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Mental health from a Person-centred Perspective: Analyzing mental health problems, risk factors and outcomes in children, adolescents and young adults

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The best thing to hold on to in life is each other. ~ Audrey Hepburn

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ABSTRACT

The relevance of mental health problems has accumulated over the last few years in light of the potential detrimental effects of the worldwide pandemic. The burden of mental ill-health with its various negative long-term consequences for children, family and the high indirect and direct costs for society raises the essentiality to make mental health promotion a central issue. General scientific research on mental health problems among children and adolescence has largely relied on variable-centred methodology (e.g., multiple regression, factor analysis, cumulative risk index) by focusing mainly on explaining relationships between variables (i.e., linear association and single relationship). However, this method assumes homogeneity of mental health problems and risk factors for mental ill-health within a population, however there is likelihood for diversity of individual patterns for types of problems and exposure to multiple risk factors. The current dissertation uses a person-centred approach, a complementary and promising method to identify subpopulations with heterogenous patterns of mental health problems and to investigate different risk subgroups.

The aims of the present work include the exploration and modelling of patterns and transitions of mental health problems with a focus on the importance of parental factors, the examination of multiple risks and the manifestation of mental disorders.

In Study I, the central question was: “How do mental health problems differ across individuals and time”. Based on a sample of almost 1,300 children and adolescents (age range 8 – 26), a three-class solution identified a normative class, an emotional problem class, and a multiple problem class. The findings confirm the stability of mental health problems as common rather than atypical. According to Latent transition analysis, the majority of the sample (91.6%) did not change latent class membership over time, while 14.7% of individuals showed a persistent pattern of mental health problems across time. Co-occurring internalizing and externalizing problems (i.e., multiple problem class) were found in 11.3% of the sample and diagnoses of

mental disorders were more likely to be reported by individuals in the emotional problem or multiple problem class. Taken together, implications for prevention can be formulated based on the findings including the importance of early, continuous, and gender-sensitive preventive interventions to ameliorate the mental health burden for the young and their family.

In Study II, the mediating role of parenting dimensions between parental personality and adolescent mental health problems was investigated with a cross-sectional sample of 4,258 German adolescents (48.7% male, 11–17 years). The results underline and extend previous indications of direct associations between parental personality and their children's mental health problems by highlighting the adverse role of neuroticism with increased externalizing and internalizing problems. Furthermore, results confirmed a positive effect of parental warmth and behavioural control on externalizing and internalizing problems and a negative effect of psychological control on both problems. An important finding includes the mediating role of parenting. Results showed negative associations between parental neuroticism as well as psychological control and adolescent mental health and highlighted their mutually reinforcing negative effect. To summarise, a good entry point for effective preventive intervention to ameliorate mental health problems during adolescence could include early screening of personality traits that may result in maladaptive parenting practises and therefore could be a guidance towards a better preparation for parenthood.

In Study III, a longitudinal survey data of 10,853 German children, adolescents and young adults was used to examine 27 robust risk and protective factors for mental health across multiple domains (i.e. individual, family, social) to identify four subgroups of individuals with different risk profiles: a basic-risk (51.4%), high-risk (23.4%), parental-risk (11.8%) and social-risk class (13.4%). Results confirmed the crucial role of family-specific risk factors across the extracted classes and point towards parents as a key target to develop effective interventions to promote children's health. Risk classes are associated with negative mental health outcomes (e.g., mental health problems, depression, ADHD). Gender differences were found. In

conclusion, results contribute to previous research by stressing the effect of multiple risk factor on youth mental health. Future approaches to ameliorate mental health problems should include a combination of strengthening protective factors, involving parents and targeting schools.

The findings of the present dissertation which include the importance of co-occurring mental health problems (Study I) and the examination of multiple risk factors (Study III) as well as the central role of parents (Study II), highlight the necessity to intervene early, continuous and on different levels of society. Implications and future research directions are discussed, focusing on the societies responsibility to guarantee that the most vulnerable and most important members have a chance for a healthy development. While important steps have been taken toward mental health prevention, there is still a lot of potential for research and practise.

1. INTRODUCTION

A wealth of research provides evidence for mental health problems among children and adolescents as a growing public health concern (Kieling et al., 2011; Polanczyk et al., 2015; Supke et al., 2021). Mental health problems in childhood, if untreated and not successfully ameliorated, can have profound health, social and economic consequences. The burden of mental ill-health with its various negative long-term consequences, including low achievement in school, delinquent behaviour, maladaptive relationships, peer rejection, engagement in risky behaviours, substance abuse, and suicide risk (Colder et al., 2013; Fanti & Henrich, 2010; Fergusson et al., 2005; Patel et al., 2007; Yoo et al., 2009), is not only difficult to bear for children and families but also exerts pressure on society. Important sequelae include loss of productivity, work incapacity and increased costs in health care and education (Narusyte et al., 2017). The estimated costs of poor mental health accounts for up to 4% of GDP in the European Union (EU) (Knapp et al., 2009; Zechmeister et al., 2008), underpinning the continuously increased attention towards mental health promotion. Albeit the importance of positive mental health has increased in recent years (Fegert et al., 2021; WHO, 2021; Wykes et al., 2021), the worldwide COVID-19 pandemic has accelerated the urgency of assessing, monitoring and promoting mental health (McArthur et al., 2021). Implemented disease containment measures covering school closure, social distancing and home confinement have raised concern over the likely negative psychological impact on children and adolescents (Fegert et al., 2021; Fore, 2020). Those measures aligned with disturbances of daily routines, separation from peers, home schooling and lack of educational resources have raised feelings of uncertainty, stress and anxiety among children and parents (Loades et al., 2020; Mazza et al., 2020). According to a representative online survey conducted among 1,586 families with 7 to 17-year-old German children and adolescents, significantly more mental health problems (i.e., hyperactivity and peer problems) were reported burdened by the COVID-19 measures (Ravens-Sieberer et al.,

2021). The impact was significantly higher for 7 to 11-year-old children compared to older children. Additionally, results from a systematic review and meta-analysis with 221,970 participants from 66 studies reported an increase of mental health problems in the global population due to COVID-19 (Wu et al., 2021). Maximising attention towards mental health is "*no longer only socially appropriate but economically meaningful and absolutely essential as an investment in the future."* (Fegert et al., 2021, p. 992)

1.1 *Mental health problems during childhood and adolescence*

Mental health problems show a worldwide prevalence of 10 - 20%, originate in early childhood, and display a high persistence into adulthood with a risk for manifestation.

A recent study by Supke et al. (2021) confirmed prevalence rates of clinically relevant mental health problems at about 15% in Germany, which is slightly higher compared to the average prevalence of 13% reported in a meta-analysis with 41 studies and 87,742 children and adolescents from various countries (Polanczyk et al., 2015). Mental health problems are commonly conceptualized in two broad dimensions (Goodman et al., 2010). Social-emotional or internalizing mental health problems describe difficulties directed inwards, for instance social withdrawal, depression and anxiety. Inversely, behavioural problems or externalizing are directed outwards such as hyperactivity, non-compliance, and aggression (Yong et al., 2014).

While, Rudolph et al. (2013) showed that 15.4% of children between 3–6 years are susceptible for ill-mental health displaying abnormalities in their socio-emotional development, other studies reported mental health problems before age 3 (Basten et al., 2016; Briggs-Gowan et al., 2006).

It is common belief that children's mental health problems are temporary and tend to diminish with age (Briggs-Gowan et al., 2006). However, shared findings across studies suggest a persistence of both domains of problems across all stages of development (i.e., childhood to adolescence to adulthood) (Basten et al., 2016; Beyer et al., 2012; Bornstein et al., 2010;

Korhonen et al., 2018; Reitz et al., 2005). For instance, Basten et al. (2016) used a population-based cohort of 7,206 children (age 1,5 to 6 years) from The Netherlands and found a stability of any problem at 40% to 68% from age 3 to 6 years. Stability of mental health seems to manifest with age (Dodge et al., 2008) and depends on the type of problem. According to Oh et al. (2020), analysing a longitudinal sample of 1,060 children across five measurement time points (i.e., pre-K, kindergarten, Grades 1, 2, and 3), the average stability of externalizing problems during school years (Grade 1, 2, and 3) was twice as high compared to the preschool years (pre-K and kindergarten). In contrast, the average stability of internalizing problems was six times higher comparing pre-school and school years. It is widely recognised that over the school years, externalizing problems slowly decrease with growing skills (i.e., regulating emotions, developing social awareness, mastering communication) and internalizing problems increase due to growing cognitive maturation (e.g., self-reflection, to remember and anticipate negative events) (Klasen et al., 2016; Lee & Bukowski, 2012; Leve et al., 2005; Yoon et al., 2017). Hence, the stability for externalizing problems are highest during childhood and adolescence, while internalizing problems persist from adolescence onwards (Copeland et al., 2013; Costello et al., 2003; Picoito et al., 2020). Continuity of the same problems over time (i.e., homotypic continuity) has been found in various studies (Arslan et al., 2021; Beyer et al., 2012; Mian et al., 2011). In contrast, heterotypic continuity (i.e., cross-dimension effects) has also been investigated and reported in recent literature (Briggs-Gowan et al., 2006; Picoito et al., 2020; Wichstrom et al., 2017). For instance, Picoito et al. (2020) describes heterotypic continuity more likely during pre-adolescence, mainly from externalizing to internalizing problems or low mental health symptoms.

High levels of externalizing and internalizing problems throughout childhood are related to diagnoses of mental disorders in adulthood, while in 75% of adults cases with mental health issues the onset occurred before age 24 years (Kessler et al., 2005). Research published within the last 20 years has shown the associated ramification if mental health problems tend to persist

into adulthood (Hofstra et al., 2002; Korhonen et al., 2018; Reef et al., 2010). For instance, a longitudinal study with 1,578 Dutch children and adolescents aged 4 through 16 years showed a 6-fold increased risk to meet criteria for DSM-IV diagnoses in adulthood (follow-up 14 years later) predicted by high levels of childhood psychopathology (Hofstra et al., 2002). The presence of externalizing and internalizing problems at childhood predicts anxiety, mood and disruptive disorders 24 years later (Reef et al., 2010). Whereby children with high or increasing internalizing problems into adolescence are more likely to show depressive and avoidant personality problems during early adulthood. In contrast, a high trajectory of externalizing problems in childhood increased the risk of a wide range of emotional and behavioural problems at the age of 27 (Korhonen et al., 2018).

1.2 *Screening and empirical approach to mental health problems*

Presently, several screening instruments have been developed to effectively detect and diagnose mental health problems. One of the most widely used questionnaire for mental health difficulties in childhood and adolescence is the Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997; Rothenberger & Woerner, 2004; Stone et al., 2010). The brief instrument with 25 items measures 5 subscales (hyperactivity/ inattention, conduct problems, emotional symptoms, peer relationship problems, and prosocial behaviour) and the daily impact of problems using multiple informants (e.g., children, parents, teacher). With more than 80 translation of the SDQ worldwide, a wealth of research has been accumulated reflecting the use of the instrument for clinical practice and scientific research. Several systematic reviews have acknowledged the SDQ as an efficient screening instrument for the identification of mental health difficulties in youth with a strong evidence for internal consistency, discriminative and structural validity (Kersten et al., 2016; Stone et al., 2010; Warnick et al., 2008).

General scientific research on mental health problems among children and adolescence has largely relied on variable-centered methodology. For instance, studies applied factor

analysis to investigate structural associations between different problem domains including a best-fitting model for single factors of internalizing and externalizing disorders (Goodman et al., 2010). Despite its usefulness, the method assumes homogeneity of mental health problems within a population, however there is likelihood for diversity of individual patterns for types of problems (Williams et al., 2013). A complementary approach to identify subpopulations with heterogenous patterns of mental health problems has only recently become popular. Only very few investigations using person-centered approaches such as Latent class and Latent transition analysis have examined individual-specific patterns of mental health problems (e.g., Basten et al., 2016; Isdahl-Troye et al., 2021; Ling et al., 2016b; McElroy et al., 2017; Picoito et al., 2020).

Despite the common understanding about the importance of mental health in children, prospective studies spanning from childhood to adolescence and early adulthood are limited.

The present dissertation contributes to previous research by analyzing individual patterns of mental health problems using a person-centered strategy (Study I). In contrast to the few recent studies on person-specific patterns of mental health problems, this dissertation uses a wide age range covering symptoms during childhood and adolescence incorporating the SDQ as a multi-informant measure using parental and self-reports.

1.3 *Co-occurrence of mental health problems*

A plethora of research indicates a close interplay between internalizing and externalizing problems providing evidence for the existence of a separate "co-occurrence" dimension (Basten et al., 2016; Briggs-Gowan et al., 2006; Fanti & Henrich, 2010; Hinnant & El-Sheikh, 2013; Ling et al., 2016a; Mezulis et al., 2010; Picoito et al., 2020; Wichstrom et al., 2017). Externalizing-internalizing co-occurrence, compared to sole mental health problems, tends to

start earlier in life, shows a higher persistence into adulthood, and is linked to more adverse outcomes.

Overall, studies have reported varying prevalence rates for co-occurrence with the smallest rate for preschool children (2%) (Basten et al., 2016; Fanti & Henrich, 2010). Higher rates were identified during middle childhood (5% - 10%) (Hinnant & El-Sheikh, 2013; Mezulis et al., 2010), and adolescence (11 to 18 years) with 20% reporting co-occurring problems (Ling et al., 2016a).

Based on the premise, that a strict separation of mental health problems into two dimensions as behavioural (i.e., externalizing) and socio-emotional (i.e., internalizing) problems may be an over-simplification as they are not mutually exclusive (Ling et al., 2016a), this dissertation will focus on identifying children with co-occurring problems (i.e., externalizing and internalizing) (Study I).

The emergence of overlapping problems has its onset very early in life with 1.7% of children showing externalizing and internalizing symptoms at age 1.5 (Basten et al., 2016). Wichstrom et al. (2017) found a persistent mixed externalizing and internalizing profile at age 5 continuing into adolescence. The persistence of co-occurring problems is stronger compared to either problem alone, especially for young children (Basten et al., 2016; Briggs-Gowan et al., 2006; Edwards & Hans, 2015; Fanti & Henrich, 2010). Basten et al. (2016) examined the stability of mental health problems for children aged 1,5 to 6 years. Findings indicate that two in three children with co-occurring problems at age 3 showed problems at age 6. Similar results were reported by Edwards and Hans (2015), using a sample of 412 infants and their primary caregivers with interviews and observations at ages 5 months, 2,5 years and 5 years, they found that children with co-occurring problems at 2,5 years had a higher likelihood to experience some type of problem at age 5.

The current dissertation expands previous research by investigating the stability of person-specific patterns of mental health problems over time (Study I). Examining person-level

transitions between internalizing, externalizing and both problems will help to gain a clearer picture of the development of problems over time and to identify individuals at risk for life-time psychopathology.

In addition to the higher persistence of co-occurring externalizing and internalizing problems, it is well known that co-development is associated with more severe adverse outcomes (e.g., mental disorders, substance abuse, deviant behaviour, risk for suicide) (Basten et al., 2016; Colder et al., 2013; Fanti & Henrich, 2010; Maslowsky & Schulenberg, 2013; Newman et al., 1998).

In using a person-oriented perspective, the present dissertation will investigate person-specific mental health patterns and their association with mental ill-health (e.g., diagnoses of depression, anxiety and ADHD) (Study I). To our knowledge, no previous person-centered study has examined individual patterns over time and their association with reported psychiatric disorders in transition to late adolescence and early adulthood.

1.4 *Predictors of mental health problems*

Despite the common appreciation of the concept of co-occurrence in research, prospective studies investigating the underlying mechanisms of co-occurrence are scarce (Oh et al., 2020). The development of co-occurrence is explained either through causal relationships (i.e., early problems cause later problems) or by the shared-risk hypothesis (i.e., overlapping risk factors). Research on the direction of the relationship between internalizing and externalizing problems yields mixed results while three scenarios have been suggested: (1) an unidirectional relationship with externalizing problems leading to the development of internalizing problems also called “failure model” (Lee & Bukowski, 2012; Oh et al., 2020; Reef et al., 2010); (2) internalizing problems predicting later externalizing problems (i.e., acting-out model) (Poirier et al., 2016); and (3) a mutually reinforcing relationship by which an increase or decrease of social-emotional problems tends to influence behavioural problems or vice versa (Lee &

Bukowski, 2012; Van der Ende et al., 2016; Wiggins et al., 2015). Recent findings by Oh et al. (2020) analysing a longitudinal sample (i.e., pre-K, kindergarten, Grades 1, 2, and 3) indicate that co-occurring problems follow a one-way direction from externalizing to internalizing problems, while, Lee and Bukowski (2012) suggest different developmental trajectories between boys and girl. Using a latent growth curve model on a sample of 2,844 Korean school children (age 10 to 13 years) followed over four years, results showed a reciprocal relationship for externalizing and internalizing problems among boys. In contrast, girls provide support for the failure model as externalizing problems precede internalizing problems. Findings indicate that each suggested direction of association seem to be possible.

In contrast to the casual explanation for co-occurrence, the shared-risk hypothesis postulates that externalizing and internalizing problems share similar risk factors, such as genetic and environmental vulnerabilities (Oh et al., 2020; Wang et al., 2020). The presence of risk factors during sensitive developmental periods are regarded to be an important marker for the development and persistence of mental health problems (McLuckie et al., 2019). Although, several studies investigated the shared-risk hypothesis, findings show inconsistencies mostly in favour for overlapping risk factors. While Moilanen et al. (2010) found that shared risk factors (i.e., parenting quality, intelligence, and neighbourhood adversity) in childhood played only a subordinate role regarding developmental cascades using a longitudinal sample of at-risk boys (N = 291), other studies support the hypothesis. For instance, Lee and Bukowski (2012) studied common risk factors associated with internalizing and externalizing problems in early adolescence using a longitudinal Korean sample. Findings provided evidence for shared risk factors (e.g., parental violence, affiliation with delinquent friends) that contribute to both mental health problems. Additionally, in a more recent study by Stone et al. (2015) using two 1-year interval data of a preschool sample (N = 1,434) and latent cross-lagged modelling, trajectories of externalizing and internalizing problems were associated with risk factors such as inadequate parenting, parenting stress, maternal health, and peer social preference.

During the lifespan, numerous highly sensitive developmental periods represented by multiple biological (e.g., puberty), cognitive (e.g., emotion-regulation, identity formation), and social-environmental changes (e.g., secure attachment, school transition, peer relationships) need to be mastered successfully to ensure positive adjustment (Reitz et al., 2005). Maladjustment during those key developmental periods predicted by the large and long-lasting impact of related risk and protective factors is marked by a significant increase of mental health disorders (Arango et al., 2018; McArthur et al., 2021). Edwards and Hans (2015) identified an association between mental health problems and risk factors reliably during infancy. Commonly, infancy and early childhood are considered as a pivotal and developmentally sensitive periods during which protective and risk factors may have a significant and long-lasting effect on mental health outcomes (Conway & McDonough, 2006; McLuckie et al., 2019; Picoito et al., 2020). A risk factor is defined as any biological or individual trait or environmental factor that is associated with an increased likelihood to develop negative or harmful health outcomes (e.g., behavioural problems) (Dekovic, 1999; Evans et al., 2013; Liaw & Brooks-Gunn, 1994). In contrast, protective factors for mental health are an important buffer which help to strengthen children by contributing to a resilient development when exposed to adversities (Wille et al., 2008; Wlodarczyk et al., 2017).

Several crucial individual level risk and protective factors for children's mental health have been identified in recent years. Some of children's characteristics including temperament (Kozlova et al., 2019; Ortiz Ruiz, 2018), self-esteem (Moksnes & Reidunsdatter, 2019), and self-efficacy (Schonfeld et al., 2016), moreover biological factor such as genetic disposition (Wang et al., 2020), low birthweight (Foulon et al., 2015), chronic illnesses (Hysing et al., 2007), and postnatal problems (Douglas & Hill, 2011) showed to be associated with negative mental health.

Nevertheless, innumerous developmental changes during childhood and adolescence do not occur independent from one another but rather within multiple contexts, including the family,

the school and the environment (Evans et al., 2013; Lanza et al., 2010; Wille et al., 2008). A large body of theory shows that family factors are among the strongest and most influential predictors for children's mental health outcomes (Costello et al., 2003; Lindblom, 2017; Puff & Renk, 2016). Children's first contact with the outside world happens through their parents or caregivers and they continue to be a vital source of support during different developmental stages (i.e., infancy, toddlerhood, childhood, and adolescence) to develop emotional, cognitive, and social skills needed to function in a community (Grusec & Davidov, 2010). As parents are within the child's proximal environment, they significantly contribute to their socialization of appropriate behaviour, their emotional development and help them to learn adequate social skills. Within this fundamental role, parents are faced with the challenge to provide a healthy learning environment that helps a child to thrive and prosper.

The presence of familial risk factors has direct implications for children's mental health development (Parra et al., 2006; Trentacosta et al., 2008). Risk and protective factors that have repeatedly shown evidence for their strong association with externalizing and internalizing mental health problems include: parental psychopathology (Fulco et al., 2019; Goodman et al., 2011), parental stress (Hintermair, 2006; Vigouroux & Scola, 2018), family structure (Fomby & Cherlin, 2007), parental education (Russell et al., 2015), parental personality (Bertino et al., 2012; Ortiz Ruiz, 2018; Puff & Renk, 2016), and parenting behaviour (Bayer et al., 2019; Calders et al., 2020; Carlson & Corcoran, 2001; Kopala-Sibley et al., 2017).

A large amount of research has reached an agreement regarding the importance of parenting behaviour on child development over the last 30 years (Bayer et al., 2011; Caron et al., 2006; Kopala-Sibley et al., 2017; Logan-Greene et al., 2019). Parenting practises which aim towards behaviours that provide support for a child's emotional, cognitive and social development, is shaped by multiple factors. One central determinant of parenting behaviour is the parent's own personality (Bornstein et al., 2011; Gladstone & Parker, 2005; McCabe, 2014; Prinzie et al., 2009). Despite the importance of parenting and parental personality on children's

mental health development, prospective studies that examine their relationship are limited (Oliver et al., 2009; Puff & Renk, 2016).

In the current dissertation, we test the hypothesis that parental personality is indirectly linked to adolescent mental health through parenting dimensions (Study II) as this mediating factor linked to mental health problems in childhood and adolescence is still insufficiently explored (Korhonen et al., 2018).

In contrast to risk factors, several protective factors from the family domain have been studied and identified as a positive predictor for mental health problems. For instance, a positive home environment and family climate help to reduce externalizing problems (Fanti & Henrich, 2010; Wuestner et al., 2019). Furthermore, parental self-perceived competence which includes parental self-efficacy and parenting satisfaction is associated with a reduced risk for children to develop mental health problems (Wlodarczyk et al., 2017).

Child functioning is additionally influenced by the social surrounding or environment, which includes peer relationships, social support, discrimination, and school climate. As adolescents seek autonomy and self-identity, peers become the main source of social support. While adverse relations and experience (e.g., bullying and discrimination) are associated with negative mental health outcomes (i.e., aggression, depression, anxiety) (Pascoe & Smart Richman, 2009; Zuba & Warschburger, 2017), supportive social contacts in turn contribute to a positive child development (Wille et al., 2008).

1.5 *Person-centered approach to multiple mental health risk factors*

Beyond that, the question whether and how a single risk factors increase the vulnerability towards mental health problems has recurrently been addressed. The presence of a single risk factor during childhood and adolescence is very common with mostly little consequences regarding developmental functioning (Appleyard et al., 2005). However, risk factors tend to co-occur within and between domains and the exposure to an accumulation of various risk factors

is associated with poorer mental health (Rutter, 1979; Wille et al., 2008). The absence or presence of multiple risk factors explains why it is not always the case that children in a single-parent homes are more likely to display poorer functioning compared to children living with both parents, which suggests heterogeneity (Pratt et al., 2016). The causal mechanism in developmental psychopathology are dominated by two concepts – multifinality and equifinality. The first describes the process of a single risk factors leading to multiple developmental outcomes, whereas equifinality refers to multiple risk factors that result in a single outcome (Klahr et al., 2012). Both concepts explain the association between risk factors and mental health disorders. For instance, while a multitude of individual, family and environmental risk factors is associated with antisocial behaviour, representing equifinality, the link between maternal depression and children's behavioural and emotional problems is well-known and provides an example for one factor influencing different outcomes (i.e., multifinality) (Fanti & Henrich, 2010; Klahr et al., 2012). The high complexity of combinations of risk and protective factors and variations between subpopulations poses a pivotal challenge for mental health research.

Methodological approaches to investigate multiple risk factor and their association with poor mental health have relied on variable-centred methods (Newcomb-Anjo et al., 2017; Wille et al., 2008). Early research has employed a cumulative risk index by creating a sum of dichotomized risk factors to account for co-occurrence and examined their association with mental health outcomes (Rutter, 1979; Trentacosta et al., 2008; Wickrama et al., 2016; Wille et al., 2008). The use of a cumulative risk measure to predict psychopathology is well established and commonly employed due to its usefulness, suitability and parsimony (Appleyard et al., 2005; Pratt et al., 2016; Wille et al., 2008). For instance, Wille et al. (2008) examined mental health and the number of potential risk and protective factors using a representative sub-sample of 2,863 families with children and adolescents aged 7 to 17 years. Main findings suggest that the co-occurrence of risk factors affect mental health problems significantly. Although

undoubtedly contributing to our understanding of the association between multiple risk factors and mental health, the cumulative risk method has shown it limitations (Lanza et al., 2010; Newcomb-Anjo et al., 2017). Independent of the number of risk factors, the presence or absence of various factors is different for each child and those diverse combinations may also influence mental health outcomes manyfold (Pratt et al., 2016). The traditional variable-oriented approach (e.g., multiple regression, factor analysis, cumulative risk index) focuses mainly on explaining relationships between variables (i.e., linear association and single relationship) (Edwards & Hans, 2015). Additionally, the lack on specificity of risk factors, their multitude of combinations and their variations across subpopulation are overlook when applying variable-centred methods (Lanza et al., 2010; Newcomb-Anjo et al., 2017). Although an useful approach, the aforementioned literature highlighted its gaps and limitations, while introducing a different approach to broaden our understanding of mental health research. One complementary and promising application to the quantitative method of capturing clustering risk factors is a person-centred approach. As said, significant heterogeneity is involved with respect to the exposure of multiple risk factors and later developmental outcomes, a person-centred approach offers a promising method to investigate different risk subgroups (Copeland et al., 2009; Logan-Greene et al., 2019; Parra et al., 2018). A person-centred approach captures the nature of risks and describes heterogeneity in the population by identifying underlying homogenous subgroups of individuals with complex combinations of risk factors. More precisely, the approach identifies the relationship between variables within individuals rather than generalizing across the entire population (Van Eck et al., 2017). For instance, the person-centred approach compared to the more popular cumulative risk method not only offers a quantitative view on multiple risk factors for mental health but additionally extracts qualitative information. Accordingly, extracted latent classes (i.e., subgroups) are distinct due to the number of risks (e.g., low, medium vs. high risk) as inferred by a variable-centred approach but also due to the nature of the risk factors (e.g., subgroup with family-related risks). According

to Howard and Hoffman (2018), a person-centred approach compared to a variable-centred method shows a higher amount of specificity with a moderate amount of parsimony.

Despite the growing popularity of person-centred approaches, it has less well been demonstrated with regard to multiple risk factor for mental health across several domains. Only a few previous studies have applied a person-centred method for modelling multiple mental health risks (Lanza et al., 2010; Parra et al., 2006). Despite these studies, the topic is still insufficiently explored.

In the present dissertation, we attempt to overcome this limitation by identifying subgroups of individuals according to their exposure to a broad range of mental health risk indicators with a large sample using a person-centred approach (e.g., LCA). Furthermore, the extracted homogeneous subgroups of multiple risk factors and their associations with different mental health issues or disorders (i.e., internalizing and externalizing mental health problems, reported diagnoses of ADHD and depression) will be examined in Study III. This procedure allows for the examination of heterogeneity and mental health outcomes that result from different patterns of risk.

2. OVERALL STUDY DESIGN

The current dissertation uses data from the first nationwide health survey the German National Health Interview and Examination Survey for children and adolescents (KIGGS), which was conducted by the Robert Koch Institute (RKI) in cooperation with national and international experts and funded by the German Federal Ministry of Health, Federal Ministry of Education and Research, and the RKI (Mauz et al., 2020; Ravens-Sieberer et al., 2008). The survey collected representative data on physical and mental health, health behaviours and psychosocial risk and protective factors, based on examinations and self-administered questionnaires. The baseline study of the KiGGS survey was conducted from 2003 to 2006 on children and

adolescents aged 0–17 years with residence in Germany. The two-stage sampling procedure included 167 communities based on the degree of urbanization and geographic distribution to represent the population size and randomly selected addresses per birth cohort. In total, 17,641 children and adolescents were included (8,985 boys and 8,656 girls) with a response rate of 66%. Besides the cross-sectional design of the survey, a longitudinal component was included to track respondents into adulthood with regular follow-ups. The first follow-up (KiGGS Wave 1, 2009 – 2012) was designed as a computer-assisted telephone interview survey and included 11,992 respondents aged 6 to 24 years (6,078 female and 5,914 male) with a response rate of 68%. The second follow-up (KiGGS Wave 2, 2014-2017) assessed 10,853 cohort participants age 10 – 31 years (5,790 female and 5,063 male participants) with a response rate of 62% of the baseline survey (Lange et al., 2018; Mauz et al., 2020). According to a non-response analysis, loss of respondents to both follow-ups was based on socio-demographic influences such as older age, male sex, lower socio-economic status (SES), and a migration background (Mauz et al., 2020). Additionally to the follow-ups, a new cross-sectional sample based on the same sampling procedure was drawn and included a total of 15,023 children and adolescents (KiGGS Wave 2 - Cross-sectional). A response rate of 40.1% was achieved. The overall KiGGS study design is illustrated in Figure 1.

As extension of the KiGGS survey, a set of independent modules based on a subpopulation was introduced to acquire in-depth knowledge on specific health-related issues. The BELLA study is one of four supplementary modules with a longitudinal design across four measurement points collecting data of children and adolescents in Germany (Ravens-Sieberer et al., 2008; Ravens-Sieberer et al., 2015). Participants of the BELLA study were randomly selected children and adolescents aged 7-17 years drawn from the KiGGS survey. In total, 2,863 families were included in the BELLA Baseline survey. The first follow-up of the BELLA study (B1) was conducted one year later (2004-2007) and included 2,423 participants aged 8 – 18 years.

The 2-year follow-up (B2, 2005-2008) and the 6-year follow-up (B3, 2009-2012) included 2,190 and 1,429 children and adolescents (response rate of 49.9%), respectively (Figure 1). Attrition was associated with participants reporting reduced time availability, loss of interest or were out of reach (Ravens-Sieberer et al., 2015). Figure 1 shows the study design for KiGGS cohort with cross-sectional assessment and the BELLA study cohort used for all analysis in this dissertation.

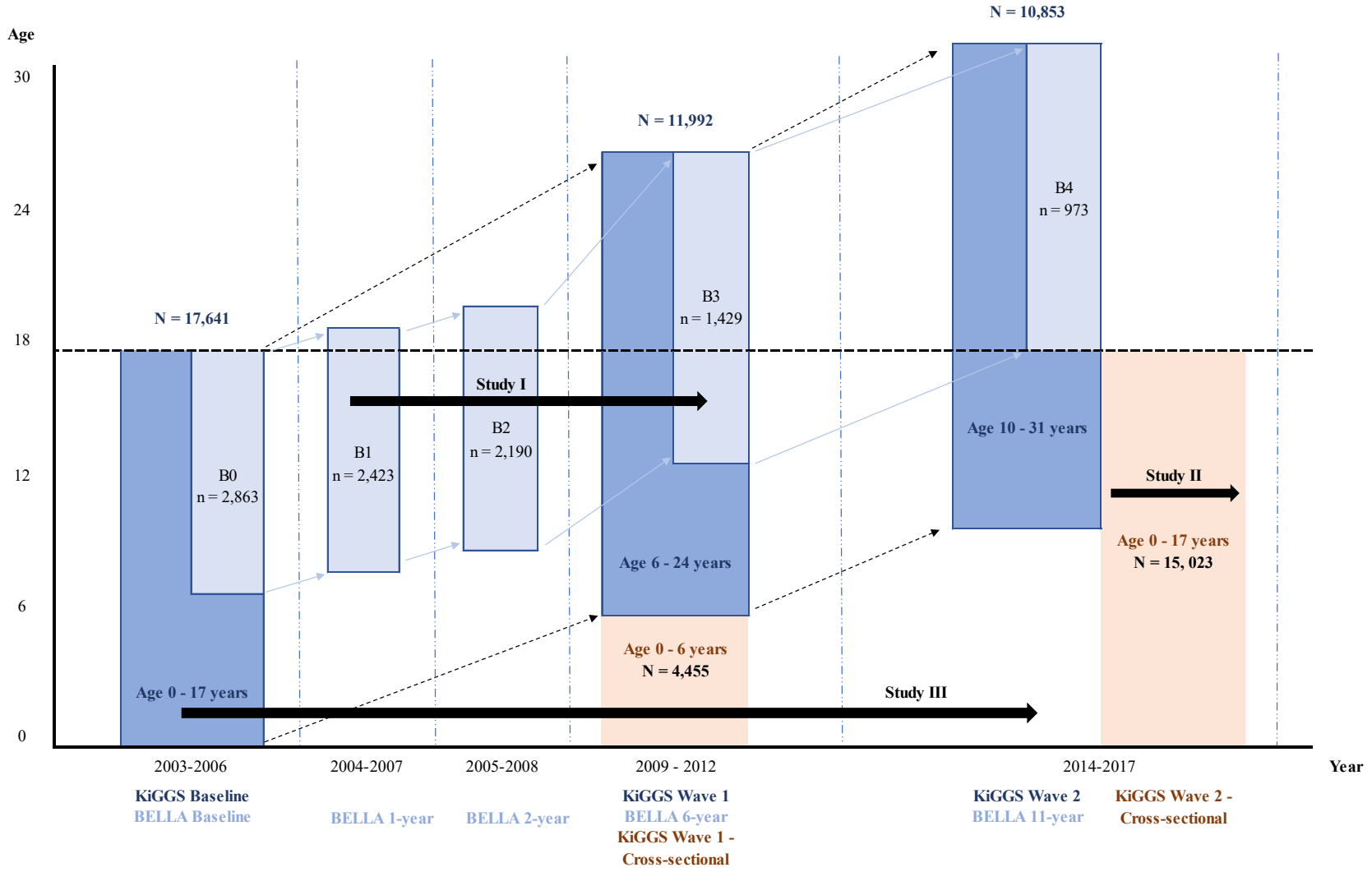

Figure 1. Study design for KiGGS and BELLA and relevant samples used for each study in the present dissertation.

3. AIMS OF THE PRESENT DISSERTATION

The current dissertation aims to explore and model patterns and transitions of mental health problems with a focus on the importance of parental factors, the examination of multiple risks and the manifestation of mental disorders.

3.1 *Mental health problems from a person-centred perspective*

In *Study I*, following a longitudinal person-centred approach, we examine socio-emotional and behavioural mental health problems, its co-occurrence, stability over time, and manifestation into mental disorders based on the SDQ measure. We will focus on the four subscales of the SDQ (i.e., hyperactivity/inattention, emotional, conduct, and peer relationship problems), their interplay and individual transition across time using a Latent transition analysis. Based on the aforementioned literature, we hypothesize the extraction of a 4-class solution that broadly reflects internalizing problems, externalizing problems, no or low mental health problems, and co-occurring problems. Secondly, we expect that children with co-occurring problems are more likely to show persisting symptoms. Lastly, we determine the association between distinct patterns of mental health problems and self-reported diagnoses of mental disorders (e.g., ADHD, depression, and anxiety). Our expectations are that individuals with co-occurrence of mental health problems are more likely to report diagnoses of mental disorders.

3.2 *Parents influence on children's mental health*

In *Study II*, we examine the links between two crucial parental risk factors for adolescents' mental health - parental personality traits and parenting dimensions. As extension to previous research, we hypothesize a direct link between parent personality and adolescent's mental health problems with a positive association for neuroticism. Furthermore, we expect an

association between parenting behaviours and adolescent's mental health problems. Precisely, high psychological control is associated with a higher risk of adolescent externalizing and internalizing problems. Lastly, we investigate the mediating role of parenting behaviour on parent personality and children's mental health problems. We hypothesize that parental personality is indirectly linked to adolescent mental health through parenting dimensions.

3.3 *Multiple mental health risk and protective factors*

In *Study III*, using a Latent class analysis, we examine distinct subgroups according to their multiple risk exposure and their association to mental ill-health. Concurrent with previous research, we expect to extract a 4-class solution (four subgroups) of risk patterns. Moreover, we expect to find subgroups that differ according to the number (e.g., low, medium vs. high risk) and nature of the risk factors (e.g., subgroup with family-related risks). Finally, we hypothesize that those extracted risk subgroups are distinctively associated to mental ill-health (e.g., reported diagnoses of mental disorders).

STUDY I

Co-occurrence, Stability and Manifestation of Child and Adolescent Mental Health Problems: A Latent Transition Analysis

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Abstract

Untreated mental health problems in early childhood set a marker for later antisocial and depressive problems. Aims of this study included the longitudinal examination of patterns of mental health problems and their transitions to reported mental disorders by using a person-centered approach (Latent class and Latent transition analysis). The sample consisted of 1,255 children and adolescents (51.7% female, mean age = 12.3 years, age range 8 – 26 years) from three time points of the comprehensive mental health and wellbeing BELLA study. Children and their parents completed the German SDQ (Strength and Difficulties Questionnaire, Goodman, 1997) and reported on diagnoses of ADHD, depression, and anxiety. Latent class analysis identified a normative class, an emotional problem class, and a multiple problem class. According to Latent transition analysis, the majority of the sample (91.6%) did not change latent class membership over time; 14.7% of individuals showed a persistent pattern of mental health problems. Diagnoses of mental disorders were more likely to be reported by individuals in the emotional problem or multiple problem class. Results highlight the need for early prevention of mental health problems to avoid accumulation and manifestation in the transition to adolescence and young adulthood.

Keywords: SDQ, mental health problems, LTA, psychiatric disorders, childhood

Worldwide, 10 to 20% in children and adolescents are affected by socio-emotional and behavioural adjustment problems (Kieling et al., 2011; Polanczyk et al., 2015; Supke et al., 2021). Untreated mental health problems in childhood set a marker for antisocial and depressive psychopathology in adolescence or adulthood (Beyer et al., 2012; Mulraney et al., 2021; Wlodarczyk et al., 2016; Yoon et al., 2017). Complex constellations of socio-emotional and behavioural problems (i.e., mental health problems) develop concurrently or consecutively, are common, and heighten the risk for subsequent poorer psychosocial health outcomes, for instance greater risk for peer rejection, association with deviant peers, engagement in risky behaviours, substance abuse, or suicide (Ling et al., 2016a; Yoon et al., 2017). Thus, it is of great importance to identify children and adolescents at risk of mental health problem including its co-occurrence, stability, and manifestation at an early stage to develop effective preventive intervention strategies in order to promote healthy development.

Mental health in childhood and adolescence

The early onset, its high prevalence, the related functional impairment, and the subsequent societal burden recognise mental health problems as a major public health challenge (Centers for Disease Control and Prevention, 2013; Hofstra et al., 2002a; Kieling et al., 2011; Narusyte et al., 2017).

The risk for mental health problems or maladjustment is given as early as infancy (Edwards & Hans, 2015). For instance, Rudolph and colleagues (2013) used a parental questionnaire and a screening test administered by trained day care staff and found that 15.4% of children between 3–6 years showed abnormalities in their socio-emotional development. Substantial research has shown that multiple risk factors portend maladjustment in children and adolescents (Göbel & Cohrdes, 2021; Lanza et al., 2010; Wille et al., 2008). For instance, family dysfunction, parental psychopathology, low socioeconomic status, and family instability are strong indicators associated with mental health problems (Fanti & Henrich, 2010a; Fomby & Cherlin, 2007).

Moreover, the highly sensitive developmental period from childhood to late adolescence also entails multiple biological (e.g., puberty), cognitive (e.g., identity formation), and socio-environmental (e.g., school transition) changes (Reitz et al., 2005), making the development of mental health problems more likely if adjustment to these challenges fails. For instance, a child faced with parental divorce or illness during a critical developmental period (e.g., beginning of middle school) has to cope with different challenges at once, by which a successful adjustment predicts healthy development.

Beyond that, mental health problems in childhood and adolescence can exert a long-term impact on adult life, family and society. Important sequelae include the risk of later delinquency, substance abuse, maladaptive social relationships, loss of productivity, work incapacity, and increased costs in health care and education (Narusyte et al., 2017; Patel et al., 2007).

Mental health problems or maladjustment are commonly conceptualized in two broad dimensions of internalizing and externalizing problems (Basten et al., 2016; Briggs-Gowan et al., 2006). While internalizing problems are described as social-emotional problems directed inwards and related to social withdrawal, depression and anxiety, inversely externalizing problems are behavioural problems directed outwards such as hyperactivity, non-compliance, aggression (Yong et al., 2014). Over the school years, externalizing problems decrease with growing skills to regulate emotions, contrarily internalizing problems increase with growing cognitive maturation. Results of a longitudinal study analyzing trajectories of depression, anxiety disorders, ADHD and conduct disorder showed that while symptoms of ADHD and conduct disorder decreased, internalizing problems (depression and anxiety) increased over the period of childhood and adolescence (Klasen et al., 2016). Additionally, while externalizing problems are consistently found to be more common in early adolescent boys, internalizing problems are more prevalent in late adolescent girls (Fanti & Henrich, 2010). Beyond that, the strict separation of mental health problems into two dimensions as behavioural (i.e.,

externalizing) and socio-emotional (i.e. internalizing) problems may be an over-simplification as they are not mutually exclusive (Ling et al., 2016a).

Co-occurrence of internalizing and externalizing problems

Research indicates the co-occurrence of socio-emotional and behavioural problems (Korhonen et al., 2018; Lee & Bukowski, 2012; Ling et al., 2016a; Yoon et al., 2017). Mental health problems tend to correlate with one another, children with socio-emotional difficulties tend to show increased behavioural problems or vice versa (Korhonen et al., 2018). Other studies, in contrast to the reinforcing relationship, have suggested an unidirectional or cascade relationship with one mental health problem leading to the development of another (Yoon et al., 2017). Co-occurrence viewed as separate dimension of mental health problems still shows overlapping risk factors with pure internalizing and externalizing problems, suggesting multifinality by which the same set of predictors may result in different developmental outcomes (Fanti & Henrich, 2010). For instance, characteristics of both child and environment such as temperament, parental psychopathology (i.e., maternal depression), socio-economic status, and single parenthood contribute to the early development of both single and co-occurring mental health problems (Edwards & Hans, 2015; Fanti & Henrich, 2010). Moreover, research shows that children with co-occurring socio-emotional and behavioural problems experience those risk factors on a higher level (Milan et al., 2006). In general, literature suggests a strong association of severity of psychopathology with co-occurrence of internalizing and externalizing problem behaviour (Newman et al., 1998). Furthermore, the monitoring of developmental changes in the exhibition of internalizing, externalizing and co-occurring problems during childhood and adolescence is essential to allow more specific identification and early intervention of at-risk individuals and further prevent “severe deviations from expected cognitive, social, and emotional development” (Centers for Disease Control and Prevention, 2013, p. 1) (i.e., mental disorders such as anxiety, mood, disruptive disorders) and

other problems in adulthood (e.g., violence, substance abuse) (Costello et al., 2011; Hofstra et al., 2002; Rutter et al., 2006).

Stability of internalizing and externalizing problems

Mental health problems are often regarded as transient meaning that problems tend to diminish with growing age due to the rapid developmental changes in childhood (Briggs-Gowan et al., 2006). Conflicting with this view, a vast amount of evidence suggests a persistence of early internalizing and externalizing problems from childhood into adolescence and adulthood (Basten et al., 2016; Beyer et al., 2012; Bornstein et al., 2010; Korhonen et al., 2018; Reitz et al., 2005). For instance, Beyer et al. (2012) studied children from a German population sample and reported the continuity of internalizing problems from preschool age to school age. Becker et al. (2015) examined children and adolescents (6-18 years) from Germany using the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) and showed that 14 to 21% of children and adolescents with abnormal scores on the SDQ-scales at baseline remained "abnormal" over a time period of 6 years. The continuity of high levels of childhood socio-emotional and behavioural problems are related to diagnoses of mental disorders in adulthood and especially co-occurring problems have been identified to be persistent (Hofstra et al., 2002; Verhulst et al., 1993). For instance, in a longitudinal study with 1,578 Dutch children and adolescents aged 4 through 16 years from the general population, Hofstra and colleagues (2002) examined continuities between child and adult psychopathology. Results showed a 6-fold increased risk to meet criteria for diagnoses of mental disorders (e.g., conduct disorder, depression, or attention-deficit/hyperactivity disorder (ADHD)) in adulthood predicted by high levels of childhood psychopathology. Findings support previous indications of both a homotypic and a heterotypic stability. Continuity of the same problems over time (i.e., homotypic stability) was found by Mian et al. (2011). Using a longitudinal design based on parents and their children from the United States, they showed that early anxiety symptoms emerged as the strongest

predictor for later anxiety outcomes. Shevlin and colleagues (2017) observed significant cross-dimension effects (i.e., heterotypic stability) with ADHD preceding internalizing disorders in a British Cohort Study. The increasing attention for co-occurring internalizing and externalizing problems and their persistence over time highlight the necessity to examine individual-specific patterns in more detail (Basten et al., 2016; Fanti & Henrich, 2010; Ling et al., 2016a; Yoon et al., 2017). An appropriate and promising method to identify individual patterns of psychopathology and its stability over time is the use of a longitudinal person-centred technique.

Latent transition analysis

An empirical approach to investigate complex combinations of problem behaviours is a person-centred technique such as Latent class analysis (LCA) or Latent transition analysis (LTA) (McElroy et al., 2017). LTA is a longitudinal extension to the LCA, which identifies homogeneous patterns or profiles of individuals cross-sectional according to their response pattern on a given number of variables (Collins & Lanza, 2009). LTA examines changes in the combination of those patterns over time or age also called latent transitions. Relative to a variable-centered approach (e.g., confirmatory factor analysis), those person-centred methods have the advantage that they assume a heterogeneity within the population regarding the influence of predictors. Previous research on mental health problems among children and adolescents has tended to provide data based on variable-centred methods that capture valuable information about relations between variables (e.g., Mellins et al., 2018). Despite its usefulness, they lack the ability to reveal the diversity of individual patterns. In contrast, LCA captures patterns of characteristics in subgroups. Furthermore, LCA classes are not based on cut-points but derived empirically. The person-centred approach may not substitute variable-centred techniques but rather give more insight into typical patterns of mental health problems (Bates, 2000).

In recent years, with the growing popularity of person-centred approach, several studies used LCA to determine patterns of mental health problems in subgroups (Mezulis et al., 2010; Olino et al., 2012; Scotto Rosato & Baer, 2012; Vaidyanathan et al., 2011). Olino et al. (2012) examined patterns of lifetime internalizing and externalizing psychopathology using LCA on a wide age ranged US sample. A four-class solution identified a 'normative' subgroup (62.5%); an 'internalizing disorders' subgroup (16.4%); an 'externalizing disorders' subgroup (16.9%); and the fourth class was characterized by both internalizing and externalizing disorders (4.2%). A more recent study by Ling and colleagues (2016a) published three distinct subtypes of internalizing and externalizing behaviours in Chinese adolescents using LCA method - a high-risk group, a middle-risk group, and a low-risk group. The main finding suggested that Chinese adolescents showing elevated mental health problems in one domain also exhibited problems in the other domain. Relatively few studies have used a LTA to examine typical patterns of co-occurring psychopathological symptoms and transition between patterns over time. Basten et al. (2016) examined the stability of internalizing and externalizing behaviour using a Dutch preschool sample (ages 1.5 to 6 years) considering distinct profiles of mental health problems and developmental changes as transitions over time. About 2% of the sample showed a co-occurring pattern with persistence at the age of 6 (Basten et al., 2016). In another study, LTA was conducted to model comorbidity of eight DSM-IV disorders from childhood (age 7.5 years) to adolescence (age 14 years) (McElroy et al., 2017). The 4-class solution identified a normative class, an internalizing class, an externalizing class, and a high risk/multimorbid class. Results suggested a very high stability of latent classes over time (80%). Additionally, Picoito et al. (2020) used a LTA to show continuity of mental health problems across different developmental stages - greater heterotypic stability between ages 3 and 5 (transition from high to moderate profiles), while homotypic transitions are more likely for children between 5 and 11 years with a consistent high probability to remain in the same profile.

Although some research has been done to use person-centred methods to capture information on the individual level to distinguish patterns of characteristics across subgroups, only little research examined the transitions of patterns over time and to our knowledge no study has investigated its association with psychiatric disorders in the transition to adulthood, yet. Identification of complex mental health patterns and their manifestation into adult psychiatric disorders would help to gain more insight into early structure and development of psychiatric disorder and therefore crucial for tailored intervention tools in childhood and adolescence.

The current study

The current study extends upon previous research by examining patterns of socio-emotional and behavioural mental health problems, its co-occurrence, stability over time, and its manifestation into self-reported diagnosis of psychiatric disorders using a longitudinal person-centred approach (LCA and LTA). The first aim was to investigate the structure and prevalence of profiles of mental health problems among children and adolescents (8-18 years) using the SDQ sub-scales hyperactivity/inattention, emotional, conduct, and peer relationship problems. In contrast to focus on preschool or adult samples as in most previous research (e.g., Basten et al., 2016; Isdahl-Troye et al., 2021; Spinhoven et al., 2012), this study uses a wide age range covering symptoms during childhood, adolescence, and early adulthood. Furthermore, to our knowledge only two studies have examined the internationally validated screening instrument SDQ to explore characteristics in subgroups so far (see Ling et al., 2016b; Picoito et al., 2020). In our study, contrary to previous research using the SDQ, not only parental reports were analyzed but a multi-informant measure of mental health problems including parent- as well as self-reports are applied as best-practice approach to assess mental health problems (Becker et al., 2004).

Based on previous findings using a person-centred approach to empirically derive patterns of mental health problems (e.g., Isdahl-Troye et al., 2021; McElroy et al., 2017; Picoito et al.,

2020), we primarily expect the emergence of a four-class solution that broadly reflects: internalizing problems, externalizing problems, a class characterized by no or low mental health problems, and a class characterized by co-occurring problems.

Previous studies used either cross-sectional data to identify subgroups of mental health problems (Ling et al., 2016a) or descriptive, variable-centred approaches (Becker et al., 2015; Klasen et al., 2016) to investigate trajectories of mental health problems using the SDQ. However, those results capture only "single problems" and do not consider individual patterns of mental health problems and transitions over time. Our study addresses this issue using a longitudinal person-centred approach (i.e., LTA).

The second aim was to examine the stability of these patterns of mental health problems over three time points covering the time span of 5 years using LTA. According to recent literature investigating LTA patterns of mental health (e.g., Basten et al., 2016; Isdahl-Troye et al., 2021; McElroy et al., 2017), we expect that children with co-occurring problems are more likely to show persisting symptoms.

Lastly, to determine associations of distinct mental health problem profiles with self-reported diagnoses of psychiatric disorders (e.g., ADHD, depression, and anxiety), several mental health outcomes were included in the analyses. To our knowledge, no previous person-centred study has examined individual patterns over time (i.e., stability vs. variability) and their association with reported psychiatric disorders in transition to late adolescence and early adulthood. Based on empirical literature, we expect a stronger association of co-occurrence of internalizing and externalizing behaviour problems with self-reported diagnosis of psychiatric disorders compared to "single mental health problems" (Hofstra et al., 2002; Verhulst et al., 1993).

Method

Sample

The current study utilized data from the comprehensive BELLA study, a module on mental health and wellbeing of the German National Health Interview and Examination Survey for children and adolescents (KiGGS). The BELLA study assessed 2,863 children and adolescents aged 7–17 years and their parents at baseline from 2003 to 2006 with three follow-ups after 1 year (B1 = 2004–2007), 2 years (B2 = 2005–2008) and 6 years (B3 = 2009–2012). A more detailed description regarding conceptualization and design is provided by Ravens-Sieberer and colleagues (2015; 2008). Ethics approval for the BELLA study was obtained from the Ethics Committee of the University Hospital Charité in Berlin and the Federal Commissioner for Data Protection in Germany.

The present analyses focused on 1,255 children and adolescents from three follow-ups of the BELLA study (B1, B2, and B3). The gender distribution was 51.7% female and the age range covered participants from 8 to 26 years with a mean age of 12.3 years (B1, SD = 3.11), 13.3 years (B2, SD = 3.11) and 18.5 years (B3, SD = 3.24). The majority of families (50.28%) had a middle SES according to the Winkler Index (Lange et al., 2007). Additional details on study design, sampling, and attrition can be found in Ravens-Sieberer et al. (2015). Participants with available data on mental health problems for at least two follow-ups (i.e., B1 and B2) and outcome variables (at B3) such as self-reported diagnoses of depression, ADHD, and anxiety.

Measures

Mental health problems. Children and their parents completed the German SDQ (Strength and Difficulties Questionnaire, Goodman, 1997) at each time point (i.e., B1, B2, and B3), which is a validated questionnaire with 20 items screening mental health problems on the sub-scales hyperactivity/inattention, emotional, conduct, and peer relationship problems. Items are answered based on a Likert-type scale ranging from ‘‘not true’’, ‘‘somewhat true’’ to ‘‘certainly true’’. The SDQ is widely used as a screening instrument for mental health problems in children and adolescents, in addition it has also been described as a sensitive measure of treatment

outcomes closely predicting the proportion of children with a mental disorder (Goodman & Goodman, 2011). A score for each subscale was summed and banding scores were used to categorize participant's mental health problems into ''abnormal'', ''borderline'', or ''normal'' (see Becker et al., 2018; Woerner et al., 2004). A conservative approach was adopted to transform scores of each subscale into a binary variable by combining "borderline" and "normal" scores. A binary variable (i.e., "abnormal" vs "normal and borderline") facilitates the interpretation of latent classes and reduces the number of parameters estimated by the models (Nylund, 2007). The present study used the four SDQ subscales to determine patterns of mental health problems, excluding the fifth scale "prosocial behaviour". The SDQ parent and self-report were administered at each time point (i.e., B1, B2 and B3). The self-report was used for children older than 11, while the parent-report was considered from age 7.

To increase the accuracy of diagnostic predictions generated by the SDQ, we included a multiple informant approach using self- and parent-reports. Information drawn from multiple informants is more valuable as for instance, in case of emotional problems, teenagers may report worries or fears that they have hidden from parents. The self- and parent-reported scores were aggregated based on the predictive algorithm published by Goodman and colleagues (2000b). Briefly, self-reported scores were prioritized over parent-reports for the subscales "peer problems" and "conduct problems". Self-reports for "hyperactivity/inattention" were only considered in case of missing parental reports, and finally, self- and parent-reports were both considered to determine "emotional problems". The SDQ has demonstrated sound psychometric properties cross-culturally (Becker et al., 2004; Goodman et al., 2000a), is used in clinical practice and published in numerous studies (Kersten et al., 2016; Ling et al., 2016b).

Mental health outcomes. At the last time point (i.e., B3), adolescents and young adults reported if they were ever diagnosed with a mental disorder according to ICD-10 criteria by either a

physician or a psychologist. Diagnoses of attention deficit hyperactivity disorder (ADHD), depression, and anxiety coded as “yes” or “no” are used as outcome for the LTA model.

Data Analysis

All analytical steps were estimated with the software Mplus Version 7.4 (https://www.statmodel.com/) and Stata SE version 14 (http://www.stata.com/). Mplus incorporates all cases under the missing at random (MAR) assumption using the full information maximum likelihood approach. The first aim of this study included the examination of profiles of mental health problems across a sample of children and adolescents for each time point (using LCA). The second and third aim included the investigation of transition of subgroups of mental health problems over time points (i.e., stability) into reported mental disorders (i.e., manifestation). More precisely, LTA includes a measurement model which describes the structure of latent classes at different time points, while the autoregressive model examines individual movement or transition between classes over time (Nylund, 2007).

LTA model was specified using the following model-building steps as suggested by Nylund (2007). In a first step, successive LCA models with ascending number of classes were specified and tested separately for each time point using the four binary mental health indicators (emotional, peer, hyperactivity, and conduct problems). The appropriate number of latent classes was determined using several fit statistics including Akaike information criterion (AIC), Bayesian information criterion (BIC), and the sample size-adjusted Bayesian criterion (aBIC), with lower values indicating better fit. The Lo–Mendel–Rubin likelihood ratio test (LMR-LRT) and Bootstrap Likelihood Ratio Test (BLRT) were used to compare (K-1)-class models to a K-class model. A significant *p*-value ($p < 0.05$) was indicative of a better model fit for the respective K-class model. In addition, the entropy and posterior probabilities were examined for each model. After the number of classes had been selected, measurement invariance was investigated in a second step, to determine whether the measurement model remained consistent

over time. Thereby, it was investigated if class solution at B1 has the same structure and meaning as class solution at B2 and B3. Competing models with different levels of conditional item probability constraints were tested for stability over time. Two different levels of measurement invariance were explored: full measurement invariance (i.e., conditional item probabilities constrained to be equal at both time points) and measurement non-invariance (i.e., conditional item probabilities freely estimated over time). Models were compared using the Log Likelihood Ratio Test (LRT) and model fit indices. Third, a LTA model with relevant covariates using the 3-step procedure was calculated such as participants' gender and age to ensure classification accuracy of our model (Bettencourt et al., 2013; Vermunt, 2010). Furthermore, individuals were classified as 'movers' (i.e., those who transition to a different class over time) or 'stayers' (i.e., those who remain in the same class over time) to study the stability and change of class membership over time. Finally, our analysis included a set of mental health outcomes (i.e., self-reported diagnoses of depression, ADHD and anxiety) to study their association with latent class membership and latent transition patterns.

Results

Descriptive Statistics

The proportion of children endorsing each SDQ subscale at each time point is reported in Table 1. Emotional problems were reported most commonly, followed by peer and conduct problems, and hyperactivity was reported least frequently. A small non-significant increase for emotional problems was visible between time point B1 and B3. A significant decrease for hyperactivity was shown between B1 and B2 ($p < 0.001$) and B2 to B3 ($p < 0.001$).

Table 1

Percentage of participants reporting specific mental health problems as

indicated by the SDQ, grouped by time point (N=1,255).

SDQ-Subscales	B1	B2	B3
Emotional Problems	11.61	12.91	13.88
Peer problems	9.81	10.55	9.84
Hyperactivity	6.70	5.51	2.43[a]
Conduct problems	9.73	9.37	10.78

Note. B1 = 2004–2007, B2 = 2005–2008, B3 = 2009–2012.

[a] significantly decreases compared to B1 & B2.

Latent class and Latent transition analysis

Step 1 - Best measurement model

Following a series of latent class analyses for each time point (B1, B2, and B3) and their fit statistics, a three-class solution was identified as optimal. Entropy values were of similar magnitude for the three-class solution over all time points. Table 2 presents the fit statistics for the different class solutions at each time point. LMR-LRT and BLRT values turned non-significant when four or five-class solutions were specified for each time point. The number of classes is decided upon fit statistics, theory and interpretability (Nylund et al., 2007). As such, based on the fit statistics, interpretability and overall model parsimony, the three-class solution represents the best fitting measurement model at all time points and will be used for further analyses.

Table 2

Fit statistics for 2- to 5-class solutions as derived from LCA at time points B1, B2 and B3.

Model	AIC	BIC	aBIC	Entropy	LMRT *p* value	BLRT *p* value

B1						
2-class	5.691.412	5.742.812	5.714.217	0.699	0.000	0.000
3-class	**5.675.873**	**5.755.828**	**5.711.348**	**0.862**	**0.000**	**0.000**
4-class	5.684.131	5.792.642	5.732.276	0.799	0.388	0.474
5-class	5.694.131	5.831.197	5.754.946	0.671	0.232	1.000
B2						
2-class	5.488.616	5.539.821	5.511.226	0.681	0.000	0.000
3-class	**5.476.521**	**5.556.172**	**5.511.692**	**0.814**	**0.000**	**0.000**
4-class	5.486.494	5.594.592	5.534.226	0.700	0.545	0.978
5-class	5.496.494	5.633.039	5.556.787	0.467	0.739	1.000
B3						
2-class	7.097.444	7.150.918	7.122.322	0.719	0.000	0.000
3-class	**7.077.793**	**7.160.976**	**7.116.493**	**0.855**	**0.002**	**0.000**
4-class	7.083.146	7.196.038	7.135.668	0.844	0.082	0.086
5-class	7.093.146	7.235.746	7.159.490	0.579	1.000	1.000

Note. B1 = 2004–2007, B2 = 2005–2008, B3 = 2009–2012; AIC, Akaike information criteria; BIC, Bayesian information criteria; aBIC, adjusted BIC; LMR LTR *p* value, Lo-Mendell-Rubin likelihood ratio test *p* value; BLRT LRT *p*, Bootstrapped Likelihood ratio test *p* value. Best-fitting models by time points are indicated in bold.

Step 2 - Measurement invariance

As confirmed by the LCA, the same number of classes were present over the three time points leading to the assumption of measurement invariance. Measurement invariance was examined by using the Log Likelihood Ratio Test (LRT) to compare the unconditional model (full

measurement non-invariance) and the model with constrains (full measurement invariance). The LRT indicated a significant difference in model fit when constrains were added ($\Delta\chi2 = -44.4$, $df = 24$, $p < 0.05$). Inspection of the BIC and adjusted BIC suggested a better model fit for the full measurement invariance model (BIC = 7638.902; aBIC = 7581.724) compared to the non-invariance model (BIC = 7777.670; aBIC = 7644.255). Full measurement invariance was supported, suggesting that, the structure of mental health problems was distributed in a similar manner across time points. Thus, full measurement invariance was used in the following analyses.

Step 3 - Latent transition analysis with covariates

The item probability plot for the conditional model is shown in Figure 1. The horizontal axis displays the four SDQ-subscales indicating mental health problems, while the vertical axis shows item probabilities. As predicted by the cross-sectional analyses, the three class solution at all time points contained a *normative class* (82.5% at B1; 80.7% at B2; 80.5% at B3) with a very low probability to show any mental health problem; an *emotional problem class* (3.9% at B1; 6.2% at B2; 8.2% at B3) with a very high probability to show emotional problems, low probability of conduct and peer problems, non-occurrence of hyperactivity; and a *multiple problem class* (13.6% at B1; 13.1% at B2; 11.3% at B3) with a high probability to endorse hyperactivity, conduct, peer and emotional problems. The proportion of the emotional problem class increased significantly over time.

In general, females were underrepresented in the normative class (RRR = 0.08, $p < 0.001$) and the multiple problem class (RRR = 0.05, $p < 0.05$) but overrepresented in the emotional problem class compared to males. The proportion of younger individuals was higher in the multiple problem class compared to the emotional problem class (RRR = 1.08, $p < 0.001$) and normative class (RRR = 1.07, $p = 0.001$).

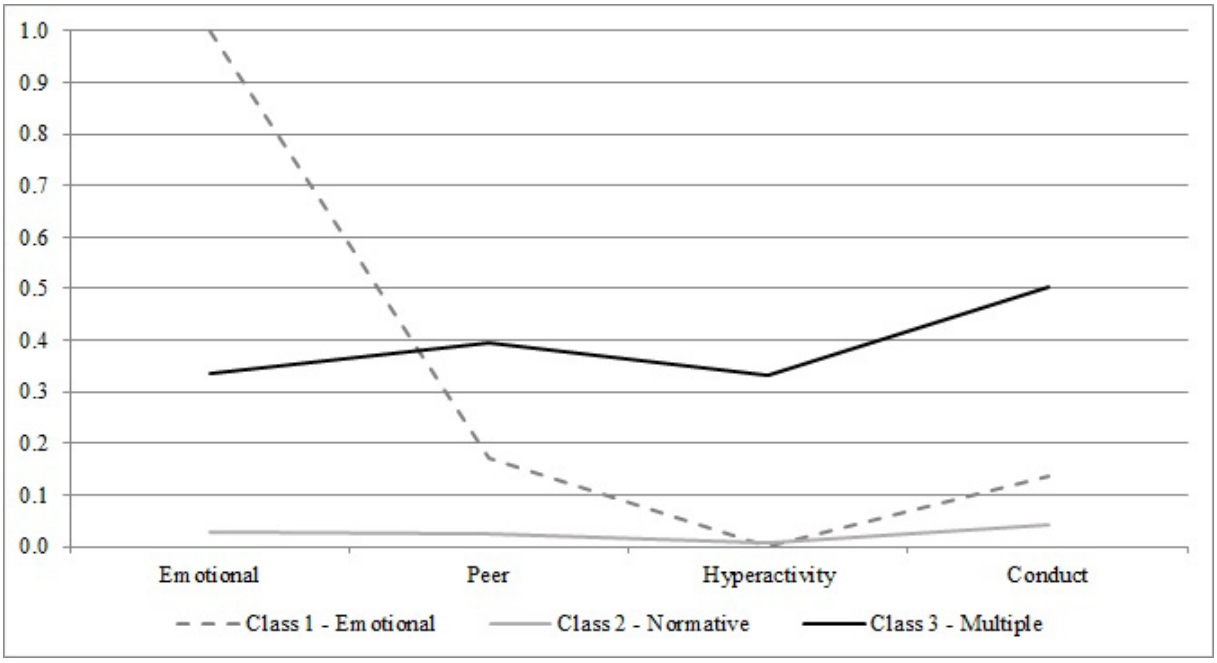

Figure 1. Conditional item probability plots in model assuming measurement invariance

Conditional transition patterns are displayed in Table 3. The transition probabilities represent the likelihood to move between classes over time points (i.e., B1, B2, and B3). Precisely, stability of class membership is very high from B1 to B2 for the normative class (85.5%), the emotional problem (96.8%) and the multiple problem class (90.9%). The transition from B2 to B3 is stable for the normative class (92.7%) and relatively constant for the multiple problem class (83%). In contrast, 63.2% of participants in the emotional problem class at B2 persisted in the class at B3 with 31.6% participants shifting from the emotional problem class to the normative class.

Table 3

Latent transition probabilities of the 3-class solution based on a conditional model with covariates comparing the time points B1 vs. B2 and B2 vs. B3.

B1	B2		
	Emotional (6.2%)	Normative (80.7%)	Multiple problem (13.1%)
Emotional (3.9%)	0.855	0.145	0.000
Normative (82.5%)	0.032	0.968	0.000
Multiple problem (13.6%)	0.000	0.091	0.909

B2	B3		
	Emotional (8.2%)	Normative (80.5%)	Multiple problem (11.3%)
Emotional	0.632	0.316	0.052
Normative	0.073	0.927	0.000
Multiple problem	0.043	0.127	0.830

Note. Each row represents the probability of individuals starting out in a given class (time point B1) transitioning to another class across B2 and B3. The diagonal probabilities represent the stability of class membership across time points.

Step 4 - LTA transition patterns and mental health outcomes

Table 4 shows the prevalence of each class combination over time (i.e., LTA transition patterns and movers/stayers). The majority of the sample was classified as stayers (91.6%). More precisely, 11.3% of all individuals starting out in the multiple problem class remained in this class about 6 years later (at B3), while 2.9% of children in the sample showed an emotional problem pattern over three time points with a higher likelihood for females compared to males ($p < 0.001$). 77.3% of children and adolescents reported throughout a low level of mental health problems.

With regard to movers, 8.4% of individuals showed a mental health problem pattern over time characterized by movement between different latent classes. Individuals with a mover pattern were significantly younger compared to stayers (16.9 vs. 18.6 years). Overall, eleven unique patterns emerged. The majority of patterns included the transition from the normative class to the emotional problem class (23.6%, 33.0% within movers). Albeit patterns of transition from the multiple problem class to the normative or emotional problem class were identified relatively often (Table 4), the reverse pattern from the normative or emotional problem class to the multiple problem class was nonexistent in the sample.

Conclusively, 14,7% of individuals in the sample showed a persistent pattern of mental health problems (multiple, emotional or both) over time at B1, B2, and B3.

Table 4

Number of individuals and prevalence of latent transition patterns differentiated between movers and stayers (N = 1.255).

Time point	B1	B2	B3	n	% within movers/ stayers	% of total sample
Stayers	Normative	Normative	Normative	970	84.4	77.3
(91.6%)	Multiple	Multiple	Multiple	142	12.4	11.3
	Emotional	Emotional	Emotional	37	3.2	2.9
Movers	Normative	Normative	Emotional	35	33.0	2.8
(8.4%)	Normative	Emotional	Emotional	25	23.6	1.9
	Multiple	Multiple	Normative	16	15.1	1.3
	Emotional	Emotional	Normative	11	10.4	0.9
	Multiple	Normative	Normative	7	6.6	0.6

	Multiple	Multiple	Emotional	6	5.7	0.5
	Normative	Emotional	Normative	5	4.7	0.4
	Emotional	Normative	Normative	1	0.9	0.2

Several mental health outcomes assessed at B3 and their association with class membership and LTA transition patterns were tested. Diagnoses of depression and ADHD were reported in the sample with 5.3% and 5.2%, respectively. While lower rates were found for diagnoses of anxiety disorders (2.6%). Table 5 shows the results for mental health outcomes and class membership at B3.

Table 5

Association between class membership and self-reported diagnoses of psychiatric disorders

Latent Classes	Depression Adjusted RRR (95% CI)	Anxiety Adjusted RRR (95% CI)	ADHD Adjusted RRR (95% CI)
Emotional problem vs. *Normative Class*	3.96* (1.23, 12.70)	6.76* (1.34, 34.01)	3.71** (1.22, 11.21)
Multiple problem vs. *Normative Class*	5.21** (1.94, 13.90)	5.11* (1.20, 21.74)	9.03*** (5.14, 15.86)
Emotional problem vs. *Multiple problem Class*	1.31 (0.32, 5.23)	0.76 (0.11, 5.02)	2.44 (0.78, 7.54)

Note. Results adjusted for gender and age; RRR relative-risk ratio; CI confidence intervals.

*$p < 0.05$ **$p < 0.01$ **$p < 0.001$.

Self-reported diagnoses of psychiatric disorders (i.e., depression, anxiety, and ADHD) were more likely to be reported by individuals in the emotional problem or multiple problem class compared to the normative class.

Multinomial regression analysis for transition patterns showed an increased likelihood for self-reported diagnoses of mental disorders for individuals with stable mental health problems. After controlling for age and gender, adolescents with a stable transition pattern for the emotional problem class are more likely to report diagnoses of anxiety disorders (RRR = 2.59, $p = 0.003$) and depression (RRR = 1.83, $p = 0.006$) compared to individuals without mental health problems across all three time points. Equally, individuals with a stable membership in the multiple problem class showed an increased likelihood to report a diagnosis of ADHD (RRR = 2.35, $p < 0.001$), depression (RRR = 1.85, $p < 0.001$) and anxiety disorder (RRR = 1.86, $p = 0.015$) compared to individuals without mental health problems over time.

In contrast, only one "mover" transition pattern showed a likelihood for reporting psychiatric disorders. After controlling for age and gender, individuals who transition from the multiple problem class (B1 and B2) to the normative class (RRR = 2.64, $p < 0.001$) at time point B3 were more likely to have reported a diagnosis of ADHD.

Discussion

Aims of the present study included the examination of subgroups of mental health problems across a sample of children and adolescents (using Latent class analysis), as well as the investigation of transition of subgroups of mental health problems across three time points (i.e., stability) into self-reported psychiatric disorders (i.e., manifestation). A three-class solution was identified with a normative class, an emotional problem class, and a multiple problem class.

The majority of the sample (91.6%) did not change latent class membership over time; 14,7% of individuals showed a persistent pattern of mental health problems. Diagnoses of mental disorders were more likely to be reported by individuals in the emotional or multiple problem class.

The present study is the first to apply LTA methodology to identify patterns of mental health problems over time using the multi-informant SDQ and to investigate later outcomes of mental disorders (self-reported diagnoses of depression, anxiety, ADHD).

Class membership

Using LTA, the present study identified heterogenous subgroups in a German sample of children and adolescents at three time points over a period of five years. A three-class solution was selected and supported by full measurement invariance as appropriate across all three time points. As expected, the largest extracted class represented a group of children and adolescents with a low level of mental health problems. As the transition from childhood to adolescence is a vulnerable period with multiple biological and social changes (e.g., puberty, school transition), the presence of mental health problems might be within limits – without clinical relevance - a common part of variation in normal development (Fanti & Henrich, 2010; McElroy et al., 2017; Reitz et al., 2005).

Against our expectation to identify four latent classes for mental health problems, no class characterized solely by externalizing problems (i.e., hyperactivity and conduct problems) has been extracted from the data. Although the reason for not identifying an externalizing class is unclear, there are few possible explanations. It is notable that our sample does not include the period of early childhood. As externalizing problems decline or even diminish with increasing age and maturation due to the development of cognition and emotion regulation (Fanti & Henrich, 2010; Montroy et al., 2016; Wakschlag et al., 2010), it may suggest an insufficient large sample range to identify this subgroup. However, while research by Ling et al. (2016a)

and Picoito et al. (2020) have suggested subtypes of internalizing and externalizing problems or age-related distinctive combinations of problems rather than pure problems, other investigators have identified a pure externalizing subgroup with similar age range as the present study (e.g., Duprey et al., 2020; Shi et al., 2020). A more promising explanation may be the use of distinct informants assessing mental health problems. In contrast to the multi-informant approach (self- and parent-report) in the current study, Duprey et al. (2020) and Shi et al. (2020) used either parent or teacher reports, respectively. According to Goodman et al. (2000b), externalizing problems (i.e., conduct problems and hyperactivity) may be more evident depending on the situation and the setting (e.g., home and school). Self-reports may describe worries or fears in terms of socio-emotional problems of teenagers more accurately as hidden from the adults, which may account for the pure internalizing subgroup (i.e., emotional class) in the current sample opposing to the missing internalizing subgroup in Shi et al. (2020) and Duprey et al. (2020). Future research should include all possible informants (i.e., self-reports, parents, and teachers) to obtain a clearer and more reliable picture of children and adolescent mental health.

Children and adolescents with externalizing problems seem to prevail within the second largest latent class - the multiple problem class equivalent to co-occurring mental health problems. As for the multiple problem class, results indicate that those class members are much younger compared to the members in other classes. This is in line with previous research suggesting an early onset of co-occurring problems and a persistence into adolescence (Basten et al., 2016; Isdahl-Troye et al., 2021; Picoito et al., 2020). However, as expected, a smaller class was extracted characterized by a very high probability for internalizing problems (emotional problem class). In contrast to externalizing problems, internalizing problems are shown to increase due to cognitive maturation during childhood and adolescence (Fanti & Henrich, 2010; Klasen et al., 2016; Picoito et al., 2020).

Stability of class membership over time

The classes replicated at each time point were very similar in terms of structure and proportion with one exception. The emotional problem class showed an increase in the proportion of class membership over time – more individuals were assigned to the emotional problem class in B3 compared to B1. The emotional problem class is characterized by a very high proportion of girls, supporting the large body of evidence outlining the sex differences in the prevalence and trajectories of internalizing problems during childhood and adolescence (Burlaka et al., 2014; Gutman & Codiroli McMaster, 2020; Klasen et al., 2016; Reitz et al., 2005; Salavera et al., 2019). Consistent gender differences have been documented to emerge during adolescence (Leve et al., 2005), while not only describing discrepancies in prevalence rates regarding mental health problems but additionally reporting a divergence over time. Internalizing problems have been shown to sharply increase during adolescence (ages 11 to 14) especially for girls (Oliva et al., 2014; Picoito et al., 2020). Our results show that although a persisting membership in the emotional problem class was less likely (transition probability 63.2%) compared to the other classes, if stability prevails then females surpass males. In addition, the low persistence of the emotional problem class over time (2.9% of the sample) may be explained by earlier studies suggesting that internalizing problems have a higher tendency to recover by the time of emerging adulthood (Stringaris et al., 2014). A number of explanations for these gender differences have been offered ranging from biological to social influences (Masfety et al., 2021). For instance, socialisation experiences based on expectation of girls to be preoccupied with interpersonal relationship by being prosocial and submissive compared to boys may explain gender differences for mental health problems (Oliva et al., 2014; Rocchino et al., 2017; Zahn–Waxler et al., 2000). In the present study, a large group of children and adolescents remains stable with low probability of mental health problems (77.3%) similar to previous findings (Supke et al., 2021).

As expected, the persistence of co-occurring mental health problems analogue to the multiple problem class was high (above 80% transition probability) and in line with previous research that showed a strong stability of social-emotional and behavioural problems for young children with co-occurring problems (Basten et al., 2016; Briggs-Gowan et al., 2006; Isdahl-Troye et al., 2021). Basten et al. (2016) assume that the stability of co-occurring problems is a reflection of poor self-regulation. Albeit homotypic stability for the multiple problem class was observed, only an unidirectional heterotypic stability was demonstrated by changing from the multiple problem class to the normative or emotional problem class but not vice versa. According to McElroy et al. (2017), there is a moderate chance for children to progress from externalizing to internalizing behaviour, but not reverse. Our findings indicate a very low probability to develop co-occurring externalizing and internalizing problems (i.e., multiple problem class) between B2 and B3, which may be due to the age-dependent decline of externalizing problems. Early childhood seems to be a crucial period for the development of co-occurring problems, which tend to stabilize well into adolescence (Klasen et al., 2016). The intriguing question of what differentiates individuals with a homotypic stability from individuals with a heterotypic stability of the multiple problem resulting in low level of mental health problems (i.e., normative class) or only internalizing problems remains to be answered by future research. We recommend a closer look at risk and protective factors for stable and unstable co-occurring mental health problems across childhood and adolescence (e.g., Göbel & Cohrdes, 2021).

Mental health outcomes and class membership over time

A further aim of the present study was to examine associations between latent class membership for mental health problems and self-reported psychiatric diagnoses (e.g., ADHD, depression, and anxiety). As expected, individuals classified with a mental problem pattern (i.e., emotional problem or multiple problem class) were more likely to report diagnoses of mental disorders (i.e., depression, anxiety, and ADHD).

The stability of the emotional problem class over time was associated with a higher risk for diagnoses of depression and anxiety. In addition, individuals with a stable membership in the multiple problem class analogue to consistent co-occurring externalizing and internalizing problems showed a very high likelihood to report diagnoses of depression, anxiety, and ADHD. This finding is in agreement with existing literature reporting that individuals with co-occurring problems exceed individuals with sole problems regarding their history of mental illness and aggressive behaviour (Arslan et al., 2021; Fanti & Henrich, 2010). Moreover, co-occurring problems seem to promote negative peer relationships by which children who are aggressive and depressed are less appreciated by peers compared to being aggressive or depressed (Keiley et al., 2003). In addition, the stability of membership in the multiple problem class over time is much higher compared to the emotional problem class (11.3% vs. 2.9%), which is in agreement with previous studies that showed a high stability for co-occurring internalizing and externalizing problems (Basten et al., 2016). In contrast, individuals with an unstable class membership over time do not show a higher likelihood to report diagnoses of mental disorder compared to individuals with no symptoms over time. One exception is represented by individuals who transition from the multiple problem class to the normative class at time point B3 reporting a diagnosis of ADHD. This finding is not unexpected considering that Attention deficit/hyperactivity disorder is one of the most common mental disorders first detected in childhood (Polanczyk et al., 2007). And although ADHD is considered a life-course disorder (Sibley et al., 2016), Biederman et al. (2010) state that about 25% with a childhood diagnosis appeared fully remitted (i.e., possible recovery) in adulthood.

Limitations

Several limitations of the present study are worth mentioning. First, the number of indicators used for the LCA might be considered rather small. However, there is an ongoing discussion about positive impact of fewer indicators as increasing number may lead to data sparseness,

low power of chi-square goodness-of-fit tests, and an increase in the number of boundary parameter estimates (Wurpts & Geiser, 2014). Second, dichotomizing continuous SDQ variables into “abnormal” and “normal and borderline” might result in loss of information. Despite this limitation, the present research uses binary data as suggested by Nylund et al. (2007) to support interpretation and model accuracy for the LCA. Third, caution needs to be taken with the interpretation of the transition patterns as sample size is small for each transition group (0.2 – 2.8%) and future studies should aim to replicate results in larger populations. Fourth, the present analysis uses data beginning from late childhood (age 8) and therefore limits the generalizability of the findings relative to younger children. Future research is needed to explore latent classes of mental health problems in early childhood (preschool years, respectively) as it is characterized as an important developmental stage with the highest sensitivity towards internalizing and externalizing problems (Picoito et al., 2020). Finally, retrospective self-reported diagnoses of mental disorders were used in the analysis which elevates the risk for recall bias. For instance, research by Schlack et al. (2018) reported that only 57.4% of parents who had reported a life-time diagnosis of ADHD reported it again after six years. They reasoned that this may be because of changes in relevance of previous diagnoses over years due to child’s recovery or corrected diagnosis. However, the prevalence of ADHD in the current sample of 5.2% was not under- or overestimated compared to the reported worldwide prevalence (Polanczyk et al., 2014; Safer, 2018). Notwithstanding these limitations, this study is one of the first to use a longitudinal person-centred approach to analyse multi-informant mental health problems and mental health outcomes across a large age range of childhood, adolescence, and early adulthood.

Prevention implications

Untreated and co-occurring mental health problems in childhood and adolescence can exert severe and long-term impact on adulthood. The stability and manifestation of socio-emotional

and behavioural problems is of great importance for the identification of children and adolescents at risk and gives the opportunity to provide early intervention and prevention of later problem manifestation (Ling et al., 2016a).

Our findings confirm the stability of mental health problems as common rather than atypical. Against the finding of a remission rate of 37.7% for mental health problems among individuals with heterotypic stability, 14.7% of individuals in the sample showed a persistent pattern of mental health problems over time, similar to previous findings (e.g., Supke et al., 2021). Targeting those children and adolescents has several implications for prevention and intervention strategies. First, the whole range of mental health problems including co-occurring externalizing and internalizing behaviour should be considered to prevent the risk of manifestation and development of psychopathology later in life (Basten et al., 2016). Second, early interventions are imperative especially for young children as co-occurring externalizing and internalizing problems are strong risk factors for adult psychopathology and the need to address both types of mental health problems will increase the duration of specialized intervention (Basten et al., 2016; Bayer et al., 2011; Fanti & Henrich, 2010; Mulraney et al., 2021). Third, a gender-sensitive approach is essential for diagnosis and treatment of mental health, as strong evidence highlights gender-specific trajectories of mental health problems whereby hyperactivity is more pronounced in boys and anxiety is more often diagnosed for girls (Ravens-Sieberer et al., 2021).

Finally, treatment should be continuous to counter the risk of chronic trajectories of psychopathology. This claim is in line with meta-analytical evidence linking longer and more intense interventions with better outcomes in different domains such as social-emotional development (Manning et al., 2010).

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STUDY II

A Lot of Warmth and a Bit of Control?
How Parenting Mediates the Relationship Between Parental Personality and Their Children's Mental Health Problems

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Abstract

Research has identified parental personality and parenting behaviour as important contributors to healthy child development. However, indirect associations are largely unknown. The current study aimed to investigate the mediating role of parenting dimension relations between parental personality and adolescent mental health problems. The cross-sectional sample included 4258 German adolescents (48.7% male, 11–17 years) and one parent who participated in a national health survey (KiGGS Wave 2). The results underline and extend previous indications of direct associations between parental personality and their children's mental health problems by highlighting the adverse role of neuroticism. Furthermore, new insights are added regarding the mediating roles of parenting dimensions (i.e., warmth, behavioural control, and psychological control). Future efforts and parent-focused prevention programmes should be extended by parental personality to identify maladaptive parenting behaviour and thus contribute to the development of their children's mental health.

Keywords: externalizing problems, internalizing problems, adolescence, parental personality, parenting

STUDY III

The whole is greater than the sum of its parts: profiles of multiple mental health risk factors using Latent class analysis

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Abstract

Background. The exposure to an accumulation of various risk factors during childhood and adolescence relative to a single risk is associated with poorer mental health. Identification of distinct constellations of risk factors is an essential step towards the development of effective prevention strategies of mental disorders. A Latent class analysis (LCA) extracts different combinations of risk factors or subgroups and examines the association between profiles of multiple risk and mental health outcomes.

Methods. The current study used longitudinal survey data (KiGGS) of 10,853 German children, adolescents and young adults. The LCA included 27 robust risk and protective factors across multiple domains for mental health.

Results. The LCA identified four subgroups of individuals with different risk profiles: a *basic-risk (51.4%), high-risk (23.4%), parental-risk (11.8%) and social-risk class (13.4%).* Multiple risk factors of the family domain, in particular family instability were associated with negative mental health outcomes (e.g. mental health problems, depression, ADHD) and predominately comprised late adolescent girls. The social environment represented a more common risk domain for young males.

Conclusion. The understanding of multiple risk and different risk "profiles" helps to understand and adjust targeted interventions with a focus on vulnerable groups.

Keywords: mental health, youth, multiple risk factors, Latent class analysis, depression

4. GENERAL DISCUSSION

The subsequent section highlights all study results and their contribution to the current state of the art regarding developmental psychopathology. Thereafter, important implications are discussed to contribute to the development of preventive interventions to mitigate mental health problems and an outlook for future research. Lastly, central limitations of the results presented are given and conclusions are drawn.

4.1 *Summary of study results*

Study I - Co-occurrence, stability and manifestation of child and adolescent mental health problems: a latent transition analysis

The first study of this dissertation included the examination of patterns of mental health problems and their association with reported mental disorders using a longitudinal person-centred method (Latent class and Latent transition analysis) over three time points (5 years). With a sample of almost 1,300 children and adolescents, a three-class solution identified a normative class, an emotional problem class, and a multiple problem class.

Previous research has demonstrated heterogeneity in patterns of externalizing and internalizing problems with prevalence rates between 10 and 20% (adolescence, Hinnant & El-Sheikh, 2013; Ling et al., 2016a). Regarding pattern sizes, our study observes equivalent rates of individuals in the multiple problem class (analogue to externalizing and internalizing co-occurring problems) between 11 to 14% (13.6% at B1; 13.1% at B2; 11.3% at B3). Given the high prevalence of co-occurring problems, more research and especially treatment that simultaneously targets both kinds of mental health problems holds great potential to lessen prospective burden for youth and reduces the risk of mental disorders later in life (Herman et al., 2011).

As research suggested, our results showed that co-occurring problems are more prevalent in younger individuals. Furthermore, transitions to the multiple problem class seem less likely later in life. Symptom identification and targeted delivery of mental health care initiated during early key developmental stages may be very beneficial (Connell et al., 2008; Waid & Kelly, 2020). Furthermore, results revealed a high stability of mental health problems of 14.2%, which highlight the importance to develop or introduce a mechanism to continuously monitor mental health of children and adolescents, and moreover provide constant mental health care for children and their families. However, according to Hintzpeter et al. (2015) only one-third of children and adolescents with mental health problems and high level of impairment and perceived parental burden seek professional care. As parents determine the intensity and persistence of mental health care use of their children (Briggs-Gowan et al., 2000), more research should focus on their role as a crucial initiator for treatment (Logan & King, 2001).

For instance, early detection of maternal depression is critical for children's mental health and positive family life. According to Freed et al. (2012), mothers with depression may not realise that their problems are attributable to a mental disorder and therefore do not see help. One suggestion for improvement may incorporate more attention from health care professionals to use the appropriate settings in the health care system to screen mothers for depression. One important setting for early identification of mental ill-health could be during pregnancy check-ups, as women are more likely to show postnatal symptoms if they suffered from prenatal depression which elevates the possibilities for treatment before child birth (Freed et al., 2012). Additionally, more awareness should be raised towards mental health during pregnancy and parenthood to avoid neglectance or stigmatization of children's mental health.

Similar to previous findings, several gender differences were also documented. The emotional problem class is characterized by a very high proportion of girls, supporting the large body of evidence outlining the sex differences in the prevalence and trajectories of internalizing problems during childhood and adolescence.

A number of explanations for these gender differences have been offered including socialization pressures or common risk factors (Masfety et al., 2021). Again, parents are key to this process as reported in Study II. A systematic review by Morawska (2020), suggests that parents differ in their parenting towards boys and girls and that these differences affect child developmental outcomes. More precisely, evidence showed that parents not only vocalise differently with their sons and daughters but also differ in terms of socialization strategies and play which highlights their significant role in the early development of gender roles (Morawska, 2020). However, more tentative support is needed to investigate the impact of gendered socialization on child developmental outcome.

Otherwise, Lee and Bukowski (2012) suggested that common risk factors could have gendered effects on externalizing and internalizing problems. For instance, parental violence seems to have a different effect across gender. While parental violence influenced co-occurring mental health problems for boys, it proved to be a unique risk factor for internalizing problems for girls. Moreover, the same was visible for the affiliation with deviant friends. A unique contribution to externalizing problems was found for boys, however among girls the affiliation with deviant friends is more related to internalizing problems.

Future research should focus more closely on socialization factors to explain gender differences and support the implementation of gender-specific treatment efforts.

Taken together, implications for prevention can be formulated based on the findings including the importance of early, continuous, and gender-sensitive preventive interventions to ameliorate the mental health burden for the young and their family.

Study II - A Lot of Warmth and a Bit of Control? How Parenting Mediates the Relationship Between Parental Personality and Their Children's Mental Health Problems

The second study aimed to investigate the mediating role of parenting dimensions on parental personality and adolescent mental health problems. Family-related factors have a significant

impact on children's mental health, specifically parent personality and parenting. Analysis on a cross-sectional sample of 4,258 German adolescents highlighted the negative effect of neuroticism on mental health with increased externalizing and internalizing problems. Additionally, conscientiousness and extraversion showed a direct positive effect with lower externalizing or internalizing behavioural problems. Furthermore, all parenting dimensions were significantly related to mental health with a positive effect of parental warmth and behavioural control on externalizing and internalizing problems and a negative effect of psychological control on both problems. An important finding includes the mediating role of parenting by explaining a significant proportion of the variance in associations between parents' personality and their children's mental health problems. The positive effect of parental conscientiousness and extraversion on adolescents' mental health, can be explained by parental warmth as well as behavioural control. The results confirmed negative associations between parental neuroticism as well as psychological control and adolescent mental health and highlighted their mutually reinforcing negative effect (Prinzie et al., 2004; Yap & Jorm, 2015). These results contribute and extent previous research in the field of parenting by highlighting the strong influence of parental personality on parenting and children's mental health, thus stressing the importance of early family prevention strategies (see Study I and Study III). Hence, a good entry point for effective preventive intervention to ameliorate adolescent mental health could include raising knowledge about maladaptive mechanisms of parenting skills and mental health outcomes by focusing on parent personality. Early screening of personality traits that may result in maladaptive parenting practises could help parents to better prepare for parenthood. Additionally, although Belsky's process model considered parental personality as the most important source of influence on parenting, the model emphasized its multiply determined nature, as child's temperament was described as another predictor (Belsky, 1984). Gölcük and Berument (2019) investigated the effects of maternal and child temperament on negative parenting (i.e., coercive vs. abusive) to understand their

interaction and identify opposing matches beneficial for prevention and intervention programmes. Results showed that both maternal personality and child temperament were associated with coercive parenting, however only mother's level of neuroticism predicted abusive parenting. Accordingly, Achtergarde et al. (2015) argues for more individually tailored parenting training dependent on parent personality and child temperament (i.e., Difficult children, Shy/anxious children and Children low on effortful control). By focusing on the question "What do children and parents need when parents and children do not ''fit'' together in terms of temperament and personality", Achtergarde et al (2015) presented several suggestions on how to conduct counselling. For instance, parents high on consciousness are described as being structured, reliable, and high in self-control up to perfectionism. Paired with a difficult child, parents may have unrealistic expectations which could lead to rejection. Hence, parenting programmes should aim to modify parental expectations and help parents to overcome shame and social pressure (Achtergarde et al., 2015).

Presently, parenting trainings are only offered to families with children showing noticeable problems or diagnosed mental disorders. However, with regard to the results in the present study, a preparatory and more preventive approach towards parenting trainings should be worthwhile (Sahithya & Raman, 2021). Moreover, to minimize the many barriers to access mental health care and trainings, new solutions based on advanced technological-assisted programmes are regarded as very promising. A review by Hansen et al. (2020), showed the effectiveness of technology-assisted parenting programmes to improve parenting outcomes and youth mental health. However, practitioners are integral as a guiding source to refer parents effectively to the most appropriate programme based on their needs.

Study III - The whole is greater than the sum of its parts: profiles of multiple mental health risk factors using Latent class analysis

The third study of this dissertation investigates distinct constellations of risk factors using a Latent class analysis (LCA) to extract combinations of risk factors or subgroups and to examine their association with mental disorders.

With longitudinal survey data (KiGGS) of 10,853 German individuals and 27 robust risk and protective factors for mental health across multiple domains, three subgroups of individuals with a high prevalence of risk factors were identified: high-risk (23.4%), parental-risk (11.8%), and social-risk class (13.4%). The largest class (basic-risk class; 51.4%) showed a low profile of risk factors for mental health, probably due to their endorsement for other factors, which could help to compensate the negative effect of single risk factors, such as high self-efficacy, positive parenting (i.e., high amount of warmth and less pressure), high family cohesion and social support.

In general, high-risk class members are older and more likely to be female; moreover, they reported the highest number of risk factors among classes, particularly in the family domain.

Our results that girls in the high-risk class were more likely to experience a greater number of risk factors and reported fewer protective factors (e.g., self-efficacy, family cohesion, parental warmth) are in line with previous research stating that risk factors for poor mental health differ by sex (Del Amo et al., 2011). For instance, according to a systematic review by Moody et al. (2018), girls are more likely to become a victim of sexual and emotional abuse compared to boys worldwide. Additionally, according to a meta-analysis by Huang (2012), males showed higher self-efficacy in three out of four domains of academic self-efficacy. And lastly, girls are more likely to experience discrimination, for instance bullying based on their weight and appearance by parents and peers (Zuba & Warschburger, 2017). The high-risk class is associated with negative mental health outcomes (e.g., mental health problems, depression, ADHD).

Almost all individuals with a class membership in the smallest group (parental-risk class) reported family instability and parental divorce. Results confirm the crucial role of family-

specific risk factors across the extracted classes and point towards parents as a key target to develop effective interventions and to promote children's health (as reported in Study II).

The social environment represented a more common risk domain for young males. Peer-related bullying behaviour or victimization as well as school-related conflicts are more common for boys compared to girls.

One possible explanation for the gender differences in reporting risk and protective factors could include socialization practices. Although gender inequality and discrimination has become more subtle in many developed societies (Endendijk et al., 2016), implicit socialization practices include gender-specific behaviours. According to recent literature, parents show different behaviours depending on their child's gender. In short, different treatment was found with regard to distribution of household chores, engagement and commitment to fathers, encouragement of gender-typical activities, and emotional expression (Chaplin & Aldao, 2013; Endendijk et al., 2016; Raley & Bianchi, 2006). Dambrun (2007) constitutes perceived discrimination as the most important predictor to explain gender differences in mental health. One study by Bell and Juvonen (2020), reported a high vulnerability towards depression and insomnia for girls if discriminated due to their gender by teachers or school staff.

These results contribute to previous research by stressing the effect of multiple risk factor on youth mental health. Thereby, future approaches to ameliorate mental health problems should include a combination of strengthening protective factors, involving parents and targeting schools. Precisely, steps to expedite the implementation of effective universal prevention to promote protective factors such as resilience (i.e., the ability to adapt well after adversities) are sought targeting parents-to-be and primary care units. Promoting factors such as social and emotional competence skills, self-efficacy, health lifestyle, and positive parenting could have public health benefits for the entire population avoiding stigmatisation (Arango et al., 2018) and the restriction to define individuals at risk (McLuckie et al., 2019)

as opposed to selective prevention. Parents and school play a central role for mental health prevention in childhood and adolescence. Effective preventive intervention based on a multicomponent approach aiming at children, parents and teachers were reported to be most beneficial (Herman et al., 2011).

4.2 *Implications and Outlook*

The combination of all findings, the importance of co-occurring mental health problems (Study I) and the examination of multiple risk factors (Study III) as well as the central role of parents (Study II), highlights the necessity to intervene early, continuous and on different levels of society.

Monitoring of mental health

Childhood is a crucial stage for the development of motor, language, cognitive, social, and emotional skills (Ruiz-Zaldibar et al., 2018). It is also a period with a high vulnerability towards adversities which lay down the foundation for future mental health patterns (Arango et al., 2018; Membride). *Findings of the current dissertation show individuals with a persistent mental health pattern across time are older compared to adolescents with a changing pattern. Furthermore, individuals with a co-occurring pattern (multiple problem class) were younger compared to the other classes (Study I).* Failing to intervene early can lead to more serious problems which are more difficult to address later in life (Reinke et al., 2009). It is widely recognized that 50% of individuals with mental disorders have an onset before the age of 14 years (Kessler et al., 2005), analogous to many chronic diseases in Germany such as diabetes mellitus type 2 with a mean onset at 64,8 years of age (Wilke et al., 2013) or a myocardial infarction with about 58 years of age (Epping et al., 2021). However, the focus of early and long-term strategies to reduce the individual, familial and societal burden has long been on

physical diseases rather than on mental ill-health. Although, the potential savings for society of indirect and direct costs of psychiatric treatment may be far greater as the onset is earlier and therefore the period in health care far longer compared to other medical conditions. Prevention of mental health focusing on sensitive developmental periods may be more effective and have long-lasting benefits (Arango et al., 2018).

Early prevention and health promotion for children have been introduced in Germany in 1971 (Kurz & Becker, 2016). Until 2007, several preventive check-ups to detect health problems and developmental delays were provided free of charge and optional. In reaction to several public cases of child abuse, most German federal sates transitioned to compulsory check-ups for children starting from birth to age 6 (U1 to U9) carried out by pediatricians (Bollig & Kelle, 2013; Kurz & Becker, 2016). Furthermore, additional pediatric check-ups were introduced beginning at primary school age (U10, 7-8 years and U11, 9-10 years of age) and adolescence (J1, 12-14 years and J2, 16-17 years of age). One important emphasis of the U10 and J1 examination have been the recognition and initiation of therapy for developmental disorders (e.g., reading and writing disorders) and mental disorders (e.g., ADHD). Although the German preventive check-up system has integrated mental health as a significant aspect, several noteworthy limitations need to be mentioned. Firstly, while the U10 check-up is optional and sometimes at the parent's expense (Schmidtke et al., 2018), the J1 examination at age 12 might be too late for the prevention of mental health problems, as continuous empirical findings point towards a higher vulnerability for behavioural and socio-emotional problems during pre-school years or even earlier.

Secondly, several studies have investigated the participation rate of those preventive check-ups, usually for U1 to U9 and J1 (Hase et al., 2016; Schmidtke et al., 2018; Stich et al., 2009; Thaiss et al., 2010; Weyers et al., 2021), no data regarding the participation for the U10 examination was found. Furthermore, findings suggest a decreasing participation rate with increasing child's age (Stich et al., 2009). Albeit, 99.7% of children participated at U1 and

93% undergo the school entry medical examination (U9, 5 years) (Schmidtke et al., 2018; Weyers et al., 2021), less than 50% of adolescents used a J1 check-up (Thyen, 2014) with 70% showing therapy-relevant findings (Hagen & Strauch, 2011). As aforementioned, prevention at an early stage is an important tool to identify problems and dissipate the risk for the development of mental disorders later in life. The crucial goal must be, to include mental health into everyday consultation routine even before U10, to keep advertising and reminding parents of the need and usefulness of U10 and J1, and to increase participation rates to enable early recognition of hidden health problems to provide appropriate treatment or counselling (Hagen & Strauch, 2011).

Third and last, findings indicate a lower participation rate of preventive check-ups for families of low socioeconomic status, with an immigration background, and single parents (Schmidtke et al., 2018; Weyers et al., 2021). Clearly, there is a stronger need to intensify education, provide multiple language information, and introduce reminder systems to consult about the usefulness of preventive check-ups and to reach this population despite their background (Hagen & Strauch, 2011).

Ultimately, mental health prevention integrated into the German preventive check-up system is not early enough, not continuous and lacks inclusiveness. Based on these limitations, a very recent health care implementation study (PROMPt Project) aims to examine whether systematic screening using the SDQ, embedded in routine pediatric health check-ups promotes the identification of children at risk (age 5 – 10 years) for mental health problems which are transferred in case of clinical relevance on the subscales “emotional problems” and “behavioural problems” to an appropriate empirically grounded indicative prevention programme (“Mutig werden mit Til Tiger“ programme for emotional problems and the programme “Stressbewältigungstraining für Trotzköpfe und Zornteufel“ for behavioural problems) (Knappe, 2021; Weniger et al., 2021). Although this project marks an important contribution to the implementation of preventive measures in children routine health care to

prevent the development of mental disorders, two critical points should be considered. As best-practice approach for the SDQ, multi-informant information including parental, teacher and self-reports is suggested to be applied to screen for mental health problems, while the project only considers parental information. *Moreover, this dissertation highlights the importance of co-occurring emotional and behavioural problems, however the PROMPt Project seems to provide indicative preventive programmes solely for "pure" emotional or behavioural problems disregarding co-development of mental health problems.*

For the early detection of mental health problems, a continuous monitoring of children's development is indispensable. While systems of mental health surveillance have been established in several developed countries around the world (e.g., US, Canada, Austria, Switzerland) since 1999 (Zhou & Xiao, 2015), a promising concept for continuously monitoring and reporting on mental health has only recently been initiated in Germany (Thom et al., 2020). In 2019, the German Federal Ministry of Health commissioned the national Public Health Institute (i.e., Robert Koch Institute) to develop a Mental Health Surveillance System, which focuses on the "ongoing and systematic collection, collation, analysis, interpretation and timely dissemination of data on health and well-being" (Thom et al., 2021, p. 35) taking respective risk and protective factors into account. Unfortunately, the project is not fully established yet and initially focuses only on the adult population (Thom et al., 2021). Clearly, there is still unexploited potential to promote mental health on the national level.

Targeting parents

Despite the acknowledgement of the importance for mental health prevention and provision, treatment is not always accessible (Feeney-Kettler et al., 2010). Evidence shows that only a minority of children with an indication for mental health problems use mental health care (about 29.5%) (Hintzpeter et al., 2015). As children are provided access to mental health care through their parents, they represent a key target to children's health.

The way parents act, think or feel emotions is greatly influenced by their personality traits (Achtergarde et al., 2015; Vigouroux & Scola, 2018) which is a significant predictor for parental well-being (Mazza et al., 2021). *Furthermore, from the results of this dissertation we know that parental personality has a direct impact on children's mental health (Study II).*

New parenthood demands facing multiple challenges which involve the development of a parent-child relationship, transitioning to family roles, and coordinate marital relationship (Lindblom, 2017). Despite providing meaningfulness, joy, and satisfaction, parenthood is also associated with distress and exhaustion. Particularly, high levels of parent neuroticism, characterized by emotional instability and frequent feelings of irritability and anger, were found to increase parental distress, while an extroverted parent who is more outgoing and socially active shows a higher level of well-being (Mazza et al., 2021). Once parents show long-lasting distress they become vulnerable to experience parental burnout which exacerbates their physical and mental health, undermines their parenting role and worsens the parent-child relationship (Vigouroux & Scola, 2018). While parental personality plays a significant role (43% of explained variance) for parental burnout, also situational factors particularly dissatisfaction with marital relationships are important predictor. Parental burnout may increase the risk for child abuse and neglect (Roskam et al., 2018), but also for separation and divorce (Roskam et al., 2017), which in turn is claimed to be the most stressful event in childhood with long lasting mental health consequences (Stadelmann et al., 2010). Unfortunately, despite the recognition of parents as a significant socialization agent, the importance of parental well-being for children's health tends to be overlooked by politicians and health providers (Fricke et al., 2021). Specialized programmes to identify and support vulnerable families are sparse and not inclusive as used more often by families with higher socioeconomic status (Eickhorst et al., 2016; Fricke et al., 2021). One promising approach to overcome this gap as proposed by Fricke et al. (2021), is the development of a screening system to identify distress and mental health disorders in parents during the routinized

pediatric check-ups for children (U1 – U9) mostly compulsory in Germany. Robust positive evidence for screening in such a setting has been published, and moreover recommended for the identification of mothers with postpartum depression (Van der Zee-van den Berg et al., 2017). Personality traits may be a useful indictor to predict vulnerability towards parental burnout and mental health disorders (e.g., depression and anxiety). Furthermore, the spread of Covid-19 and the implementation of measures (e.g., closure of schools and day care centres) to control the pandemic has harmful consequences for parent's well-being by elevating parent's responsibilities and parenting stress. The difficulty for parents to combine working hours, caring for small children and home schooling increases the risk for parental burnout (Huebener et al., 2021; Kerr et al., 2021). A stronger emphasis needs to be placed on healthy parents to ensure healthy children.

While first-time parenthood forces adults to rethink their role and identity, the infant completely relies on their caregiving. Parents and caregivers are defined "*as one of the biggest influencers on children's development – their thoughts, feelings, and behaviours dictate when, why, and how they interact with their children, which impacts when, why, and how the child learns"* (Kucker et al., 2021, p. 540-541) and therefore have a strong influence on children's mental health development (Ruiz-Zaldibar et al., 2018). *As confirmed by this dissertation, parental personality influences children's mental health indirectly through caregiving practices which are relevant for children's mental health.* The parenting role is a challenging task packed with financial, emotional and time-consuming demands and conflicts to raise children into adults fit for society (Nomaguchi & Milkie, 2020).

During pregnancy, birth and antenatal care, every woman in Germany is entitled to free and personalized midwifery care including antenatal educational courses paid by health care providers to prepare for the transition to parenthood. Usually, those courses are well accepted and attended by most couples, although participation is more likely for first-time, well educated, and married mothers and fathers (Lange & Ullrich, 2019). While information

delivered during those courses focus merely on the process of labour and delivery, there is a lack of adequate preparation for parenthood or information about parenting skills (Entsieh & Hallstrom, 2016; Spiteri, 2018). Discussions about parental competence, parenting skills, emotional well-being, and couple's relationship is usually not part of many antenatal educational courses. Despite, the plethora of parenting research over the last forty years producing consensus regarding the importance of competent parenting for parents themselves, their infants and society at large (Nomaguchi & Milkie, 2020; Teti et al., 2017), most first-time parents feel unprepared to embark this life-long journey of parenthood (Xuereb et al., 2012). The long-term repercussions of the lack of preparation for parenthood has been shown with regard to lower self-efficacy (Shorey et al., 2015), parental distress (Lindblom, 2017; Vigouroux & Scola, 2018), burnout (Fricke et al., 2021; Kerr et al., 2021; Roskam et al., 2017), depression (Shorey et al., 2015), lower relationship satisfaction and divorce (Huss & Pollmann-Schult, 2019; Spiteri, 2018), and child neglect and abuse (Guterman et al., 2009).

While parenthood is a developmental and transformative process which comes naturally with the birth of a child, parenting skills may not be as simple or straightforward for many parents. A systematic review and meta-synthesis of qualitative literature about the specific needs of first-time parents specifically for early parenthood by Entsieh and Hallstrom (2016), highlights the necessity to provide parents with a strong foundation of knowledge and resources regarding parenting skills to master the life-changing phase of parenthood and childrearing. In line with the present-day parenting culture emphasizing "intensive" caring, many parents feel the need to inform themselves about the 'proper' way of 'doing' parenting by purchasing books, searching for advice in the World Wide Web or in their social network. However, this information varies in quality and may contain lay advice. Coming up with feasible solutions to these needs may be a far-reaching benefit not only for parents, but also for their children and society at large. The vast amount of research literature on parenting has reached a consensus on what detrimental and inappropriate parenting practices entails, resulting in a

wide spectrum of measures varying in their scope (prevention or intervention), theoretical foundation, target group and proof of effectiveness (Heinrichs, 2021). In Germany, several parenting trainings are available to support parents to develop a healthy parenting style, for instance "SAFE – Sichere Ausbildung für Eltern", "Systematic training for effective parenting (STEP)", "Positive Parenting Program (Triple P)", and "Kess-erziehen", just to mention a few (Heinrichs, 2021). As these programmes appear to be available from the health care provider only for families in need (e.g., teenage parents, single parents, and parents with mental illness) or problematic families (e.g., with a history of neglect, abuse), an additional preventive approach for all first-time parents would also help families with less financial, educational and social resources to improve knowledge and childrearing practices. Parenting trainings could be adapted to already existing structures such as the antenatal educational courses and preventive pediatric check-up for children (U1 - U9), which would help to provide information on healthy parenting skills. One promising suggestion was formulated by Achtergarde et al. (2015) which entails parenting training based on parent's personality which could also contribute to parental well-being.

Multidomain approaches

Early intervention that help children to strengthen their social-emotional development, self-efficacy and resilience to adversities throughout life (Membride, 2016), is one important step towards a healthy society. Efforts to prevent mental ill-health in childhood should not exclusively focus on the promotion of protective factors but also aim at the reduction of malleable risk factors across multiple domains of children's life. Single risk factors are unavoidable, rather common and less likely to impact mental health. *This dissertation provides further evidence for the association of multiple risk factors across several domains on mental ill-health.* As parents instill healthy habits in their children, the social environment is also an important agent to minimise risk and foster protective factors to ensure positive mental

development. The childhood-adolescence transition is a pivotal period for prevention especially for internalizing mental health problems (Graber et al., 2014) by which the school plays an important part. Treatment focus should be expanded beyond children and family-based intervention but also include a teacher-focused component as all domains need to be addressed to treat the complexity of mental health problems and reduce the risk for adult psychopathology. For instance, the evidence-based preventive intervention programme "Papilio – 3to6" for preschool children (and eventually "Papilio - 6to9" for primary school children) overcomes these challenges by preventing early-onset behavioural disorders in day care centres and primary schools through child-centred methods (e.g., strengthening social-emotional skills), teacher trainings towards a positive class environment, and parental support (e.g., parenting methods) during early childhood (Koivula et al., 2020; Scheithauer et al., 2021; Zarra-Nezhad et al., 2021). While there are already promising programmes developed, more efforts need to be put into the effectiveness evaluation and nationwide implementation of such preventive interventions.

Moreover, this dissertation highlights gender differences regarding vulnerabilities towards mental health problems and risk factors. While females tend to show a higher likelihood for stable internalizing problems and report a high number of family-related risk factors such as low family cohesion, high family dysfunction, insufficient parenting (i.e., low warmth und high pressure), child maltreatment (i.e., emotional neglect/abuse, physical neglect/abuse and sexual abuse) and experiences with discrimination experience, males are more likely to report multiple problems and social risk factors (e.g., low well-being with peers and in school). More research emphasis should be directed toward the underlying mechanisms to understand these differences, while prevention needs to considered gender-specific trajectories of mental health problems. One interesting premise has been postulated by Mesman and Groeneveld (2018), saying that although gendered parenting is uncommon in today's society, gendered

socialization is expressed primarily implicitly rather than explicitly which is an important step towards the understanding of gendered child development.

4.3 *Strengths and Limitations*

The strengths of this dissertation include the use of person-centred methods complementary to the more common variable-centred approach investigating different aspects of mental health. Additionally, our studies use cross-sectional and longitudinal data of a nationwide health survey with multiple measurement points and an age range from infancy to young adulthood. Furthermore, this dissertation includes a wide range of health relevant risk and protective factors including a multi-informant and internationally validated screening instrument (SDQ) to assess mental health problems.

Despite these strengths, the findings should be considered in light of the following limitations. First, associations between variables cannot be considered as causal which eliminates the possibility to draw conclusions about developmental changes during childhood, adolescence, and early adulthood. Although, one study did take a longitudinal approach, the time over all measurement points might not be long enough (5 years) to cover all sensitive periods of developmental.

Second, some subsamples may be too small to extract reliable transition groups across time which can be examined thoroughly for differences. Moreover, although study samples originated from the same overall population (i.e., KiGGS survey), unfortunately no cross-over analysis was possible as the number of identical participants was rather small or no matching variables were available.

Third, another limitation pertains to child temperament as a missing predictor for parenting practices. According to Belsky's model not only parent's characteristics (e.g., personality) determine parenting behaviour but also child factors (e.g., child temperament) and contextual

factors (e.g., marital relationship). Achtergarde et al. (2015) showed evidence for a bidirectional parent-child relationship by which each has an effect on the other. Future research should consider all possible influence when investigating parenting behaviours.

Lastly, it must be noted that most risk factors were assessed retrospectively elevating the risk for recall bias. Furthermore, quality of mental health assessment (i.e., SDQ) would benefit from including teacher report to self- and parental reports.

4.4 *Conclusion*

Children are our most precious resource and fundamental for a healthy society. To date, only a small body of research that investigates mental health problems during childhood, adolescence and young adulthood is based on person-centred methods. Although variable-centred methods are important and appreciated, using a complementary approach helps to further understand the developmental trajectories of mental ill-health through person-specific differences. Mental health is long part of the global health agenda and besides saving societal costs with early prevention (Kieling et al., 2011), we are also ethically responsible to guarantee that the most vulnerable and most important members of our society have a chance for a healthy development and thereby ensure healthy future generations. While important steps have been taken toward mental health prevention, there is still a lot of potential for research and practise. Targeting influential factors or agents for mental ill-health early, continuously and with a multi-dimensional approach may be a successful strategy towards a healthy society.

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ZUSAMMENFASSUNG

Die Relevanz psychischer Verhaltensauffälligkeiten bei Kindern und Jugendlichen hat sich in den letzten Jahren angesichts der potenziell nachteiligen Auswirkungen der weltweiten COVID Pandemie erhöht. Die Belastung durch psychische Erkrankungen mit ihren vielfältigen negativen Spätfolgen für Kinder, Familie und den hohen indirekten und direkten Kosten für die Gesellschaft macht die Förderung von psychischer Gesundheit zu einem zentralen Thema. Die allgemeine wissenschaftliche Forschung zu psychischen Verhaltensauffälligkeiten bei Kindern und Jugendlichen stützt sich weitgehend auf variablenzentrierte Methoden (z. B. multiple Regression, Faktorenanalyse, kumulativer Risikoindex) und konzentriert sich hauptsächlich auf die Erklärung von Beziehungen zwischen Variablen (d. h. lineare Assoziation und einzelne Beziehung). Diese Methode geht jedoch von der Homogenität von psychischen Verhaltensauffälligkeiten und Risikofaktoren für psychische Erkrankungen innerhalb einer Population aus. Allerdings besteht die Wahrscheinlichkeit einer Vielfalt individueller Muster von Verhaltensauffälligkeiten oder Risiko- und Schutzfaktoren für die psychische Gesundheit. Die vorliegende Dissertation verwendet mit einem personenzentrierten Ansatz eine komplementäre und vielversprechende Methode um Subpopulationen mit heterogenen Mustern psychischer Verhaltensauffälligkeiten zu identifizieren und verschiedene Risikosubgruppen zu untersuchen. Die Ziele der vorliegenden Arbeit umfassen die Erforschung und Modellierung von Mustern und Entwicklungsübergängen psychischer Verhaltensauffälligkeiten bei Kindern und Jugendlichen mit Fokus auf die Bedeutung elterlicher Faktoren, die Untersuchung multipler Risiken und die Manifestation von psychischen Störungen.

Studie I beschäftigt sich mit der zentralen Frage, wie sich psychische Verhaltensauffälligkeiten individuell und zeitlich unterscheiden. Basierend auf einer Stichprobe von fast 1.300 Kindern und Jugendlichen (Altersgruppe 8 – 26), wurde eine drei-Klassen-Lösung identifiziert: „normative class“, „emotional problem class“ und „multiple problem class“. Die Ergebnisse

bestätigen die Stabilität psychischer Verhaltensauffälligkeiten als häufig und nicht als atypisch. Laut den Ergebnissen der Latent transition analyse zeigen sich keine Veränderung der latenten Klassenzugehörigkeit für die Mehrheit der Stichprobe (91,6 %). Darunter wurden 14,7 % der Personen mit einem anhaltenden Muster psychischer Verhaltensauffälligkeiten identifiziert. Gleichzeitig auftretende internalisierende und externalisierende Verhaltensauffälligkeiten (d.h. mehrere Problemklassen) wurden bei 11,3 % der Stichprobe gefunden. Diagnosen psychischer Störungen wurden mit größerer Wahrscheinlichkeit von Personen in der „emotional problem class“ oder in der Klasse mit multiplen Auffälligkeiten (multiple problem class) berichtet. Zusammengenommen können auf der Grundlage der Ergebnisse Implikationen für die Prävention abgeleitet werden, einschließlich der Bedeutung früher, kontinuierlicher und geschlechtsspezifischer Präventionsmaßnahmen zur Linderung der psychischen Gesundheitsbelastung für junge Menschen und ihre Familien.

In der zweiten Studie wurde an einer Querschnittsstichprobe von 4.258 deutschen Jugendlichen (48,7 % männlich, 11–17 Jahre) der Mediationseffekt von elterlichen Erziehungsdimensionen zwischen Elternpersönlichkeit und jugendlichen psychischen Verhaltensauffälligkeiten untersucht. Die Ergebnisse unterstreichen und erweitern frühere Hinweise auf direkte Zusammenhänge zwischen der Elternpersönlichkeit und den psychischen Verhaltensauffälligkeiten ihrer Kinder, indem sie die nachteilige Rolle von Neurotizismus mit zunehmenden externalisierenden und internalisierenden Problemen hervorheben. Darüber hinaus bestätigen die Ergebnisse einen positiven Effekt der Erziehungsdimension elterliche Wärme und Verhaltenskontrolle auf externalisierende und internalisierende Auffälligkeiten und einen negativen Effekt psychologischer Kontrolle auf beide Probleme. Eine wichtige Erkenntnis ist der indirekte Mediationseffekt der Erziehungsdimensionen. Die Ergebnisse bestätigen einen negativen Zusammenhang zwischen elterlichem Neurotizismus sowie psychologischer Kontrolle und jugendlicher psychischer Gesundheit und verdeutlichen die sich gegenseitig verstärkende negative Wirkung. Zusammenfassend lässt sich sagen, dass ein frühes

Screening von elterlichen Persönlichkeitsmerkmalen, die zu maladaptiven Erziehungspraktiken führen ein guter Einstiegspunkt für wirksame präventive Interventionen sein könnte, welche zur Verbesserung psychischer Verhaltensauffälligkeiten während der Adoleszenz beitragen.

In Studie III wurden Längsschnittdaten von 10.853 deutschen Kindern, Jugendlichen und jungen Erwachsenen verwendet, um anhand von 27 robusten Risiko- und Schutzfaktoren für die psychische Gesundheit in mehreren Bereichen (d. h. individuell, familiär, sozial) vier Untergruppen von Personen mit unterschiedlichen Risikoklassen zu identifizieren: „basic-risk“ (51.4 %), „high-risk“ (23.4 %), „parental-risk“ (11.8 %) und „social-risk“ (13.4 %). Die Ergebnisse bestätigen die entscheidende Rolle familienspezifischer Risikofaktoren in den extrahierten Klassen und weisen auf die Eltern als Hauptzielgruppe hin, um wirksame Interventionen zu entwickeln und die Gesundheit von Kindern zu fördern. Risikoklassen sind mit negativen Auswirkungen auf die psychische Gesundheit assoziiert (z. B. psychische Probleme, Depressionen, ADHS). Zusammenfassend tragen die Ergebnisse zu früheren Forschungen bei, indem sie die Wirkung mehrerer Risikofaktoren auf die psychische Gesundheit von Jugendlichen betonen. Zukünftige Ansätze zur Linderung psychischer Gesundheitsprobleme sollten eine Kombination aus der Stärkung von Schutzfaktoren beinhalten, Eltern einbeziehen und auf Schulen abzielen.

Die Ergebnisse der vorliegenden Dissertation, die die Bedeutung gleichzeitig auftretender psychischer Gesundheitsprobleme (Studie I) und die Untersuchung mehrerer Risikofaktoren (Studie III) sowie die zentrale Rolle der Eltern (Studie II) umfassen, unterstreichen die Notwendigkeit von Präventionsansätzen, die frühzeitig, durchgehend und auf verschiedenen Ebenen der Gesellschaft greifen. Implikationen und zukünftige Forschungsansätze werden mit einem Fokus auf die Rolle der Gesellschaft diskutiert und der Verantwortung, dass die schwächsten und wichtigsten Mitglieder eine Chance auf eine gesunde Entwicklung haben. Obwohl wichtige Schritte in Richtung psychischer Gesundheitsprävention unternommen wurden, gibt es noch viel Potenzial für Forschung und Praxis.

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SELBSTSTÄNDIGKEITSERKLÄRUNG

Hiermit erkläre ich, die vorliegende Dissertation selbstständig verfasst und ohne unerlaubte Hilfe angefertigt habe. Alle Hilfsmittel, die verwendet wurden, habe ich angegeben. Die Dissertation ist in keinem früheren Promotionsverfahren angenommen oder abgelehnt worden.

Berlin, Mai 2022 Kristin Göbel