Moderate), or 3 (Weak). An overall score is determined based on the composition of domains. For instance if six ratings are given, a "Strong" overall rating is given when no domains were coded as "Weak" and at least three domains were coded as "Strong". A "Moderate" overall rating is provided if one domain is coded as "Weak" item, or fewer than three domains are coded as "Strong". Lastly, a "Weak" overall rating is found when two or more domains are coded as "Weak". This adapted version of the Quality Assessment Tool for Quantitative Studies has been reported to be suitable for the assessment of observational and experimental studies (Mackenbach et al., 2014) and has been used by other researchers (Van Veen et al., 2021).

3. Results

A flowchart of the study selection process is shown in Fig. 1. Out of 6312 studies found through the initial databases and hand search, a total of 54 studies were included in the present review. Interrater reliability of full-text screening was very good with k = 0.86.

3.1. Study characteristics

The studies were published from 1980 to 2022, with 63% (n = 35) having been published more than ten years ago. The majority of studies were conducted in western industrialized countries and all were published in English. A large range of children's ages was represented from shortly after birth to 18 years of age, however, most studies were conducted in families with (very) young children, while studies with older children or adolescents were rare. Sample sizes ranged from 5 to 177 families, with different family constellations. The analysis of communication was the primary study aim in 61% of the included studies (n = 33), while the remaining studies reported communication as a secondary outcome or as an incidental result of other analyses. The assessment of communication was very heterogenous, with only a small number of studies using validated assessment tools for some aspects of communication (n = 9). Observation took place at home in the majority of studies (n = 43), while some took place in a laboratory or room in the clinic (n = 8) or else the setting was not reported (n = 4). Meals were recorded on video in 87% of the included studies (n = 47). Several studies were completed with the same study samples, sometimes within the scope of a larger sample, or sometimes to investigate different hypotheses (Beals, 1993; de Temple & Beals, 1991; Edelson et al., 2016; Fries et al., 2017; Patton et al., 2004, 2008; Stein et al., 1994, 2001). Mealtime communication in families with ED history was analyzed in three of the included studies (Stein et al., 1994, 2001; Waugh & Bulik, 1999).

3.2. Quality rating

The majority of studies (n = 32) received a "Moderate" quality rating, while n = 10 studies received a "Strong" quality rating and the remaining studies (n = 12) received a "Weak" quality rating. This was mainly due to weak component ratings for Representativeness I and Representative II, whereby data analysis and reporting was mainly strong.

3.3. Classification of communication

Despite this review's focus on verbal communication and modeling behavior as core aspects of communication, the results reported in the included studies remained extremely heterogeneous. In order to present the findings in a structured way, three subgroups of communication aspects relevant for this review were formed: (a) quantitative language characteristics, (b) qualitative language characteristics, and (c)

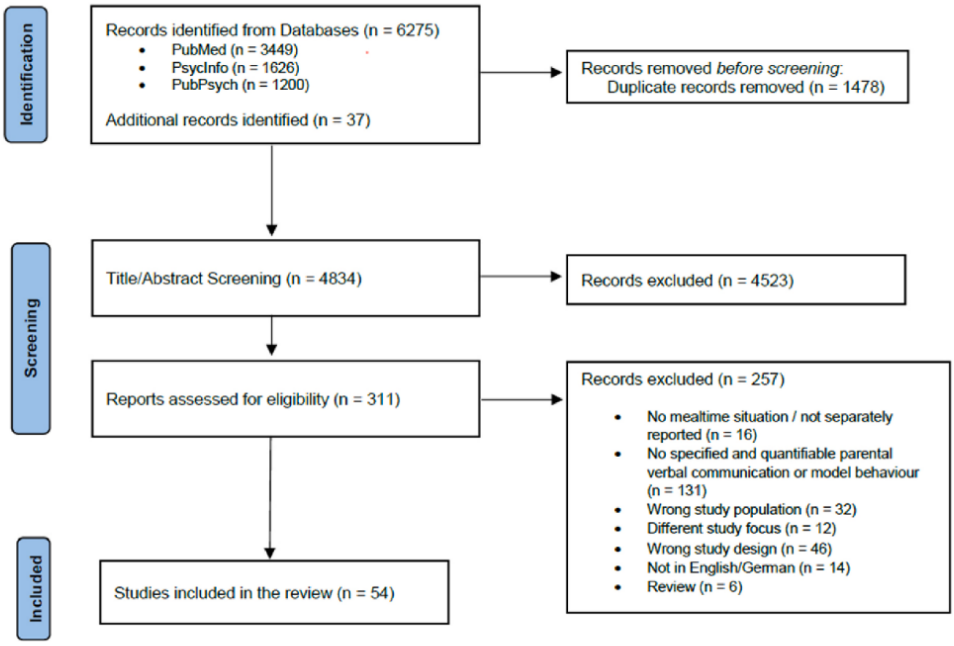

Fig. 1. Prisma flow diagram of study inclusion.

modeling behavior. Due to the low number of studies investigating parental communication with their children during mealtimes in families with ED history, these results are reported separately.

3.4. Quantitative language characteristics

The term "Quantitative language characteristics" includes data on quantifiable amounts of communication, e.g. the number and type of words used by the parents or the amount of time the family members spent talking. In total, 18 studies reported these aspects of parent-child communication in mealtime situations (Table 1; Supplementary Material 1). In general, a wide range of total utterances, total number of words and amount of different words in the parental speech during mealtimes was described (Bornstein et al., 1999; Brumark, 2006; Brumark, 2010; Davidson & Snow, 1996; Hoff-Ginsberg, 1991; Huang & Oi, 2001a, 2001b; Leech et al., 2018; Longobardi et al., 2022; Rondal, 1980; Tamis-LeMonda et al., 2019; Tulviste, 2001, 2003; Weizman & Snow, 2001), possibly due to the wide age range and the different durations of the meal. The studies by Brumark et al. (Brumark, 2006, 2010) focused on quantitative differences in parental communication with children with younger and older siblings and found contradicting results, with more utterances per minute found once in the older and once in the younger group.

Table 1
Summary of quantitative aspects of communication.

Mothers + fathers	• Wide range of: o Total amount of utterances o Total amount of words o Total amount of different words
Mothers vs. fathers	• Amount of speech: Mothers ↑ • Complexity of speech: Mothers ↑ • Variety of words: Mothers ↑
Mothers	• Greater range of maternal vocabulary/higher rate of verbal responsiveness in interaction with older children • Most used word categories: o Food words o Cooking and eating verbs o Naming of utensils

Studies that analyzed the communication of mothers and fathers separately suggest that mothers communicate more, in a more complex way, and with a greater variety of words with their children during mealtimes than fathers (Beals, 1993; Davidson & Snow, 1996; Liu et al., 2021; Rondal, 1980).

Mothers seemed to use more verbs than nouns and a broader range of words when milk feeding compared with solid feeding (Zimmerman et al., 2019). Bornstein et al. (1999) found a significant greater range of maternal vocabulary and a higher rate of verbal responsiveness when the children were 20 months of age compared to 13 months of age. Reissland and Snow (1996) were the only ones who investigated prosodic aspects of maternal communication in mealtime and play situations. This data showed a slight increase in the mean frequency of maternal speech with children's age, whereby mean length of utterances (MLU) and mean amplitude of maternal speech remained similar. However, these differences were not tested statistically. Observations of the same study population in a play situation resulted in same mean amplitude, however, fundamental frequency was found to be significantly higher at both ages and pitch range to be wider when speaking to children at 11 months, indicating that mothers use a change in pitch height to mark differences between situations (Reissland & Snow, 1996). Furthermore, food words, cooking and eating verbs together with the naming of utensils were the most frequently used word categories used by mothers during feeding (Tamis-LeMonda et al., 2019).

3.5. Qualitative language characteristics

In this review, qualitative language characteristics encompass all results related to the intention of the parental speech as well as type of

speech used by parents in mealtime situations (Table 2; Supplementary Material 2). In general, parents often seemed to be trying to motivate their children to eat (Hughes et al., 2011; Orrell-Valente et al., 2007), using predominantly neutral prompts (Edelson et al., 2016; Orrell-Valente et al., 2007). Parents were found to be prompting their children to eat more in occasions where children were confronted with unknown food (Edelson et al., 2016), and were using autonomy-supportive prompts (e.g. reasoning) more frequently than coercive-controlling prompts (e.g. food reward) (Fries et al., 2017). In food-related discussions during mealtimes, parents mainly referred to arguments of quantity (e.g. "at least a little more") and quality (e.g. "it is delicious"), while arguments appealing to the consistency of past behaviors (e.g. "you used to like it very much") and arguments of "expert" opinion (e.g. "This is the one Grandpa bought") were used less frequently (Bova, 2021; Bova & Arcidiacono, 2014). In regards to the latter argument, i.e. arguments of expert opinion, it was imperative that the child sees him or her as an expert, rather than any objective criteria of this status (Bova, 2021). In a study examining decontextualized speech in mealtime conversations, the most frequent type of input was about the past (Leech et al., 2018). Parents used verbal framing to distinguish between different contexts (Reissland, 1998). During feeding, parents used an instructional framework, i.e., where they directly told the child what to do, significantly more often than an interactional framework, i.e., where they indirectly tried to encourage the child to do something. This occurred independent of the children's age (Reissland, 1998). One study investigating gustatory "mmms" during mealtimes found that these most often occurred when the food was placed inside the child's mouth, as opposed to before or after (Wiggins, 2019). Parents seemed to regulate their younger children more frequently than their older children and adapted their use of direct and indirect regulation to the age of their children (Brumark, 2010). However, results regarding the aspect of direct and indirect verbal behavior were not consistent (Patton et al., 2004, 2008; Powers et al., 2005). Children's physical activity was the most frequent type of regulation used by parents (Brumark, 2006).

When directly comparing the behaviors of mothers and fathers, mothers seemed to participate in more explanatory talk and seemed to have more argumentative turns than fathers (Beals, 1993; Brumark, 2008; de Temple & Beals, 1991). Furthermore, mothers appeared more likely to encourage or discourage their children's eating behaviors when compared to fathers (Iannotti et al., 1994), as well as using more reasoning talk, albeit this type of speech was overall quite rare (Liu et al., 2021). These results are in line with findings of Orrell-Valente et al. (2007), who reported a higher average number of verbal parenting strategies during mealtimes by mothers compared to fathers. Moreover, mothers were found to initiate more topics and ask more questions than fathers during mealtime conversations (Davidson & Snow, 1996).

Concentrating on maternal communication specifically, more verbal encouragements to eat were observed than discouragements (Drucker et al., 1999; Mosli et al., 2015), while a low amount of restrictive behaviors were seen (Farrow et al., 2018; Palfreyman et al., 2015). In a study investigating mothers and their three-year-old children, a total of 12.5 feeding directed vocalizations per 10 min were observed, of which about one third were feeding directed prompts (MacDonald et al., 1997). Mothers were observed to use statements more often than directives or questions (Adi-Bensaid et al., 2022; Reissland et al., 1999). It was found that mothers made utterances mostly for promoting or maintaining communication with the child (Hoff-Ginsberg, 1991; Longobardi et al., 2022). Another research group focused specifically on maternal questions during mealtimes and found about 12–20% of the total utterances to be questions, with these being predominantly requests for information (Huang & Oi, 2001a; 2001b). In total, mothers seemed to use more non-aversive verbal behavior than aversive behavior during feeding (Berge et al., 2013; Morawska et al., 2014; Sanders et al., 1993, 1997), however, verbal pressure also appeared to be commonly used (Palfreyman et al., 2015; Rendall et al., 2022). In another study, verbal teaching and control was rated with 2.5 on a 9-point scale (Lindberg et al., 1996). Explicit negative verbal interactions during feeding appeared to occur only on low levels (Blissett et al., 2001). Mothers verbally regulated their children's physical activity more often than their children's attention or verbal activity (Tulviste & Raudsepp, 1997). Mothers' regulatory speech was primarily conversation-eliciting and in the form of behavioral directives (Tulviste, 2001, 2003). Compared to referential language, which provides or elicits information about objects or activities (Tamis-LeMonda et al., 2019), regulatory language was used on a lower level by mothers (Tamis-LeMonda et al., 2019). An analysis of parental gustatory *"mmms"* during mealtimes found that these expressions were mostly uttered alone and usually in the direct context of placing food in the child's mouth, whereby the parental eye gaze was focused on the child (Wiggins, 2019). Regarding total vocalizations during mealtimes, verbal interaction about things other than food and eating made up a much higher percentage of time than food and eating related communication (Singer et al., 1996).

One study was found which focused on the investigation of father's communication with their children during mealtime situations. This study found that positive statements were more frequently made by fathers than negative statements (Chatoor et al., 2022).

Table 2
Summary of qualitative aspects of communication.

Mothers + fathers	• A common behavior is to motivate the child to eat with neutral prompts. • More prompts by the confrontation with unknown food • Autonomy-supportive prompts > coercive-controlling prompts • Most frequently used type of arguments: arguments of quantity and quality • Instruction framework > interaction framework • Gustatory *"mmms"* occurred most often when the food was placed in the children's mouth • Children's physical activity was the most frequent type of regulation
Mothers vs. fathers	• Explanatory talk: Mothers ↑ • Argumentative turns: Mothers ↑ • Requests to eat or to stop eating: Mothers ↑ • Parenting strategies: Mothers ↑ • Questions, initiations of topics: Mothers ↑
Mothers	• Encouragements to eat > Discouragements to eat • Restrictions rarely reported • Statements > directives or questions • Utterances made mostly for promoting or maintaining the communication with the child • Non-aversive > aversive verbal behavior • Verbal pressure is commonly used • Regulation: children's physical activity > children's attention or verbal activity • Communication about food and eating was only a small part of total verbal interaction
Fathers	• Positive statements > negative statements

3.6. Modeling behavior

Seven studies examined parental modeling in eating situations (Costantini et al., 2018; Edelson et al., 2016; Hughes et al., 2011; Morawska et al., 2014; Palfreyman et al., 2015; Vacaru et al., 2022; Wiggins, 2019), see Table 3 and Supplementary Material 3. Maternal co-eating as well as parental mouth opening and closing seemed to be a widely used behavior while feeding children (Costantini et al., 2018;

Table 3
Summary of parental modeling.

Mothers + fathers	• Maternal chewing movements as well as mouth opening and closing during feeding appear to be common parental behaviors. • Verbal modeling is a frequently used parental behavior. • Modeling is more frequently used in situations with unknown food.

Vacaru et al., 2022). Verbal modeling comprising utterances related to food and eating behavior were also frequently found (Palfreyman et al., 2015). Other types of modeling were reported on lower levels. In a study conducted by Morawska et al. (2014), 10% of the participating mothers used modeling in feeding situations, which was labelled as a positive parenting strategy, however, no further explanation was given. Similarly, low rates of observed modeling behavior were reported by Hughes et al. (2011), who classified modeling as "parent takes seconds" and "enthusiastic modeling". Both behaviors occurred on average less than 0.5 times per meal (Hughes et al., 2011). These results are in line with those reported by Palfreyman et al. (2015), who observed unintentional maternal modeling less than once per meal, indicating that mothers were well aware of their modeling behaviors. Modeling occurred significantly more often during "new food" occasions, were children tasted unknown foods than during main meals (Edelson et al., 2016). A study that analyzed gustatory "*mmms*" of parents during mealtimes, defined modeling "*mmms*" as "the parents enact their own enjoyment of food" and found 21 modeling "*mmms*" distributed over 66 recorded mealtimes of five different families (Wiggins, 2019).

3.7. Communication and modeling during mealtimes in parents with EDs

Three studies included in this review investigated parents with EDs (Stein et al., 1994, 2001; Waugh & Bulik, 1999), see Supplementary materials 4. The first study by Stein et al. (1994) examined mothers and their infants aged 12–14 months, and found significant differences between mothers with and without EDs in terms of negative expressed emotions. Mothers with EDs were found to direct more critical, negative or denigratory expressions at their infants during mealtimes in comparison to mothers without EDs. However, no significant differences were found between the groups in regards to positive expressed emotions, including positive, affectionate or complimentary comments directed at the infant. Furthermore, mothers with and without EDs did not differentiate in their use of controlling statements during mealtimes or in the absolute amount of controlling and non-controlling statements used (Stein et al., 1994). Another study conducted by the same authors and the same ED group but a larger control group reported a significantly higher application of strong verbal control and a higher proportion of controlling to total statements in mothers with ED during meals and play, whereby no differences were found regarding gentle verbal control (Stein et al., 2001). However, no statistical tests were conducted for differences between the groups for the mealtime situation. Descriptively, mothers with EDs seemed to use more strong verbal control (e.g. commands or prohibits), and slightly less gentle verbal control (e.g. suggestions), whereas the controlling statements to total statements proportion appears to be similar in both groups (Stein et al., 2001). In contrast to Stein et al. (1994), Waugh and Bulik (1999) found a significantly lower use of positive eating comments in mothers with EDs compared to mothers of the control group during mealtimes. No differences in any other verbal behaviors were detected. However, mothers with EDs were less likely to eat with their child than mothers of the control group (Waugh & Bulik, 1999).

4. Discussion

The aim of this systematic review was to provide an overview of parental verbal communication strategies and modeling behaviors while interacting with their children during mealtimes, with a special emphasis being placed on the differences between families with and without a history of EDs.

Overall, parental communication patterns during mealtimes are diverse regarding frequency, variability and intention. Research on the communication of parents with a history of ED is currently scarce. However, negatively expressed emotions were found to be more frequent in mothers with EDs compared to mothers without ED history (Stein et al., 1994). A descriptive trend was also seen for more frequent use of strong verbal control among mothers with EDs in comparison to those without (Stein et al., 2001).

In general, parents often seemed to try to encourage their children to eat (Drucker et al., 1999; Hughes et al., 2011; Mosli et al., 2015; Orrell-Valente et al., 2007; Palfreyman et al., 2015; Rendall et al., 2022), especially in situations where children were confronted with unfamiliar foods (Edelson et al., 2016; Fries et al., 2017). Potential effects of such encouragements to eat on children's eating behaviors depends on *how* parents encourage their children, which is supported by previous self-report data (Norton et al., 2022). Encouraging children to eat with an authoritarian style was associated with a decrease in fruit and vegetable intake, whereby an "uninvolved style" had no effect on the intake (Norton et al., 2022). Furthermore, previous research reported that encouragement for a healthy diet including a variety of foods in childhood resulted in lower picky eating in adulthood, however, parental pressure to consume more foods was associated with higher levels of picky eating (Ellis et al., 2018). Parental pressure to eat has further been associated with lower intuitive eating in adulthood (Ellis et al., 2016) and increased eating disorder symptomatology in previous studies (Ellis et al., 2016; Peterson et al., 2007). Therefore, encouragements which are accompanied by parental pressure to eat might contribute to the development or maintenance of disordered eating in children and requires further investigation. Unfortunately, it was not possible to include a study that analyzed the encouragements to eat in families with a history of EDs, therefore comparisons between parents with and without EDs regarding encouragements to eat were not possible. The few studies included in this review reporting on verbal restriction found very low levels of restriction (Farrow et al., 2018; Palfreyman et al., 2015). This is a positive finding, regarding the results of a former study, in which girls' desire to be thinner and subsequent dieting behaviors were associated with parental encouragements to control weight (Thelen & Cormier, 1995), and from which we might assume that verbally expressed restriction can have the same effect. In the studies with families with ED history, restriction was not investigated separately, making it difficult to derive conclusions. Verbal modeling and co-eating seemed to be common behaviors (Costantini et al., 2018; Vacaru et al., 2022). Since the parents' mouth movement frequently occurred after the infant's mouth movement, this behavior may be to imitate the infant's actions rather than to model how the eating process works (Vacaru et al., 2022). The authors further consider that these mimicking behaviors may have the purpose of supporting the infant's learning of social mimicry and may either reinforce social belonging and smooth eating interactions, or else be used as a social reward for the enhancement of the desired eating behavior (Vacaru et al., 2022).

In a direct comparison of both parents, mothers communicated more, in a more complex way, and with a greater variation of words during mealtimes than fathers (Beals, 1993; Davidson & Snow, 1996; Liu et al., 2021; Rondal, 1980). Differences between maternal and paternal parenting styles have previously been reported. A recently published systematic review investigating this topic reported that mothers used an authoritative parenting style more often than fathers, whereas fathers seemed to exert an authoritarian parenting pattern more often than mothers (Yaffe, 2023). The authoritative parenting style is characterized by the simultaneous occurrence of high control while supporting the autonomy and independence of the child (Baumrind, 1971). These differences in parenting styles are partly reflected in the results of this review, as mothers were found to engage in more explanatory and reasoning talk and have more argumentative turns compared to fathers (Beals, 1993; Brumark, 2008; de Temple & Beals, 1991; Liu et al., 2021).

As stated above, parents' communication with their children during mealtimes in families with a history of EDs has hardly been investigated. Only three studies could be included in this review, in which only mother-child dyads were analyzed, making it difficult to derive general statements. Furthermore, despite the low number of studies, the reported results are somewhat contradictory. Nevertheless, the higher

frequency of expressed negative emotions found by Stein et al. (1994), the lack of positive comments in parents with ED found by Waugh and Bulik (1999), and the descriptive trend of mothers with EDs scoring higher on the measure of strong verbal control found by Stein et al. (2001) indicate a potentially negative impact of the ED on maternal communication. This trend is in line with the results of previous reviews which reported that parenting in general, as well as parental feeding behaviors may be influenced by parental EDs (Chapman et al., 2021), and that mothers with EDs seemed to exhibit more problems with feeding behaviors, starting with breastfeeding (Kaβ et al., 2021; Martini et al., 2020). It is also well conceivable that parental mealtime communication may have an effect on the development of eating difficulties such as the Avoidant Restrictive Food Intake Disorder (ARFID), however, as this is a relatively new ED diagnosis, there are currently very few studies that have investigated this interaction. Furthermore, it has been found that in families with children displaying disordered eating/feeding behaviors, parents have been reported to make more negative comments in regards to eating than parents of healthy children (Sanders et al., 1993), indicating that this type of behavior might be relevant for the reinforcement or maintenance of disordered eating habits in children.

4.1. Strengths and limitations of the present review

This review is the first to provide an overview of parental communication strategies and modeling behaviors in mealtime situations, and reflecting dysfunctional parent-child interactions as a key factor for adverse child developmental and psychopathology outcomes. Uncovering such dysfunctional interaction patterns may deliver crucial information for targeted prevention programs. Furthermore, by limiting the studies to those with direct mealtime observations, we were able to investigate both explicit and implicit parental communication, rather than relying on self-report questionnaire data. The presence of a video camera during such interactions is not necessarily a barrier to communication, nor does it automatically result in the production of a specific type of conversation (Speer & Hutchby, 2003). Further strengths of this review include the methodical procedure according to the PRISMA statement, as well as the inclusion of studies without a restriction regarding publication time.

However, several limitations must also be kept in mind. Due to the heterogeneity of the aspects of communication investigated in the included studies, many of the results are single findings and have yet to be replicated. Furthermore, although more than half of the included studies focused on parental communication, many of the reported results were not suitable for this review. This was due to a variety of reasons, such as the comparison of an index group with a control group, where we only could use the control group data. In other studies, communication was a secondary outcome or an incidental result of another analysis and was therefore often only reported descriptively and not discussed further. We decided to exclude studies that investigated parents with overweight or underweight as their mealtime communication may be impaired due to possible weight-related concerns. However, we cannot completely rule out that some of the samples in the included studies may have included parents with overweight or underweight and did not explicitly mention this. Lastly, it is important to mention that the coding of the data was done by the first author alone, so there remains a risk that information was overlooked.

4.1.1. Methodological considerations

Parental communication with their children during mealtimes is a broad field of research. Due to the multitude of aspects which may fall under the term "communication" (Krauss & Fussell, 1996, pp. 655–701), a limitation to verbal communication and modeling behaviors was chosen for this review. However, the aspects analyzed and reported results of the included studies nevertheless remained highly heterogenous. Most of the studies included used videotaped mealtime situations and relied on a rating of communication or modeling behaviors in mealtime situations, which has several advantages over self-report assessments. Direct observation of mealtimes is a complex and costly study design, but it provides a complementary approach to questionnaire data because it is possible to objectively record communication. However, the interpretation of the communication and interaction subject to a variety of subjective influences of the research team. In this context, it is noteworthy that only a minority of studies used validated assessment tools or rating schemes. Rondal (1980) stated, that most measures were simple counting procedures and therefore not required for reliability checks, an argument, which can be applied to many studies reporting quantitative aspects of communication. However, without the use of validated and reliable measurement tools, the reliability, interpretability and comparability of the results is limited and data should be interpreted with caution. A further point is that communication is not limited to verbal utterances and modeling behaviors, i.e., the aspects investigated in this review. Rather, non-verbal communications including facial expressions and gestures are other important aspects of interpersonal communication that should be further investigated. Although some studies reported the communication of mothers and fathers separately, the focus of research continues to be on mother-child rather than father-child interactions. Since paternal communication has been reported to affect the development of children's EDs (Dahill et al., 2023; Treasure, 2018) and the included studies demonstrated there to be significant differences in the communication of mothers and fathers, father-child communication during mealtimes should be more stringently included in future research.

5. Clinical implications of review findings

Overall, the research on communication in families with a history of ED is scarce and published studies date back several years. Therefore, the interpretability and transferability of those results is clearly limited. Looking at studies that examined healthy populations can provide important insights that may be applied to families with ED as both, preventive measure for their offspring or intervention, easing such potential stressful situation to affected individuals. In the working model of Arroyo et al. (2017) maternal commentary about weight and the modeling of disordered eating and weight control behaviors were identified as potential facilitators for disordered eating. Although the investigated aspects of communication in the studies included in this review differed from those included in the theoretical model and only initial indications have been found that communication in families with EDs differs compared to families without EDs, parental communication during mealtimes might be a potential mechanism in the transgenerational transmission of EDs. Furthermore, Arroyo et al. (2017) raised the question of how mothers can communicate to prevent the intergenerational transmission of EDs. The present review synthesizes evidence on parent-child communication and interaction from over 50 studies in healthy populations and hence outlines which quantitative and qualitative aspects are relevant during family meals and might therefore be important targets for both research and theoretical models on family influences on the regulation of eating behavior.

6. Conclusion and implication for further research

Providing an overview of parental communication in mealtime situations is an important contribution to the understanding of the development of children's eating behavior and potentially also the transgenerational transmission of EDs. The results of this review suggest that parents generally rely on a great variety of types of speech with different intentions during mealtime situations, and that differences exist between mothers and fathers. The data suggests that communication during mealtimes in families with ED history may be impaired and therefore might be a mechanism in the transmission of EDs, however, this is based on only three small studies. This review revealed a major

research gap with regard to communication in families with ED history. At the same time, our review outlines major fields of parent-child communication and modeling behavior around family meals which might be relevant to investigate and integrate into models of intergenerational transmission of eating behavior and disordered eating. The synthesized evidence in these fields for healthy populations represents a valuable starting point for research towards disordered eating behavior and weight regulation. Further research on parental communication in families with ED history is strongly needed to shed light on possible influences and to reduce family burden associated with EDs.

Pre-registration/Protocol

The systematic review protocol was registered on the PROSPERO international prospective register of systematic reviews (ID: CRD42023436840).

Ethical statement

Ethical approval was not required for this research as it is based on published literature. The protocol for the systematic search was registered on PROSPERO (https://www.crd.york.ac.uk/prospero/, ID: CRD42023436840).

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CRediT authorship contribution statement

Jana Katharina Throm: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Denise Schilling:** Writing – review & editing, Methodology, Formal analysis. **Johanna Löchner:** Writing – review & editing. **Nadia Micali:** Writing – review & editing. **Annica Franziska Dörsam:** Writing – review & editing. **Katrin Elisabeth Giel:** Writing – review & editing, Supervision, Methodology, Conceptualization.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article to disclose.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.appet.2024.107584.

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Affective Dimensions in Maternal Voice During Child Feeding in Mothers With and Without Eating Disorder History—Findings From a Machine Learning Analysis of Speech Data

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ABSTRACT

Objective: Eating disorder (ED) history may impact mother-child communication during mealtimes and contribute to transgenerational transmission of ED. This study employed machine learning (ML) to identify speech characteristics during mother-child feeding interactions, aiming for investigating whether vocalised affective characteristics differ between mothers with and without ED history when feeding their child.

Method: Mothers with (n = 17) and without ED history (n = 27) and their children (10 months) were filmed at home during mealtime. Various ML models were exploratively tested to assess their suitability for analysing maternal voice data. Diagnosis of an ED history was based on the structured Eating Disorder Examination Interview.

Results: A ML model specialised for the prediction of emotional arousal, valence and dominance provided the most pronounced differences between the groups. These variables were consistently stronger expressed in the voices of mothers with ED history during child feeding, predominantly in the middle of the interaction.

Conclusions: Voice data suggests that mothers with ED history might be emotionally stronger involved throughout child feeding. This indicates that there are differences in communication between women with and without ED history and highlights the importance of research into maternal communication in affected families. ML approaches are promising tools as they can detect more subtle nuances compared to questionnaires.

Highlights

- Differences in affective dimensions of the voices of mothers with and without ED history were found, highlighting the need for further research to explore the role of communication in the transmission of ED.
- Mothers with ED history expressed stronger emotionality in their voices throughout child feeding, with 'emotional hotspots' generally occurring in the middle of the feeding interaction.
- ML approaches are promising tools as they can detect more subtle nuances compared to questionnaires.

1 | Introduction

Eating disorders (ED) such as anorexia nervosa (AN), bulimia nervosa (BN) and binge-eating disorder (BED) are serious and complex mental disorders which may transmit to following generations (Bould et al. 2015). Maternal ED are associated with problematic feeding behaviour, difficulties in children's cognitive development, and a higher risk of mental disorders in the offspring (Martini et al. 2020; Watson et al. 2018). Furthermore, numerous studies reported an increased risk for the development of ED in children of affected mothers (Bould et al. 2015; Lydecker and Grilo 2017; Ziobrowski et al. 2019), with both, genetic and environmental factors as potential underlying mechanisms (Martini et al. 2020).

In recent years, there has been increasing interest in the role of communication in the intergenerational transmission of disordered eating (Arroyo et al. 2017; Oliveira et al. 2019). A cross-sectional study was conducted to investigate the relationship between current eating behaviour of women (aged 18–40 years) and early caregiver eating messages (Oliveira et al. 2019). Correlation analysis indicated a significant association between the recall of restrictive/critical caregiver eating messages and disordered eating (Oliveira et al. 2019). Furthermore, maternal commentary about weight and size was found to be a significant mechanism for the transmission of EDs in a three generation study (Arroyo et al. 2017). Parent-child interaction was further found to be severely affected in parents with depression and a key aspect in the transition of depression for example long-term effects of risk and resilience factors in families with children aged 0–3 in a representative sample (Dubber et al. 2015). However, there is little evidence on the impact of maternal ED history on mother-child communication during mealtimes, therefore, a major research gap remains regarding this issue (Chapman et al. 2021; Throm, Schilling, et al. 2024).

Outside the mealtime context, one study reported that maternal AN diagnosis was associated with emotionally unmatched flat mother-child dialogues lacking involvement and interest of mothers and children (Cimino et al. 2020). Furthermore, mothers with ED history were reported to use more verbal control in the interaction with their children during play and mealtime (Stein et al. 1994, 2001). Most of the few studies investigating verbal mother-child mealtime communication in mothers with ED history date back to the 1990ies and report more negative expressed emotion toward their infants (Stein et al. 1994) and fewer positive comments about food and eating (Waugh and Bulik 1999) compared to controls. However, in a more recent study by our group, we found negligible interaction differences between mothers with and without during child feeding, relying on a structured coding scheme (Doersam et al. 2024).

Previous analyses of speech in persons with ED were mainly based on simple counting or rating procedures and bear the risk of subjective judgement. In contrast, using technology-supported digital analysis approaches may help to overcome these difficulties and greatly expand the possibilities for the analysis of speech data. Automated identification of diseases using artificial intelligence on speech data is rapidly emerging in recent years (Milling, Pokorny, et al. 2022; Berardi et al. 2023). Beyond ED, the analysis of emotional states - including emotional dimensions such as valence, arousal, and dominance - has raised a fair amount of interest for investigating aspects of mental disorders, such as depression or autism, especially in computationally-aided approaches (Valstar and et al. 2013; Milling, Baird, et al. 2022). By modelling data using machine learning (ML) approaches, it may be possible to detect differences in speech, that remain hidden using other analysis methods. ML has been previously used in the context of EDs, with promising outcomes regarding the ability to predict ED status and the forecast of symptom progression (Fardouly et al. 2022; Levinson et al. 2023). Therefore, applying ML approaches on videotaped mealtime situations of mother-child dyads with and without maternal ED history may allow to draw further conclusions on the impact of communication on adverse child outcomes in families with ED history.

The main objective of this study was to investigate the possibility of distinguishing mothers with and without an ED history based on their voice recordings during a videotaped feeding situation with their child. This was achieved through exploratory testing of different ML models, which analysed the voices of mothers including the dimensions of valence, arousal and dominance.

1. We hypothesised that mothers with ED history can be distinguished from mothers without ED history through ML voice analysis during child feeding at the end of the first year postpartum.
2. Furthermore, we hypothesised that mothers with ED history would differ from mothers without ED history regarding emotional dimensions in maternal voice during child feeding at the end of the first year postpartum.

2 | Method

2.1 | Study Design and Participants

The data used in this study stem from the EMKIE study (Doersam et al. 2024, 2022; Dörsam et al. 2022; Throm, Dörsam, et al. 2024), a family cohort study conducted at the Department of Psychosomatic Medicine and Psychotherapy at the Medical University Hospital Tübingen. The EMKIE study assesses the influence of maternal ED on offspring and the family system

from late pregnancy (≥ 28th week of pregnancy) until 42 months postpartum, distributed over four measurement points. An overview of the EMKIE study procedure is provided in Figure 1.

Women with and without ED history according to DSM-5 criteria, including AN, BN, BED and other specified feeding or eating disorder (OSFED), and their partners were recruited in pregnancy between 2018 and 2022. ED history was evaluated with the Eating Disorder Examination-Interview (EDE) (Hilbert and Tuschen-Caffier 2016) administered in late pregnancy by a trained staff member, using an adapted version for the assessment of previous ED. Inclusion criteria were an age between 18 and 40 years, an inconspicuous singleton pregnancy and birth and sufficient German language skills. Women with a severe medical illness that require acute treatment and make study participation difficult or impossible were excluded. Exclusion criteria on the child's part comprised chromosomal abnormalities, congenital infections and severe perinatal complications. Recruitment was carried out using announcements in parenting magazines, e-mails in the university and clinic mailing list, flyers at gynaecologist's offices, and contacting former ED patients treated at the University Hospital Clinic.

2.2 | Procedures

This paper focuses on data from assessment 3 of the EMKIE study, which was conducted between eight and 12 months postpartum. A study member visited the families in their homes at the child's regular mealtime. Prior to the meal, time was scheduled to complete questionnaires. This was to allow the child and the mother to become acquainted with the situation and the presence of the study staff, thereby reducing potential behavioural biases during the filming of the meal. Following this brief period of acclimatization, the feeding interactions of the mother-infant dyads were recorded using a smartphone mounted on a tripod positioned on the table. There were no guidelines on the type of food or how the mother should feed her child. During the mealtime, the study member left the room where possible, in order to minimise distractions and ensure that the situation was as natural as possible. The filming continued until the mother announced the end of the meal. Some families recorded a meal by themselves, as in some cases, a home visit was not possible due to corona restrictions or due to long travel distances. Furthermore, the mothers were required to complete online questionnaires regarding their eating behaviours, perceived stress, and depressive symptoms. Further details on the longitudinal results of the questionnaires can be found elsewhere (Throm, Dörsam, et al. 2024).

2.3 | Measures

Eating Disorder Examination-Questionnaire. The German Version of the Eating Disorder Examination-Questionnaire (EDE-Q) was used to assess severity of ED psychopathology (Hilbert, Tuschen-Caffier, et al. 2016). The four subscales *Restraint, Eating Concern, Weight Concern and Shape Concern* with a total of 22 items ascertain the intensity of ED psychopathology of the last 28 days. Six further items record diagnostically relevant behaviour. Frequencies and intensity of ED-specific characteristics are rated on seven-point Likert-scales. Higher scores represent more severe ED psychopathology. Internal consistency is high ($\alpha \leq 0.97$) and the questionnaire is sensitive to change (Hilbert, Tuschen-Caffier, et al. 2016).

Perceived Stress Scale. A German Version (Klein et al. 2016) of the Perceived Stress Scale (PSS10) (Cohen et al. 1983) was used to measure participants' perceived stress. The 10-item self-report scale indicates the level of subjective stress of the last month, measured on 5-point Likert-scales ranging from 0 (never) to 4

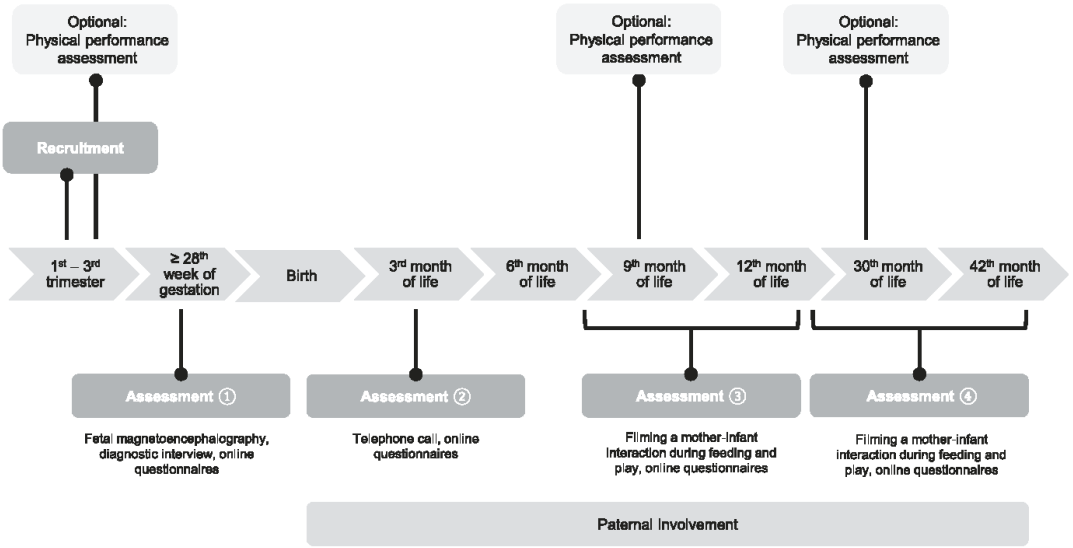

FIGURE 1 | EMKIE study procedure (Doersam et al. 2024).

(very often). The German Version demonstrated good internal consistency ($\alpha = 0.84$) and construct validity (Klein et al. 2016).

Patient Health Questionnaire-9. The depression module of the Patient Health Questionnaire (PHQ-D) was applied to screen for depressive symptomatology (Löwe and et al. 2001). Each of the nine items is scored on a four-point Likert-scale. The score varies from 0 to 27, with a score lower than 5 indicating the absence of a depressive disorder (Löwe and et al. 2001). The PHQ-D has been reported to have excellent criterion validity and good internal consistency for depressive disorders ($\alpha = 0.88$) (Gräfe et al. 2004).

At study inclusion, the women completed a self-report questionnaire to assess maternal sociodemographic data. Further information regarding pregnancy were extracted from the medical record of prenatal and natal care.

2.4 | Ethics

This study was approved by the ethics committee of the medical faculty of the Eberhard-Karls-University and the University Hospital Tübingen (219/2018BO1; 859/2021BO2). All study participants analysed in this study provided written informed consent.

2.5 | Statistical Analysis

IMB SPSS Statistics for Windows, Version 28.0 was used for statistical analysis. Fisher's exact test was used to assess intergroup differences in nominal data. Metric data was checked for normal distribution and intergroup differences calculated with Student's *t*-test and Mann-Whitney-*U*-test, depending on the result. Level of significance was defined as $p < 0.05$. Analysis of variance (ANOVA) was used to assess group differences with regard to the emotional dimensions.

2.6 | Video Data Analysis With Machine Learning Approaches

The main goal of our ML analyses was the attempt to train a classifier that can distinguish between individuals with and without ED, solely based on their voice recordings. Therefore, we first resampled the raw audio signal before applying SpeechBrain (Ravanelli et al. 2021) in order to detect speech and remove non-speech segments like silence or ambient noise from the audio. This allowed us to automatically segment the data into *utterances*—segments of continuous speech without (long) pauses. These utterances formed our units of analyses, that is, the 'instances' over which the following feature extraction steps and ML algorithms were performed. Overall, we used two different procedures for extracting features over each utterance:

a. *Rolling-window features*, where the features were extracted over overlapping windows. This means that for an input utterance of duration X and a window 'hop' of Y, voice parameters were extracted X/Y times. This process is further outlined in (Miranda and et al. 2022).
b. *Utterance-level features*, where the features were extracted over the entire utterances. This means that for an input utterance of duration X, voice parameters were extracted once for the entire duration X of the audio. This is a standard process that has been used in multiple previous works for speech analysis.

For (a), we extracted the extended Geneva Minimalistic Acoustic Parameter Set (eGeMAPS), a standardized expert-selected set of 88 acoustic high level descriptors (Eyben et al. 2015) and the Mel frequency cepstral coefficients (MFCCs), a representation of the short-term energy spectrum on the human-hearing-inspired Mel-scale (Davis and Mermelstein 1980). eGeMAPS, in particular, has proven to be very effective on a variety of voice-based tasks (Triantafyllopoulos et al. 2023), such as depression (Milling, Pokorny, et al. 2022; Gerczuk et al. 2023), PTSD (Kathan et al. 2023), or stress (Baird et al. 2021).

For (b), we extracted eGeMAPS as well as learnt representations from large, pretrained deep neural networks. Specifically, we utilised models derived from the state-of-the-art wav2vec2.0 architecture (Baevski and et al. 2020), namely w2v2-large, a model trained on a large English dataset, and w2v2-emo (Wagner et al. 2023), a variant of w2v2-large which was further fine-tuned to predict arousal, valence, and dominance on a large, speech emotion recognition dataset in a normalised range from 0 to one in each emotional dimension. For the last model in particular, we experimented both with its intermediate representations (w2v2-emo-emb) and its output predictions (w2v2-emo-avd), the latter having the added benefit of being *interpretable* as proxies for emotional arousal, valence, and dominance.

Finally, for the ML steps of the training, we applied random forests (RFs) and support vector machines (SVMs) to find decision boundaries between the two classes. The individuals of the study were separated into 5 subject-independent folds, which were balanced with respect to eating disorder condition and control group. In other words, all data of each of the 44 subjects was assigned to one of the five folds, leading roughly nine subjects per fold, of which roughly 4 subjects were from the ED group. Based on these splits, we ran a nested 5-fold cross-validation, that is, we trained our models on 4 folds, while testing it on the held-out fold. During training, one of the four folds was additionally held out, based on which the hyperparameters of the respective model were optimised.

The models were trained on the total sum of instances in each training fold. This was equivalent to the number of utterances in each video (as we extracted one feature vector per utterance). However, the ground truth was available on the speaker level. This means we were able to treat the independent predictions obtained over all instances in a video as a *bag of predictions* which needed to be aggregated to provide one final, speaker-level prediction, that is, we applied majority voting across the sample level predictions to obtain one prediction per speaker.

For our evaluation, we used the unweighted average recall (UAR; the average recall for each class; also referred to as *balanced*

accuracy in literature). This we computed both on the instance-level (UAR_I) and the speaker-level (UAR_{SP}). See Kathan et al. (2023) for more details on this process.

3 | Results

3.1 | Sample Characteristics

A total of 44 mother-child dyads were analysed in this study. $n = 17$ women had a history of ED (AN = 12, BN = 2, OSFED = 3) while $n = 27$ served as control group. At study inclusion, 10 women of the ED group had an active ED, while seven were remitted for an average of 9.71 ± 3.09 years. There were no differences between the groups regarding sociodemographic variables (Table 1). However, mothers with ED history reported significantly higher ED psychopathology ($Z = -4.255$; $r = 0.64$; $p < 0.001$), with Shape Concern being the most pronounced ED symptom. Moreover, women with ED history had significantly higher depression scores (PHQ-9: $Z = -2.596$, $r = 0.39$, $p = 0.009$). There were no differences between the children of the two groups regarding age, birth weight and weight at 10 months (Table 1). For our machine learning analysis, we detected and analysed overall a total of 4528 utterances, lasting a total of 6.78 h, the majority of which resulting from the control group with 4.37 h, and the ED group only contributing 2.41 h in utterance length, which closely reflects the subject ratio between the two groups.

3.2 | Machine Learning Analysis

The ML results for all experiments are reported in Table 2 in terms of the UAR, with the mean (and 95% CI) over the five folds. We first observed that speech features extracted over a rolling window resulted in chance-level performance (50%, Table 2). This indicated on the one hand that audio features struggled to obtain good performance, and that further segmenting individual utterances with rolling windows resulted in worse performance for this task. As hyperparameters were optimised per fold on the corresponding validation set, the specific settings are not further reported in the results.

Speech features extracted over the entire utterance resulted in moderately better performance—at least exceeding chance-level.

TABLE 1 | Maternal and child characteristics.

	Total sample		ED		HC		ES	
	%	*n*	%	*n*	%	*n*	*p* value	*Φ*
Maternal characteristics								
Nullipara	61.4	27	58.8	10	63.0	17	1.000[c]	0.04
German nationality	93.2	41	100.0	17	88.9	24	0.272[c]	0.22
University degree	75.0	33	70.6	12	77.8	21	0.724[c]	−0.08
In a relationship	95.5	42	88.2	15	100.0	27	0.144[c]	0.28
Family income ≥ 4000	59.1	26	47.1	8	66.7	18	0.225[c]	0.19
	M ± SD	*N*	*M* ± SD	*n*	*M* ± SD	*n*	*p* value	*d/r*
Age (years)	31.32 ± 4.34	44	32.06 ± 4.10	17	30.85 ± 4.50	27	0.375[a]	0.28
BMI (kg/m^2)	21.54 ± 2.86	43	21.03 ± 3.06	16	21.84 ± 2.75	27	0.375[a]	0.28
EDE-Q								
Restraint	0.91 ± 1.37	44	1.91 ± 1.75	17	0.28 ± 0.40	27	**< 0.001**[b]	0.51
Eating concern	0.34 ± 0.57	44	0.73 ± 0.75	17	0.10 ± 0.15	27	**< 0.001**[b]	0.58
Weight concern	0.98 ± 1.25	44	1.95 ± 1.52	17	0.36 ± 0.42	27	**< 0.001**[b]	0.62
Shape concern	1.32 ± 1.33	44	2.36 ± 1.49	17	0.66 ± 0.64	27	**< 0.001**[b]	0.57
Total score	0.89 ± 1.00	44	1.74 ± 1.13	17	0.35 ± 0.28	27	**< 0.001**[b]	0.64
PHQ-9	6.77 ± 4.69	44	9.35 ± 5.35	17	5.15 ± 3.41	27	**0.009**[b]	0.39
PSS10	15.61 ± 7.01	44	17.00 ± 6.88	17	14.74 ± 7.07	27	0.303[a]	0.32
Child characteristics								
Age (months)	10.30 ± 0.46	43	10.21 ± 0.21	16	10.35 ± 0.56	27	0.220[a]	0.32
Birth weight (kg)	3.42 ± 0.46	44	3.31 ± 0.47	17	3.50 ± 0.45	27	0.228[b]	0.18
Weight at 10 months (kg)	9.69 ± 1.40	44	9.52 ± 1.46	17	9.80 ± 1.39	27	0.531[a]	0.20

Note: Data presented as mean (*M*) ± standard deviation (SD). Bold values indicate $p < 0.05$.
Abbreviations: BMI, body mass index; ED, eating disorder group; EDE-Q, eating disorder examination questionnaire; HC, healthy control group; PHQ-9, Patient Health Questionnaire-9; PSS10, Perceived Stress Scale.
[a]Student's *t*-Test.
[b]Mann-Whitney-U-Test.
[c]Fisher's Exact Test.

TABLE 2 | ML results with 95% CI for speech parameters.

Features	UAR_I [%]	UAR_{SP} [%]
eGeMAPS [rolling]	50 [50; 50]	50 [50; 50]
MFCC [rolling]	46 [46; 47]	51 [45; 59]
eGeMAPS [utterance]	51 [50; 52]	50 [50; 50]
w2v2-large	53 [52; 55]	58 [42; 73]
w2v2-emo-emb	51 [50; 53]	56 [41; 71]
w2v2-emo-avd	57 [55; 57]	59 [46; 70]

Note: Data presented as mean (*M*) results with 95% CI for a subject-independent 5-fold cross-validation. Note that we did hyperparameter and classifier selection based on the development set on a fold-level, which may lead to different settings being selected across folds.
Abbreviations: eGeMAPS, extended Geneva Minimalistic Acoustic Parameter Set; MFCC, Mel frequency cepstral coefficients; UAR_I, unweighted average recall, instance-level; UAR_{SP}, unweighted average recall, speaker-level.

This was particularly true for learnt representations from w2v2 models, with the best performance of 59% obtained using the output predictions of w2v2-emo (Table 2).

Given that w2v2-emo-avd yielded the best results (though only marginally better than w2v2-large), we proceeded to visualise the predictions of arousal, valence, and dominance for all participants in Figure 2. Specifically, we visualised the mean and 95% confidence intervals obtained with bootstrapping. Furthermore, these figures illustrated the AVD values for percentiles of video duration—for example, the 10^{th} percentile corresponded to the utterances that were recorded in the beginning 10% of the video. This allowed us to compare AVD values in time for videos of different duration.

The curves reveal interesting trends (Figure 2). First of all, we noted that the group of ED participants shows slightly higher arousal, valence, and dominance, throughout the feeding situation, with arousal and dominance showing larger differences than valence. However, statistical significance ($p < 0.05$) according to an analysis of variance (ANOVA) can only be reported for all emotional dimensions for the percentile 50 and for arousal and dominance for the percentile 60 and 100. All three dimensions hovered around neutral and tended to lean negative. Moreover, all three variables peaked in the middle of the interaction, with the peak being more pronounced for the ED group than the control (on average, this occurred approx. 6 min after the beginning of each video). In this stage, the separation between the two groups was at its highest, with no overlap in the confidence intervals.

4 | Discussion

This study employed deep learning techniques to analyse maternal voice data, with a particular focus on affective dimensions in maternal speech during feeding situations in mothers with and without ED history and their children. While it was not possible to distinguish the groups based on the speech features, we found that maternal arousal, valence, and dominance were consistently stronger expressed in the voices of mothers of the ED group throughout the feeding situations, with statistical significance for all emotional dimensions for the percentile 50 and for arousal and dominance for the percentile 60 and 100. However, despite elevated arousal levels observed in the voices of the ED group, they maintained a neutral state, whereas the HC group demonstrated a tendency toward inactivity. Analogous outcomes as for arousal were observed for dominance. Concurrently, both groups showed a general inclination towards negative valence. Furthermore, a peak was observed in all three affective variables in the middle of the feeding interaction, with the peak being more pronounced for the ED group than the control group.

Arousal spans from a state of sleep, through varying levels of drowsiness and alertness, to intense excitement at the other extreme (Russell and Mehrabian 1977). Higher levels of arousal are indicative of a heightened level of activation, which may be associated with positive emotions such as happiness, but could also be indicative of negative emotions such as fear or anger (Gangamohan et al. 2019). In general, elevated levels of arousal suggest that the person perceives a situation as more stimulating or stressful. As has been previously reported in the literature, mealtimes in families with EDs are often problematic and characterised by conflict (Chapman et al. 2021). This suggests the possibility that heightened levels of arousal may be attributable to negative emotions experienced. Furthermore, this would align with data previously reported from our sample, showing considerable psychopathology in the ED group and difficulties in adjustment (Throm, Dörsam, et al. 2024). However, we did not find significant differences in the subjective stress scores as assessed by the PSS between the two groups. Further, when the elevated arousal scores are considered alongside the higher levels of valence, which reflects an individual's perception of pleasantness or unpleasantness (Stasak and et al. 2016), the findings rather suggest that mothers with ED history perceive the feeding situation as more positive and pleasant than mothers in the control group. Although this contradicts what we expected, it fits with a result found in a recent analysis of observational feeding data of a subsample of the EMKIE study by our group, which did not fully overlap with the sample in the present study. That study found that the quality of mother-child interaction during feeding was not affected by ED psychopathology and that mothers in the control group made significantly more negative statements about their infant's food intake or preferences and were more concerned about mess during the feeding than mothers with ED history (Doersam et al. 2024). The authors concluded that the mother's concern about transmitting their disordered eating might be an explanation for those findings, in the form of an overcompensation and an attempt to achieve 'optimal' performance during feeding interactions (Doersam et al. 2024), which may be also applicable for the findings of the present study. It is important to note that despite having higher levels compared to mothers in the HC group, mothers in the ED group maintained within a 'normal' range of arousal. Both groups showed an inclination towards negative valence, a tendency that was more evident among the mothers in the HC group. This finding indicates that, despite exhibiting higher valence levels compared to those without ED, mothers in the ED group still perceived the situation as uncomfortable.

We refrained from interpreting the findings regarding dominance, as our analysis demonstrated a strong correlation with arousal. This finding indicates that the model may lack the

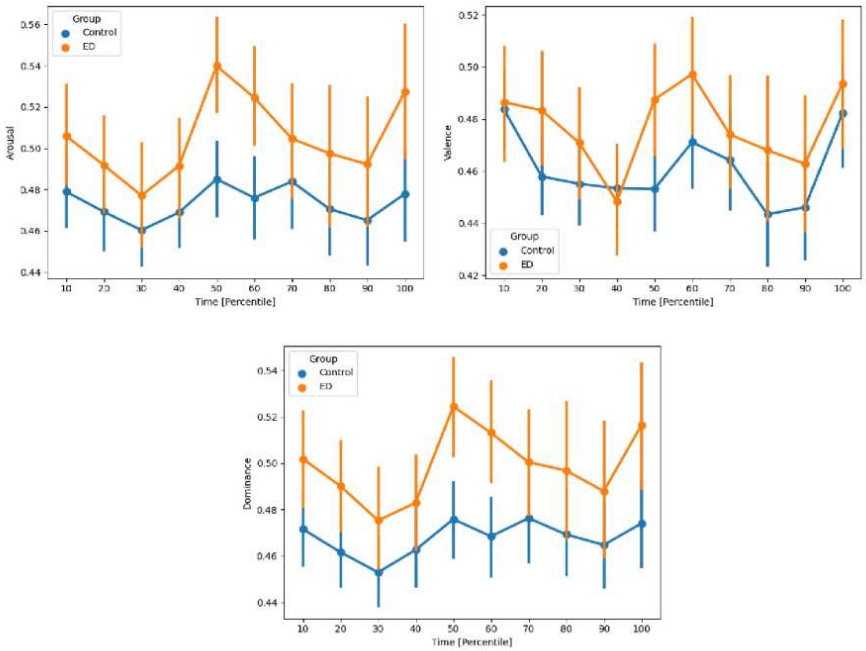

FIGURE 2 | Arousal, valence and dominance in maternal speech throughout the videos.

capacity to differentiate between dominance and arousal, thereby precluding further conclusions regarding the dimension dominance.

Linking emotional dimensions to categoric dimensions is difficult, as mapping is not constant. However, a tentative explanation for the higher levels of arousal and valence in voices of mothers with ED history might also be attributed to their greater overall emotional involvement in the situation. As eating is a core component of eating disorders (Treasure et al. 2012), mealtimes can be emotionally significant experiences, potentially exerting a considerable influence on individuals currently or formerly affected by eating disorders. For mothers in the control group, mealtimes may be more unencumbered events that are of lesser importance than for women with ED, which may have resulted in lower emotional involvement or an emotional state of boredom. However, this has to be tested in further studies.

The peak in arousal and valence, with significant differences between the groups, shows that the interactions between mother-child dyads exhibit 'emotional hotspots' that are clustered in the middle of the feeding interaction. It is possible that the mothers became accustomed to the unfamiliar situation of being filmed during mealtimes and may experience a sense of relief if the child is eating well, thereby enhancing the overall pleasantness of the situation. As time progresses, the children's appetite may diminishes, and they become more engaged with other activities than the food itself, impeding the eating situation with the result of reduced valence levels.

Reasons for the different results across ML approaches may lie in the way they process the data. While the models based on the traditional feature extraction methods (MFCC and eGeMAPS) are tasked to learn differences in the patterns solely from the comparatively small data set of our study, wav2vec is an already trained deep learning model that benefits from a large data basis, promising to leverage information through a rich emotional representation.

5 | Strengths and Limitations

The main strength of this study is the pioneering use of ML approaches for the analysis of maternal voice in mealtime situations in families with and without ED history. This enables an objective evaluation in real time and minimises the risk of subjective judgement. Furthermore, the use of videotaped observations as a data source is advantageous over written texts as it captures spontaneous communication in a more authentic manner.

Nevertheless, some limitations have to be considered in the context of our results. Despite the amount of data being comparable to that of similar explorative analyses for voice patterns related to diseases and disorders, it is possible that patterns do exist, but are subtler, such that more data would be necessary to successfully train the ML algorithms or that the differences could only be discovered with different types of features or ML algorithms. Furthermore, the unstructured nature of the recording sessions and the general audio quality pose additional challenges to the ML experiments and thus might limit the expressiveness of the results. Finally, we note that any interpretation of AVD values is *tentative*. These are not variables

annotated by human raters (or self-reported by the subject themselves). Rather, they are predicted by an ML model trained on such data on one dataset (Wagner et al. 2023). This model necessarily inherits the biases present in that data, which potentially include, among others, biases with respect to gender, ethnicity, recording conditions, and the demographics of the raters used to annotate it. A further downside of the model is that it relies on linguistic information for its valence predictions (Triantafyllopoulos and et al. 2022). Given that it was trained on English data and the data in this study is German, there is a high degree of unreliability regarding this variable in particular. Nevertheless, we expect these errors to be systematic, that is the trend of the errors is consistent across all speakers and utterances. The observed differences across the groups may therefore indicate an underlying effect, even though the raw scores should be interpreted with more caution. A similarly performing model solely focused on the German language might overcome such limitations but is currently not available in literature. General limitations regarding the EMKIE study have been described elsewhere (Doersam et al. 2024).

6 | Conclusions and Implications for Further Research

Although it was not possible to distinguish women with and without ED history on the basis of speech features, ML models revealed differences in the emotionality in mothers' voices during mealtimes with their children in women with and without ED history. Women with ED history were found to be more emotionally involved in the feeding situation, with arousal, valence, and dominance being consistently stronger expressed in the voices of those mothers. The middle of the mealtime situation seems to be an 'emotional hotspot' in mother-child mealtime interaction, independent of ED diagnosis. The findings of this study highlight the importance of research into maternal communication in families with ED history, as differences in the affective dimensions in the maternal voices during feeding were found. This may be a mechanism in the transgenerational transmission of the disorder. The use of ML approaches is promising as they may detect more subtle nuances as compared to rating schemes or self-report. Clinical implications of our findings include targeted preventive interventions focussing on mothers-to-be with ED and their children as particular risk groups for the development of mental health burden.

Author Contributions

Jana Katharina Throm: conceptualization, formal analysis, investigation, writing – original draft, writing – review and editing, visualization, project administration. **Manuel Milling:** conceptualization, methodology, formal analysis, writing – original draft, writing – review and editing, visualization. **Andreas Triantafyllopoulos:** conceptualization, methodology, formal analysis, writing – original draft, writing – review and editing, visualization. **Alexander Kathan:** conceptualization, methodology, formal analysis, writing – original draft, writing – review and editing, visualization. **Annica Franziska Dörsam:** investigation, writing – review and editing, project administration, funding acquisition. **Johanna Löchner:** conceptualization, writing – review and editing. **Björn Schuller:** conceptualization, methodology, writing – review and editing, supervision. **Katrin Elisabeth Giel:** conceptualization, writing – review and editing, supervision, project administration, funding acquisition.

Ethics Statement

This study was approved by the ethics committee of the medical faculty of the Eberhard-Karls-University and the University Hospital Tübingen (219/2018BO1; 859/2021BO2).

Consent

All study participants analysed in this study provided written informed consent.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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BRIEF REPORT OPEN ACCESS

Dyadic Psychopathology and Adjustment to Parenthood in Families With and Without Eating Disorder History—Findings From a Longitudinal Study

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ABSTRACT

Objective: Transition to parenthood is a vulnerable period for individual health and partnership quality. This study investigated parental health and partnership after childbirth in families with and without maternal eating disorder (ED) history. We report longitudinal data on parental ED psychopathology, depressive symptoms, and adjustment, including dyadic associations.

Method: Data derived from the prospective multi-method cohort study EMKIE. Women with ($n = 24$) and without ($n = 33$) ED history and their partners took part from late pregnancy to 10 months postpartum and completed the Eating Disorder Examination Questionnaire, the Patient Health Questionnaire, and the Maternal Adjustment and Maternal Attitudes Questionnaire or the paternal equivalent.

Results: ED psychopathology increased in mothers in both groups. Mothers in the ED group had more severe ED psychopathology, higher depression scores, and lower levels of adjustment to motherhood compared to the control group across all measurement points. No group differences emerged between partners, but ED psychopathology increased in partners of women with ED history over time. A negative correlation between maternal ED severity and paternal adjustment was observed in the ED group.

Discussion: After childbirth, mothers with ED history experienced mental health deterioration and adjustment difficulties and fathers struggled with paternal adjustment if their partner was affected by severe ED symptoms. These results emphasize the need for close monitoring and consistent care of women with ED during this vulnerable period and highlight adjustment needs of partners of severely affected women. Further qualitative approaches are needed to deepen the knowledge of paternal experiences during this period.

Summary

- In families with maternal ED history, transition to parenthood is characterized by an increased burden in terms of mothers experiencing mental health deterioration and adjustment difficulties and fathers struggling with paternal adjustment if their partner is affected by severe ED symptoms.
- The paternal role may also be supportive in the family system affected by ED history.
- Couples with ED history may need more support during the vulnerable period after childbirth.

1 | Introduction

Transition to parenthood is a special time in couples' lives, associated with a decline in relationship functioning (Doss and Rhoades 2017), changes in parental eating behavior (e.g., skipping meals, irregular eating) (Versele et al. 2021) and risk of mental health deterioration (Smythe, Petersen, and Schartau 2022).

A history of eating disorders (ED) adds an additional burden and intensifies the typical challenges associated with the transition to parenthood (Sadeh-Sharvit et al. 2020). ED psychopathology has been reported to increase during the postpartum period, especially in women with anorexia nervosa (AN) and bulimia nervosa (BN) and rates of postpartum depression are higher in women with ED than in the general population (Astrachan-Fletcher et al. 2008; Makino, Yasushi, and Tsutsui 2020). Koubaa, Hällström, and Hirschberg (2008) found that mothers with a history of AN or BN before pregnancy had lower maternal adjustment 3 months after delivery than mothers without ED history. Furthermore, couples with ED history reported decreased relationship satisfaction (Dick et al. 2013), which may be exacerbated in the postpartum period. Qualitative studies with partners of individuals with ED provide consistent evidence of overwhelming feelings and psychosocial distress in general (Batchelor et al. 2022; Linville et al. 2016; O'Connor, Daly, and Higgins 2019; Schmit and Bell 2017). However, no study yet investigated the mental health outcomes in partners of women with ED history in the vulnerable period of transition to parenthood.

This study investigated parental mental health and dyadic partnership in families with and without maternal ED history by reporting longitudinal data on eating behavior, depressive symptoms, and adjustment to parenthood in mothers and their partners in the first year postpartum. We also investigated potential associations between parental psychopathology.

We hypothesized that

1. ED psychopathology and depressive symptoms would be more pronounced in women with ED history compared to women without ED history at all time points.
2. ED psychopathology and depressive symptoms would increase after childbirth in mothers with and without ED history.
3. Adjustment to parenthood would be lower in mothers with ED history compared to mothers without ED history.
4. Partners of women with ED history would experience more ED and depressive symptoms and more difficulties in adjusting to parenthood than partners of women without ED history in the first year after childbirth.

2 | Method

This study was part of the family cohort study EMKIE, conducted at the Department of Psychosomatic Medicine and Psychotherapy at the University Hospital Tübingen. The EMKIE study assesses the influence of maternal ED on the family system from the third trimester of pregnancy until 42 months postpartum. More information on study design, recruitment process, and inclusion criteria has been described elsewhere (Doersam et al. 2022, 2024; Dörsam et al. 2022).

The present study focused on data from the validated self-report questionnaires ED Examination Questionnaire (EDE-Q) (Hilbert and Tuschen-Caffier 2016) and the depression module of the Patient Health Questionnaire (PHQ-9) (Löwe et al. 2001), which were completed online by the mothers during the third trimester of pregnancy (T1), 3 months (T2) and 10 months postpartum (T3) and by the fathers at T2 and T3. Additionally, the subscales Body Image, Marital relationship and Attitudes to pregnancy and the baby of the maternal adjustment and maternal attitudes questionnaire (MAMA) (Kumar, Robson, and Smith 1984) and the subscales Marital relationship and Attitudes towards pregnancy and baby of the paternal adjustment and paternal attitudes questionnaire (PAPA) (Pinto et al. 2017) applied at T2 and T3 were analyzed. More detailed information on the questionnaires can be found in Appendix S1. Maternal sociodemographic data were assessed with a self-report questionnaire administered at study inclusion and information from the medical record of prenatal and natal care were extracted.

Ethical approval was obtained from the ethics committee of the medical faculty of the Eberhard-Karls-University and the University Hospital Tübingen (219/2018BO1). All study participants provided written informed consent.

Statistical analysis was performed using IBM SPSS Statistics for Windows, Version 28.0. Sample characteristics are presented as means and standard deviations or percentages. Intergroup differences were assessed with Fisher's exact test for nominal variables. For metric variables, *t*-tests for normally distributed variables and Mann–Whitney *U*-tests for not normally distributed variables were used. Normal distribution was checked by using histograms and Shapiro–Wilk test. Bonferroni-Holm correction was used for multiple comparisons. Friedman tests with Dunn-Bonferroni correction were used to investigate possible changes regarding EDE-Q and PHQ-9 scores for mothers over all three measurement points. Changes in the MAMA and PAPA scores as well as changes regarding paternal EDE-Q and PHQ-9 scores from T2 to T3 were tested with paired *t*-tests or Wilcoxon tests. Effect sizes were quantified using either Phi-coefficient ϕ, the correlation coefficient *r*, or Cohen's *d*. The classification of

these effect sizes was as follows: small (ϕ, $r = 0.10$, $d = 0.20$), medium (ϕ, $r = 0.30$, $d = 0.50$), and large (ϕ, $r = 0.50$, $d = 0.80$) (Cohen 2016). Correlations between maternal and paternal characteristics were tested using Bravais-Pearson correlation. The level of statistical significance was defined as $p < 0.05$.

3 | Results

Fifty-seven women and 56 partners were recruited in pregnancy. Twenty-four women had an ED history (AN = 16, BN = 4, other specified feeding or ED (OSFED) = 3, binge-ED (BED) = 1), 12 of which were in remission at study entry. Dropout was low, with one participant lost at T2 and a total of three participants reporting no data at T3. Sample characteristics can be found in Table 1 (see Appendix S2, S4 and S5 for further details).

3.1 | Eating Disorder Psychopathology

Across all measurement points, women with ED history scored significantly higher on the EDE-Q global score than women without ED history (T1: $Z = -3.470$, $p < 0.001$, $r = 0.46$; T2: $Z = -3.654$, $p < 0.001$, $r = 0.48$; T3: $Z = -4.490$, $p < 0.001$, $r = 0.60$, Figure 1). Regarding intragroup differences, global ED psychopathology increased significantly in both groups from T1 to T3 (ED: $Z = -1.217$, $p < 0.001$, $r = 0.25$; HC: $Z = -0.697$, $p = 0.014$, $r = 0.12$). This increase was larger in women with ED history ($Z = -3.515$, $p < 0.001$, $r = 0.47$). For women in the ED group, a significant increase in global ED psychopathology was also observed from T2 to T3 ($Z = -0.739$, $p = 0.037$, $r = 0.15$).

Partners showed no significant differences in EDE-Q global scores at T2 and T3 (Figure 1). Partners of women with ED history reported significantly more ED psychopathology at T3 compared to T2 ($Z = -1.981$, $p = 0.048$, $r = 0.42$). Partners of women without ED history had no change in their ED psychopathology from T2 to T3.

3.2 | Depressive Symptoms

Across all measurement points, mothers with ED history had significantly higher depression scores compared to women in the control group (T1: $Z = -2.542$, $p = 0.011$, $r = 0.34$; T2: $Z = -2.354$, $p = 0.019$, $r = 0.31$; T3: $Z = -2.804$, $p = 0.005$, $r = 0.38$; Figure 1). Depressive symptoms did not change significantly over time in both groups.

There were no significant differences between partners of women with and without ED history regarding PHQ-9 scores across the two measurement points (Figure 1). Furthermore, there were no time effects in both groups.

3.3 | Adjustment to Parenthood

Mothers in both groups did not significantly differ in their rating of the Marital Relationship (Figure 1). Mothers in the control group scored higher on the Body Image subscale on both measurement points (T2: $t(55) = -3.292$, $p = 0.006$, $d = 0.88$; T3: $Z = -3.146$, $p = 0.006$, $r = 0.42$) and on the attitudes towards pregnancy and baby subscale at T3 ($Z = -2.811$, $p = 0.010$, $r = 0.38$) compared to mothers with ED history. There was a significant decrease in the Marital Relationship subscale score for women in the HC group from T2 to T3 ($t(32) = 2.537$, $p = 0.048$, $d = 0.44$). No other time effects were found.

Fathers did not differ regarding the PAPA subscale scores (Figure 1). Further, no time effects were found in either group.

3.4 | Correlations With ED Psychopathology

Maternal EDE-Q global scores were not associated with paternal EDE-Q global scores and paternal PHQ-9 scores at T2. There was a significant negative correlation between the maternal EDE-Q global scores and the PAPA subscale scores attitudes towards pregnancy and baby in the ED group with medium effect ($r = -0.440$, $p = 0.036$), while no significant correlations were found in the HC group between maternal EDE-Q global scores and paternal adjustment scores (Appendix S3).

At T3, there were no significant correlations between maternal ED psychopathology and paternal characteristics, neither in the HC nor in the ED group.

No correlations between paternal eating behavior and maternal characteristics were found in the individual groups or across the time periods.

4 | Discussion

This study longitudinally investigated ED psychopathology, depressive symptoms, and adjustment to parenthood in mothers with and without ED history and their partners during the first year after childbirth. Mothers with ED history had significantly more severe ED psychopathology and higher depression scores, as well as lower levels of adjustment to motherhood compared to the HC group across all measurement points. Further, ED psychopathology increased significantly from late pregnancy to 10 months postpartum in both groups. Hence, our findings mostly support previous research (Astrachan-Fletcher et al. 2008; Baskin, Meyer, and Galligan 2021; Koubaa, Hällström, and Hirschberg 2008; Tan et al. 2023). The increase in ED psychopathology postpartum in both groups highlights the vulnerability of women in this period regarding disordered eating, especially in women with ED history, however, effect sizes were small. The medium and strong effect regarding intergroup differences in the MAMA subscale Body Image reflect the stronger struggles with body-related aspects in women with ED history. We further confirmed the findings of Koubaa, Hällström, and Hirschberg (2008) that women with ED history have less positive attitudes towards pregnancy and the baby compared to HC mothers. The marital relationships of women without ED appear to be adversely affected during the initial postpartum year, with a medium effect. However, mean subscale scores remained higher than those observed in the ED group. We found no increases in depressive symptomatology after childbirth in neither group. This may be due to the overall low severity of ED psychopathology in our sample and may be

TABLE 1 | Parental characteristics.

	Total sample		ED		HC		ES	
	%	*n*	%	*n*	%	*n*	*p*	*φ*
Maternal characteristics (T1)								
Sample size	100	57	42	24	58	33	n.a.	
Nullipara	68.4	39	66.7	16	69.7	23	1.000[c]	0.032
Primipara	21.1	12	20.8	5	21.2	7		
Pluripara	10.6	6	12.5	3	9.1	3		
German nationality	93.0	53	100.0	24	87.9	29	0.130[c]	0.234
University degree	73.7	42	66.7	16	78.8	26	0.368[c]	−0.136
In a relationship	96.5	55	91.7	22	100.0	33	0.173[c]	−0.224
Family income ≥4000 €	56.1	32	50.0	12	60.6	20	0.589[c]	−0.106
Mental health comorbidities	10.5	6	20.8	5	3.0	1	0.073[c]	−0.286
Self-reported physical complaints during pregnancy	77.2	44	91.7	22	66.7	22	0.030*[c]	−0.294
Conspicuous course of birth[d]	22.8	13	16.7	4	27.3	9	0.524[c]	0.125
	M ± SD	*n*	M ± SD	*n*	M ± SD	*n*	*p*	*d*/*r*
Age (years)	31.30 ± 4.18	57	31.83 ± 3.99	24	30.91 ± 4.33	33	0.415[a]	0.221
BMI (kg/m^2)	25.42 ± 4.15	57	25.78 ± 5.64	24	25.16 ± 2.66	33	0.734[b]	0.045
Gestational week	30.96 ± 2.81	57	30.79 ± 3.05	24	31.09 ± 2.66	33	0.442[b]	0.102
Gestational weight gain (kg)	12.76 ± 4.86	52	11.19 ± 5.45	21	13.82 ± 4.19	31	0.055[a]	0.556
Paternal characteristics (T2)								
Sample size	100	56	41	23	59	33		
Age (years)	35.23 ± 7.13	52	34.91 ± 6.35	23	35.48 ± 7.80	29	0.956[b]	0.008
BMI (kg/m^2)	26.28 ± 4.11	54	27.52 ± 5.64	22	25.42 ± 2.34	32	0.291[b]	0.144
Paternal leave (weeks)	6.85 ± 6.38	55	6.52 ± 5.15	23	7.09 ± 7.21	32	0.666[b]	0.058

Note: Data presented as mean (M) ± standard deviation (SD) or %.
Abbreviations: BMI, body mass index; ED, eating disorder group; ES, effect size; HC, healthy control group.
[a]Student's *t*-test.
[b]Mann-Whitney-*U*-test.
[c]Fisher's exact test.
[d]Participant's self-report.
*$p < .05$.

different in a study population with more severely ill patients. Overall, women who have not previously experienced an ED appear to demonstrate greater resilience in responding to novel challenges they encounter.

The findings in relation to the fathers are not in line with those of previous research (Batchelor et al. 2022; Linville et al. 2016; O'Connor, Daly, and Higgins 2019; Schmit and Bell 2017). The lack of differences in ED psychopathology between the groups in our study may be explained by the overall relatively low levels of ED symptoms. However, ED psychopathology of fathers in the ED group significantly increased from T2 to T3, and paternal adjustment was significantly correlated with maternal ED psychopathology three months after birth, with medium effects. Hence, findings on paternal mental health are mixed: Fathers whose partners report higher ED severity tended to struggle with their role adjustment after childbirth, reflecting a specific burden in families affected by ED (history). On the other hand, paternal self-report on low ED symptoms and depression might be seen as encouraging. Furthermore, fathers may play a protective role in families with maternal ED history by serving as a role model for healthy eating behavior for their children (Savage, Fisher, and Birch 2007).

4.1 | Strengths and Limitations

This is the first longitudinal study on mental health outcomes in mothers with ED history and their partners in early and later postpartum stages. The participants of this study were recruited from the general population and group allocation was based on the EDE. The low drop-out rate prohibits data loss and attrition bias.

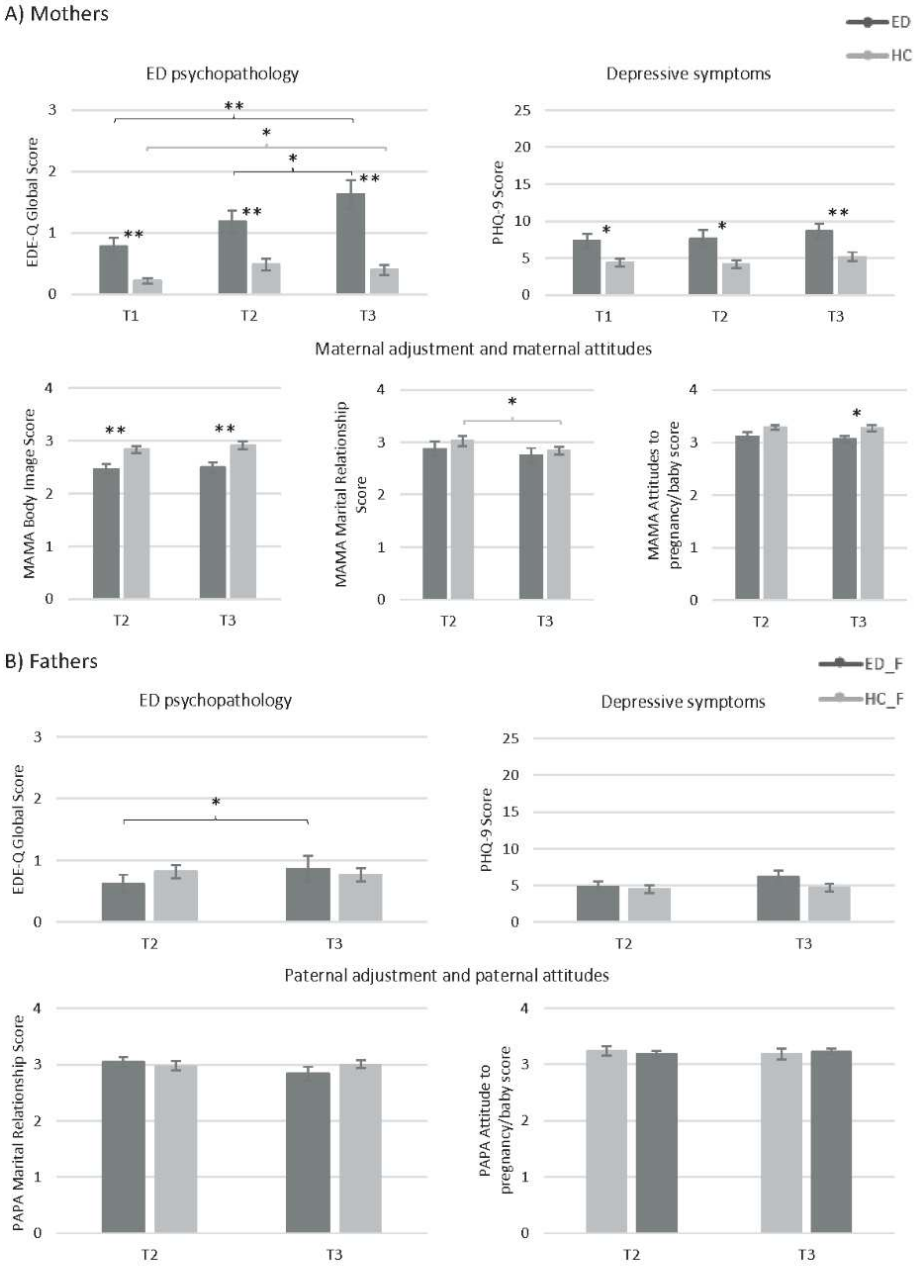

FIGURE 1 | Course of parental eating pathology, depressive symptoms and adjustment to parenthood. ED, eating disorder; ED_F, partners of women with eating disorder history; EDE_Q, eating disorder examination-questionnaire; HC, healthy control; HC_F, partners of women without eating disorder history; MAMA, maternal adjustment and maternal attitudes questionnaire; PAPA, paternal adjustment and paternal attitudes questionnaire; PHQ-9, patient health questionnaire-9.*$p < 0.05$; **$p < 0.01$.

Limitations include the small sample size, the representation of mainly women diagnosed with AN in the ED group, and the use of non-validated questionnaires to assess parental adjustment. Further, paternal outcomes were assessed starting postpartum, so, as opposed to mothers, we cannot compare to pre-birth values in fathers. Lastly, some recruitment took place

during the COVID-19 pandemic, which may have influenced the results.

5 | Conclusions and Implications

Mothers with an ED history report higher levels of psychological distress and adjustment difficulties in the first year after childbirth compared to mothers without ED history. Maternal ED severity correlated with parental adjustment; however, this does not necessarily manifest in psychological distress. These results highlight the need for a close monitoring and consistent care of women affected by ED during the vulnerable postpartum period and also highlight adjustment needs of partners of severely affected women. Further qualitative approaches would help to deepen the knowledge of the paternal experiences during this period. Of note, partners of women with ED may play a supportive role in the family system affected by ED. Future research should consider the investigation of the impact on paternal mental health on the offspring in families with ED history.

Author Contributions

Jana Katharina Throm: formal analysis, investigation, project administration, visualization, writing – original draft. **Annica Franziska Dörsam:** conceptualization, investigation, methodology, project administration, writing – review and editing. **Nadia Micali:** conceptualization, funding acquisition, methodology, writing – review and editing. **Hubert Preissl:** conceptualization, funding acquisition, writing – review and editing. **Katrin Elisabeth Giel:** conceptualization, funding acquisition, methodology, project administration, supervision, writing – review and editing.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.

How do partners experience the pre- and postpartum period depending on maternal eating disorder? - Findings from a qualitative interview study

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Consent for publication: All participants provided written informed consent prior to participating in this study.

Availability of Data and Materials: The data generated and analyzed during the current study are not publicly available due to data protection regulations but are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests

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Keywords: eating disorder, fathers, transition to fatherhood, prepartum, postpartum, well-being, parental role, eating behavior, relationship

Abstract

Background

The transition to fatherhood constitutes a substantial life event that can have a profound impact on individuals and their relationships. This influence may be further intensified in cases where an eating disorder (ED) is present within the family. The present study aimed to examine paternal experiences during the pre- and postpartum period to assess the potential influence of maternal ED on these experiences, based on interviews with partners of women with and without ED.

Methods

Six qualitative interviews were conducted with three male partners of women with and without ED, to explore their prepartum perspectives on the paternal role, as well as their postpartum eating behaviors, overall well-being, and the impact of the ED on their relationship. The subsequent analysis of the data was conducted in accordance with the principles of qualitative content analysis as proposed by Mayring.

Results

The thematic analysis yielded six main categories that were deductively identified from the interview guide, with three to eight sub-categories that were generated from the interview data. The main categories included parental role considerations, prepartum expectations on the impact of childbirth on the individual general well-being, challenges after birth, change of eating behavior after birth, postpartum experiences of individual general well-being, and the influence of ED on the couple's relationship. The fathers raised many common themes during the interview. However, group-specific aspects also emerged, such as a low level of reflection on the role of fatherhood among partners of women with ED. All partners of women with ED further described an impact of the disorder on the couple's relationship, for example by causing conflicts.

Conclusion

The distinct pre- and postpartum experiences reported by fathers in the two groups highlight the impact of maternal EDs on the family context and underscore the importance of incorporating paternal perspectives in research on ED during the transition to parenthood. Integrating fathers' experiences can provide a more comprehensive understanding of familial dynamics and inform the development of targeted interventions to support all family members during this critical period.

Plain English summary

Becoming a father is a significant life event that can have a profound impact on a man's life and his relationships. This impact can be stronger if there is an eating disorder (ED) in the family. This study examined how fathers experience the period before and after childbirth, and how the mother's ED might influence these experiences. Six partners of women with and without ED were interviewed and their responses analyzed. Six main topics with several sub-categories emerged. The main topics were: parental role considerations before birth; prepartum expectations about the impact of childbirth on individual general well-being; challenges after birth; changes of eating behavior after birth; and

postpartum experiences of individual general well-being. While many experiences were similar, some differences emerged, such as less reflection on fatherhood among partners of women with ED. All of the partners of women with ED stated that the disorder had affected their relationship, for example by causing conflict. This study demonstrates the impact of ED on the family environment, emphasizing the importance of including fathers in research concerning ED during the transition to parenthood.

Introduction

The transition to fatherhood is a substantial life event with an enormous impact for the individual and the partnership (Škvařil & Presslerová, 2024). This time is often accompanied by worries and the weight of responsibility (Baldwin et al., 2018; Škvařil & Presslerová, 2024; White & Jarvis, 2024). Sleep deprivation, lack of spare time, and the necessity of adjusting priorities are experiences and challenges frequently reported by men during this period (Baldwin et al., 2018; Leanderz et al., 2025; Shorey & Chan, 2020; White & Jarvis, 2024). This time is further associated with changes in eating behavior (Versele et al., 2021) and an increased risk of mental health deterioration (Smythe et al., 2022). Alongside individual challenges, the partnership may be strained due to a rise in conflicts and a reduction in shared time during the transition to parenthood (Kluwer, 2010; Škvařil & Presslerová, 2024).

These challenges might be intensified by a history of eating disorders (ED) in the family (Sadeh-Sharvit et al., 2020). Couples with ED history were found to be negatively influenced by the ED on a number of areas in the partnership, e.g., regarding communication and emotional health (Dick et al., 2013). These impairments result in decreased relationship satisfaction and may impede the recovery of the individual with the ED (Dick et al., 2013). Literature investigating the impact of the ED on the non-affected partner's mental health are partly contradicting, however, there seems to be a negative impact of the ED (Batchelor et al., 2022; Linville et al., 2016; O'Connor et al., 2019; Schmit & Bell, 2017; Throm et al., 2024). Various forms of strains, such as feelings of being overwhelmed and the occurrence of psychosocial distress in partners of individuals with ED have been repeatedly reported

(Batchelor et al., 2022; Linville et al., 2016; O'Connor et al., 2019; Schmit & Bell, 2017). Simultaneously, feelings of inadequacy in providing the necessary support and the constant concern for the partner's well-being contribute to the experienced distress (Batchelor et al., 2022; Schmit & Bell, 2017). It has been reported that the partners of individuals with ED often feel responsible for monitoring the eating behavior of the affected partner and experience an urge to model healthy eating behavior themselves (Linville et al., 2016). If such impairments persist during the transition to parenthood, it is conceivable that the experiences of fathers partnered with women with an ED may be negatively affected and differ from those of fathers whose partners do not suffer from this disorder.

To date, evidence on paternal experiences around childbirth and early parenthood of partners of women with an ED history is limited. A previous study of our group quantitatively investigated the impact of maternal ED history on parental mental health around childbirth (Throm et al., 2024). While no differences were identified between partners of women with and without ED regarding ED psychopathology, depressive symptomatology, and adjustment to fatherhood, data revealed a positive correlation between maternal ED severity and the paternal struggle with adjustment to parenthood.

Driven by this finding, the present study aimed to improve the understanding of the impact of maternal ED on partners' wellbeing in the pre- and postpartum period. Qualitative interviews with male partners of women with and without ED history were conducted for a deeper understanding of their experience prior to and after birth, and to identify the potential impact of the ED on these experiences. This approach gives a voice to fathers, who are commonly underrepresented and overlooked in research of women's mental health in the reproductive context. The resulting knowledge may help to better respond to the needs of affected families and thereby contribute to an improved family functioning, especially in the vulnerable period around childbirth and early infancy.

Therefore, the following research questions were explored:

1. Do the experiences of partners of women with an ED differ from those of partners of women without ED in the pre- and postpartum period?

2. How do the partners of women with ED estimate the influence of their partner's ED on those outcomes?

Methods

Study design and participants

This qualitative subproject has been conducted as a part of the EMKIE study, a longitudinal multi-method cohort study conducted at the Department of Psychosomatic Medicine and Psychotherapy at the University Hospital Tübingen. The EMKIE study aims to investigate the impact of maternal ED on the family system (Doersam et al., 2022; Doersam et al., 2024). Between 2018 and 2022, N = 57 heterosexual couples with and without maternal ED history according to DSM-5 criteria were recruited in late pregnancy and followed up to 42 months postpartum. More details on the EMKIE study procedure and information on the recruitment process can be found elsewhere (Doersam et al., 2022; Doersam et al., 2024; Throm et al., 2024).

All partners enrolled in the EMKIE study were approached and invited to participate in this interview study irrespective of their progress in the EMKIE study. For practical reasons, a total of six qualitative interviews were aimed for, with three partners from each group, to gain information from different perspectives and to identify commonalities as well as differences between the two groups. Inclusion criteria comprised an age ≥ 18 and sufficient proficiency of the German language. Serious complications during the partner's pregnancy and serious illnesses of the child were exclusion criteria, however, these criteria had already been clarified as a prerequisite for participation in the EMKIE study. The interview participants received a reimbursement of 20 € as compensation for their time.

A total of six men were included, three were partners of women with an ED (average illness duration: 10.67 ± 4.93 years) and three were considered as controls. Information on the fathers mental health has been described before, with an overall low level of psychological distress (Throm et al., 2024). All three women in the ED group had a diagnosis of anorexia nervosa (AN). At the time of the interview,

the men were on average 33.33 ± 5.05 years old and the average time since birth was 3.80 ± 0.41 years. The duration of the relationship ranged between 5 and 15 years, with a mean of 9.50 ± 4.04 years. The interviews were conducted between February and March 2024 and lasted between 9.11 and 25.12 minutes (m = 16.48 minutes).

Data collection

The interviews were primarily conducted remotely via the video conferencing program VidyoConnect (Vidyo Inc., 2022), however, one interview was conducted face-to-face on the premises of the department. A semi-structured interview guide was created based on the parameters investigated in a previous study with the EMKIE sample and discussed with an independent researcher before the start of the study. The men were invited to share their thoughts and experiences regarding their role as parents, the challenges they encountered after birth, and their general wellbeing, as well as their eating behaviors in the pre- and postpartum period. Furthermore, the partners of women with ED history were asked to reflect and estimate the impact of their partner's ED on these experiences. Open-ended questions were used to obtain comprehensive descriptive data.

Data analysis

The interviews were audio recorded and subsequently transcribed by a study member according to the transcription system of Dresing and Pehl (2015). Subsequently, the transcripts were imported in the software MAXQDA (VERBI Software, 2021) and analyzed based on the qualitative content analysis of Mayring and Fenzl (2019) with a mixed deductive and inductive development of categories. Thereby, a coding frame with deductively formed codes is further elaborated with inductive coding of all data, which can be assigned to a specific main category. In the first step, initial codes were deductively generated based on the questions asked in the interviews by the primary author. Following, sub-themes were coded by two independent researchers in an iterative coding process to refine the coding structure. The coding of the sub-themes was data-driven with the aim to answer the research question. Any disagreements in coding were carefully discussed until a consensus was reached.

In terms of qualitative quality criteria, reflexivity was maintained throughout the entire research process. This included discussions with members of the working group as well as the author's critical self-reflection to identify potential subjective biases.

Ethical considerations:

The study received ethical approval from the medical faculty of the Eberhard-Karls-University and the University Hospital Tübingen (219/2018BO1; 859/2021BO2; 826/2023BO2). All participants provided written informed consent.

Results

Category system

The thematic analysis based on Mayring and Fenzl (2019) revealed 6 main categories which derived from the interview guide: 1. Parental role considerations before birth, 2. Prepartum expectations about the impact of childbirth on general well-being, 3. Challenges after birth, 4. Change of eating behavior after birth, 5. Postpartum experiences of general well-being, 6. Impact of ED on the couple's relationship (Figure 1). For each of the aforementioned categories a total of three to eight subcategories were inductively developed from the interview content. Related significant quotations for each subcategory can be found in Supplementary Material 1.

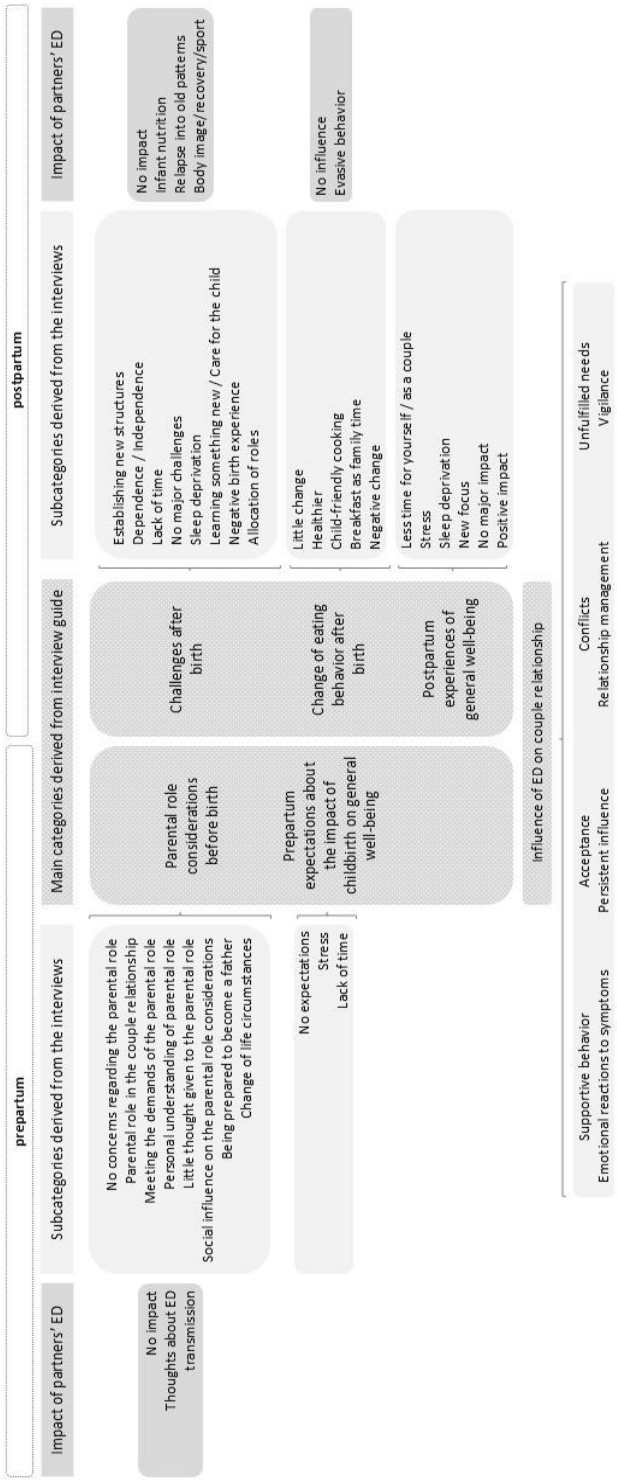

Figure 1: Overview of the category system

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1. Parental role considerations before birth

The fathers reported a variety of different aspects regarding their parental role considerations during their partner's pregnancy. While the majority of these aspects were mentioned in both groups, some were specific to the ED group or the HC group. An overview of all subcategories and the number of participants mentioning it in the two groups can be found in Table 1.

Table 1: Parental role considerations before birth

	ED	HC	Total
No concerns regarding the parental role	2	3	5
Parental role in the couple relationship	3	2	5
Meeting the demands of the parental role	1	3	4
Personal understanding of parental role	2	1	3
Little thought given to the parental role	3	-	3
Social influence on the parental role considerations	1	2	3
Being prepared to become a father	-	2	2
Change of life circumstances	-	2	2

Abbreviations: ED (eating disorder group), HC (healthy control group)

The majority of the fathers reported that they did not have significant concerns regarding their role as a father. Notably, all fathers in the ED group but none in the HC group reported that they did not thoroughly contemplate their parental role before birth. One father in the ED group stated that he had simply "taken it as it came" (Interview 2). However, all fathers except for one in the HC group reported thoughts about how they imagined their parenting role would be in their relationship. These thoughts encompassed considerations of their anticipated parenting style, the allocation of responsibilities within the partnership, and the family model they envisioned.

> *"We talked a lot about, ahm, what kind of parenting style we have, just talked about a lot with each other about everything concerning the children." (Interview 6, Pos. 8, HC)*

For some of the men, considerations regarding their role as fathers included their personal understanding of the paternal role. This mainly included their own parents as either positive or negative role models.

"I guess, that I, that I wouldn't have thought too much about it but that I would have tried doing the same as I experienced myself." (Interview 5, Pos. 18, ED).

Another frequently mentioned thought pertains to the fulfillment of the requirements of the child. While only one father in the ED group indicated that he was contemplating strategies to best support the child in his development, all three partners from the HC group reflected on their ability to "meet the needs" of the child. Likewise, the notion of societal influence was more prominent in the HC group, encompassing reflections on gender roles, childcare arrangements, and socio-political contexts.

"We lived in [state] at that time and knew, that childcare is going to be extremely bad at a certain point." (Interview 6, Pos. 19, HC)

The two subcategories "being prepared to become a father" and "change of life circumstances" were mentioned exclusively by fathers from the HC group. These included reflections on the possession of all necessities, as well as the potential for sleep deprivation and the suspension of hobbies.

"And ahm, stuff like clothing or so, 'do we have everything' and so, yes of course." (Interview 4, Pos. 6, HC)

"Ahm, yes, on the one hand, how our living circumstances will change, which hobbies and other commitments we have, probably had to be put aside for the benefit of the children or we want to put them aside to phrase it correctly." (Interview 6, Pos. 8, HC)

Impact of the partner's eating disorder on the parental role considerations

Two of the partners of women with ED history reported that their partner's history of ED did not have a significant impact on their considerations regarding their roles as fathers. However, the third father indicated that he contemplated the transgenerational transmission of EDs and the potential influence of the impact of the disorder on his children.

"Um, when I look at children who run to the right and left of my sons, um, who display a particular behavior, I always have the feeling that it must come from somewhere." (Interview 3, Pos. 22, ED)

"And that in turn has given me a bit of hope, okay, if we deal with um, my son, with the older son […] and give him awareness for, for the whole topic of food, nutrition, then, um, he may not be so affected by it, maybe we also have that in our hands." (Interview 3, Pos. 22, ED)

2. Prepartum expectations about the impact of childbirth on general well-being

When asked about their expectations regarding the impact of childbirth on their well-being, all fathers expressed that they did not have any such expectations (Table 2).

Table 2: Prepartum expectations about the impact of childbirth on general well-being

	ED	HC	Total
No expectations	3	3	6
Stress	1	1	2
Lack of time	1	1	2

Abbreviations: ED (eating disorder group), HC (healthy control group)

A lack of time and increased stress were anticipated by some of the fathers, but it was not expected that these factors would have a significant impact on wellbeing.

"Well, what I expected was, but I didn't necessarily consider this as something to worry about, that you have less time for yourself." (Interview 2, Pos. 66, ED)

3. Challenges after birth

A number of challenges following birth were reported by both groups. While two fathers in the HC group reported experiencing no major challenges, the HC group as a whole reported a higher prevalence of minor challenges in comparison to the fathers in the ED group (Table 3).

Table 3: Challenges after birth

	ED	HC	Total
Establishing new structures	1	2	3
Dependence / independence	1	2	3
Lack of time	2	1	3
No major challenges	-	2	2

Sleep deprivation	-	1	1
Learning something new / care for child	-	1	1
Negative birth experience	-	1	1
Allocations of roles	1	-	1

Abbreviations: ED (eating disorder group), HC (healthy control group)

A total of three participants indicated that one of the most substantial challenges they faced after birth pertained to the establishment of a novel daily routine and the adjustment to a new dependence.

> *"Oh well. I guess, to find yourself in a completely new routine and to accept a completely new, ahm, dependence." (Interview 3, Pos. 24, ED).*

> *"And as soon as the child is there, it just means, you have to be attentive the whole time, you don't have peace or anything." (Interview 6, Pos. 14, HC)*

Similarly, the scarcity of time was a pervasive challenge that resulted in the restriction of personal interests and the inability to allocate time for oneself.

> *"And, ahm, yes, basically putting your own activities on hold in favor of the child, but you do that happily." (Interview 6, Pos. 14, HC)*

The subcategories "Sleep deprivation", "Learning something new/care for child", and "Negative birth experience" were each mentioned as challenge after birth exclusively by an individual father from the HC group. While one father reported that the sleep deprivation was a major challenge, another father reported positive experiences regarding this issue, which was therefore not classified as a challenge.

> *"Ahm, but yes, in the long run, or rather over time, ahm, actually also the topic of sleep, ahm, because our daughter just, well, slept very badly, or rather ahm, well, she didn't stay very long, ahm, in the sleeping periods, so to speak, I guess." (Interview 1, HC)*

The remaining two subcategories encompassed worrying about the wellbeing of the child and a negative birth experience.

"But the biggest I guess worries, you just have, maybe for no reason, is just that, ahm, 'what's the procedure? Ahm, is he sleeping enough? Is he eating enough?' and stuff like that." (Interview 5, Pos. 10, HC)

One father of the ED group reported challenges regarding the allocation of roles. He expressed that he had not anticipated the extent to which he himself would be involved in the upbringing of the child.

"Hm and actually my wife always told me, that I have to do more at home, in addition to working, which still causes friction from time to time.." (Interview 5, Pos. 28, ED)

One father of the HC group positively highlighted how the support they received in the hospital after birth was helpful in reducing the challenge of learning something new/caring for the child.

"And there are midwives around you, who can show you, how to dress your child well or correctly, because you obviously worry a bit about breaking this little worm." (Interview 4, Pos. 10, HC)

Impact of the partner's eating disorder on challenges after birth

All three partners indicated that their partner's ED did not have a direct impact on the challenges they encountered postpartum. However, two of them described minor obstacles after birth that they attributed to the ED. They described challenges related to infant nutrition, such as heightened awareness of their child's eating habits or tensions within the partnership dyad due to the mother's strictness regarding their child's eating.

"I guess my wife projects a lot from her eating disorder, also on the eating habits of our boys, by being incredibly careful with what they are allowed to eat, ahm, what's healthy and what's not healthy." (Interview 5, Pos. 22, ED)

One father described his wife's struggle with the physical constraints and the inability to exercise so soon after giving birth.

287 *"But, well, you notice that she struggles with not being able to exercise as much and having*
288 *time for herself." (Interview 2, Pos. 48, ED)*

289 Yet another father detailed his own struggle with his wife's relapse into old patterns after birth,
290 following a period of remission during pregnancy.

291 *"It was actually sad that it went back to old habits after birth." (Interview 5, Pos. 30, ED)*

292 **4. Change of eating behavior after birth**

293 All fathers reported some kind of alterations in their eating behavior after birth, however, four of
294 them characterized these alteration as minor (Table 4).

295 *Table 4: Change in eating behavior after birth*

	ED	HC	Total
Little change	2	2	4
Healthier	1	3	4
Child-friendly cooking	-	3	3
Breakfast as family time	1	-	1
Negative change	1	-	1

Abbreviations: ED (eating disorder group), HC (healthy control group)

296 The most frequently mentioned dietary modification was characterized by a shift toward a more
297 nutritious diet, accompanied by a decrease in sugar and fast-food consumption. It is noteworthy that
298 all fathers in the HC group contributed to this subcategory, while only one father of the ED group
299 made a notation in this direction. Overall, the changes appeared to be maintained only for a limited
300 period of time.

301 *"Just funny things like the child should get 32 different types of vegetables in a month, and all*
302 *of this stuff, we tried it, until work and everyday live caught up with us." (Interview 6, Pos. 16,*
303 *HC)*

304 A transition to child-friendly cooking was reported by all fathers in the HC group, but none in the ED
305 group. This change included a reduced use of spices and the incorporation of tips from child nutrition
306 guides.

307 *"Logically, you stop eating spicey food, and stuff like that, ahm, or, well, just avoid some stuff*
308 *and add some to the diet and, ahm, well, my wife is the one who, the one who takes care of*
309 *the food for us." (Interview 4, Pos. 14, HC)*

310 The subcategories "Breakfast as family time" and "Negative change" were each noted by one father
311 from the ED group, respectively. While one father started to have breakfast to spend more time with
312 his family, another father experienced negative changes in his eating behavior.

313 *"To eat slowly like before, to eat consciously / ah, consciously in respect of knowing what you*
314 *ate, that you chewed properly, that you, ah, well, that you really notice the taste and so on,*
315 *that got lost." (Interview 3, Pos. 32, ED)*

316 ***Impact of the partner's eating disorder on their own eating behavior***

317 Only one of the three fathers experienced an impact of his partner's ED on his own eating behavior.
318 He reported that he tried to avoid consumption of particular items with the aim of avoiding triggering
319 his partner. He further described a tendency towards evasive behavior:

320 *"Well, if it comes to sweets and stuff like that, I switch to eating that throughout the day and*
321 *at work and don't have much at home." (Interview 5, Pos. 34, ED).*

322 **5. Postpartum experience of general well-being**

323 A total of six sub-categories emerged in the main category of impact of childbirth on general well-being
324 (Table 5).

325 *Table 5: Postpartum experience of general well-being*

	ED	HC	Total
Time for yourself / as a couple	2	3	5
Stress	1	2	3
Sleep deprivation	1	2	3
New focus	1	2	3
No major impact	1	1	2
Positive impact	-	1	1

Abbreviations: ED (eating disorder group), HC (healthy control group)

The most frequently mentioned theme was the limitation of time for one-self and for the couple, however, this was often not seen as something to worry about.

> *"It's really just that time for yourself and time for each other as a couple, that falls short." (Interview 2, Pos. 68, ED)*

The aspects "Stress", "Sleep deprivation" and "New focus" were reported by three participants, two fathers of the HC group and one of the ED group, respectively. One father from each group indicated that they did not experience any considerable change in their well-being following birth, and one father of the HC group indicated that he experienced a positive effect on his well-being due to the emotional feedback he receives from caring for his child.

> *"I would say I also have a bit of a helper syndrome, which means, I'm also drawing strength from it when I can take care of my child, when we can spend time together, yes." (Interview 6, Pos. 26, HC)*

6. Influence of an eating disorder on the couple relationship

All three partners of women with an ED history reported some kind of influence of the disorder on their partnership.

Tabelle 6: Influence of ED on couple relationship

	ED
Supportive behavior	3
Emotional reactions to symptoms	3
Acceptance	2
Persistent influence	2
Conflicts	1
Relationship management	1
Unfulfilled needs	1
Vigilance	1

Abbreviations: ED (eating disorder group), HC (healthy control group)

One of the most frequently mentioned aspects was that they tried to support their partner, e.g., by taking the children to give her some time for herself or by telling her that she is great the way she is.

"Mmh, well we talked, we talked a lot and still talk a lot about, ahm, we are, well… I guess the confirmation that she is beautiful the way she is." (Interview 2, Pos. 74, ED)

Despite their desire to provide support to their partners, all of the fathers described emotional reactions related to the ED symptomatology, including anger, frustration and regret.

"Yes, I sometimes get a bit annoyed, the comments she makes, but otherwise not much has changed." (Interview 5, Pos. 34, ED)

Two partners reported that they have accepted their partner's disease. Concurrently, two fathers stated that the disease exerts a constant influence on the relationship and that it must always be kept in mind. One of the fathers also reported that the ED is a source of conflict in the relationship and explained how the ED of his partner makes it more difficult to provide her with enjoyable experiences. Another father described his unfulfilled needs as a result of his partner not feeling physically attractive. One individual reported experiencing a constant state of alertness due to his partner's ED and feeling responsible for her nutrition.

Discussion

This study aimed to improve the understanding of the impact of maternal ED on the father's experiences in the period prior to and after the birth of their child by interviewing partners of women with and without ED. Overall, fathers raised topics that were classified into six broad thematic areas, covering the spectrum from individual behavior and experiences to the couple's relationship and family life. Many topics were raised by both groups and in support of previous research, however, some topics were group specific. Despite stating that their partner's ED had limited influence, these fathers nevertheless disclosed a number of aspects regarding their relationship with a partner affected by an ED that are in line with the small amount of previously existing literature regarding couples with ED.

Overall, our findings regarding the general experiences of fathers during the pre- and postpartum period are reflective of former research (Baldwin et al., 2018; White & Jarvis, 2024). Most of our results including the continuous demand of presence, broken sleep patterns, and the shift in priorities after birth with the necessity of balancing activities and establishing new routines appear to be a common experience for fathers in the postpartum period (St John et al., 2005; White & Jarvis, 2024) and seem to be independent of an ED diagnosis in the family. Similarly, previous literature examining men's wellbeing during the transition to fatherhood has also reported considerations regarding meeting the expectations of fatherhood, as well as reflections on their anticipated role and identity as fathers (Baldwin et al., 2018; White & Jarvis, 2024). Expectations regarding the impact of childbirth on the father's well-being were low in both groups of our study and comparable in terms of content. The questions in the interviews referred to the period around the birth of their first child, i.e., when fathers had no previous experience of fatherhood. Hence, it may be assumed that they simply could not imagine the changes that would ensue after birth, and therefore had no expectation of how these would affect their well-being. This assumption is supported by Gemayel et al. (2022), who reported a limited awareness of fathers prepartum regarding the huge responsibilities awaiting them. All fathers reported some kind of change in their eating behavior after birth, however, most of them stated that these changes were minor and persisted only for a limited time period. This is in line with a study of Versele et al. (2023), who found no significant changes in dietary intake during the transition to parenthood. However, the shift to a healthier diet to act as a role model has also been described (Versele et al., 2021).

Throughout the interviews, a number of differences between the experiences of partners of women with and without ED were reported, as well as a degree of influence of the partners' ED on those experiences. During the prepartum period, partners of women with ED thought less about their paternal role than partners of mothers without ED. In fact, all three fathers in the ED group stated that they did not in depths think about the paternal role. This lack of reflection might represent a more distant relationship to the idea of fatherhood, which would be in line with previous quantitative

findings by our workgroup (Throm et al., 2024). Previously reported data from the EMKIE study indicated that paternal attitudes and adjustment to pregnancy and the baby were inversely associated with maternal ED symptom severity. Further, one father from the ED group shared his thoughts on the transmission of ED and that being a good example might prevent the burden for his child. This thought may result in an increase in pressure and perceived responsibility for the individual, potentially leading to evasive behavior and following the above-mentioned lack of reflection. Postpartum, fathers in the HC group reported more challenges than those in the ED group, who reported only experiencing minimal challenges and indicated that they did not initially associate their partner's ED with these difficulties. However, upon further reflection, fathers in the ED group did subsequently identify certain obstacles that they would attribute to their partner's disorder. This finding suggests a lack of awareness or suppression regarding the impact of their partner's ED on themselves, which only surfaces when prompted directly. Only one father reported an influence of the ED on his eating behavior after birth. He described avoiding food that triggers his partner, however, the description of this behavior seemed to be a more general behavior and not limited to the period around childbirth.

When regarding the influence of the ED on the couple's relationship, our results support earlier findings. Previous research reported that partners of persons with ED felt pressure to monitor their partners' eating behavior and that the ED added conflict to their relationship (Linville et al., 2016), which was also mentioned by the participants in our study. Furthermore, decreased intimacy related to the ED (Linville et al., 2016) was also reported in our study, leading to unfulfilled physical needs from the fathers' perspectives. Overall, the fathers reported that they tried to support their partner, however, they also described a persistent impact of the ED on the relationship and on their own emotional behavior regarding the symptomatology. The ED was a reason for conflicts and has complicated the partnership that could potentially have long-term effects on the entire family system.

The impact of the ED beyond the partnership also emerged in various statements of the fathers. The fear of the transgenerational transmission of ED might altered the father's behavior in relation to eating and the nutrition of his offspring. Situations such as playing with their children in front of the

bathroom on particularly difficult days for the mother, or anticipating the need to mediate future conflicts between the mother and children regarding food and eating behaviors, illustrate how children become entangled in ED related dynamics. These experiences may exert influence on the children's development and potentially result in enduring psychological and behavioral consequences. This underscores the necessity for further research and the provision of comprehensive support for the entire family. Further, incorporating the perspectives of siblings and older children concerning their mother's ED in future research may provide valuable insights for designing tailored support interventions and further advancing the knowledge base.

During the interviews, it was observed that the fathers conveyed their experiences with notable openness and candor. They demonstrated a strong willingness to share their perspectives and actively contribute to the research concerning partners of persons with ED during the transition to parenthood.

Limitations

All participants were partners of women with AN, therefore limiting the transferability of these findings to other ED diagnoses. Further research should include diverse samples to avoid a bias of demographic and diagnostic factors on the experiences of fathers in the pre- and postpartum period. The time of birth was on average over three years ago, increasing the probability of recall biases. Six participants were interviewed, three of partners of women with ED and three without a history of ED in the close family. Data saturation could not be reached, and some perspectives may not be presented. The EMKIE study sample shows a generally high education level and a comparably high socioeconomic status (Doersam et al., 2024; Throm et al., 2024), which is presumably associated with more resources, hence also influencing the perception of parenthood in these families. This also limits the generalizability of the present findings, as fathers with a lower socioeconomic status might face different challenges than the fathers interviewed in the present study.

Conclusion and implications

443 In conclusion, this study gives a voice to fathers, who are commonly overlooked in research regarding
444 the pre- and postpartum period. Examining the paternal experiences, including partners of women
445 with ED in the pre- and postpartum period, uncovered insights not previously assessed. Overall, the
446 observed differences in pre- and postpartum experiences of the partners of women with and without
447 ED underscore that a partner's ED impacts the whole family environment and emphasizes the necessity
448 to incorporate fathers in this area of research. Our results further enhance the knowledge and
449 understanding of the transition to fatherhood in general, as well as in families with an ED diagnosis.
450 These results can inform the development of innovative parental preparation models tailored to men's
451 specific needs during the transition to fatherhood.

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