

**Parenting Behavior as a Mediator of the Association Between Parental
Depression, Anxiety and Stress and Child Externalizing Symptoms in a
Clinical Sample**

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List of Abbreviations

ADHD	Attention-deficit/hyperactivity disorder
APA	American Psychiatric Association
CD	Conduct disorder
DASS	Depression Anxiety Stress Scales
DSM	Diagnostic and Statistical Manual of Mental Disorders
FPNE	Questionnaire for Positive and Negative Parenting
ICD	International Classification of Diseases
ODD	Oppositional defiant disorder
RCT	Randomized controlled trial
SCL-ADHD	German Symptom Checklist for Attention-Deficit/Hyperactivity Disorder
SCL-DBD	German Symptom Checklist for Disruptive Behavior Disorders
SPSS	Statistical Package for the Social Sciences
SUPPORT	Telephone-based support
TAU	Treatment as usual
WASH	Web-assisted self-help

Summary

Summary in English

This thesis aimed to highlight the mechanisms underlying the often-found link between parental internalizing symptoms and externalizing symptoms in children. A mediation effect was found for the relationship between parental internalizing symptoms (symptoms of depression, anxiety, and stress) and child oppositional defiant disorder (ODD) symptoms through negative parenting behaviors in two published manuscripts, (Klemp et al., 2022; Klemp et al., 2023) which form the main chapters of this dissertation. Both cross-sectional and longitudinal analyses showed significant associations between parental internalizing symptoms and child attention-deficit/hyperactivity disorder (ADHD) and ODD symptoms, however a mediation effect was only found for the ODD symptoms (Klemp et al., 2022; Klemp et al., 2023).

Although they both belong to externalizing disorders, ADHD and ODD should be considered differently, since the results of these studies indicate that negative parenting behaviors influence the child's oppositional symptoms, but not the child's ADHD symptoms. The mechanisms mediating the relationship between parental internalizing symptoms and child ADHD symptoms should be further investigated. In the ODD model, more mediators could also be investigated, as the mediation effects found were small. Given how much parents often unconsciously influence their children and how important the variables studied are, it would make sense to go into more detail in future research. Understanding how these factors intersect, e.g. how parents regulate anxiety, stress and depression and the effect that has on their children and symptoms, could provide valuable insights into the dynamics that contribute to families' well-being and symptoms.

Summary in German

Ziel dieser Dissertation war es, die Mechanismen aufzuzeigen, die dem häufig gefundenen Zusammenhang zwischen internalisierenden Symptomen der Eltern und externalisierenden Symptomen bei Kindern zugrunde liegen. In den zwei aufgeführten Publikationen im Hauptteil dieser Arbeit (Klemp et al., 2022; Klemp et al., 2023) wurde ein Mediationseffekt für die Beziehung zwischen elterlichen internalisierenden Symptomen (Depression, Angst und Stress) und kindlichen oppositionellen Symptomen durch negatives Erziehungsverhalten gefunden.

Sowohl Querschnitts- als auch Längsschnittsanalysen in den Arbeiten zeigten signifikante Assoziationen zwischen internalisierenden Symptomen der Eltern und Aufmerksamkeitsdefizits-/Hyperaktivitätsstörung (ADHS) und oppositionellen Symptomen der Kinder (signifikanter Gesamteffekt; Klemp et al., 2022; Klemp et al., 2023). Obwohl ADHS und die oppositionelle Störung mit Trotzverhalten beide zu den externalisierenden Störungen zählen, ergaben die vorliegenden Analysen einen Mediationseffekt über negatives Erziehungsverhalten nur in dem Modell zur oppositionellen Symptomatik des Kindes. Die Ergebnisse der Studien weisen daher darauf hin, dass eine differenzierte Betrachtung der Zusammenhänge zwischen der elterlichen internalisierenden Symptomatik und der kindlichen ADHS- versus oppositionellen Symptomatik erfolgen sollte, da die Mechanismen, über die diese Zusammenhänge vermittelt werden, sich zu unterscheiden scheinen.

Die Mechanismen, die den Zusammenhang zwischen elterlichen internalisierenden Symptomen und kindlichen ADHS-Symptomen vermitteln, sollten insgesamt weiter untersucht werden. Im Modell zur oppositionellen Symptomatik könnten auch mehr Mediatoren untersucht werden, da die gefundenen Mediationseffekte nur gering waren. Durch das Wissen über die häufig unbewusste Beeinflussung von Kindern durch ihre Eltern und die Bedeutung der untersuchten Variablen, wäre es sinnvoll, in der künftigen Forschung weiter ins Detail zu gehen. Zu verstehen, wie diese Faktoren ineinandergreifen, z. B. wie Eltern Angst, Stress und Depressionen regulieren und welche Auswirkungen dies auf ihre Kinder und deren Symptome hat, könnte wertvolle Erkenntnisse über die Dynamik liefern, die zum Wohlbefinden oder eben auch zur Symptomentstehung innerhalb von Familien beiträgt.

1 Introduction

Chapter 1 provides general information about the classification of ADHD and ODD, as well as overall information about parenting behaviors, parenting styles and internalizing disorders, in order to explain these constructs as components of the model under study. The underlying theoretical models are described in more detail, followed by a presentation of empirical findings on associations between parental internalizing symptoms, parenting behaviors, and child externalizing symptoms. In addition, the study WASH, which provides data for this dissertation, will be presented. Finally, at the end of chapter 1, the objectives of this thesis will be enlightened.

Chapter 2 presents a publication on the mediation of the association between internalizing symptoms of the parents (depression, stress, and anxiety) and externalizing symptoms of the child (ADHD and ODD) through positive and negative parenting behaviors based on cross-sectional data (Klemp et al., 2022).

Chapter 3 comprises a publication on the analysis of this mediation model using longitudinal data. Due to the results of the first publication and results of previous studies, this second publication focused on negative parenting behavior as a single mediator (Klemp et al., 2023).

The final chapter 4 discusses the information from the previous chapters.

This cumulative thesis focuses on the role of parenting behavior in the mediation of the association between parental internalizing and child externalizing symptoms in a clinical sample of children with externalizing behavior disorders. Reference throughout this dissertation is made to the two articles listed below both in first authorship (Klemp et al., 2022; Klemp et al., 2023).

Parenting can be seen as one of the most challenging and rewarding roles in life, but may be especially difficult for parents who struggle with their own mental health. This, in turn, may affect children's development and mental health, and common childhood behavioral disorders, such as externalizing behavior disorders in children, should be particularly considered (Mazzucchelli & Sanders, 2018). Symptoms of externalizing behavior disorders, including attention-deficit/hyperactivity disorder (ADHD) and oppositional defiant disorder (ODD), impose a heavy burden on affected children and adolescents, as well as on their families and social environment (Goodman, 2007; Harpin, 2005; Riley et al., 2016; Szentiványi et al., 2019). In addition, these disorders also lead to increased healthcare costs and can have a negative impact on the personal and professional future of affected children (Goodman, 2007; Harpin, 2005; Szentiványi et al., 2019). Considering the persistence of symptoms into

adolescence and adulthood in at least a significant percentage of the children (Bussing et al., 2010; Faraone et al., 2006), early detection of risk factors for the development of externalizing symptoms as well as prevention and treatment are crucial. In this regard, it is important to obtain knowledge about the pathogenesis of externalizing disorders.

The biopsychosocial model recognizes that genetic, neurological, and physiological factors can play a role in the development of psychiatric disorders, including externalizing disorders like ADHD and ODD, and that these disorders can be influenced by social, cultural, and environmental factors (Coghill & Banaschewski, 2009; Faraone & Larsson, 2019; Matthys & Lochman, 2017). While genetic factors seem to be more important than environmental factors in the development of ADHD symptoms, the contrary seems to be the case in the development of oppositional symptoms (Banaschewski et al., 2017; Faraone & Larsson, 2019; Schneider & Margraf, 2009). Overall, the biopsychosocial model offers a comprehensive and nuanced understanding of psychiatric disorders, and it emphasizes the importance of considering multiple factors when assessing and treating these conditions. Previous research hints at both cross-sectional and longitudinal associations between parental psychopathology and child externalizing symptoms, suggesting that parental psychopathology might be an important condition in the pathogenesis of externalizing disorders (Beck, 1999; Glover, 2014; Goodman et al., 2011; Granic & Patterson, 2006). From a theoretical perspective, as outlined in a model by Goodman & Gotlib (1999), several mechanisms could potentially account for the association between parental psychopathology and child symptoms, including heritability and an exposition to parental cognitions, behaviors, and affect. The way in which parents interact with their children and the environments they create can have a significant impact on the child's emotional, social, and cognitive development.

In line with the model by Goodman & Gotlib (1999) and based on previous research on associations of child externalizing symptoms with both parental psychopathology and parenting behaviors, this dissertation focuses on the putative mediation of the association between parental internalizing symptoms (i.e., symptoms of depression, anxiety, and stress) and child externalizing symptoms through parenting behavior in a clinical sample. Understanding the specific ways in which parental internalizing symptoms exert effects on child behavior symptoms provides the opportunity to identify potential points for intervention and develop targeted treatment interventions to improve the well-being of children and families. The mediation model was examined based on both cross-sectional and longitudinal data, which were collected in the scope of a randomized controlled trial on the efficacy of a web-assisted self-

help (WASH) intervention for parents of children with elevated levels of externalizing symptoms (Döpfner, Wahnke, et al., 2020).

1.1 Classification of Attention-Deficit/Hyperactivity Disorder

ADHD is a childhood-onset neurodevelopmental disorder, which is characterized by elevated levels of inattention, hyperactivity, and/or impulsivity (World Health Organization, 2019). The global average prevalence of ADHD is approximately 5%, with an additional 5% for symptoms in the subclinical range (Sayal et al., 2018). According to the International Classification of Diseases, 11th revision (ICD-11), ADHD, in addition to inappropriate levels of inattention, hyperactivity, and/or impulsivity, is characterized by impaired functioning and development (World Health Organization, 2019). The ICD-11 also specifies that the symptoms of ADHD must be present for at least six months, and must cause significant impairment in at least two settings (e.g. at home and school). It is important to note that the diagnostic criteria for ADHD can vary slightly depending on the used classification system. However, the general concept of ADHD as a disorder characterized by inattention, hyperactivity, and impulsivity is consistent across both standard classification systems (American Psychiatric Association, 2022; World Health Organization, 2019). A section of examples of ADHD symptoms in daily life includes excessive talking, the inability to concentrate on a topic, impairment in organizational skills, forgetfulness, difficulties in communication, the urge to move in situations in which this is not appropriate, and a lack of self-control (Kelly, 2018). The presence of comorbidities is common in children and adolescents with ADHD. In this context, learning disorders (56%), sleep disorders (23%), disruptive behavior disorders, e.g., ODD (20%), and affective disorders such as anxiety disorders (12%) need to be mentioned (Reale et al., 2017).

Learning, sleep, and substance use disorders are also among common comorbidities (Heinzl, 2018; Terán Prieto, 2020). Diagnostics should therefore include the likelihood of comorbid psychiatric and/or other developmental disorders in order to provide appropriate treatment. Additionally, a strict diagnostic approach is necessary to differentiate ADHD from other psychological disorders with similar symptoms like anxiety, depression, or certain types of learning disorders. Diagnosing ADHD in childhood and adolescence usually requires a multimodal approach, including and integrating information from parents, teachers, and the children/adolescents themselves (Faraone et al., 2021; Heinzl, 2018).

If untreated, ADHD can have severe long-term consequences. Research has demonstrated that untreated individuals exhibit significantly worse outcomes than treated patients in academic, occupational, and social functioning (Colvin & Stern, 2015; Erskine et

al., 2016), leading to antisocial behavior, substance use or depressive symptoms (Colvin & Stern, 2015).

Treatment for ADHD typically involves a combination of multimodal cognitive behavioral therapy (e.g. including patient-centered therapy and parent training), as well as medication, depending on the individual's symptoms and needs (Döpfner, Hautzinger, & Linden, 2020).

The etiology and pathogenesis of ADHD is not fully understood. Current research suggests that genetics play an important role, while also taking environmental factors and other possible causes and risk factors (such as brain injuries or low birth weight) into consideration (Faraone et al., 2021; Faraone & Larsson, 2019). Nevertheless, potential interaction of these factors, which, for example, show as epigenetic factors e.g., changes in DNA methylation caused by environmental factors (Hamza et al., 2019) need to be considered. While scientific evidence suggests that genetic factors play the leading role in the development of ADHD symptoms (Banaschewski et al., 2017), there is also evidence for the influence of environmental factors (Schonwald & Lechner, 2006; Sciberras et al., 2017).

1.2 Classification of Oppositional Defiant Disorder

ODD is a mental disorder, which is characterized by a pattern of disobedient, hostile, and defiant behavior toward authority figures (American Psychiatric Association, 2022; Hamilton & Armando, 2008; World Health Organization, 2019). In order to be classified as ODD, this behavior must be present for more than six months and have a negative influence on the child's social, academic, or occupational functioning (American Psychiatric Association, 2022; Hamilton & Armando, 2008; World Health Organization, 2019). Reports on the prevalence of ODD vary widely, with occurrence rates ranging from 2% to 11% (Canino et al., 2010). The disorder is typically diagnosed in early elementary school, with first symptoms often appearing two or three years earlier (Hamilton & Armando, 2008). Individuals affected with ODD may struggle with effectively managing their temper and emotional reactions (Riley et al., 2016). The disorder includes a variety of emotional and behavioral problems characterized by angry or irritable moods, argumentative behavior, and vindictiveness (Lin et al., 2022).

Affected children have substantially strained relationships with their parents, teachers, and peers while demonstrating high rates of comorbid conditions and psychiatric issues, such as ADHD and mood disorders (Hamilton & Armando, 2008). Moreover, they show an increased risk of developing conduct disorders and an antisocial personality disorder (Hamilton &

Armando, 2008). Furthermore, children with ODD are often involved in interpersonal conflicts and demonstrate maladjustment (Lin et al., 2022).

It is important to note that the pathogenesis of ODD is not fully understood. The causes of the disorder are not clarified and further research is needed to better understand the contributing factors (Hamilton & Armando, 2008). So far, research provides evidence for the influence of both genetic aspects and environmental factors, e.g. parenting styles, negative life events, family functioning (Hamilton & Armando, 2008). ODD is most common among children in low-income households (Canino et al., 2010; Lin et al., 2022). Furthermore, additional elements in families, such as family-related mental health issues, inadequate methods of discipline, mistreatment, and lack of care, have been found to have a strong correlation with children's disruptive behaviors (Hamilton & Armando, 2008; Lin et al., 2022). ODD is found to be more widespread in families where childcare is frequently interrupted by a series of different caregivers or in families that frequently employ harsh, inconsistent, or neglectful child-rearing methods (Lin et al., 2022).

Treatment for ODD usually necessitates a distinct focus on comprehending the interplay between various levels of familial elements that impact the onset and escalation of ODD symptoms (Lin et al., 2022). Rather than exclusively addressing factors related to the individual child, it is imperative to account for the forecasters and the mechanisms that influence or regulate the child's symptoms (Lin et al., 2022).

Psychological interventions with parents and children can significantly expand short- and long-term outcomes (Hamilton & Armando, 2008). Research supports the effectiveness of parent training, parent-child interaction therapy (PCIT), individual therapy, social skills training and collaborative problem-solving. These interventions aim to encourage the development of skills in tolerating frustration, being flexible, and avoid emotional overreaction (Hamilton & Armando, 2008). When ODD co-occurs with ADHD, stimulant therapy also is an effective method in order to reduce the symptoms of both disorders (Hamilton & Armando, 2008). Moreover, early intervention endeavors to hinder the progression of conduct disorders and substance abuse, which have the capacity to lead to persistent impairments throughout an individual's life (Riley et al., 2016).

1.3 Internalizing Disorders

Internalizing disorders are mental health conditions characterized by an individual's tendency to internalize their feelings, rather than expressing them outwardly. They often manifest as feelings of anxiety, depression, negative thinking or emotional distress and are not

easily apparent to others (American Psychiatric Association, 2022; Eisenberg et al., 2001; World Health Organization, 2019). Additionally, affected individuals often demonstrate neurotic traits and over-controlled behavior (Eisenberg et al., 2001). Internalizing disorders are often co-morbid, e.g., depression and anxiety disorders often manifest together. Furthermore, trauma and stress-related disorders often occur in conjunction with depression and anxiety disorders. Moreover, internalizing disorders show high comorbidity rates with externalizing disorders, such as ADHD, ODD, and conduct disorder (Tandon et al., 2009).

Comparing externalizing and internalizing disorders, the main difference is found in the expression of symptoms. Internalizing disorders tend to be composed of relatively covert symptoms, many of which are cognitive and internal, and difficult to observe. In contrast, externalizing disorders are overt, often highly observable, and typically stated as behavioral excess (Reynolds, 1998).

1.4 Parenting Behavior and Parenting Styles

The type of parenting affects children in multiple areas, such as social, intellectual and personal competences as well as character development, including personality, values, and opinions (Huang et al., 2022). Children get early competence, skills, and ways of thinking particularly through their experiences at home, with caregivers playing the most significant role in their early socialization (Huang et al., 2022; Sanvictores & Mendez, 2022). Parenting styles and behaviors are multidimensional constructs and have been associated with distinct outcomes in children's development (Grusec & Davidov, 2010; Huang et al., 2022; Linberg, 2018).

Parenting styles are usually described as the overall approach that a parent takes to raise their child and comprise broad patterns of parenting behaviors (Baumrind, 1971). In turn, parenting behaviors are typically described as specific actions and activities in which a parent engages with their child to implement their parenting style (Huang et al., 2022; Linberg, 2018; Sanvictores & Mendez, 2022).

Parenting styles can be described as permissive, authoritarian or authoritative (Baumrind, 1967). Permissive parenting is characterized by few guidelines or rules and allows the children to regulate their behavior and most of their choices by themselves (Dalimonte-Merckling & Williams, 2020; Darling & Steinberg, 1993). Parents who demonstrate this parenting style often consider themselves as equal to their child rather than a parental figure (Dalimonte-Merckling & Williams, 2020; Darling & Steinberg, 1993). Authoritative parents establish limits for their children, while emphasizing the importance of implementing these boundaries with affection, practical anticipations, and consequences suitable for the child's age.

(Dalimonte-Merckling & Williams, 2020; Darling & Steinberg, 1993). This style focuses on connection and building an encouraging environment, while also expecting maturity and cooperation (Darling & Steinberg, 1993; Lopez et al., 2018).

Parenting styles can moderate the effects of specific parenting practices on child development, necessitating a clear distinction between parenting style and practices to understand socialization processes (Darling & Steinberg, 1993).

Parenting styles mostly evolve from parental education, family background, and parents' values and standards (Huang et al., 2022; Sanvictores & Mendez, 2022). A frequently discussed aspect in this context is the parents' education: parents with higher levels of education might possess greater understanding about their child's developmental stages and acknowledge the significance of creating an enriched home environment in contrast to parents with lower educational attainment (Huang et al., 2022; Sanvictores & Mendez, 2022). Moreover, education equips parents with the abilities and aptitudes to foster their children's growth by offering them exceedingly nurturing engagements and a home learning environment that is rich in cognitive and verbal stimulation (Huang et al., 2022; Sanvictores & Mendez, 2022). The extent to which the assumption of education-parenting relations can be used as an indicator of parenting styles is still being discussed, especially due to many contrary findings such as higher expectations, more pressure, less time and more coldness coming from well-situated families (Huang et al., 2022).

Previous research has established a characterization of parenting behaviors in terms of warmth, hostility, and behavioral control (McKee et al., 2013; Schaefer, 1965), or, in more detail, in terms of warmth, autonomy and control, involvement and monitoring, neglect and rejection, and inconsistency and unpredictability. The dimension of warmth refers to the extent to which parents provide emotional support and affection to their children (Ding et al., 2022; Pinquart, 2017; Xiao et al., 2018). The dimension of control and autonomy characterizes the extent to which parents set rules and boundaries for their children, while also allowing them to make their own choices and decisions (Pinquart, 2017). The dimension of involvement and monitoring relates to the extent to which parents actively participate in their children's lives, e.g. activities and interactions (Karaer & Akdemir, 2019; Pinquart, 2017). The dimension of neglect and rejection concerns the extent to which parents are emotionally distant or unresponsive to their children, or neglect their basic needs (Akse et al., 2004; Greene et al., 2020). Finally, the dimension of inconsistency and unpredictability refers to the extent to which parents are inconsistent in their discipline and communication, or respond to their children in unpredictable ways (Li & Belsky, 2022; Yoshizumi et al., 2006).

Broader dimensions that combine more dimensions are positive and negative parenting behaviors. Positive parenting behavior often includes warm, highly-involved, and open, supportive behavior towards the child, while negative parenting describes rejective, low-involved or conflictive behaviors (Chronis et al., 2007; Klemp et al., 2022; Liu et al., 2022). Previous research has also examined early parenting behaviors as pathways connecting family background and parental behavior to children's behavior development (Huang et al., 2022).

Overall, parenting can be seen as a multifaceted construct, which includes various parenting styles and behaviors towards the child. All these behaviors contribute to the development and abilities of a child (Liu et al., 2022).

1.5 Theoretical Models on Associations Between Parental Internalizing Symptoms, Parenting Behavior, and Child Externalizing Symptoms

There are several theoretical models that examine the associations between parental internalizing symptoms (such as depression, anxiety, and stress), parenting behaviors, and child symptoms.

The model by Goodman and Gotlib (1999) explains how depression in mothers may increase the risk of psychopathology in their children. This model suggests that maternal depression can influence child psychopathology through various mechanisms: (1) heritability, (2) essential dysfunctional neuroregulatory mechanisms, (3) exposure to unhealthy maternal cognitions, maternal behaviors, and maternal affect, and (4) a stressful setting (Goodman & Gotlib, 1999). The impact of the single mechanisms varies across different developmental stages, e.g. during infancy maternal depression can lead to negative parenting practices which can harm the development of the child (Goodman & Gotlib, 1999). Overall, the model highlights the importance of considering multiple pathways in understanding the transmission of risk from mothers to their children and these mechanisms of transmission influence one another over time (Goodman & Gotlib, 1999). Understanding and empirically testing these pathways could help to develop more effective interventions to reduce the risk of psychopathology in children (Goodman & Gotlib, 1999).

The present thesis posits this hypothesis from the model that internalizing symptoms of the parent may lead to less functional parenting practices, which, in turn, lead to increased symptoms in children.

In order to directly associate parenting behaviors and child externalizing symptoms, the coercion theory by Patterson (1986) may be applied. This theory explores the associations between parental behaviors in early childhood, with child externalizing symptoms (such as

aggression and antisocial behavior), and the choosing of social relationships and difficulties later on in life (Patterson, 1986; Patterson et al., 1989).

The model suggests that certain types of parental behavior, such as high levels of criticism, can lead to increased child externalizing symptoms. The model also proposes that the use of coercion in the parent-child relationship can create a cycle of negative interactions, where the child engages in disruptive behavior, leading to increased parental control, which in turn further escalates the child's externalizing symptoms (i.e., coercive parenting and child externalizing symptoms mutually reinforce each other).

Both of these models highlight the importance of considering the interaction between different factors in understanding the development of child externalizing symptoms. It is important to note that these models can influence each other. Overall, both models provide frameworks for understanding the complex relationships between parental internalizing symptoms, parenting behaviors, and child externalizing symptoms and therefore also form the basis for the mediation analyses within this dissertation.

1.6 Empirical Findings on Associations Between Parental Internalizing Symptoms, Parenting Behavior, and Child Externalizing Symptoms

In line with the theoretical models, there are empirical findings on the associations between parental internalizing symptoms, parenting behavior, and child externalizing symptoms. Research findings support the assumption that internalizing symptoms in parents influence their parenting behavior (Bloomfield & Kendall, 2012; Kashdan et al., 2004; Letourneau et al., 2010; Waylen & Stewart-Brown, 2010). Likewise, many studies show that parenting behavior influences symptoms in their children (Burt et al., 2021; Buschgens et al., 2010; Ellis & Nigg, 2009; Harvey et al., 2011; Wirth et al., 2019). Moreover, there is an empirical indication for the link between internalizing symptoms in parents and external symptoms of children (Civic & Holt, 2000; Elgar et al., 2003; Kouros & Garber, 2010; Theule et al., 2013; Wüstner et al., 2019). However, there is also evidence for the opposite direction of effects (i.e., children naturally also influence their parents) as well as for bidirectional influences (Antúnez et al., 2018; Gross et al., 2009; Mackler et al., 2015).

One other study focused on the mediation of the association between depressive symptoms of the parents and ODD and hyperactive symptoms of their child through inconsistent discipline and were confirmed in their assumption (Dette-Hagenmeyer & Reichle, 2014). Moreover, other mediation analyses suggest that the styles of attachment (Cummings et

al., 2008) and reduced affirmation from parent to child (Bellina et al., 2020) mediate the association between parental internalizing symptoms and child externalizing symptoms.

Nevertheless, to the best of our knowledge, no study has examined these associations longitudinally within a clinical sample of children, aged 6-12 years, with elevated levels of externalizing symptoms.

1.7 The WASH Study

Data for the analyses presented in this thesis were derived from a three-arm randomized controlled trial on the efficacy of web-assisted self-help (WASH) for parents of children with externalizing disorders under routine care conditions (Döpfner, Wähnke, et al., 2020). The study was carried out at the University Hospital of Cologne, Germany.

The WASH intervention examined in this study aimed at reducing ADHD and ODD symptoms. The potential contribution to the improvement of care for children with externalizing disorders was investigated. The project was funded by the innovation fund of the German health insurance (“Innovationsfond der Krankenkassen”). The WASH program for parents (parent training website) was developed by Döpfner and Schürmann (2017) in cooperation with the AOK-Bundesverband based on written parent self-help programs consisting of self-help booklets for parents, including working sheets (Döpfner et al., 2021; Döpfner & Schürmann, 2023; Döpfner, Wähnke, et al., 2020; Dose et al., 2017).

The study was registered at the German Clinical Trials Registry (identifier: DRKS00013456) and approved by the Ethics Committee of the Medical Faculty of the University of Cologne. Three study conditions were compared within the randomized controlled trial (RCT): Treatment as usual (TAU), the use of an online parent-training website (WASH), and WASH with additional telephone-based support (WASH+SUPPORT).

For the analyses presented in this article, data from participants in all three study conditions (WASH+SUPPORT, WASH and TAU) were used. The study includes three main measurement time points (pre-, intermediate, post assessment) and a fourth follow-up measurement time point. The first three measurement time points are three months apart, but the follow-up takes place six months after the end of treatment. All three main measurement time points were used for this thesis. Children's ADHD and ODD symptoms, parenting behaviors, and parents' internal symptoms via parent judgment were used from the WASH study questionnaires for this dissertation.

1.8 Aims of the Present Thesis

The aim of the first study in this thesis was to examine cross-sectionally whether parenting behaviors mediate the relationship between parental internalizing symptoms (symptoms of depression, anxiety, and stress) and externalizing symptoms (ADHD symptoms, ODD symptoms) of the child (Klemp et al., 2022). Based on the theoretical models by Goodman and Gotlib (1999) and Patterson (1986) as well as on previous empirical findings, we hypothesized that a higher level of parental internalizing symptoms would be associated with more negative parenting behaviors, which would, in turn, be associated with a higher severity of child externalizing symptoms. The main limitation of the first publication was the cross-sectional nature of the data, limiting causal interpretations.

The aim of the second publication was therefore to perform a longitudinal examination whether negative parenting behavior mediates the relationship between parental internalizing symptoms and child externalizing symptoms. Based on the results from the first publication, we hypothesized that the association between internalizing symptoms of the parents and ODD symptoms of the child would be mediated by negative parenting behavior (Klemp et al., 2022; Klemp et al., 2023).

Overall, the purpose of this thesis is to investigate the mediating role of parenting behaviors in the association between parental internalizing symptoms and child externalizing symptoms. Furthermore, this work aims to provide a deeper understanding of the transmission of mental health problems from parents to their children, as well as to identify potential target points for interventions and to improve mental health for the whole family.

1.9 References Introduction

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2 Parenting Behaviors as Mediators of the Association Between Parental Internalizing Symptoms and Child Externalizing Symptoms

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Parenting Behaviors as Mediators of the Association Between Parental Internalizing Symptoms and Child Externalizing Symptoms

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Abstract

This study analyzes whether the association between parental internalizing symptoms (depression, anxiety, stress) and child symptoms of attention-deficit/hyperactivity disorder (ADHD) or oppositional defiant disorder (ODD) is mediated by positive and negative parenting behaviors. Cross-sectional data of 420 parents of children (age 6–12 years) with elevated levels of externalizing symptoms were collected in a randomized controlled trial. Measures included parent ratings of their internalizing symptoms and parenting behaviors and of their child's externalizing symptoms. Two mediation models were examined, one including ADHD symptoms and one including ODD symptoms as the dependent variable. Parental internalizing symptoms were modeled as the independent variable and positive and negative parenting behaviors were modeled as parallel mediators. Regression analyses support negative parenting behavior as a mediator of the association between parental internalizing symptoms and child ODD symptoms. For the ADHD model, no significant mediator could be found. Future studies should use prospective designs and consider reciprocal associations.

Keywords Attention-deficit/hyperactivity disorder (ADHD) · Oppositional defiant disorder (ODD) · Parenting behavior · Mediation analysis

Introduction

Externalizing disorders such as attention-deficit/hyperactivity disorder (ADHD) and oppositional defiant disorder (ODD) are common mental disorders in childhood, with worldwide pooled prevalence rates of 3.4% for ADHD and 3.6% for ODD among children and adolescents [1]. ADHD is characterized by developmentally inappropriate levels of hyperactivity, impulsivity, and/or inattention [2, 3], while ODD is defined as a pattern of short-tempered mood and anger, irritability, and confrontational behavior, but without

severe violent or harmful behavior [2, 3]. The two disorders show a high degree of comorbidity with each other [4–6].

A number of studies have demonstrated associations between parental internalizing symptoms and child externalizing behavior problems. For instance, meta-analyses revealed higher rates of both internalizing and externalizing symptoms in parents of children with versus without ADHD [7, 8], with the highest rates found for parental ADHD, depression, and anxiety symptoms [7]. Moreover, a recent study using longitudinal data reported that increasing parental mental health problems were related to increasing ADHD symptoms of the child over time [9, 10]. Particularly considering internalizing symptoms of the parents, previous research found higher levels of anxiety, depression, and stress in parents of children screening positive for ADHD compared to screening-negative controls [11]. Additionally, several longitudinal studies have reported associations between maternal depressive symptoms and later child externalizing behavior problems [6, 12–14], and maternal depressive symptoms were identified as a risk factor for high trajectories of hyperactivity-impulsivity and inattention symptoms in the child [15].

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While some studies support the presence of a unidirectional influence from parental depressive symptoms to child externalizing symptoms [13, 16], others hint at the reverse effect, insofar as child externalizing behavior, such as the tendency for tantrums and emotional dysregulation, affects parental mood [17, 18]. Indeed, mothers of children with externalizing behavior problems such as ADHD were found to show high levels of parenting stress over time, and child behavior problems and parental depressive symptoms both predicted parental stress [9]. However, other longitudinal studies have demonstrated that child and parental psychopathologies influence one another, thus suggesting that the effect is reciprocal in nature [19–21].

To improve the prevention and treatment of child externalizing behavior disorders, it would be useful to know the mechanisms that account for the association between parental internalizing symptoms and child externalizing symptoms. It is most likely that the association between parental and child symptoms is the result of a complex interplay of different factors. In an integrative, developmentally sensitive model, Goodman and Gotlib [22] suggested four mechanisms through which maternal depressive symptoms exert an effect on child psychopathology: (1) heritability, (2) innate dysfunctional neuroregulatory mechanisms, (3) exposure to the mother's negative and/or maladaptive cognitions, behaviors, and affect, and (4) exposure to a stressful environment. This model can probably be generalized to other maternal mental health conditions [22, 23]. In terms of the development or modification of psychosocial interventions for the treatment of child psychopathology, the mechanism relating to the mother's dysfunctional cognitions, behavior, and affect is of particular interest, as interventions may be designed to target these constructs. One hypothesis relating to this mechanism is that parental symptoms lead to specific parenting behaviors, which in turn affect the symptoms of the child. To test such a hypothesis, mediation analyses can be used [24, 25].

On a theoretical level, the association between parenting practices and child externalizing symptoms might be explained using the coercive family process model by Patterson (1983, 1989), which models the mutual reinforcement of dysfunctional parenting practices and disruptive behaviors of the child, and thus explains the development and escalation of these behaviors [26]. In line with this model, numerous studies have revealed associations between parenting practices and ODD symptoms or externalizing symptoms in general. For instance, parental rejection and overprotection as perceived by the child were shown to precede externalizing behavior problems in general [27, 28], and overreactive parenting practices were found to be prospectively related to the presence of ODD symptoms [14]. Moreover, harsh parenting is very likely to lead to antisocial behavior in children [29].

Furthermore, parents of children with externalizing disorders were found to show a more inconsistent and hostile parenting style compared to a control group [11]. Another study reported that in children diagnosed with ADHD, both comorbid ODD and conduct disorder were significantly associated with maternal negative/ineffective discipline [30]. Although the model by Patterson was not designed to explain the development of ADHD symptoms, some aspects of negative parenting behavior have also been linked to this disorder. For instance, inconsistent discipline [31], overreactive parenting [14, 32] and rejecting parenting [33] have been found to be predictive of later ADHD symptoms.

On the other hand, aspects of positive parenting practices seem to act as protective factors regarding the development of different types of externalizing behavior. For example, positive parenting practices have been associated with fewer future conduct problems [6] and were found to have a positive impact on ADHD symptoms [34]. In a longitudinal study, warm parenting by adoptive mothers predicted lower levels of later child externalizing problems [35], and a study of clinic-referred families reported an association between higher parental involvement and lower levels of later hyperactivity and inattention [32]. Moreover, cross-sectional data revealed that parents of children screening negative for ADHD demonstrated more warmth than parents of children with positive screening results [11]. Parental symptoms of depression, anxiety, and stress may contribute to dysfunctional parenting practices. For instance, depressive mothers tend to report fewer firm and consistent parenting behaviors, less warm and nurturing parenting, and fewer positive parenting practices than do non-depressed mothers [36]. Moreover, mothers experiencing depressive symptoms often show a decline in positive parenting practices [37], and mothers with recurrent episodes of depression reported more anger and hostility and less tolerance towards their toddlers [38]. Similarly, maternal anxiety was found to lead to less parental warmth and less positive engagement [39]. These parenting practices might permit interactions within the family which reinforce disruptive behaviors of the child, as emphasized in the model by Patterson.

To the best of our knowledge, only a small number of studies have directly examined parenting practices as potential mediators of the association between parental symptoms of depression, anxiety, and stress and child externalizing symptoms, with some studies detecting mediating effects and others reporting no such effects. Analyzing a community sample, Trepát et al. [40] found that corporal punishment mediated the (non-significant) association between maternal anxiety-depression symptoms and child ODD symptoms in preschool-age girls but not boys. The relation between paternal internalizing symptoms and child ODD was not mediated by paternal parenting practices [40]. In a large community sample, Elgar et al. [41] demonstrated

that the effect of self-rated parental depression on later self-rated child externalizing symptoms was mediated by child-rated parental nurturance and rejection. Using longitudinal data of a community sample of school-age children, Dette-Hagenmeyer and Reichle [42] reported that mothers' inconsistent use of discipline mediated the longitudinal association between the mothers' depressive symptoms and the children's ODD and hyperactivity symptoms [42]. When considering fathers, the authors found that inconsistent discipline (positively) mediated the association between paternal depressive symptoms and child ODD symptoms, and positive parenting behavior (negatively) mediated the association between paternal depressive symptoms and child hyperactivity [42]. To our knowledge, only one study has examined the mediation of the association between parental internalizing symptoms and child externalizing behavior in a clinical sample [43]. Based on cross-sectional data from a sample of mother-child dyads (child age 8–12 years) referred for treatment, Van Doorn et al. [43] demonstrated a strong association between self-reported maternal depressive symptoms and maternal reports of children's internalizing and externalizing mental health problems. However, different aspects of observed mother-child interactions (i.e., maternal warmth and maternal psychological control) did not mediate the relation between maternal depressive symptoms and child mental health problems. The findings were limited by the sample size ($n = 111$) and the authors suggested that the study may have been underpowered [43]. Moreover, the results were further limited by the low internal consistency of the scale used to assess parental warmth.

The present study examined the mediation of the impact of a general measure of parental symptoms of depression, anxiety, and stress on child ADHD and ODD by positive parenting behaviors (e.g., the use of praise, encouragement, joint play, supportive strategies; cf. [44]) and negative parenting behaviors (e.g., verbal criticism, harshness; cf. [44]). In contrast to previous studies, we considered a large clinical sample of children with elevated levels of externalizing behavior problems. Moreover, while most previous analyses concentrated on the effects of parental depressive symptoms, we expanded the previously tested models by also including parental symptoms of anxiety and stress, thus considering parental internalizing symptoms on a more general level.

In particular, we hypothesized that more severe symptoms of parental depression, anxiety, and stress would predict a lower level of positive parenting behaviors and a higher level of negative parenting behaviors, which would in turn lead to more severe ADHD or ODD symptoms, respectively, in the child. ADHD symptoms seem to be more strongly determined by genetic influences than do ODD symptoms [45, 46], whereas a recent twin study demonstrated a strong influence of environmental factors on the development of ODD symptoms [30, 47]. Moreover, the aforementioned coercive

family process model was originally conceived to explain the development of disruptive symptoms (and not the development of ADHD core symptoms). Thus, the association between parenting practices and child symptoms seems to be more strongly pronounced in children with ODD than in children with ADHD [48–50].

Accordingly, we expected the effects of parental symptoms on child ODD symptoms to be more strongly mediated by parenting behaviors compared to the respective effects on child ADHD symptoms. Moreover, from an exploratory perspective, we examined the relative contribution of positive and negative parenting practices to this mediation process.

Methods

Study Design and Participants

The data for the current analyses were gathered as part of a randomized controlled trial [RCT] on the efficacy of a web-assisted self-help program [WASH] for parents of children with symptoms of ADHD and/or ODD [51]. The RCT was registered at the German Clinical Trials Register (identifier: DRKS00013456) and approved by the Ethics Committee of the University Hospital Cologne, Germany. We compared three study conditions: treatment as usual, WASH plus treatment as usual, and WASH plus telephone-based support. The analyses presented in this article used baseline data from participants in all three study conditions.

For recruitment purposes, study information was sent to 5015 pediatricians and child and adolescent psychiatrists in Germany, who could then register eligible participants. Recruitment took place between December 2017 and February 2020. To participate in the RCT, families had to meet the following inclusion criteria: (a) the child was aged between 6 and 12 years, (b) the referring health care provider had diagnosed the child with an externalizing behavior disorder or suspected the diagnosis of an externalizing disorder, and (c) the child demonstrated an elevated level of externalizing symptoms. Externalizing symptoms were assessed by a clinician using the semi-structured Clinical Parent Interview for Externalizing Disorders in Children and Adolescents [52–54], which was conducted by telephone. Additionally, parents had to indicate the presence of either at least five out of nine symptoms of inattention, at least four out of nine symptoms of hyperactivity-impulsivity, at least eight out of 18 ADHD symptoms (inattentive or hyperactive-impulsive), or/and at least four out of eight ODD symptoms in their child. Exclusion criteria for the children were the diagnosis of a serious mental illness, the diagnosis of an autism spectrum disorder, or the need for inpatient treatment as indicated by the health care provider. The terms "parents" or "mother/father" include not only biological parents but also

other primary caregivers of the child who are most likely to perform a parenting function for the child.

Measures

The participating parents completed all questionnaires used for the current analyses online; there was no face-to-face contact with any of the participants. The parents rated their child's ADHD and ODD symptom severity on the German Symptom Checklist for Attention-Deficit/Hyperactivity Disorder (SCL-ADHD), German: "Fremdbeurteilungsbogen für Aufmerksamkeitsdefizit-/Hyperaktivitätsstörungen [52], and on the German Symptom Checklist for Disruptive Behavior Disorders (SCL-DBD), German: "Fremdbeurteilungsbogen für Störungen des Sozialverhaltens [52]. The items of both questionnaires are based on DSM-5 and ICD-10 symptom criteria. The SCL-ADHD assesses ADHD symptoms with eighteen items. From the SCL-DBD, we only applied the eight-item ODD scale. Parents rated each item on a four-point Likert-type scale ranging from 0 (not at all) to 3 (very much/particularly severe). An overall ADHD score and an overall ODD score were computed by averaging the respective item scores. Both the SCL-ADHD and the SCL-DBD have demonstrated factorial validity and satisfactory internal consistency [52, 55–57]. In the present sample, Cronbach's α was 0.89 for the overall ADHD score and 0.88 for the ODD score.

In addition, the parents rated the extent to which they had experienced symptoms of depression, anxiety, and stress in the preceding week using the German version of the Depression Anxiety Stress Scales [58–61]. This 42-item questionnaire consists of three 14-item scales measuring the negative emotional states of depression, anxiety, and stress, respectively. Parents rated each of the items on a four-point Likert scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much or most of the time). For the current analyses, item mean scores were calculated for the total scale and for the three subscales (the analyses including the subscales are only provided in the online supplement; see below). The factor structure of the DASS has been confirmed by both exploratory and confirmatory factor analyses [59]. Moreover, the DASS subscales have demonstrated high internal consistency ($\alpha \geq 0.81$) and convergent validity [59]. In the present sample, all subscales and the total score demonstrated good to very good internal consistency (Cronbach's α for the total score: 0.95, Cronbach's α for the subscales: 0.83–0.90). Functional and dysfunctional parenting behaviors were assessed via self-report using the German questionnaire for positive and negative parenting behavior (German: "Fragebogen zum positiven und negativen Erziehungsverhalten", FPNE; [62]). The questionnaire comprises 21 items assessing positive parenting behaviors (i.e., behaviors to promote beneficial parent–child interactions) and 17

items assessing negative parenting behaviors (i.e., inconsistent, impulsive, and/or rigid parenting behavior). The items originate from the Management of Children's Behavior Scale (MCBS; [63]) and the Parent Practices Scale (PPS; [64]). Moreover, the scale comprises some newly developed items, which capture aspects of behavioral parent training (e.g., handling of family rules). Parents rated all items on a four-point Likert-type scale ranging from 1 (never) to 4 (very often/most of the time); scale scores were derived by averaging the associated item scores. Several studies have demonstrated sound psychometric properties of the MCBS, the PPS, and the FPNE itself. Psychometric analyses of the MCBS supported the internal consistency, sensitivity to change, as well as the concurrent and predictive validity of the scale [63]. The PPS has also demonstrated internal consistency and construct validity [64]. The two scales of the FPNE have demonstrated satisfactory internal consistency both in previous analyses [62] and in the present sample (positive parenting: $\alpha = 0.88$; negative parenting: $\alpha = 0.71$).

Statistical Analyses

To examine whether positive and negative parenting behaviors mediate the association between parental internalizing symptoms and ADHD or ODD symptoms, respectively, we conducted mediation analyses using the SPSS macro PROCESS [24]. PROCESS employs ordinary least squares (OLS) regression to estimate the model parameters. In a simple mediation model, the independent variable (X) influences the dependent variable (Y) through a mediator variable (M) [25]. The total effect of X on Y (c) is the sum of a direct effect (c') and an indirect effect (ab) through the mediator variable [25]. The indirect effect (ab) is the product of two paths: the effect of X on M (a), and the effect of M on Y after controlling for the effect of X (b). This product ab can be tested for significance [25]. The direct effect (c') represents the effect of X on Y when controlling for M [25]. Several putative mediators that are not supposed to causally influence each other may be considered together in a parallel multiple mediator model [24]. In such a model, the specific indirect effect through one of the mediator variables (M_i) is the product of the paths linking X and M_i and M_i and Y ($a_i b_i$), controlling for all other mediators in the model. The specific indirect effects add up to the total indirect effect. The total effect in this model is composed by the sum of the indirect effects and the direct effect [24].

In the present study, we analyzed two separate parallel multiple mediator models, using either child ADHD symptom severity or child ODD symptom severity as the dependent variable and total parental internalizing symptoms as the independent variable. To provide an impression of the associations at the DASS subscale level, additional results for models considering either parental anxiety symptoms,

depression symptoms, or stress symptoms as independent variable are presented in the online supplement. In each model, positive and negative parenting behaviors were used as parallel mediators (see Fig. 1). To interpret the indirect effects, we considered the significance of the product ab , but not the significance of the single paths constituting these effects, which is in line with current recommendations [24]. We report unstandardized regression coefficients and determined percentile bootstrap confidence intervals (10,000 iterations) [24]. An estimate was considered as statistically significant if the 95% confidence interval did not include zero. To enable an estimation of the size of the effects, we provide completely standardized total, direct, and indirect effects. Completely standardized effects express the unstandardized effects divided by the standard deviation of the dependent variable and multiplied by the standard deviation of the independent variable [24]. Moreover, to gain an impression of the goodness of fit of our hypothetical models, we considered the proportion of variance in the mediators explained by the independent variable and the proportion of variance in the dependent variable explained by the independent variable and the mediators taken together [24].

Usually, mediation models assume causal relationships, hypothesizing that the independent variable influences the mediator, which in turn has an effect on the dependent variable. To establish such a causal chain, it is recommended to assess the independent variable, the mediator(s), and the dependent variable in consecutive order [24, 65]. However, as we assessed all variables in our models at the same assessment point, we cannot rule out the possibility

that another configuration of the models could be closer to reality. Moreover, from a theoretical perspective, it might be conceivable that parental symptoms directly affect child symptoms (e.g., due to genetic reasons), which then influence how parents behave towards the child. Therefore, we additionally examined two alternative models, in which we modeled parental internalizing symptoms as independent variable, child ADHD symptoms and child ODD symptoms as parallel mediators, and either positive parenting behaviors or negative parenting behaviors as dependent variable.

Results

Sample Characteristics

From January 2018 to March 2020, pediatricians and child and adolescent psychiatrists registered a total of $N=565$ participants for the study. Of these, 431 families met the inclusion criteria, agreed to participate in the study, and were thus randomly assigned to one of the three groups. For the analyses in this article, we considered data of 420 families who subsequently completed the online questionnaires (see Fig. 2).

On average, the 420 children (81.7% male) were 9.4 years old ($SD=1.7$). The referring physicians indicated that 58.3% of the children met the diagnostic criteria for ADHD (F90.0), 13.6% of the children had been diagnosed with a hyperkinetic conduct disorder (F90.1), 2.9% had a diagnosis of other specified behavioral and

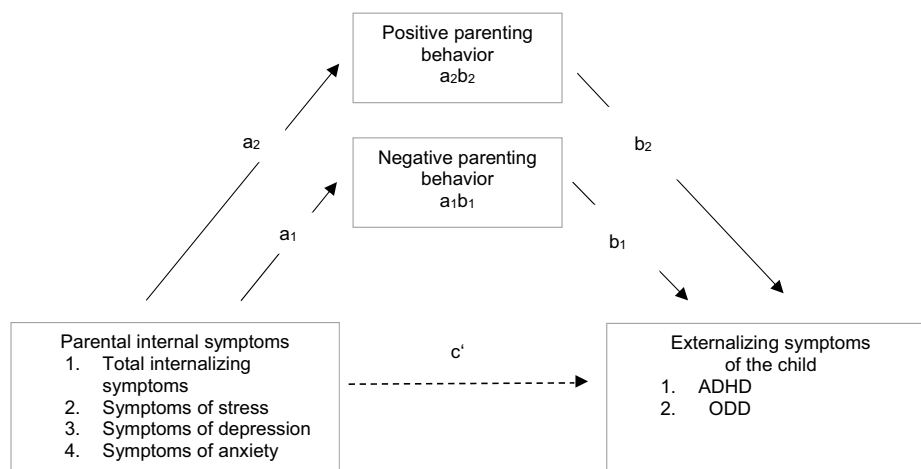
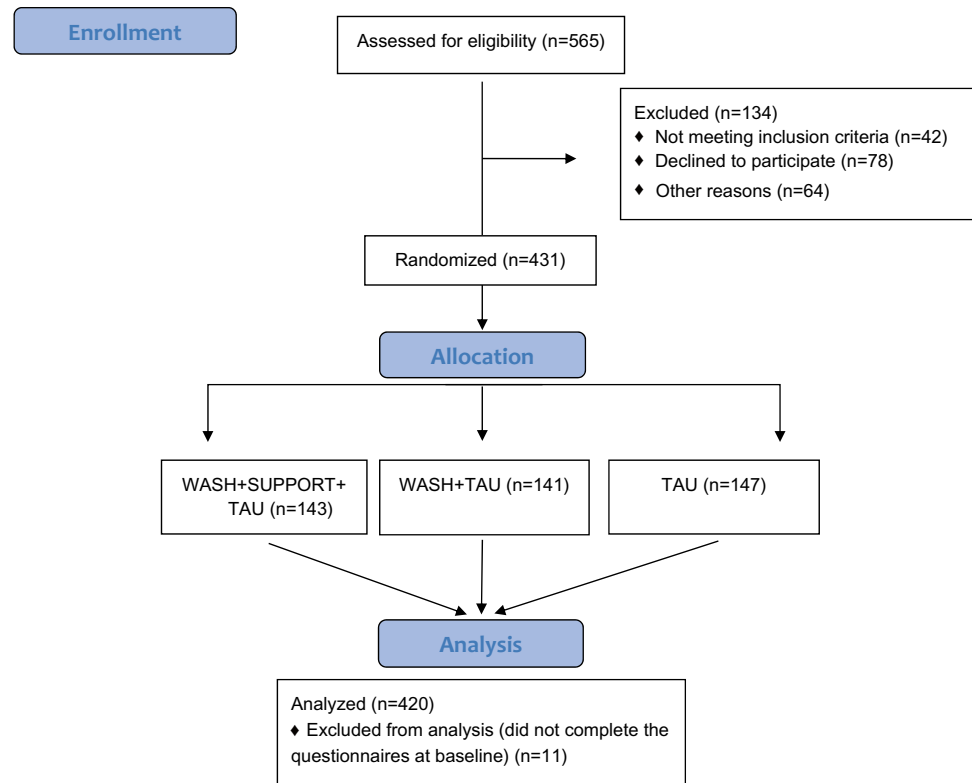


Fig. 1 Multiple mediator model for the mediation of the association of parental internalizing symptoms and child externalizing behavior through parenting behaviors. In total, eight different models were considered: either child ADHD symptoms or child ODD symptoms were considered as dependent variable, and either total parental internalizing symptoms (symptoms of depression, anxiety, and stress combined), symptoms of depression, symptoms of anxiety, or symptoms

of stress as independent variable. All models used positive parenting behavior and negative parenting behavior as parallel mediators. The results for the models including symptoms of depression, symptoms of anxiety, and symptoms of stress as independent variable are provided in the online supplement. *ADHD* attention-deficit/hyperactivity disorder, *ODD* oppositional defiant disorder

Fig. 2 Selection of analysis sample

Notes. WASH = web-assisted self-help, SUPPORT = telephone based support, TAU = treatment as usual.

emotional disorders (F98.8), 1.2% met the diagnostic criteria for ADHD other type or unspecified type (F90.8; F90.9), and 0.5% of the children had been diagnosed with ODD (F91.3). Moreover, the referring physicians suspected a diagnosis of ADHD in 23.6% of the children. About half of the children (54.8%) were on ADHD medication and 26% of the parents indicated that their child was currently undergoing psychotherapy. In 88.3% of the cases, the participating parent was the biological mother of the child with externalizing behavior problems; 7.6% of the participants were biological fathers, 3.3% were adoptive mothers, and 0.7% were grandparents or other caregivers. The mean age of the participating parents was 41.5 years ($SD = 5.8$). Most of the children (69.5%) lived with both of their parents, 14.3% lived with their mother only, 1% lived with their father only, 11% lived with their mother and her partner, 0.5% lived with their father and his partner, 0.2% lived with their grandparents or other relatives, and 3.6% reported different constellations (e.g., weekly rotation principle, foster care).

Notably, the participating parents reported a rather low level of internalizing symptoms as well as a rather high level of positive parenting behavior (see Table S1 in the online supplement).

Mediation Analysis

To examine whether the association between parental internalizing symptoms and child externalizing symptoms was mediated through positive and negative parenting behaviors, we first examined a model which used child ADHD symptom severity as the dependent variable, total parental internalizing symptoms as the independent variable and positive and negative parenting behaviors as parallel mediators. This model yielded a significant total effect. Parental internalizing symptoms showed a significant negative association with positive parenting behaviors and a significant positive association with negative parenting behaviors. Moreover, there was a significant positive association between positive parenting behaviors and child ADHD symptoms. The specific indirect effect of parental internalizing symptoms on child ADHD symptoms through positive parenting behaviors was significant. In other words, a higher level of parental internalizing symptoms was associated with a lower level of positive parenting behavior, which – contrary to our expectations – led to a lower level of child ADHD symptoms. The corresponding completely standardized specific indirect effect was -0.09 , meaning that children whose parents differ by one unit in their internalizing symptoms differ in

their ADHD symptom severity by 0.09 standard deviations as a result of the indirect effect through positive parenting behaviors. The specific indirect effect of parental internalizing symptoms on child ADHD symptoms through negative parenting behaviors was non-significant in this model. The direct effect of parental symptoms on child ADHD symptoms remained significant after controlling for the mediators (see Table 1). In this model, parental internalizing symptoms explained 14% of the variance in negative parenting behaviors and about 5% of the variance in positive parenting behaviors. Moreover, parental internalizing symptoms and the mediators taken together explained about 12% of the variance in child ADHD symptoms.

Second, we examined a model using child ODD symptom severity as the dependent variable, total parental internalizing symptoms as the independent variable and positive and negative parenting behaviors as parallel mediators. This model yielded both a significant total effect and a significant direct effect after controlling for the mediators. In this model, there was a significant positive association between parental internalizing symptoms and negative parenting behaviors. Moreover, we found a significant positive association between negative parenting behaviors and child ODD symptoms. The specific indirect effect of parental internalizing symptoms on child ODD symptoms through negative parenting behaviors was also significant. That is, a higher level of parental internalizing symptoms predicted a higher level of negative parenting behaviors, which in turn led to

a higher level of ODD symptoms. The corresponding completely standardized specific indirect effect was 0.08. That is, children whose parents differ by one unit in their internalizing symptoms differ in their ODD symptom severity by about one tenth of a standard deviation as a result of the specific indirect effect through negative parenting behaviors. The specific indirect effect through positive parenting behaviors was non-significant. In this model, parental internalizing symptoms and the mediators taken together accounted for about 9% of the variance in ODD symptoms.

Finally, we regarded parental internalizing symptoms on the DASS subscale level. That is, we considered either parental anxiety symptoms, depression symptoms, or stress symptoms as independent variable (with child ADHD or ODD symptoms, respectively, again modeled as dependent variable and positive and negative parenting behaviors modeled as parallel mediators). The findings for the resulting models were, on an overall level, comparable to those for the models including a composite score for parental internalizing symptoms. However, when considering child ADHD symptoms as dependent variable and either parental symptoms of depression or parental symptoms of anxiety as independent variable, we found an additional significant specific indirect effect through negative parenting behaviors. Here, a higher level of parental symptoms of depression or anxiety, respectively, predicted a higher level of negative parenting behaviors, which was in turn associated with a

Table 1 Unstandardized regression coefficients, bootstrap confidence intervals, and model information for the multiple mediator model for the mediation of the association of parental internalizing symptoms

	Outcome							
	ADHD				ODD			
	Coeff	Bootstrap SE	95% bootstrap CI	Completely stand. effect	Coeff	Bootstrap SE	95% bootstrap CI	Completely stand. effect
a_1	0.27*	0.03	0.20; 0.33		0.27*	0.03	0.20; 0.33	
b_1	0.17	0.09	- 0.01; 0.36		0.50*	0.12	0.26; 0.75	
a_1b_1	0.05	0.02	- 0.002; 0.10	0.04	0.13*	0.04	0.06; 0.21	0.08
a_2	- 0.19*	0.04	- 0.27; - 0.11		- 0.19*	0.04	- 0.27; - 0.11	
b_2	0.26*	0.07	0.11; 0.40		- 0.10	0.10	- 0.29; 0.09	
a_2b_2	- 0.05*	0.02	- 0.09; - 0.02	- 0.04	0.02	0.02	- 0.02; 0.06	0.01
c'	0.40*	0.06	0.27; 0.52	0.31	0.21*	0.08	0.04; 0.37	0.12
c	0.40*	0.06	0.28; 0.51	0.31	0.36*	0.08	0.20; 0.52	0.22

a_1 parental symptoms of depression, anxiety, and stress \rightarrow negative parenting behavior, b_1 negative parenting behavior \rightarrow outcome, a_1b_1 indirect effect of parental symptoms of depression, anxiety, and stress on outcome through negative parenting behavior, a_2 parental symptoms of depression, anxiety, and stress \rightarrow positive parenting behavior, b_2 positive parenting behavior \rightarrow outcome, a_2b_2 indirect effect of parental symptoms of depression, anxiety, and stress on outcome through positive parenting behavior, c' direct effect of parental symptoms of depression, anxiety, and stress on outcome, c total effect of parental symptoms of depression, anxiety, and stress on outcome, *ADHD* attention-deficit/hyperactivity disorder, *ODD* oppositional defiant disorder, *Coeff.* unstandardized regression coefficient, *SE* standard error, *CI* confidence interval

*Significant coefficient (95% CI does not include zero). The standard errors and confidence intervals for the total effects were determined with the use of bootstrap samples

(depression, anxiety, and stress symptoms) and child externalizing behavior through parenting behaviors ($n=420$)

higher level of ADHD symptoms (see Table S2 in the online supplement).

When we reversed the mediators and outcomes, i.e. when we considered child ADHD and ODD symptoms as parallel mediators and used negative or positive parenting behaviors, respectively, as outcomes, the results were as follows (also depicted in Table 2): In both the model using positive parenting behaviors and the model using negative parenting behaviors as outcome, we detected a significant total effect and a significant direct effect when controlling for the mediators. In the model using positive parenting behaviors as outcome, we detected both a significant specific indirect effect through child ADHD symptoms and a specific indirect effect through child ODD symptoms. A higher level of parental internalizing symptoms was associated with a higher level of child ADHD symptoms, which was in turn associated with more positive parenting behaviors (completely standardized effect: 0.07). On the other hand, a higher level of parental internalizing symptoms was related to a higher level of ODD symptoms, which in turn demonstrated a negative association with positive parenting behaviors (completely standardized effect: -0.04). In the model including negative parenting behaviors as outcome, only the specific indirect effect through child ODD symptoms became significant. As stated above, a higher level of parental internalizing symptoms was associated with a higher level of child ODD symptoms. Here, a higher level of ODD symptoms was in turn related to more negative parenting behaviors (completely standardized

effect: 0.05). Parental internalizing symptoms accounted for about 9% of the variance in ADHD symptoms and about 5% of the variance in ODD symptoms. Moreover, parental internalizing symptoms and the mediators taken together explained about 10% of the variance in positive parenting behaviors and about 18% of the variance in negative parenting behaviors.

Discussion

The present study aimed to illuminate the mechanisms underlying the often-found association between parental internalizing symptoms and child externalizing symptoms by analyzing the mediation of this association by positive and negative parenting behaviors in a clinical sample of school-age children with elevated levels of externalizing behavior problems. The analyses revealed significant associations between parental internalizing symptoms and both child ADHD and child ODD symptoms. However, differential mediation effects were detected for the different outcome variables. While the relationship between parental internalizing symptoms (depression, anxiety, and stress) and child ADHD symptoms was mediated by positive parenting behaviors (small, negative indirect effect), a small positive indirect effect of parental internalizing symptoms on child ODD symptoms through negative parenting behaviors was detected. The indirect effects of the global measures of

Table 2 Unstandardized regression coefficients, bootstrap confidence intervals, and model information for the multiple mediator model for the mediation of the association of parental internalizing symptoms

	Outcome							
	Positive parenting				Negative parenting			
	Coeff	Bootstrap SE	95% bootstrap CI	Completely stand. effect	Coeff	Bootstrap SE	95% bootstrap CI	Completely stand. effect
a_1	0.40*	0.06	0.28; 0.51		0.40*	0.06	0.28; 0.51	
b_1	0.15*	0.04	0.08; 0.22		-0.02	0.03	-0.08; 0.03	
a_1b_1	0.06*	0.02	0.03; 0.09	0.07	-0.01	0.01	-0.03; 0.01	-0.01
a_2	0.36*	0.08	0.21; 0.52		0.36*	0.08	0.21; 0.52	
b_2	-0.10*	0.03	-0.15; -0.04		0.09*	0.02	0.05; 0.14	
a_2b_2	-0.04*	0.01	-0.06; -0.01	-0.04	0.03*	0.01	0.02; 0.06	0.05
c'	-0.21*	0.05	-0.30; -0.12	-0.24	0.24*	0.04	0.17; 0.31	0.34
c	-0.19*	0.04	-0.27; -0.11	-0.22	0.27*	0.03	0.20; 0.33	0.37

a_1 parental symptoms of depression, anxiety, and stress \rightarrow ADHD symptoms of the child, b_1 ADHD symptoms of the child \rightarrow outcome, a_1b_1 indirect effect of parental symptoms of depression, anxiety, and stress on outcome through ADHD symptoms of the child, a_2 parental symptoms of depression, anxiety, and stress \rightarrow ODD symptoms of the child, b_2 ODD symptoms of the child \rightarrow outcome, a_2b_2 indirect effect of parental symptoms of depression, anxiety, and stress on outcome through ODD symptoms of the child, c' direct effect of parental symptoms of depression, anxiety, and stress on outcome, c total effect of parental symptoms of depression, anxiety, and stress on outcome, *ADHD* attention-deficit/hyperactivity disorder, *ODD* oppositional defiant disorder, *Coeff.* unstandardized regression coefficient, *SE* standard error, *CI* confidence interval

*Significant coefficient (95% CI does not include zero). The standard errors and confidence intervals for the total effects were determined with the use of bootstrap samples

parental internalizing symptoms on child ADHD symptoms through negative parenting behaviors and on ODD symptoms through positive parenting behaviors were non-significant. However, when considering parental internalizing symptoms on the subscale level, we additionally detected a significant effect of both parental symptoms of depression and parental symptoms of anxiety on child ADHD symptoms through negative parenting behavior.

To sum up, in line with our expectations, our results particularly underline the role of negative parenting behavior in mediating the association between parental internalizing symptoms and child ODD symptoms, respectively. Higher levels of parental internalizing symptoms (only symptoms of depression and anxiety in the model using ADHD as outcome) were associated with a higher level of negative parenting behavior, which was in turn associated with more severe child ADHD or ODD symptoms, respectively. This finding is consistent with the results of some previous mediation studies [41, 42] and with one of the mediating mechanisms proposed by Goodman and Gotlib [22, 23], namely the mediation of the impact of parental symptoms on child symptoms by parental behavior. However, the mediation effects found in the present study were rather small. Furthermore, in all models, parental internalizing symptoms and the mediators taken together explained only a small amount of the variance in child ADHD or ODD symptoms, respectively, indicating a rather poor data fit of the proposed models. As such, there might be other (additional) variables accounting for the association between parental internalizing and child externalizing symptoms, for example a common genetic disposition and/or environmental factors.

On a descriptive level, the mediation effects through negative parenting behavior were somewhat larger in the models using ODD symptoms as outcome compared to the models using ADHD symptoms as outcome, and the mediation effect in the ADHD model was non-significant when considering a global score of parental internalizing symptoms as predictor (which additionally comprised parental symptoms of stress). This might be explained by the assumption that ADHD symptoms are more strongly determined by biological or genetic factors [45, 46].

Regarding the mediation of the association between parental symptoms and child ADHD symptoms by positive parenting behavior, we found that with increasing parental internalizing symptoms, positive parenting behavior was reduced (negative correlation). Contrary to our expectations, however, positive parenting behavior was positively associated with ADHD symptoms. In other words, with more pronounced positive parenting behavior, more severe ADHD symptoms were observed in the child. This second path contradicts the results of previous studies, which reported that lower levels of aspects of positive parenting behavior were associated with higher ADHD symptom severity [31, 34].

The cross-sectional nature of our data complicates the justification of the causal sequence proposed in the mediation models; we cannot rule out that another sequence of the mediators and outcomes might be closer to reality. The examination of alternative model configurations using parental internalizing symptoms as independent variable, child ADHD and ODD symptoms as parallel mediators, and either positive parenting behavior or negative parenting behavior as outcome yielded significant specific indirect effects through both ADHD and ODD symptoms in the model including positive parenting behavior and a significant specific indirect effect through ODD symptoms in the model including negative parenting behavior. While the direction of the indirect effect through ADHD is hard to interpret (more severe ADHD symptoms were associated with a higher level of positive parenting behavior), the indirect effects through child ODD symptoms might make sense from a theoretical point of view. It is conceivable that parental internalizing symptoms lead to child externalizing symptoms, e.g., as they share a common genetic basis, and that child externalizing symptoms, in turn, affect the way parents behave towards the child [66]. Future studies should use longitudinal data to further clarify the relation and sequence of the variables used in the models in this study, and also consider the possibility of reciprocal associations.

This study has several limitations. First, the major limitation is the cross-sectional nature of the data, which does not allow for causal interpretations. As we found some reasonably interpretable results in both our original analyses and the analyses with reversed mediators and outcomes, future studies using longitudinal data are required. Such studies would have the potential to illuminate the possibly reciprocal and complex associations between internalizing symptoms of the parents, parenting behavior, and externalizing symptoms of the child. Preferably, these studies should concentrate on children at risk of developing externalizing behavior and begin treatment before the symptoms manifest.

Second, the results are limited by the fact that all questionnaires were completed by the parents, thus reflecting parental judgment only, which might be prone to bias by socially desirable responding or dissimulation tendencies. One previous study compared self-judgment to observed judgment, and only found a significant correlation for parental warmth. Observations of parental control practices, which include inconsistency, were not significantly associated with self-judgment of these behaviors [67]. Another study showed no correlation between parent and child judgment of parenting behavior [68]. Moreover, a previous study failed to find significant effects for the mediation of the association between depressive symptoms of the parents and child internalizing and externalizing symptoms through observed parent-child interactions [43]. However, the latter study had several shortcomings, including possibly insufficient power

to detect a mediating effect [43]. Taken together, the results of the latter study and the present study highlight the need to consider different sources of information (e.g., clinical ratings and observations of parental behavior) in larger clinical samples in future studies. Moreover, as the parents in the present study scored very high on the positive parenting behavior scale, their ratings may be subject to a ceiling effect [69].

Third, positive and negative parenting behavior were assessed on a fairly global level in the current study. Future studies might benefit from a more differentiated assessment of parenting behavior. For example, a questionnaire similar to the Parenting Styles and Dimensions Questionnaire (PSDQ) [70], but specifically related to externalizing disorders, may be beneficial, as these children pose special challenges to parenting. Besides the format (observations or clinical ratings), a wider range of categories (including some content from the FPNE as well) could be created: for example, abilities of the parents to “bond and respond”, consistency, dealing with boundaries and rules, dispute culture and possibilities for autonomy.

Fourth, our study did not consider potential moderators of the mediation effects. For example, parental externalizing psychopathology might affect the mediation process. A previous study found that women with ADHD symptoms have significantly more difficulties in raising their children than women without ADHD [71]. Unfortunately, ADHD symptoms of the parents were not recorded within the present study.

Fifth, another limitation is the underrepresentation of fathers in the sample. Although we imposed no restrictions concerning the gender of the parent participating in our study, the sample mostly comprised mothers. Therefore, our findings cannot be easily transferred to associations of fathers' psychopathology and parenting behavior with the child's symptoms. Similarly, no conclusions can be drawn concerning the effects on girls (comprising only 18.3% in the present sample) with ODD/ADHD.

Summary

Numerous studies have demonstrated associations between parents' internalizing symptoms and their children's ADHD and ODD symptoms. Moreover, low levels of positive parenting behavior and high levels of negative parenting behavior have been linked to child externalizing symptoms. The aim of this study was to analyze whether the associations between parental internalizing symptoms (depression, anxiety, stress) and child symptoms of ADHD or ODD are mediated by positive and negative parenting behaviors. Cross-sectional data of 420 parents of children (age 6–12 years) with elevated levels of externalizing symptoms were

collected within a randomized controlled trial. Measures included parent ratings of their internalizing symptoms and parenting behaviors and of their child's externalizing symptoms. Two mediation models were examined, one including ADHD symptoms and one including ODD symptoms as dependent variable. Parental internalizing symptoms were modeled as the independent variable, and positive and negative parenting behaviors were modeled as parallel mediators. Regression analyses yielded a significant indirect effect of parental internalizing symptoms on child ODD symptoms through negative parenting behavior and a significant indirect effect on ADHD symptoms through positive parenting behavior. However, the direction of the latter effect was contrary to our expectations (i.e., it encompassed a positive association between positive parenting and ADHD symptom severity). Thus, this study mainly supports the assumption of negative parenting behavior as a mediator of the association between parental symptoms and child ODD symptoms. The main limitation of the study pertains to the cross-sectional nature of the analyses. Future studies should use prospective designs and consider reciprocal associations.

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Declarations

Conflict of interest Manfred Döpfner, Julia Plück and Christina Dose receive royalties from publishing companies as authors of books and treatment manuals on parent training and of assessment manuals. None of the other authors of this study report any conflicts of interest.

Ethical Approval All procedures performed in our study were approved by the Ethics Committee of the University Hospital of Cologne and were therefore in accordance with the 1964 Declaration of Helsinki and its later amendments. Informed consent was obtained from all individual participating caregivers prior to their inclusion in the study.

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3 Negative Parenting Mediates the Longitudinal Association Between Parental Internalizing Symptoms and Child Oppositional Symptoms

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Negative Parenting Mediates the Longitudinal Association between Parental Internalizing Symptoms and Child Oppositional Symptoms

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Abstract

Research has pointed to both cross-sectional and longitudinal associations between parental internalizing symptoms and child externalizing symptoms. This study analyzed whether the association is mediated by negative parenting behavior in view of previous reports that both parental internalizing symptoms and child externalizing symptoms are related to parenting behaviors. Longitudinal data for the current analyses were derived from a randomized controlled trial on the efficacy of a web-assisted self-help intervention for parents of children with elevated levels of externalizing symptoms. Two different mediation models were analyzed, one using attention-deficit/hyperactivity disorder (ADHD) symptoms as the dependent variable and the other using oppositional defiant disorder (ODD) symptoms. Both models included parental internalizing symptoms as the independent variable, negative parenting behavior as a mediator, and study condition as a confounder. The longitudinal analyses support the mediating role of negative parenting behavior in the association between early parental internalizing symptoms and later child ODD symptoms.

Keywords Attention-deficit hyperactivity disorder · Oppositional defiant disorder · Parenting · Longitudinal analysis · Randomized controlled trial

Introduction

Externalizing disorders are common in childhood and represent one of the main reasons for referral to child and adolescent mental health services [1]. The most frequent externalizing disorders between the ages of 6 and 12 years are oppositional defiant disorder (ODD), with a prevalence of 4.9%, and attention-deficit hyperactivity disorder (ADHD), with a prevalence of 4.3% [2]. To improve the treatment of these disorders, deeper knowledge about their etiology and pathogenesis is needed.

The etiology of both ADHD and ODD is considered to be multifactorial [3, 4]. That is, both genetic and environmental factors seem to affect the development of these disorders. Regarding ADHD, genetic factors seem to play the most important role [5], while for ODD, environmental factors seem to be more determinant [6]. Previous research has shown that parental factors such as parental psychopathology and parenting behaviors can have a significant impact on the development and manifestation of ODD and ADHD symptoms in children [7–9].

Previous research has demonstrated positive associations of internalizing symptoms of the parents, such as anxiety and depressive symptoms, with child externalizing symptoms. While some studies reported positive longitudinal associations between parental internalizing symptoms at an early assessment point and child externalizing symptoms (e.g. ADHD or overarching externalizing symptoms) at a later assessment point [10–12], others found associations between early child externalizing symptoms (i.e. child inattention and oppositional-conduct problems) and later parental mood and stress, pointing at the reverse direction of effect [13, 14]. Moreover, some studies have indicated

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bidirectional associations for children with ODD, disruptive behavior and externalizing behavior in general [15–17].

To make these etiological considerations and related empirical findings useful for improving the prevention and treatment of externalizing behavior disorders, knowledge regarding the mechanisms through which parental internalizing symptoms exert their effects on child externalizing symptoms is crucial.

In this regard, the integrative model by Goodman and Gotlib [18] suggests four potential mechanisms: (1) genetic factors, (2) innate dysfunctional neuroregulatory mechanisms, (3) exposure to dysfunctional parental cognitions, behaviors, and affect, and (4) the stressful life context of the children. Especially the third factor might be of interest when deriving conclusions for treatment, as parental cognitions and behaviors are potentially modifiable. A more detailed presentation of the way in which parenting behaviors might affect child externalizing behaviors is provided by Patterson's model of the family coercive process [19]. This model provides a theoretical framework to understand how disruptive behavior problems in children are shaped within the family environment [19]. According to this model, ongoing cycles of negative interactions between parents and children can lead to the mutual reinforcement and escalation of problematic behaviors. This cycle is characterized by coercive exchanges, where both parents and children engage in aversive and confrontational behaviors [19].

In line with these models, parental health and psychological well-being have been found to be related to parenting behavior [20]. Maternal symptoms of anxiety appear to be cross-sectionally related to less maternal warmth and less positive engagement [21]. Moreover, based on longitudinal data, mothers with depressive symptoms have been found to show a decline in positive parenting practices and to report less consistent parenting behavior, fewer positive parenting practices, and less warm and nurturing parenting behaviors [22, 23].

Previous research also points to a positive cross-sectional association of negative and inconsistent parenting behavior with children's antisocial behavior [24]. Typically, the term negative parenting behavior refers to inconsistency, impulsivity and rigidity in parents' behavior. Parents of children with externalizing symptoms (i.e. ODD, ADHD) have been shown to use more negative parenting practices, to be critical of their children, and to show less monitoring behavior in community samples [25, 24, 26–28]. Positive parenting behaviors, by contrast, comprise behaviors that serve to promote favorable parent-child interactions, and previous longitudinal studies have demonstrated protective effects of positive parent-child interactions in school, community, and clinical samples [29].

Studies examining positive and negative parenting behaviors as mediators of the effects of behavioral treatments hint at a greater importance of negative parenting behaviors for children's behavior problems (i.e. ODD and ADHD) [30–34], suggesting that this association is particularly crucial [35, 32, 36, 37]. However, some longitudinal studies found that only positive parenting behaviors acted as mediators, or that a combination of positive and negative parenting behaviors exerted an impact [38–40].

Studies focusing directly on the mediation of the association between parental internalizing symptoms and child externalizing symptoms through parenting behaviors are rare. Dette-Hagenmeyer & Reichle [41] found in a non-clinical sample that mothers' inconsistent use of discipline mediated the longitudinal association between maternal depressive symptoms and child ODD and hyperactive symptoms. Moreover, mediation analyses in a clinical sample suggest that parental affirmation [42] and negative parental emotional expressiveness [43] mediate the association between parental internalizing symptoms and child or adolescent externalizing symptoms.

Tom sum up, to the best of our knowledge, only few studies have directly explored how parenting practices could serve as mediators of the association between parental symptoms of depression, anxiety, and stress on the one hand, as well as the manifestation of externalizing symptoms in children on the other hand. Currently, no study has focused on the mediation of the association between parental internalizing symptoms and externalizing symptoms in children through parenting behaviors in a clinical sample of children with elevated levels of externalizing symptoms from a longitudinal perspective. In a first analysis based on cross-sectional data, we found that negative parenting behaviors mediated the association between parental internalizing symptoms and ODD symptoms, but not the association between parental internalizing symptoms and ADHD symptoms [44]. A possible explanation for this discrepancy might be that ADHD symptoms are determined more by genetic influences compared to ODD symptoms, for which environmental influences seem to play a greater role [45–47]. Since the development of both disorders is multifactorial, it is necessary to determine how crucial parental symptoms and parenting behaviors are in this process, how they interact, and to what extent they influence the child's symptoms. Moreover, in the previous cross-sectional analysis, we detected a small indirect effect of parental internalizing symptoms on child ADHD symptoms through positive parenting behaviors. However, the direction of this effect was contrary to our expectation. While in line with our assumption, increased parental internalizing symptoms were associated with a lower level of positive parenting behaviors, in contrast to our hypothesis, a lower

level of positive parenting behaviors was related to lower ADHD symptom severity [44].

The aim of the current study was to examine whether negative parenting behavior also mediates the longitudinal association between parental internalizing symptoms (that is, symptoms of depression, anxiety, and stress) and child externalizing symptoms (ADHD symptoms, ODD symptoms). Using data from three consecutive assessment points, we analyzed whether higher levels of parental internalizing symptoms (such as depression, anxiety, and stress) would predict higher levels of negative parenting behavior, which in turn would lead to more severe externalizing symptoms in the child. As our first set of cross-sectional analyses yielded different mediation effects in the models considering ADHD and ODD symptoms, respectively, as outcomes, we decided to also consider these two externalizing domains separately in the current longitudinal analyses. As in the analyses based on cross-sectional data, we hypothesized a significant mediation of the association between parental internalizing symptoms and child ODD symptoms through negative parenting behavior, but no such mediating effect when considering child ADHD symptoms as the outcome. Our previous cross-sectional analyses did not detect any reasonably interpretable mediating effects through positive parenting behaviors. Moreover, there seems to be a larger empirical basis for the mediation through negative parenting behavior compared to positive parenting behavior [48, 36, 35, 49, 25]. Accordingly, we decided to concentrate on mediating processes through negative parenting behavior in the current analyses.

To allow for a more fine-grained analysis of the mediating effect of negative parenting behavior on the association between different domains of internalizing symptoms and child externalizing symptoms, we subsequently considered separate models including parental symptoms of depression, anxiety, or stress, respectively. The findings of this research are intended to help to improve the treatment of externalizing behavior problems by providing information on putative etiological mechanisms.

Methods

Study Design and Participants

The data for the present analyses originate from a randomized controlled trial (RCT) on the efficacy of a twelve-month web-assisted self-help (WASH) program for parents of children with externalizing symptoms, that is, symptoms of ADHD and/or ODD [50]. The randomized controlled trial (RCT) compared three different conditions: the first one was treatment as usual (TAU), the second one was WASH

in addition to TAU, and the third one was WASH along with telephone-based support in addition to TAU. Data for the present analyses were collected at baseline (T1), after three months (interim assessment; T2) and after six months (post-assessment, T3) in all three study conditions. Registration was carried out at the German Clinical Trials Register (identifier: DRKS00013456).

For participant recruitment, we sent study information to 5,015 pediatricians and child and adolescent psychiatrists throughout Germany, who were encouraged to register eligible families. The recruitment period lasted from December 2017 to February 2020. Families were eligible to participate in the RCT if they met the following criteria: (a) the child was aged between 6 and 12 years, (b) the referring health care provider had diagnosed the child with an externalizing behavior disorder or suspected such a diagnosis, and (c) the child showed an elevated level of externalizing symptoms, as indicated by a clinician based on the semi-structured German-language Clinical Parent Interview for Externalizing Disorders in Children and Adolescents (ILF-EXTERNAL) [50–52], which was conducted by telephone. In particular, symptoms were considered as significantly elevated if the mean score on any of the externalizing scales or the total score on the ILF-EXTERNAL was more than 1.5 standard deviations above the mean score of a representative normative sample on the corresponding scale of a parent-rated questionnaire containing the same items [53]. Clinicians were required to assess the parent interview and determine if the child demonstrated five or more symptoms of inattention, four or more symptoms of hyperactivity-impulsivity, eight or more symptoms of ADHD (either inattentive or hyperactive-impulsive), or four or more symptoms of ODD. The diagnostic criteria were evaluated by clinicians and resulted in the following diagnoses: 39.22% of the children did not meet diagnostic criteria for any diagnosis, 18.10% of the children were diagnosed with the predominantly inattentive subtype of ADHD, 6.90% with the predominantly impulsive/hyperactive subtype of ADHD, 9.05% with the combined type of ADHD, 8.62% of the children fulfilled diagnostic criteria for ODD, and 18.10% for any ADHD diagnosis combined with ODD.

Children who met diagnostic criteria for a serious mental illness or autism spectrum disorder, or who needed to be hospitalized as determined by the referring healthcare provider, were excluded from the study. The article uses the terms “parents” or “mother/father” to refer to all individuals who serve as the primary caregivers for the child and are expected to take on parenting responsibilities.

Measures

All measures were completed by the participating parents and processed online. There was no study-related face-to-face contact with any of the participants or parents.

Depression Anxiety Stress Scales (DASS), Parent Rating

The German version of the DASS [37–40] comprises 42 items assessing the extent to which symptoms of depression, anxiety, and stress have been experienced in the preceding week. The questionnaire uses a four-point scale (ranging from 0 to 3) to rate symptoms related to depression, anxiety, and stress. The item scores can be combined to a total score and three 14-item subscales. Both exploratory and confirmatory factor analyses have yielded support for the factor structure of the DASS [54]. Moreover, the DASS subscales have shown high internal consistency ($\alpha \geq .81$) and convergent validity [54]. In the present sample, all subscales and the total score showed good to very good internal consistency at all three measurement time points (Cronbach's α for the total score: .95 to .97, Cronbach's α for all three subscales: .85 to .93).

Questionnaire for Positive and Negative Parenting Behavior (PNPQ), Parent Rating

The PNPQ (German: "Fragebogen zum positiven und negativen Erziehungsverhalten" [55]) assesses positive and negative parenting behaviors. It is based on the Management of Children's Behavior Scale (MCBS [56, 57]) and the Parent Practices Scale (PPS [58]). Furthermore, it encompasses newly created items that address specific aspects of behavioral parent training, such as the management of family rules. For the current analyses, we only applied the 17-item subscale on negative parenting behaviors. The items are answered using a four-point scale ranging from 1 (never) to 4 (very often/most of the time). To obtain scale scores, the average of the associated item scores was taken. The MCBS, PPS, and FPNE have demonstrated good psychometric properties in terms of internal consistency and construct validity [55, 56, 58]. Moreover, the MCBS has been shown to be sensitive to change [56]. In the present sample, Cronbach's alpha was .63 to .67 for the negative parenting scale across all three measurement time points.

German Symptom Checklists for Attention-Deficit Hyperactivity Disorder (SCL-ADHD) and Disruptive Behavior Disorders (SCL-DBD), Parent Rating

The SCL-ADHD (German: "Fremdbeurteilungsbogen für Aufmerksamkeitsdefizit-/Hyperaktivitätsstörungen" [53])

and the SCL-DBD (German: "Fremdbeurteilungsbogen für Störungen des Sozialverhaltens" [53]) capture items of ADHD and disruptive behavior disorders, respectively, according to the DSM-5 and ICD-10. From the SCL-DBD, we only used the ODD subscale, which is suitable for the age group under study. The 18 symptom-related items of the SCL-ADHD and the eight items of the SCL-DBD ODD subscale are rated on a four-point Likert-type scale ranging from 0 (not at all) to 3 (very much/particularly severe). To obtain the ADHD score and the ODD score, the item scores were averaged. The SCL-ADHD and SCL-DBD have been shown to be valid in terms of their factor structure and reliable in terms of internal consistency [53, 59–61]. In the present sample, Cronbach's alpha was .89 to .91 for the SCL-ADHD total score and .88 to .90 for the SCL-DBD score across the three measurement time points.

Statistical Analyses

To examine whether negative parenting behavior mediates the longitudinal association between parental internalizing symptoms and ADHD or ODD symptoms, respectively, we conducted mediation analyses using the SPSS macro PROCESS [62], which estimates the model parameters based on ordinary least squares (OLS) regression.

A simple mediation model assumes that an independent variable (X) influences a dependent variable (Y) through a mediator variable (M) [63]. In this model, the direct effect of X on Y when controlling for M (c') and the indirect effect of X on Y through the mediator variable M (ab) add up to the total effect (c) [63]. The indirect effect (ab) can be expressed as the product of two paths, namely the effect of X on M (a) and the effect of M on Y after controlling for the effect of X (b), and can be tested for significance [63]. In the context of statistical analysis, a mediator is a variable that helps explain the underlying mechanism or process through which the independent variable affects the dependent variable.

In the present study, we set up eight separate single mediator models, modelling either child ADHD symptom severity or child ODD symptom severity as the dependent variable and either parental symptoms of anxiety, symptoms of depression, symptoms of stress, or total parental internalizing symptoms as the independent variable. In each model, negative parenting behavior was used as a mediator (see Fig. 1). Moreover, to control for the likely confounding influence of the study condition, we included this variable as a covariate in our models. That is, the study condition was included as a predictor of both the mediator (negative parenting behaviors) and the dependent variable (ADHD symptom severity or ODD symptom severity, respectively).

To account for the causal relationships that are generally hypothesized by mediation models [62–64], we assessed

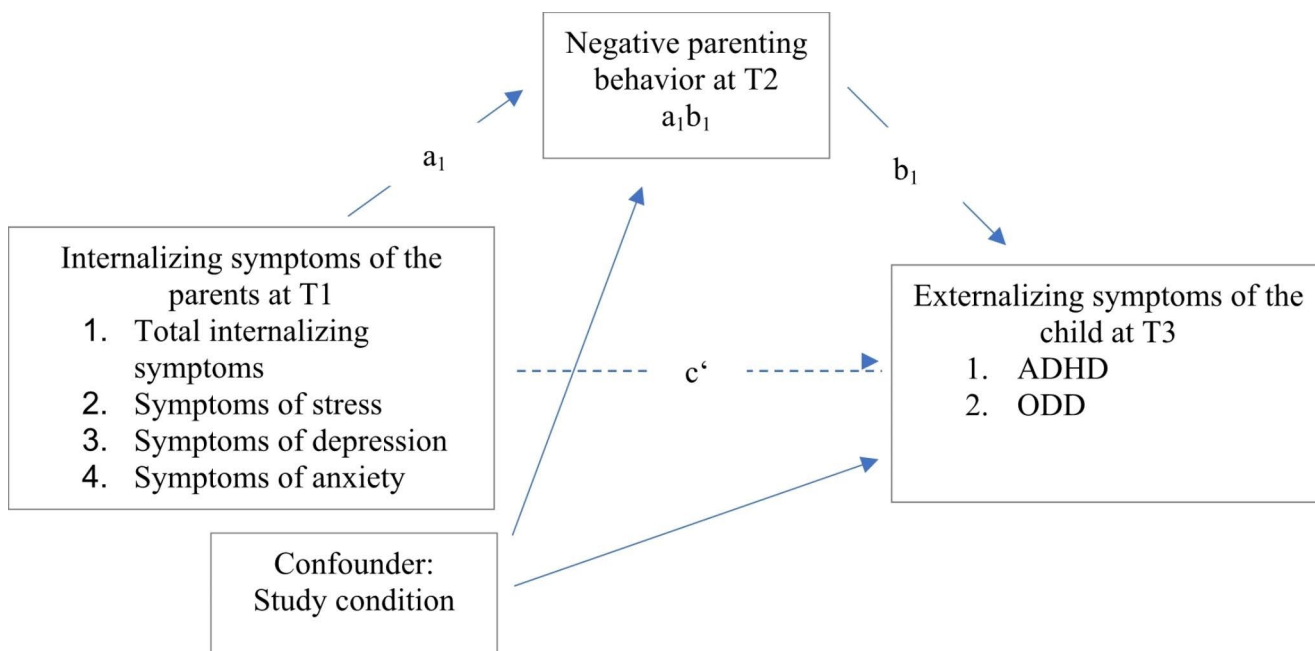


Fig. 1 Single Mediator Model for the Mediation of the Association of Parental Internalizing Symptoms and Child Externalizing Symptoms Through Negative Parenting Behavior. *Note.* In total, eight different models were considered: Either child ADHD symptoms or child ODD symptoms at T3 (post-assessment) were considered as the dependent variable, and either total parental internalizing symptoms (symptoms of depression, anxiety, and stress combined), symptoms of depression, symptoms of anxiety, or symptoms of stress at T1 (baseline) as the

parental internalizing symptoms (independent variable), negative parenting behavior (mediator variable) and child externalizing symptoms (dependent variable) in a consecutive order. That is, we examined the hypothetical model that a higher level of parental internalizing symptoms at baseline (T1) would be associated with a higher level of negative parenting behavior at the interim assessment (T2), which would in turn lead to a higher severity of child externalizing symptoms at post-assessment (T3).

To decide on the significance of the mediation effect, as recommended by Hayes [62], we regarded the significance of the product ab but not the significance of the single paths a and b . We report unstandardized regression coefficients as well as percentile bootstrap confidence intervals (10,000 iterations [62]), with estimates being considered as statistically significant if their 95% confidence interval does not include zero. We computed completely standardized total, direct, and indirect effects. Completely standardized effects are obtained by dividing the unstandardized effects by the standard deviation of the dependent variable and multiplying them by the standard deviation of the independent variable [62]. We also regarded the percentage of variance in the mediator explained by the independent variable and the covariate taken together and the percentage of variance in the dependent variable explained by the independent

independent variable. All models used negative parenting behavior at T2 (three-month interim assessment) as the mediator. The results for the models including symptoms of depression, symptoms of anxiety and symptoms of stress as the independent variable are provided in the online supplement. Study condition was included as a confounding variable in all models. ADHD = attention-deficit/hyperactivity disorder, ODD = oppositional defiant disorder

variable, the covariate and the mediator taken together to evaluate how well the hypothetical models fit the data [62].

To obtain an impression of the influence of potentially confounding variables (apart from study condition, which was included as covariate into the main analyses), we performed an additional set of analyses. These analyses included baseline values of the respective dependent variable (ADHD or ODD) and of the mediator (negative parenting behavior) (cf. [65]), child's sex and child age as additional covariates to control for their influence. Moreover, the ADHD model included post-assessment ODD symptoms as additional covariate, while the ODD model additionally controlled for post-assessment ADHD symptoms to account for the mutual influences of these variables.

Results

Sample Characteristics

Between January 2018 and March 2020, $N=565$ participants were registered by pediatricians and child and adolescent psychiatrists. Of these, 431 families were eligible for the study, agreed to participate, and were randomized to one of the three study conditions. The present analyses included

the data of $n=232$ families who completed the online questionnaires at all three measurement time points (see Fig. 2).

The mean age of these children was 9.42 years ($SD=1.71$) and 82.33% were male. In addition to the diagnoses mentioned above from the interviews, the diagnoses of the children as indicated by the referring physicians were as follows: 55.17% ADHD (F90.0), 14.66% hyperkinetic conduct disorder (F90.1), 4.31% other specified behavioral and

emotional disorders (F98.8), 0.86% ADHD, other type or unspecified type (F90.8; F90.9), and 0.43% ODD (F91.3). In addition, the physicians who referred the children assigned a tentative diagnosis of ADHD in 24.57% of the cases. At the outset of the study, approximately half of the children (51.72%) were taking medication for ADHD and 22.41% of the parents reported that their child was currently receiving psychotherapy. In the majority of cases (88.79%), the

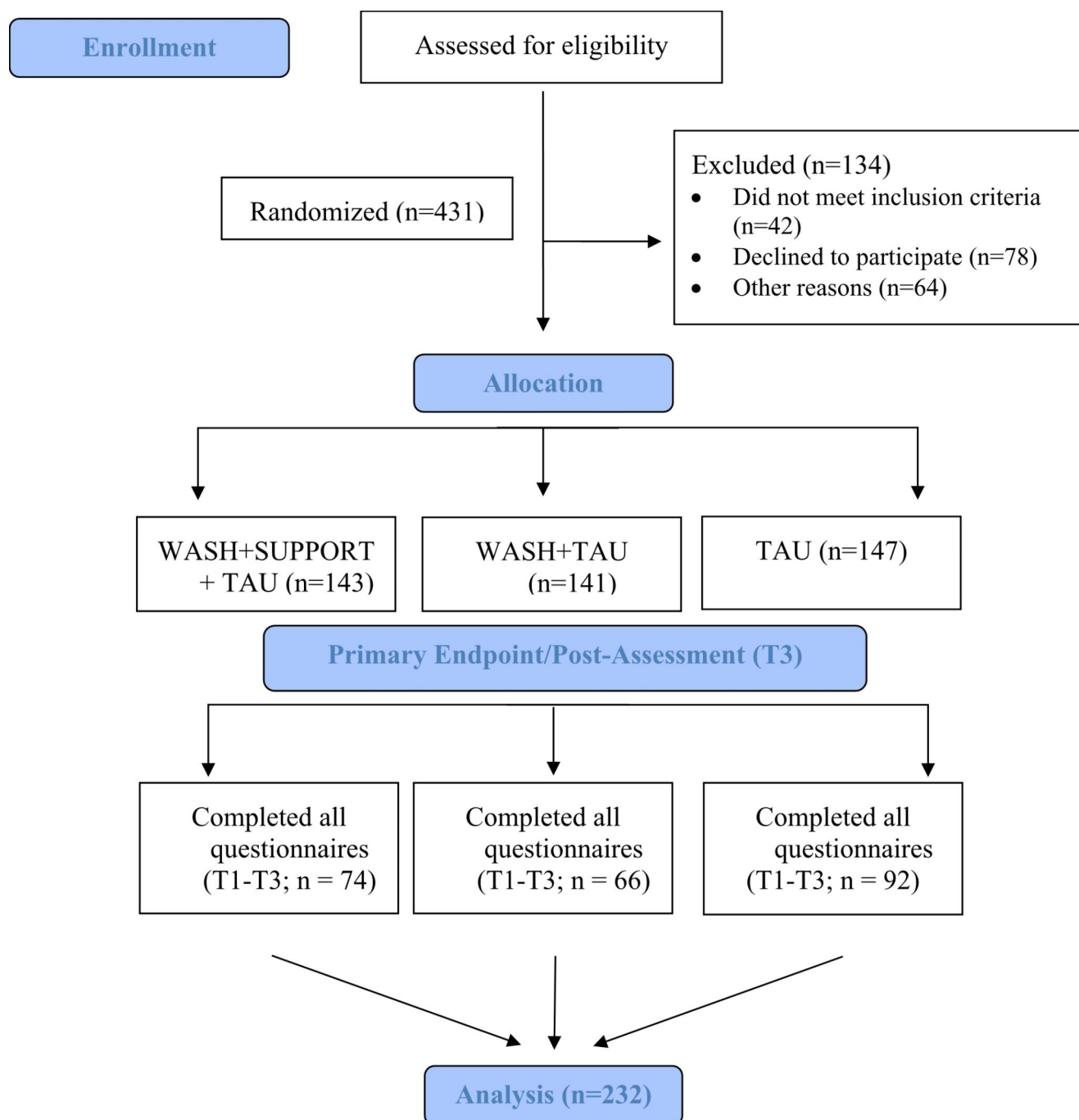


Fig. 2 Selection of Sample of Analysis. *Note.* WASH=web-assisted self-help, SUPPORT=telephone-based support, TAU=treatment as usual, T1=baseline assessment, T2=three-month interim assessment, T3=post-assessment

biological mother of the child with externalizing behavior problems participated in the study; 7.76% of the participants were biological fathers, 3.02% were adoptive mothers and 0.43% were other caregivers. On average, the participating parents were 42.11 years old ($SD=5.63$). Most of the children (73.28%) lived with both of their biological parents, 10.78% lived with their mother only, 0.86% lived with their father only, 11.21% lived with their mother and her partner, 0.43% lived with their grandparents or other relatives, and 3.45% of families reported other constellations (e.g., weekly rotation principle, foster care). Descriptive statistics for child externalizing behavior problems, negative parenting behavior and parental internalizing symptoms at T1, T2 and T3 can be found in the online supplement (see Table S1).

Mediation Analysis

The mediation analyses yielded both a significant total effect and a significant direct effect after controlling for negative parenting behavior (mediator) in the model including parental internalizing symptoms as the independent variable and ADHD symptoms as the dependent variable. In this model, parental internalizing symptoms were significantly and positively associated with negative parenting.

The association between negative parenting behavior and child ADHD symptoms was non-significant. Likewise, the indirect effect of parental internalizing symptoms on child ADHD symptoms through negative behavior was non-significant (see Table 1).

This present model, 13% of the variance in negative parenting behavior was accounted for by parental internalizing symptoms and study condition (covariate). Additionally, parental internalizing symptoms, study condition (covariate) and the mediator taken together explained about 8% of the variance in child ADHD symptoms.

The model comprising the total score for parental internalizing symptoms as the independent variable and child ODD symptoms as the dependent variable yielded a significant total effect but no significant direct effect. In this model, we detected both a significant positive association between parental internalizing symptoms and negative parenting behavior and a significant positive association between negative parenting behavior and child ODD symptoms. Furthermore, there was a significant indirect effect of parental internalizing symptoms on the severity of child ODD symptoms through negative parenting behavior. This means that higher levels of parental internalizing symptoms were associated with increased negative parenting behavior, which in turn was associated with greater severity of ODD symptoms in children. The corresponding completely standardized indirect effect was 0.07. In other words, when parents differ by one unit in their internalizing symptoms, their children's ODD symptom severity differs by approximately one tenth of a standard deviation due to the indirect effect through negative parenting behavior. In this model, parental internalizing symptoms, study condition and negative parenting behavior taken together accounted for about 8% of the variance in ODD symptoms.

When the DASS subscales (i.e., parental symptoms of depression, anxiety, and stress) were considered separately as independent variables, overall, the results were comparable to those for the models including a composite score for parental internalizing symptoms (see Table S2 in the online supplement).

Regarding the models which controlled for additional potential confounders (baseline values of the dependent variable, baseline values of the mediator, child age, child sex, ODD symptoms in the ADHD model/ADHD symptoms in the ODD model), the total effect was non-significant for both models, which was contrary to the results for our original models. According to Hayes (2018), a significant

Table 1 Unstandardized Regression Coefficients, Bootstrap Confidence Intervals, and Model Information for the Mediation Model

	Outcome				Outcome			
	ADHD		ODD		ADHD		ODD	
	Coeff.	Bootstrap SE	95% Bootstrap CI	Completely Standardized effect	Coeff.	Bootstrap SE	95% Bootstrap CI	Completely Standardized effect
a_1	0.22*	0.04	0.14; 0.30		0.22*	0.04	0.14; 0.30	
b_1	0.13	0.13	-0.11; 0.38		0.55*	0.17	0.22; 0.90	
a_1b_1	0.03	0.03	-0.02; 0.09	0.02	0.12*	0.05	0.04; 0.22	0.07
c'	0.33*	0.09	0.15; 0.49	0.25	0.19	0.12	-0.05; 0.44	0.11
c	0.36*	0.08	0.19; 0.52	0.27	0.31*	0.11	0.09; 0.53	0.18

Note. sample size $n=232$. a_1 : parental internalizing symptoms (i.e., symptoms of depression, anxiety, and stress) at baseline \diamond negative parenting behavior at three-month interim assessment, b_1 : negative parenting behavior at three-month interim assessment \diamond outcome at post-assessment, a_1b_1 : indirect effect of parental internalizing symptoms on outcome through negative parenting behavior, c' : direct effect of parental internalizing symptoms on outcome, c : total effect of parental internalizing symptoms on outcome, ADHD=attention-deficit/hyperactivity disorder, ODD=oppositional defiant disorder, Coeff. = unstandardized regression coefficient, SE=standard error, CI=confidence interval. * significant coefficient (95% CI). The standard errors and confidence intervals for the total effects were determined without the use of bootstrap samples. Study condition was included as a confounding variable in both models

total effect is not a prerequisite for detecting mediation. However, the analyses for these more complex models did not yield any significant indirect effects. That is, contrary to the results for our original analyses, the indirect effect of parental internalizing symptoms on child ODD symptoms through negative parenting behavior just failed to reach significance ($a1b1 = 0.007$, 95%-Bootstrap-CI = [-0.009, 0.04], completely standardized indirect effect = 0.004; see Table S3 in the online supplement).

Discussion

The aim of the current study was to examine the mediating role of negative parenting behavior in the frequently reported longitudinal association between parental internalizing symptoms (i.e., depression, anxiety, and stress) and child externalizing symptoms (ADHD symptoms and ODD symptoms) in a sample of school-age children with elevated levels of externalizing behavior problems. Although several studies have revealed both cross-sectional and longitudinal associations between parental internalizing symptoms and child ADHD and ODD symptoms [7–12], suggesting that parental psychopathology might play a role in the etiology of both disorders, little empirical research has focused on the mechanisms through which parental internalizing symptoms might affect child externalizing symptoms. Based on the integrative model on the transmission of risk for psychopathology by Goodman & Gotlib [18], we examined negative parenting behaviors as one putative mechanism. Previous research has yielded support for the single paths that constitute our model, that is, besides for the association between parent and child symptoms, for the associations between parental internalizing symptoms and negative parenting behaviors [20, 21, 23, 8] and for the associations between negative parenting behaviors and child externalizing symptoms [24, 26]. However, to our knowledge, no study has analyzed a comprehensive mediation model combining these paths in a sample of children with elevated levels of externalizing behavior problems. The analyses yielded significant associations between parental internalizing symptoms at the start of the study and the severity of both child ADHD symptoms and child ODD symptoms at post-assessment. Furthermore, our results demonstrated that negative parenting behaviors (assessed at an interim assessment point) mediated the association between parental internalizing symptoms and child ODD symptoms, supporting the hypothesis that parental behavior is one of the mechanisms through which parental symptoms might affect child symptoms, as suggested by Goodman & Gotlib [18]. However, no such indirect effect could be detected in the model including ADHD symptoms as the dependent

variable. In other words, in line with our hypotheses, a higher level of early parental internalizing symptoms was followed by a higher level of negative parenting behavior, which in turn predicted a higher level of later child ODD symptoms. When we included a number of additional putative confounders into this model, the indirect effect through negative parenting behavior just failed to reach significance. However, this might also be due to reduced power to detect a significant indirect effect in this more complex model. Hence, we conclude that our study provides limited evidence for indirect effect of parental internalizing symptoms on child externalizing symptoms through negative parenting behavior. Whether this effect persists in more complex models, including more confounders, could be subject to further studies using larger samples. When setting up separate models for parental depression, anxiety, and stress symptoms as independent variables instead of considering a composite score for parental internalizing symptoms, the results remained very similar. That is, the analyses of all models yielded significant associations of depression, anxiety, or stress symptoms, respectively, with both child ADHD and ODD symptoms. Again, no significant indirect effect through negative parenting behavior was detected in the models employing child ADHD symptoms as the dependent variable. However, the respective indirect effect was significant in all models using child ODD symptoms as the dependent variable.

To sum up, in line with our expectations, the present findings underline the role of negative parenting behavior in mediating the association of parental internalizing symptoms with child ODD symptoms, but not child ADHD symptoms. Thus, the findings for the ODD model is in line with the model of transmission of risk for psychopathology by Goodman & Gotlib [18], which assumes that a mediation through parental behaviors is one of several mechanisms through which parental symptoms might exert their effects on child symptoms, and also with previous empirical findings. In particular, this finding corresponds to the results of our previous mediation analysis based on cross-sectional data [44]. Moreover, it is in line with the results of previous mediation studies which demonstrated that the longitudinal association between parental depressive symptoms and child externalizing symptoms was mediated by parental nurturance and by parental rejection in a community sample [66], that the cross-sectional association between maternal internalizing symptoms and child externalizing symptoms were mediated by maternal affirmation in a clinically referred sample [43], and that the longitudinal relation between parental depressive symptoms and child maladjustment was mediated by the use of inconsistent discipline in a nonclinical sample [41]. Interestingly, the latter two studies found different patterns in mothers and fathers. While Bellini et al. were only

able to establish the above-mentioned mediating effect for mothers, but not for fathers [43], Dette-Hagenmeyer et al. report that positive parenting was found to be an additional mediator of the effects of paternal, but not maternal, depressive symptoms on child adjustment [41]. However, due to the small number of fathers in our sample, we were not able to examine whether the results for our model differ between mothers and fathers.

Of note, in all models, parental internalizing symptoms, study condition (covariate) and negative parenting behavior taken together only accounted for a small amount of the variance in child ADHD or ODD symptoms, respectively, pointing to a rather poor data fit of the hypothesized models. Thus, there are likely other (additional) variables that mediate the association between parental internalizing and child externalizing symptoms, such as a common genetic predisposition and/or environmental factors, stressful life events or personality traits like neuroticism [67, 48, 68–71].

The finding that a significant indirect effect only emerged in the ODD model and not in the ADHD model might be attributable to the fact that ADHD symptoms are more strongly determined by biological or genetic factors [72, 73, 70, 5, 74]. The development and maintenance of oppositional and defiant symptoms, by contrast, is often explained by environmental factors. For instance, the coercive family process model by Patterson assumes a mutual reinforcement of dysfunctional parenting practices and child troublesome behaviors [19]. This theory is supported by empirical findings [68], and in our analyses it might particularly explain the association between negative parenting behaviors and child ODD symptoms.

Taken together, the results of our mediation analyses and previous empirical findings on the mediation of the effects of parental internalizing symptoms on child externalizing symptoms or child maladjustment point at the important role of parenting behaviors as mediator. In our study, this mediation process related to child ODD symptoms as an outcome, but not to child ADHD symptoms. For clinical practice, these findings would suggest that if parents demonstrate internalizing symptoms, they should receive particular counselling regarding their parenting behaviors, as these are one of several putative mechanisms mediating between their symptoms and the child's externalizing symptoms (or especially ODD symptoms, as the present study suggests). Such an approach is usually taken in behavioral parent training interventions.

The present study has several strengths and limitations. A particular strength is that we were able to consider longitudinal data, with the components of the model being assessed in a consecutive order. This is often recommended to account for the causality that is generally hypothesized in mediation models. Moreover, in contrast to most previous

studies, we considered a clinical sample with a good sample size and a homogeneous age group.

On the other hand, some limitations have to be considered when interpreting the results. First, all measures were completed by the participating parents; thus, the respective ratings might potentially be biased by socially desirable responding and by simulation or dissimulation tendencies. Previous research on the association between self-reported and observer-reported parenting behavior only demonstrated a significant correlation for parental warmth, and found no significant associations between direct observations of parental control practices, including inconsistency, and self-judgment of these behaviors [75]. Another study reported no significant association between parent and child perceptions of parenting behavior [76]. Moreover, pertaining directly to mediation analyses, a previous study was unable to establish observed parent-child interactions as a mediator of the association between parental depressive symptoms and child internalizing and externalizing symptoms [77]. The previous study, however, had various limitations, such as potentially inadequate statistical power to identify a mediating effect [77]. Moreover, as all measures were rated by the parents, common method bias is conceivable. We performed Harman's single-factor test for common method bias, which did not point at the presence of such bias in the current data. However, as the sensitivity of this test has been criticized [78], and as we did not control for common method bias in our analyses, we cannot completely rule out the possibility that such bias might have had an influence. Given the aforementioned limitations associated with the ratings of all measures by the same rater, and to account for the different previous findings for data from different informants, future studies should incorporate different sources of information (e.g., clinical ratings and observations of parental behavior).

Second, we did not analyze potential moderators of the mediation effects (e.g. parental ADHD). A previous study revealed that mothers with ADHD symptoms demonstrated more psychiatric and occupational problems, more dysfunctional cognitions (lower self-esteem, more external locus of control) and less effective parenting practices than mothers without ADHD symptoms [79]. Unfortunately, we did not assess parental externalizing psychopathology in the present study.

Third, the vast majority of the participating parents were mothers, which might limit the ability to generalize the results to the mediation of the associations between fathers' potential psychopathology and child symptoms through paternal parenting behavior. As outlined above, given the limited number of fathers in our sample ($n = 18$), we were not able to compare results between mothers and fathers. Similarly, the sample only comprised a small proportion

of girls (17.67%), again limiting the generalizability of the findings.

Fourth, another study limitation is the broad age range (6–12 years) considered in this study. It might be possible that the associations examined in this study differ between age groups. For instance, it is conceivable that the association between parenting behaviors and symptom severity is stronger in younger children. This question could be subject to future research.

Fifth, data were collected during the COVID-19 pandemic. Pandemic-related stress may have influenced both the parents' and the children's symptoms and biased the results. In line with this, a recent study shows that the pandemic led to interruptions in psychological treatment and had an impact on families due to COVID-19-related stress [80].

Sixth, also we conducted an additional set of analyses to obtain an impression of the influence of potentially confounding variables, we cannot rule out that there might have been other or additional confounders. For example, it is conceivable that family socioeconomic status has an influence on the results. Unfortunately, our collected data does not include a suitable variable that describes the family socioeconomic status. As outlined above, contrary to our original analyses, in the more complex model controlling for more confounders the indirect effect of parental internalizing symptoms on child externalizing symptoms through negative parenting behavior just failed to reach significance. On the one hand, this might indicate the absence of such an indirect effect. However, given that the indirect effect in this model was close to significance and that this model included a number of more variables than the original ODD model, the non-significance of this effect might also be due to reduced power. Thus, we conclude that our analyses provide limited evidence for the indirect effect of parental internalizing symptoms on child externalizing symptoms through negative parenting behavior.

Preferably, future longitudinal studies should concentrate on children at risk of developing externalizing behavior symptoms to be able to more closely approach the causality hypothesized in mediation models. Reciprocal relationships are, of course, also conceivable and could be considered in further research projects.

Summary

Previous research has revealed associations between parental internalizing symptoms and child externalizing symptoms, as well as between parenting behaviors and child externalizing symptoms. Only a few studies have investigated, how parenting practices might act as mediators in the relationship between internalizing parental symptoms and

externalizing symptoms in children. Moreover, an earlier analysis by our research group found that negative parenting behaviors mediated the association between parental internalizing symptoms (symptoms of depression, anxiety, and stress) and oppositional-defiant symptoms of the child. However, this finding was limited by the use of cross-sectional data. Thus, the present study examined whether negative parenting behavior also mediates the longitudinal association between early parental internalizing symptoms and later child externalizing symptoms (i.e., symptoms of attention-deficit/hyperactivity disorder [ADHD] and oppositional defiant disorder [ODD]). Data from 232 parents of children (6–12 years) with elevated levels of ADHD and ODD symptoms were collected at three consecutive assessment points during a randomized controlled trial on the efficacy of a web-assisted, parent-directed self-help intervention. Two mediation models were examined: In both models, parental internalizing symptoms at baseline were modeled as the independent variable and negative parenting behavior was modeled as a mediator. One model considered child ADHD symptoms at post-assessment as the dependent variable and the other model considered child ODD symptoms at post-assessment. Moreover, both models controlled for the possibly confounding influence of study condition. Regression analyses yielded a significant indirect effect of early parental internalizing symptoms on later child ODD symptoms through negative parenting behavior (assessed at an interim assessment point). No mediation effect was found for the model including child ADHD symptoms as the dependent variable. The longitudinal results provide evidence for the involvement of negative parenting behavior in mediating the correlation between parental internalizing symptoms and the severity of child ODD symptoms. This result is limited by the fact that this indirect effect just fails to reach significance in a model which controls for a number of additional potential confounders, which might, however, also be due to power issues. The consecutive assessment of the variables in this model accounts for the causality that is usually assumed by mediation models. The different findings between the two models might be explained by the fact that ODD symptoms are more strongly determined by environmental factors.

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Availability of data and materials Data and materials are available on reasonable request.

Declarations

Ethics approval All procedures performed in our study were approved by the Ethics Committee of the University Hospital of Cologne and were in accordance with the 1964 Declaration of Helsinki and its later amendments. Informed consent was obtained from all individual participating caregivers prior to their inclusion in the study.

Competing interests Manfred Döpfner, Julia Plück and Christina Dose receive royalties from publishing companies as authors of books, treatment manuals and assessment manuals. None of the other authors of this study report any conflicts of interest.

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4 Discussion

4.1 Parenting behavior as a mediator of the associations between parental and child symptoms

This section summarizes and discusses the results and findings from the studies presented in chapters 2 and 3.

Parenting is a vital and complex task that shapes the development of children and their future in numerous ways. The present thesis aimed to investigate the relationship between parental internalizing symptoms and child externalizing symptoms by examining the mediation of the effects of parental symptoms of depression, anxiety and stress on child externalizing symptoms through parenting behavior. The findings of these studies extend previous research on the relationship between parental internalizing symptoms, parenting behaviors, and child externalizing symptoms by examining specific mediation models, using both cross-sectional and longitudinal data from a clinical sample. Doing so, this work aims to contribute to a better understanding of the role of parenting behavior in the relationship between parental internalizing symptoms and externalizing symptoms of the child, providing necessary knowledge for tailored interventions for the treatment of ADHD and ODD symptoms in children.

Based on both cross-sectional and longitudinal data, the results of the aforementioned studies (Klemp et al., 2022; Klemp et al., 2023) indicate that negative parenting behavior serves as a mediator of the association between parental internalizing symptoms and child ODD symptoms.

Regarding the mediation of the association between parental symptoms of depression, anxiety, and stress through negative parenting behaviors, the following associations were found: If parents demonstrated higher levels of internalizing symptoms, they were more likely to engage in negative parenting behaviors, which, in turn, were both cross-sectionally and longitudinally associated with increased child ODD symptoms. This empirical finding is in line with one of the theoretically expected mechanisms through which the risk for the development of psychopathological symptoms might be transmitted from parents to their children in the model proposed by Goodman & Gotlib (1999), namely the exposure to negative parental cognitions, behaviors, and affects. Moreover, the finding that a higher level of negative parenting behaviors was associated with more severe ODD symptoms yields empirical support

for the model of coercive interactions by Patterson (1989), which explains the development and maintenance of child disruptive behaviors through negative parent-child interactions, highlighting the mutual fortification of dysfunctional parenting behaviors and child disruptive behaviors (Patterson et al., 1989).

These findings are consistent with the results of previous studies, which emphasize that the psychopathology of the parents or early adverse experiences in the mother's life (Hanetz-Gamliel & Dollberg, 2022) influence parenting negatively, which in turn affects the development of the child neurobiologically (Whittle et al., 2022) and is related to children's behavior problems (Hanetz-Gamliel & Dollberg, 2022; Whittle et al., 2022). Correspondingly, mediation analyses by other authors demonstrate that the correlation of parental internalizing symptoms and children's behavior problems is mediated by parenting behavior (Chen et al., 2022; Dette-Hagenmeyer & Reichle, 2014; Elgar et al., 2003; Frigoletto et al., 2022; Hanisch et al., 2014; Hautmann et al., 2015).

In summary, both the association between internalizing symptoms in parents and ODD symptoms in children and the mediation of this association through negative parenting behaviors as demonstrated in this thesis highlight the key role parents play in the development of the children's oppositional symptoms. Thus, addressing both parenting behavior and parental health could have a vast impact on the child's development and ODD symptoms.

There was no significant mediation effect through parenting behaviors when considering the association between parental internalizing symptoms and child ADHD symptoms. The different results for ODD and ADHD might be explained by a higher genetic determination of ADHD symptoms (Balogh et al., 2022), while environmental factors, including parenting behaviors, seem to be more influential in the development and maintenance of ODD symptoms (Lin et al., 2022). As a result, understanding different factors could be particularly important for successful treatment.

Interestingly, no mediation effect through positive parenting behavior was present in any of the models based on cross-sectional data. Based on these results and due to methodological problems with the scale used for the assessment of positive parenting behaviors, including low internal consistency and limited variance in the ratings, the examination of the mediating role of positive parenting behaviors was excluded from the longitudinal analysis. The results of the cross-sectional analysis might suggest that negative parenting behaviors are more

important for the mediation of the association between parental and child symptoms than positive parenting behaviors. These findings are consistent with previous studies indicating that the change of negative parenting behaviors appears to be more central to changing children's behavior problems than changes of positive parenting behaviors (Fenesy et al., 2019; Hanisch et al., 2014; Jendreizik et al., 2022; Thomas et al., 2022; Zhang & Li, 2022). Nevertheless, the results of the studies presented in this thesis might be biased by a lack of reliability and validity of the scale for the assessment of positive parenting behaviors. Thus, the role of positive parenting behaviors in the mediation of the association between parent and child symptoms could nurture future investigations and should be examined further.

Although a significant mediation of the effect of parental internalizing symptoms on child ODD symptoms through negative parenting behaviors was present, the respective effect was rather small. This suggests that there might be other, supplementary factors accounting for the association between parent and child symptoms. For instance, relating to the model by Goodman and Gotlib (1999), factors like heritability, neuroregulatory mechanisms, and the stressful environment caused by parental symptoms could play a role. Thus, the mechanisms by which internalizing symptoms of the parents exert their effects on the externalizing symptoms of the child still warrant further research.

4.2 Clinical Implications of the Findings

The findings of this study suggest that there is a positive association between parental internalizing symptoms and child ODD symptoms and that negative parenting behaviors play a crucial role in this link. Regarding the treatment of children with ODD, if clinicians assume that the parents' psychopathology might play a role in the development of an individual child's ODD symptoms, special emphasis should be put on the assessment and treatment of especially negative parenting behaviors (although, as outlined above, the role of positive parenting behaviors still warrants further research). Identifying and treating parental internalizing symptoms and addressing negative parenting behaviors could help to prevent or reduce ODD symptoms in children. These assumptions could be further explored in intervention study. For the association between parental internalizing symptoms and child ADHD symptoms, our analyses do not point at the mediating role of parenting behaviors.

Healthcare professionals should be aware of the potential impact of especially negative parenting behavior and parental mental health on their children's behavior and provide early intervention to families who may be at risk. Moreover, parent-focused interventions that address negative parenting behavior could be an effective way to reduce ODD symptoms in children. Additionally, parental psychopathology should be considered as a possible influential factor in the treatment process of externalizing symptoms (ADHD and ODD) in children in general.

4.3 Strengths and Limitations

The current research provides new insight into the mechanisms through which parental symptoms of depression, anxiety, and stress may exert their effects on child ADHD and ODD symptoms. The strengths of this work include a derivation of the empirically tested models from well-established theoretical models, and the consideration of multiple, consecutive assessment points for the longitudinal analyses, which are in line with causal interpretations. Additionally, we performed the mediation analyses in line with current recommendations (as opposed to traditional approaches; see Hayes, 2018). We employed widely used and psychometrically sound measures for the assessment of both parental internalizing symptoms and child externalizing symptoms. Moreover, this work adds to the few studies which explicitly examined a mediation model instead of only considering single paths constituting this model. Finally, as opposed to many previous studies, we examined a clinical sample.

On the other hand, this work has several limitations. First, the main limitation of the analyses presented in the first publication concerns the cross-sectional nature of the data, which limits the prospect to draw causal conclusions. In this regard, longitudinal analyses such as those described in the second study in chapter 3 are more informative.

Still, there is an ongoing debate about whether it is useful to apply mediation analyses on cross-sectional data, with some authors raising concerns (Maxwell et al., 2011). However, if the empirically tested models can reasonably be justified based on theoretical models and previous empirical findings, cross-sectional mediation analyses can be beneficial (Hayes, 2018). However, in this case, the conclusion should be considered carefully (Hayes & Rockwood, 2020).

Second, in our specific mediation model, we assumed unidirectional effects of parental internalizing symptoms on both parenting behaviors and child externalizing symptoms as well

as unidirectional effects of parenting behaviors on child externalizing symptoms. An opposite direction of the effects or reciprocal associations are also conceivable. Actually, previous research has yielded support for such reciprocal associations (Antúnez et al., 2018; Mackler et al., 2015). Future studies should examine more complex models, including more assessment points and considering reciprocal associations.

Third, the mediation effects through negative parenting behaviors were rather small in both the cross-sectional and the longitudinal analysis, suggesting that there might be other, additional factors accounting for the association between child and parental symptoms. This could also be subject to future research.

Fourth, in mediation analyses, as in multiple regression in general, paths can be overestimated or underestimated, resulting in actually non-significant or significant effects being found or passed off as such (Hayes, 2018).

Fifth, male caregivers and fathers were underrepresented in the current sample. Hence, conclusions about maternal, rather than paternal, internalizing symptoms and their consequences can be drawn based on the distribution of males and females in the sample. Future research should strive to incorporate the views of male caregivers to a greater extent.

Sixth, there were methodological problems in the assessment of positive parenting behavior (i.e., limited internal consistency, limited variance in the ratings).

Seventh, the data on which the analysis was based was collected only by the parents' judgment. Parent ratings of their symptoms, their child's symptoms and parenting behaviors might be prone to bias through dissimulation or aggravation tendencies, or social desirability (Stokes et al., 2011). In this context, parents expressed towards the study staff that they had difficulties completing the questionnaire on parenting behavior, as often no answer felt right or topics that parents considered important did not occur in the questionnaire about parenting behavior. In addition, some parents indicated during the telephone-based interviews, that they provided socially desirable answers in the online questionnaire, as they did not perceive the questionnaire as a safe space, especially with regard to sensitive questions (e.g. do you hit your child?).

Eighth, as mentioned in the publications, parenting behavior is also difficult to categorize and classify without overlooking aspects through too much openness or a zoom lens.

Observations may assess parenting behavior in detail in specific situations, while questionnaires often look at the bigger picture.

4.4 Challenges and Future Directions

Future research could explore more complex models, including reciprocal associations between parental internalizing symptoms, parenting behaviors and child symptoms, and more assessment points. Besides parenting behaviors, other potential mediators and moderators may be considered. Externalizing symptoms of the parents could be studied in relation to the other model concepts. The variables mentioned could, of course, be studied in more detail, i.e. to what extent parents self-regulate their own anxiety, stress, depression or ADHD symptoms and how this in turn affects the child and their symptoms and chosen or/and copied regulation strategy. In this way, valuable insights can be gained that benefit the whole family.

As proposed in the first and second manuscript, the use of multiple methods, e.g. combining self-report with observational measures for data collection could provide a more comprehensive understanding of parenting behavior. Future research should therefore incorporate different assessment perspectives and survey methods to enable a valid assessment of parenting behavior. A possible tool for future research could be the use of semi-structured clinical interviews, e.g., to assess parenting behavior. (Semi)-structured clinical interviews provide a high standard for assessing symptoms (Hoyer & Knappe, 2012; Nordgaard et al., 2013; Thöne et al., 2020).

To conclude, this study offers evidence for the mediating role of negative parenting behavior in the link between parental internalizing symptoms (depression, anxiety and stress) and child ODD symptoms. The findings suggest that interventions aimed at reducing negative parenting behavior may be an effective way to prevent or reduce the risk of ODD symptoms in children. Ultimately, this research underscores the importance of addressing both parental and child mental health and how to deal with it, as well as parenting behavior to reduce the risk of negative outcomes in children.

4.5 References Discussion

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5 Appendix

5.1 Supplementary Material

Supporting Information for *Parenting Behaviors as Mediators of the Association between Parental Internalizing Symptoms and Child Externalizing Symptoms* by Klemp et al. 2022

Table S1

Descriptive statistics for child externalizing behavior problems, parenting behavior and internal parental psychopathology (depression, anxiety and stress)

		<i>M</i>	<i>SD</i>	Range (theoretical)
Symptom Checklists for ADHD and DBD (SCL-ADHD, SCL-DBD)	ADHD	1.76	0.52	0.4 - 3.0 (0-3)
	ODD	1.50	0.68	0.0 - 3.0 (0-3)
Depression Anxiety Stress Scales (DASS)	Stress	0.79	0.47	0.0 - 2.5 (0-3)
	Anxiety	0.51	0.40	0.0 - 2.1 (0-3)
	Depression	0.56	0.40	0.0 - 2.4 (0-3)
	Total	0.62	0.41	0.0 - 2.3 (0-3)
Questionnaire for Positive and Negative Parenting Behavior (FPNE)	Positive parenting behavior	3.02	0.35	1.9 - 3.9 (1-4)
	Negative parenting behavior	1.93	0.29	1.2 - 2.8 (1-4)

Note. Sample size $n = 420$; ADHD = attention-deficit/hyperactivity disorder, ODD = oppositional defiant disorder.

Table S2

Multiple mediator models for the mediation of the impact of parental symptoms of depression, anxiety and stress on child externalizing symptoms through parenting behaviors

Independent variable		Dependent variable							
		ADHD				ODD			
		Coeff.	Bootstrap SE	95% Bootstrap CI	Completely stand. effect	Coeff.	Bootstrap SE	95% Bootstrap CI	Completely stand. effect
Parental symptoms of depression	a_1	0.22*	0.03	0.15; 0.29		0.22*	0.03	0.15; 0.29	
	b_1	0.22*	0.09	0.04; 0.40		0.52*	0.13	0.27; 0.76	
	a_1b_1	0.05*	0.02	0.01; 0.09	0.04	0.12*	0.03	0.06; 0.19	0.07
	a_2	-0.15*	0.05	-0.24; -0.06		-0.15*	0.05	-0.24; -0.06	
	b_2	0.24*	0.08	0.09; 0.39		-0.10	0.10	-0.30; 0.10	
	a_2b_2	-0.04*	0.02	-0.07; -0.01	-0.03	0.02	0.02	-0.02; 0.05	0.01
	c'	0.35*	0.06	0.23; 0.47	0.27	0.20*	0.08	0.04; 0.35	0.12
	c	0.37*	0.06	0.25; 0.48	0.28	0.33*	0.08	0.17; 0.49	0.20
Parental symptoms of anxiety	a_1	0.25*	0.04	0.18; 0.32		0.25*	0.04	0.18; 0.32	
	b_1	0.20*	0.09	0.03; 0.38		0.51*	0.13	0.26; 0.76	
	a_1b_1	0.05*	0.02	0.01; 0.10	0.04	0.13*	0.04	0.06; 0.20	0.07
	a_2	-0.18*	0.05	-0.27; -0.09		-0.18*	0.05	-0.27; -0.09	
	b_2	0.26*	0.07	0.11; 0.40		-0.10	0.10	-0.30; 0.11	
	a_2b_2	-0.05*	0.02	-0.09; -0.02	-0.03	0.02	0.02	-0.02; 0.06	0.01
	c'	0.38*	0.06	0.27; 0.50	0.29	0.21*	0.08	0.05; 0.37	0.12
	c	0.38*	0.06	0.26; 0.50	0.29	0.35*	0.08	0.19; 0.51	0.21
Parental symptoms of stress	a_1	0.25*	0.03	0.20; 0.31		0.25*	0.03	0.20; 0.31	
	b_1	0.15	0.09	-0.03; 0.34		0.50*	0.13	0.24; 0.76	
	a_1b_1	0.04	0.02	-0.01; 0.09	0.04	0.13*	0.04	0.06; 0.20	0.09
	a_2	-0.18*	0.04	-0.25; -0.11		-0.18*	0.04	-0.25; -0.11	
	b_2	0.26*	0.07	0.12; 0.41		-0.10	0.10	-0.29; 0.11	
	a_2b_2	-0.05*	0.02	-0.08; -0.02	-0.04	0.02	0.02	-0.02; 0.06	0.01
	c'	0.34*	0.06	0.23; 0.45	0.31	0.16*	0.07	0.02; 0.30	0.11
	c	0.33*	0.05	0.23; 0.44	0.30	0.31*	0.07	0.17; 0.44	0.21

Note. Sample size $n = 420$. a_1 : independent variable \rightarrow negative parenting behavior, b_1 : negative parenting behavior \rightarrow dependent variable, a_1b_1 : indirect effect of independent variable on dependent variable through negative parenting behavior, a_2 : independent variable \rightarrow positive parenting behavior, b_2 : positive parenting behavior \rightarrow dependent variable, a_2b_2 : indirect effect of independent variable on dependent variable through positive parenting behavior, c' : direct effect of independent variable on dependent variable, c : total effect of independent variable on dependent variable, ADHD = attention-deficit/hyperactivity disorder, ODD = oppositional defiant disorder, Coeff. = unstandardized regression coefficient, SE = standard error, CI = confidence interval. * significant coefficient (95% CI). The standard errors and confidence intervals for the total effects were determined without the use of bootstrap samples.

Supporting Information for *Negative parenting mediates the longitudinal association between parental internalizing symptoms and child oppositional symptoms* by Klemp et al. 2023

Table S1

Descriptive Statistics for Child Externalizing Behavior Problems, Negative Parenting Behavior and Internal Parental Psychopathology

Measure	Measurement Time Point	Scale/Subscale	<i>M</i>	<i>SD</i>	Range (theoretical)
Symptom Checklists for ADHD and DBD (SCL-ADHD, SCL-DBD)	T1	ADHD	1.75	0.51	0.40 – 2.90 (0-3)
		ODD	1.49	0.68	0.00 – 3.00 (0-3)
	T2	ADHD	1.50	0.52	0.30 – 3.00 (0-3)
		ODD	1.34	0.66	0.00 – 2.88 (0-3)
	T3	ADHD	1.42	0.53	0.25 – 2.85 (0-3)
		ODD	1.25	0.70	0.00 – 3.00 (0-3)
Depression Anxiety Stress Scales (DASS)	T1	Stress	0.78	0.47	0.00 – 2.50 (0-3)
		Anxiety	0.51	0.39	0.00 – 2.14 (0-3)
		Depression	0.55	0.40	0.00 – 2.36 (0-3)
		Total	0.61	0.40	0.02 – 2.26 (0-3)
	T2	Stress	0.69	0.49	0.00 – 2.57 (0-3)
		Anxiety	0.45	0.44	0.00 – 2.14 (0-3)
		Depression	0.46	0.40	0.00 – 2.21 (0-3)
		Total	0.53	0.43	0.00 – 2.26 (0-3)
	T3	Stress	0.65	0.53	0.00 – 2.93 (0-3)
		Anxiety	0.43	0.47	0.00 – 2.71 (0-3)
		Depression	0.43	0.43	0.00 – 2.64 (0-3)
		Total	0.50	0.46	0.00 – 2.76 (0-3)
Questionnaire for Positive and Negative Parenting (FPNE)	T1	Negative parenting behavior	1.94	0.30	1.24 – 2.82 (1-4)
	T2	Negative parenting behavior	1.84	0.27	1.18 – 2.47 (1-4)
	T3	Negative parenting behavior	1.83	0.29	1.00 – 2.82 (1-4)

Note. Sample size $n = 232$; ADHD = attention-deficit/hyperactivity disorder, ODD = oppositional defiant disorder.

Table S2

Single Mediator Models for the Mediation of the Impact of Parental Symptoms of Depression, Anxiety and Stress on Child Externalizing Symptoms Through Negative Parenting Behavior

Independent variable		Dependent variable							
		ADHD				ODD			
		Coeff.	Bootstrap SE	95% Bootstrap CI	Completely stand. effect	Coeff.	Bootstrap SE	95% Bootstrap CI	Completely stand. effect
Parental symptoms of depression	a_1	0.19*	0.04	0.12; 0.29		0.19*	0.04	0.12; 0.29	
	b_1	0.14	0.13	-0.10; 0.39		0.57*	0.17	0.25; 0.91	
	a_1b_1	0.03	0.03	-0.02; 0.08	0.02	0.11*	0.04	0.04; 0.21	0.06
	c'	0.34*	0.08	0.17; 0.50	0.26	0.17	0.13	-0.08; 0.41	0.10
	c	0.37*	0.08	0.20; 0.53	0.28	0.28*	0.11	0.06; 0.50	0.16
Parental symptoms of anxiety	a_1	0.21*	0.04	0.13; 0.29		0.21*	0.04	0.13; 0.29	
	b_1	0.16	0.13	-0.08; 0.42		0.57*	0.17	0.24; 0.91	
	a_1b_1	0.03	0.03	-0.02; 0.09	0.02	0.12*	0.04	0.05; 0.21	0.07
	c'	0.30*	0.09	0.11; 0.47	0.22	0.17	0.12	-0.06; 0.42	0.10
	c	0.33*	0.09	0.16; 0.50	0.24	0.29*	0.12	0.06; 0.52	0.16
Parental symptoms of stress	a_1	0.19*	0.04	0.12; 0.27		0.19*	0.04	0.12; 0.27	
	b_1	0.14	0.13	-0.11; 0.39		0.54*	0.17	0.20; 0.89	
	a_1b_1	0.03	0.03	-0.02; 0.08	0.02	0.10*	0.04	0.04; 0.19	0.07
	c'	0.26*	0.08	0.10; 0.41	0.23	0.18	0.11	-0.03; 0.39	0.12
	c	0.29*	0.07	0.14; 0.43	0.25	0.28*	0.10	0.09; 0.47	0.19

Note. Sample size $n = 232$. a_1 : independent variable \rightarrow negative parenting behavior, b_1 : negative parenting behavior \rightarrow dependent variable, a_1b_1 : indirect effect of independent variable on dependent variable through negative parenting behavior, c' : direct effect of independent variable on dependent variable, c : total effect of independent variable on dependent variable, ADHD = attention-deficit/hyperactivity disorder, ODD = oppositional defiant disorder, Coeff. = unstandardized regression coefficient, SE = standard error, CI = confidence interval. * significant coefficient (95% CI). The standard errors and confidence intervals for the total effects were determined without the use of bootstrap samples. Study condition was included as a confounder variable in all models.

Table S3

Unstandardized Regression Coefficients, Bootstrap Confidence Intervals, and Model Information for the Mediation Model, Controlling for Potential Confounders

	Outcome							
	ADHD				ODD			
	Coeff.	Bootstrap SE	95% Bootstrap CI	Completely Standardized effect	Coeff.	Bootstrap SE	95% Bootstrap CI	Completely Standardized effect
a_1	0.06	0.04	-0.02; 0.14		0.04	0.04	-0.03; 0.12	
b_1	0.23*	0.10	0.04; 0.43		0.18	0.16	-0.13; 0.50	
a_1b_1	0.01	0.01	-0.004; 0.04	0.01	0.007	0.01	-0.009; 0.04	0.004
c'	0.07	0.07	-0.07; 0.21	0.05	-0.08	0.08	-0.24; 0.09	-0.04
c	0.09	0.07	-0.05; 0.22	0.07	-0.07	0.08	-0.23; 0.10	-0.04

Note. The analyses controlled for study condition, ADHD and ODD baseline symptoms, baseline parenting behaviour, child age and child sex. The ADHD model additionally included post-assessment ODD symptoms as covariate; the ODD model additionally included post-assessment ADHD symptoms as covariate. Sample size $n = 232$. a_1 : parental internalizing symptoms (i.e., symptoms of depression, anxiety, and stress) at baseline \rightarrow negative parenting behavior at three-month interim assessment, b_1 : negative parenting behavior at three-month interim assessment \rightarrow outcome at post-assessment, a_1b_1 : indirect effect of parental internalizing symptoms on outcome through negative parenting behavior, c' : direct effect of parental internalizing symptoms on outcome, c : total effect of parental internalizing symptoms on outcome, ADHD = attention-deficit/hyperactivity disorder, ODD = oppositional defiant disorder, Coeff. = unstandardized regression coefficient, SE = standard error, CI = confidence interval. * significant coefficient (95% CI). The standard errors and confidence intervals for the total effects were determined without the use of bootstrap samples. Study condition was included as a confounding variable in both models.

5.2 Curriculum Vitae

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Education

- 2017 – 2023 Interdisciplinary Program Health Sciences (IPHS)
at the University of Cologne | Germany
Philosophiae doctor / PhD candidate
- 2016 – 2021 University Hospital Cologne, School for Child and Adolescent Cognitive
Behavior Therapy | Germany
Training / Residency: Behavioral child and adolescent psychotherapist
- 2011 – 2015 University Koblenz-Landau | Germany
Dipl.-Päd. / Equivalent to a Masters degree in Education (including Psychology,
Sociology, Early Childhood Education, Adult Education and Political Science)
- 2012 Full-time-internship at the St. Joseph School Toronto (Part of the university
curriculum) | Canada
Curriculum conversion, teaching assistant, students with special needs

Practical experience

- since 2021 Private practice for psychotherapy in Bonn | Germany
Child and adolescent psychotherapist
- since 2021 Research associate and project manager in the research project OTHELO:
Optimization of therapist training through e-learning at the University Hospital
Cologne | Germany
- 2017 – 2021 Research associate / assistant in the research project WASH: web-assisted self-
help at the University Hospital Cologne | Germany

Honorary office

- 2019 – 2023 Representative at the IPHS Study and Examination Committee, University of
Cologne | Germany
- 2016 – 2022 Confidential contact and family sponsorship in Bonn | Germany
- 2013 – 2015 Member of the Department for International Affairs and Equality
at the University Koblenz-Landau | Germany
- 2012 Volunteer at the German School in Richmond Hill in Toronto | Canada

Publications

Klemp, M.-T., Dose, C., Hautmann, C., Jendreizik, L. T., Mühlenmeister, J., Plück, J., Wähnke, L., & Döpfner, M. (2022). Parenting Behaviors as Mediators of the Association Between Parental Internalizing Symptoms and Child Externalizing Symptoms. *Child Psychiatry and Human Development*. Advance online publication. <https://doi.org/10.1007/s10578-022-01462-0>

Klemp, M.-T., Dose, C., Mühlenmeister, J., Plück, J., Wähnke, L., & Döpfner, M. (2023). Negative Parenting Mediates the Longitudinal Association Between Parental Internalizing Symptoms and Child Oppositional Symptoms. *Child Psychiatry and Human Development*. Advance online publication. <https://doi.org/10.1007/s10578-023-01575-0>

Döpfner, M., Wähnke, L., Klemp, M.-T., Mühlenmeister, J., Schürmann, S., Hellmich, M., & Plück, J. (2020). Efficacy of web-assisted self-help for parents of children with ADHD (WASH) - a three-arm randomized trial under field/routine care conditions in Germany. *BMC Psychiatry*, 20(1), 76. <https://doi.org/10.1186/s12888-020-2481-0>

5.3 Declaration in German

Hiermit versichere ich an Eides statt, dass ich die vorliegende Dissertationsschrift selbstständig und ohne die Benutzung anderer als der angegebenen Hilfsmittel angefertigt habe. Alle Stellen - einschließlich Tabellen, Karten und Abbildungen -, die wörtlich oder sinngemäß aus veröffentlichten und nicht veröffentlichten anderen Werken im Wortlaut oder dem Sinn nach entnommen sind, sind in jedem Einzelfall als Entlehnung kenntlich gemacht. Ich versichere an Eides statt, dass diese Dissertationsschrift noch keiner anderen Fakultät oder Universität zur Prüfung vorgelegen hat; dass sie - abgesehen von unten angegebenen Teilpublikationen - noch nicht veröffentlicht worden ist sowie, dass ich eine solche Veröffentlichung vor Abschluss der Promotion nicht ohne Genehmigung der / des Vorsitzenden des IPHS-Promotionsausschusses vornehmen werde. Die Bestimmungen dieser Ordnung sind mir bekannt. Die von mir vorgelegte Dissertation ist von Univ.-Prof. a. D. Dr. Manfred Döpfner betreut worden.

Darüber hinaus erkläre ich hiermit, dass ich die Ordnung zur Sicherung guter wissenschaftlicher Praxis und zum Umgang mit wissenschaftlichem Fehlverhalten der Universität zu Köln gelesen und sie bei der Durchführung der Dissertation beachtet habe und verpflichte mich hiermit, die dort genannten Vorgaben bei allen wissenschaftlichen Tätigkeiten zu beachten und umzusetzen.

Übersicht der Publikationen:

Klemp, M.-T., Dose, C., Hautmann, C., Jendreizik, L. T., Mühlenmeister, J., Plück, J., Wähnke, L., & Döpfner, M. (2022). Parenting Behaviors as Mediators of the Association Between Parental Internalizing Symptoms and Child Externalizing Symptoms. *Child Psychiatry and Human Development*. Advance online publication. <https://doi.org/10.1007/s10578-022-01462-0>

Klemp, M.-T., Dose, C., Mühlenmeister, J., Plück, J., Wähnke, L., & Döpfner, M. (2023). Negative Parenting Mediates the Longitudinal Association Between Parental Internalizing Symptoms and Child Oppositional Symptoms. *Child Psychiatry and Human Development*. Advance online publication. <https://doi.org/10.1007/s10578-023-01575-0>

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gemacht habe und verpflichte mich, jedmögliche, die obigen Angaben betreffenden Veränderungen dem IPHS-Promotionsausschuss unverzüglich mitzuteilen.

Die dieser Arbeit zugrundeliegenden Daten wurden im Rahmen des vom Innovationsfonds (Gemeinsamer Bundesausschuss) geförderten Forschungsprojektes „Web-Assisted Self-Help“ (WASH) an der Klinik und Poliklinik für Psychiatrie, Psychosomatik und Psychotherapie des Kindes- und Jugendalters der Universität zu Köln erhoben (ID: VF1_2016–058). Für die Studienkonzeption, -koordination und das Studienmanagement innerhalb der WASH-Studie war Univ.-Prof. a. D. Dr. Manfred Döpfner in Kooperation mit Priv.-Doz. Dr. Julia Plück zuständig. Sie unterstützten mich zudem in der der Planung und Revision der beiden Manuskripte. Die Patient*innen-Rekrutierung und Datenerhebung innerhalb der WASH-Studie führten federführend Laura Wähnke und ich über den gesamten Studienzeitraum durch. Hierbei wurden wir durch Judith Mühlenmeister, Julia Walger, Elena Kamenetska, Alina Huemer, Katharina Daun und Jennifer Dünnwald unterstützt.

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13.11.2023

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Datum

M.-Th. Klomp
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