EMOTIONAL PROBLEMS IN CHILDHOOD AND ADOLESCENCE

PREDICTORS, PATHWAYS AND UNDERLYING STRUCTURE

BY

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What a journey! Quite long, quite short. Quite comfortable, quite painful. Quite intensive, quite slow. Very enjoyable, quite tough. From time to time I have had a feeling of being on the 'highway to hell', but with a dream of 'stairways to heaven'. I have heard that it is the journey (being on the road), and not the destination, that makes it worth it. It remains to see whether this is true.

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Evalill Karevold, Oslo, May 2008

SUMMARY

Emotional problems refer to symptoms of anxiety and depression, and are the most common mental health problems in childhood and adolescence. Symptoms of emotional problems in childhood have a strong predictive value for problems in late adolescence, and sub-threshold levels of emotional problems in early adolescence put the youth at heightened risk for psychiatric disorders later in life.

The present study use previous research findings, developmental theory and methodologically advanced analyses of longitudinal data to illuminate pathways to emotional problems in childhood and adolescence. The study includes data from 921 families. Mothers have reported information about their children, themselves, and their surroundings from the children were 1 ½ years old until the children were 12-13 years old. At the age of 12-13 years, the young adolescents reported information about themselves and their surroundings. Both the design and the data set are well suited for investigating the dimensionality and the construct validity of emotional problems and to explore moderating and mediating processes that contribute to development of anxious and depressive symptoms in childhood and early adolescence. Such knowledge has implications for the design of early intervention and preventive actions for maladaptive development in childhood and adolescence.

A basic issue in the field of developmental psychopathology concerns the identification of valid constructs. Previous research using emotional symptom scales have had divergent findings on the underlying structures of anxiety and depression, and whether it is a one- or two-dimensional constellation of emotional symptoms. Thus, the first aim of the present study was to examine construct validity of the depression and anxiety scales and the agreement between parent and child reported symptoms in 12-13 years old adolescents. We also wanted to integrate contributions from both adolescents and their mothers in a way that illuminated their shared and unique contributions. It is important to know the amount of trait, source and unique variance in symptom scales, as the understanding of anxiety and depression depends to a certain extent on the use of such scales.

The key findings were firstly that the scales used to measure maternal and self-reported symptoms of anxiety and depression showed good psychometric properties. Compared to previous research, there was a relatively high level of parent-child agreement. The reported overlap between symptoms of anxiety and depression were, however, high for both informants. The measures of anxiety and depression manifested convergent validity, but poor discriminative validity. Lastly, the method applied serves as a good example of how to integrate data from multiple informants on symptoms of anxiety and depression. The contributions from both informants were separated into trait variance, source variance and unique variance, which made us able to clarify what the respondents agreed on and what they reported uniquely.

Another basic issue is the identification of predictors, processes and mechanisms that contribute to development of emotional problems. To acquire a better understanding of factors leading to an increase or a decrease in the symptom level, we need to investigate the longitudinal relations between different temperamental and contextual risk and

protective factors. First we examined internalising problems in childhood by examining the complex interplay between maternally reported child temperament traits, gender and internalising behaviour problems. We found that higher levels of shyness predicted higher internalising scores from age 1 ½ to age 8 ½ years. The child's activity level did not have any direct impact on the development of internalising problems. However, the negative impact of shyness on internalising problems was reduced for shy boys with a high activity level. No such moderation effect existed for girls.

Then we investigated mediating pathways to internalising problems in young adolescents. We examined the longitudinal relations between child temperamental shyness and emotionality, maternal distress, family adversities and social support from early childhood and onwards, and their direct and indirect effects on symptoms of anxiety and depression at the age of 12-13 years. Unique effects of the predictors on symptoms of anxiety versus depression were also examined. The results showed that temperamental and contextual predictors in childhood account for 32% of the variance in symptoms of anxiety and depression in early adolescence. We found direct effects of contextual predictors on adolescent problems already from the second year of life. There were two main pathways to core internalising problems (co-varying symptoms of anxiety and depression). The first pathway was through temperament, as nearly all risk factors were mediated through child emotionality in mid-childhood. The second main pathway was through early contextual risk factors, with all direct and indirect contextual effects from before age five. As expected, girls were more likely than boys to show core internalising symptoms in early adolescence, but the gender differences were generally not accounted for by the other predictors. The results showed a direct effect from family adversity in mid-childhood to later symptoms of depression, but no unique predictors of anxious symptoms.

The present study illuminates several major concerns related to emotional problems in childhood and adolescence. The importance of the following findings is underscored:

- The continuous significance of child temperamental emotionality and shyness
- The persisting impact of contextual predictors in families with children under age five
- The significance of having more than one informant when using rating scales
- The need for anxiety and depression scales with context-specific symptoms

LIST OF PAPERS

Paper 1
Karevold, E., Røysamb, E., Ystrøm, E., & Mathiesen K.S. (2007). Symptoms of anxiety and depression in early adolescence: A multitrait-multisource factor analytic approach. *Psychological Assessment. Submitted.*

Paper 2
Karevold, E., Stoolmiller, M., & Mathiesen, K.S. (2007). Temperamental activity level moderates the effect of shyness for boys, but not girls, on internalizing trajectories from infancy to 8.5 years. *Development and Psychopathology*. *Submitted (2nd revision).*

Paper 3
Karevold, E., Røysamb, E., Ystrøm, E., & Mathiesen, K.S. (2007). Predictors and pathways from infancy to symptoms of anxiety and depression in early adolescence. *Developmental Psychology. Submitted.*

1. INTRODUCTION

1.1 Background

"Emotional problems" is a higher-order construct related to the more general concept of psychopathology in childhood and adolescence (Kovacs & Devlin, 1998). It refers to symptoms of anxiety and depression, such as sadness, loneliness, worrying, feelings of worthlessness and anxiousness. From a psychological perspective, emotional problems have major personal costs, including reduced levels of functioning in relation to family and friends, school achievements and subjective wellbeing. From a public health perspective, emotional problems have large economic costs related to treatment, medical and psychological care, and reduced work capacity later in life.

Results from epidemiological studies indicate that depression and anxiety disorders are the most common disorders in childhood and adolescence (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003). Emotional problems in childhood have a strong predictive value for problems in late adolescence (Verhulst & van der Ende, 1992; Stoolmiller, Kim, & Capaldi, 2005), and sub-threshold levels of emotional problems in early adolescence put the youth at heightened risk for psychiatric disorders later in life (Jaffee et al., 2002; Fergusson, Horwood, & Boden, 2006; Clark, Rodgers, Caldwell, Power, & Stansfeld, 2007).

Despite the high prevalence of these disorders, emotional problems in children and adolescence are difficult to identify (Costello & Angold, 2006). The boundaries between the different disorders, and between normality and disorder, are characterized by uncertainty (Rutter, 2003; Fergusson et al., 2006; Fergusson et al., 2006). Measures of anxiety and depression have repeatedly been found to correlate strongly, independent of whether the mood states are categorically or dimensionally measured (Cole, Truglio, & Peeke, 1997; Kovacs & Devlin, 1998). Research on problem behaviour in early childhood often classifies symptoms of anxiety and depression as internalizing problems (Campbell, 1995; Mathiesen & Sanson, 2000). Later on in development these two problem dimensions are treated as separate entities. A conceptualisation of anxiety and depression as two distinct entities with unique risk and protective factors implies that the measure of such constructs should show convergent and discriminant validity.

The identification of early markers and longitudinal relations has important implications for the design of preventive actions for maladaptive development in childhood. Considering the serious impact of emotional problems in childhood and adolescence, it is important to identify predictors, processes and mechanisms that contribute to development of emotional problems. To acquire better understanding of what leads to an increase or a decrease in the symptom level, we need to investigate the complex interplay between child and environmental risk and protective factors. The boundaries between symptoms of anxiety and depression are unclear, and an investigation of their underlying structure is needed. Hence, the main purpose of this study is to examine the underlying structure and early predictors of emotional problems in

childhood and adolescence, and to investigate developmental pathways towards these problems.

1.1.1 Emotional problems

Concepts and prevalence

Symptoms of mental health problems in childhood and adolescence are usually classified into two broadband categories, emotional (internalising) and behavioural (externalising) problems (Kovacs & Devlin, 1998). In the present study, the construct of emotional problems, referring to symptoms of anxiety and depression, will be used interchangeably with the construct of internalising problems. A main focus is to examine to which degree changes in risk and protective factors account for changes in symptoms of anxious and depression, and a continuous and dimensional perspective on psychopathology is adapted. When comparing research on subclinical levels of emotional symptoms and clinically significant disorders, both domains are found to have comparable correlates and consequences (Rutter, 2003; Grant et al., 2003; Pickles & Angold, 2003). Thus, I will refer to studies on anxiety and depression that have both symptoms and disorders as outcomes.

Findings from population-based studies indicate that 9-12% have so strong emotional symptoms that it has a negative impact on daily functioning (Puura et al., 1998; Egger & Angold, 2006; Costello, Egger, & Angold, 2005). Lifetime prevalence rates for major depression in adolescence ranges from 4 % up to 25%, but most often the rates are around 15-20% (see Kessler, Avenevoli, & Merikangas, 2001, for a review). The prevalence estimates is almost half the size in childhood (Roberts & Bishop, 2005; Cicchetti & Toth, 1998). Lifetime estimates of any anxiety disorders in school-aged children and adolescents ranges from 4% to 27% (Merikangas, 2005; Costello et al., 2005).

Prevalence estimates vary across specific disorders or symptom levels, and across age, gender, groups and cultures, measurement methods and informants (e.g. Kovacs & Devlin, 1998; Merikangas, 2005; Costello et al., 2003; Kessler et al., 2001). The above prevalence estimates are based on cut-off points, implying dichotomization of variables. Since the main focus in this study is on variation and covariation between continuous variables, prevalence estimates will not be further discussed. Both measures of anxious and depressive symptoms in this study are based on criteria from Diagnostic and Statistical Manual of Mental Disorders, 4th ed. (American Psychiatric Association, 1994). In this diagnostic system, the core symptoms of most anxiety and depression disorders are essentially viewed as similar in childhood, adolescence and adulthood. The application of adult criteria to children and adolescents are questioned, and age appropriate guidelines that are sensitive to developmental changes are needed (Weiss & Garber, 2003).

Symptoms of depression

In DSM-IV a Major Depressive Disorder is characterized by one or more Major Depressive Episodes, which indicates "at least two weeks of depressed mood or loss of interest accompanied by at least four additional symptoms of depression" (DSM IV, p. 317). The core symptoms in a Major Depressive Episode for children and adolescents include 1) feelings of

sadness or emptiness, 2) irritable mood or somatic complaints, 3) social withdrawal or diminished interest in nearly all activities, 4) significant and unexpected weight changes or somatic complaints, 5) psychomotoric agitation or retardation, 6) fatigue or loss of energy, 7) feelings of worthlessness or excessive guilt, 8) lack of concentration, and 9) suicidal thoughts (DSM IV).

Depressive symptomatology is wide-ranging, and covers areas as diverse as appetite disturbance, restlessness and suicidal thoughts (Angold et al, 1995 se SMFQ). The depressive symptoms measured in the present study cover the core depressive symptomatology from the DSM IV and ICD 10.

Symptoms of anxiety

The main categories of anxiety disorders include separation anxiety disorder (SAD), social phobia, generalized anxiety disorder (GAD)/overanxious disorder (OAD, subsumed by GAD), specific phobias and obsessive-compulsive disorder. Among these, SAD, GAD/OAD and phobias (including social phobia) are the most common in childhood and adolescence (Costello et al, 2005; Merikangas, 2005; Axelson & Birmaher, 2001). SAD is characterized by excessive worry about separation from home or from significant attachment figures, and is supposed to (mainly) develop in childhood. Additional symptoms are tearfulness, somatic complaints (headache, stomach pain), nightmares and school refusal. GAD/OAD is characterized by excessive anxiety and worry over several areas of life functioning. It is associated with psychophysiological symptoms like restlessness, sleep disturbance, irritability or muscle tension. Affected children typically worry about disasters like earthquake or nuclear war, their school performance and they have excessive need for approval. Social phobia is characterized by excessive fear of unfamiliar social situations or performance situations, and especially fear of being evaluated by others. The failure to reach expected levels of functioning is typical for children with social phobia, while adolescent onset is characterized by a decrease in social and academic performance. Specific phobias are characterized by excessive fears of events or objects.

Anxiety disorders and their manifestations across development are broadly understudied. This reflects, in part, the belief that anxiety disorders constitute ’mild’ psychopathology. One of the main concerns regarding anxiety is the definition of impairment, with unclear boundaries between ‘normal’ and ‘abnormal’ anxious symptoms.

1.1.2 Child development and emotional problems

The present study focuses on development of emotional problems in children from age 1.5 to 12-13 years. The meaning and importance of symptoms vary depending on the developmental period in which the child is. A nuanced understanding of child and adolescent psychopathology requires knowledge on characteristics of both normal and maladjusted developmental pathways (Cicchetti, 2006). Thus, the understanding of normal development is just as important as knowledge on abnormal development.

Transitional changes in childhood are known as vulnerable periods (Rutter, 2003; O'Connor, 2006; Essex, Klein, Cho, & Kraemer, 2003). Shifts in social settings may involve transitions

from primary care-taker to another care-taker, from home to kindergarten, from kindergarten to preschool, from preschool to school, or from primary school to secondary school. The development from childhood to adolescence, with the following onset of puberty including hormonal, cognitive, behavioural and emotional changes, is known as a specifically vulnerable period related to development of emotional problems. Thus, the timing in which the exposure to risk factors takes place is assumed to be critical, since it may influence the way in which the child copes with developmentally specific challenges (Essex et al., 2003). In order to assess whether risk factors actually predict anxious and depressive symptoms, and not vice versa, it is essential to identify risk factors as early as possible.

1.2 Theoretical perspectives

The present understanding of child development and psychopathology lies within a developmental psychopathology perspective. This evolving scientific discipline provides a broad framework witch integrates contributions from theories and perspectives on normal and abnormal development. Developmental psychopathology focuses on "the interplay among the biological, psychological, and social-contextual aspects of normal and abnormal development across the life span" (Cicchetti, 2006, p.1). Such a multidisciplinary integration provides conceptual scaffolding and places the comprehension of adaptation and maladaptation in a dynamic relationship between the individual and its internal and external contexts. Developmental psychopathology brings forward a pathway approach and has risk and protective factors, contextual influences, and mutual interplay between normality and psychopathology as its major conceptual issues and principles.

The present study is inspired by several theoretical perspectives and models. The choice of variables in the three papers is influenced by life span and transactional perspectives of development. The vulnerability model addresses the current understanding of the relation between temperament and psychopathology. The design of this study is guided by a general conceptual model of associations between stressors and psychopathology. A short presentation of these perspectives follows.

1.2.1 Life span developmental model

A central assumption of life span developmental models is that "individual differences in psychological development arise from the individual's particular profile of risk and protective experiences as accumulated through experience" (O'Connor, 2006, p.207). Of major concern are the timing of exposure to risk and protective factors and the longitudinal impact these factors have on development. The relation between early adversity and later developmental outcome is seen as probabilistic. The probability of persisting effects is thought to depend on subsequent exposure and experiences (O'Connor, 2006). Hence, there is a developmental order in the link between early experiences and later outcomes in that early risk exposure is either reinforced or maintained by mediating factors. The life span model seeks to explain individual variation in developmental pathways and incorporates both additive and interactive effects in the pathways followed. Exposure to contextual risks is expected to have a direct or indirect relation to individual differences in adaptation. The flexibility between exposure and outcome is characterized by the emphasis this approach places on equifinality (multiple paths

to a single outcome) and multifinality (a single risk may lead to multiple outcomes) (Cicchetti & Toth, 1998).

Whether the focus is on timing, frequency, or severity of exposure, "life course developmental models require a measurement-intensive approach to determine if the effects of early experience are mediated by later experience" (O'Connor, 2006, p.211).

1.2.2 Transactional perspective

The transactional model of development states that any developmental process is influenced by the interplay between the individual and its context (Sameroff, 1975; Gutman, Sameroff, & Cole, 2003; Sameroff & MacKenzie, 2003). The focus is on qualitative transformations over time, where development is emerging from the continuous dynamic interactions of the child and the experience provided by the family and social context. Thus, developmental outcome is a combined product of the individual and its experience, and never a function of the individual or the environment alone. The emphasis is equally placed on the bidirectional effects of the child and its context. There is a dialectic core of the transactional process "in that the child was changed by experience and experience was changed by the child's more complex understanding" (Sameroff & MacKenzie, 2003, p. 614). However, despite the dialectic, organismic influence on the approach, it is emphasized that any operationalisation requires a mechanistic measurement model.

The practical challenges of the transactional model are (at least) threefold; 1) theoretical, i.e. how to assess a dynamic system, 2) logistic, i.e. presumes a longitudinal and large sample with many time points, and 3) methodological, i.e. how to assess multiple interacting domains over time that identifies qualitative changes (Sameroff & MacKenzie, 2003).

1.2.3 Vulnerability model

The relation between temperament and psychopathology has been a disputed topic for decades (Nigg, 2006; Rothbart & Bates, 2006; Watson, Gamez, & Simms, 2005). Three perspectives on the causes of this relation have been proposed: 1) Temperament has a causal influence on psychopathology, either by predisposing an individual to initially develop a disorder (the vulnerability model), or by affecting the subsequent course or severity (the pathoplasty model). 2) Psychopathology produces changes in a persons emotional or personality characteristics temporarily (the complication model) or permanently (the scar model). 3) Temperament and psychopathology reflect the same underlying processes, either by a shared etiological factor (the common cause model) or by representing different levels on the same continuum (the spectrum model) (Watson et al., 2005; Rothbart & Bates, 2006).

In the present study temperament is defined as constitutionally based personality traits that are present in early childhood (Buss & Plomin, 1984). The understanding of the relation between temperament and internalising problems is based on a vulnerability-resilience perspective (Shiner & Caspi, 2003; Nigg, 2006). The vulnerability model holds that some manifestations of temperamental traits represent a potential vulnerability for developing psychopathology, and that environmental factors or multiple trait influences are necessary for

pathology to develop. Some temperament traits may also function as protective factors in conditions that often put children at risk for psychopathological outcomes, and thereby promote resilient pathways (re: resilience model).

1.2.4 A conceptual model of the association between stressors and symptoms of psychopathology

Grant and colleagues (2003) have presented a model of the role of stressors in the development of child and adolescent psychopathology. Their model builds on earlier models of psychopathology (e.g. Hammen & Rudolph, 1996), and is based on five central propositions; 1) stressors contribute to psychopathology; 2) moderators influence the relation between stressors and outcome; 3) mediators explain the relation between stressors and outcome; 4) there is specificity between all the above relations; and 5) there are reciprocal and dynamic relations among stressors, moderators, mediators and psychopathology.

The authors view moderators as characteristics of the child or the child's context prior to the stressor. Mediators are substantially increasing or decreasing characteristics of the child or the child's context in response to a stressor. Thus, mediators are assumed to be activated or caused by the stressor and thereby account for the relation between the stressor and the outcome (Grant et al., 2003; Baron & Kenny, 1986). Several specific hypotheses grows out of the mutually inclusive propositions; a) each variable influences the other, b) the role of each variable may vary across stressors and time, and c) the reciprocal and dynamic relations among stressors, moderators and mediators will predict both the onset and development of psychological symptoms.

The perspectives and theoretical models presented above have been sources of inspiration throughout the work with this study. The substantial focus in the manuscripts has been within the field of developmental psychopathology. The research questions are formulated based on theoretical perspectives on development (life span models) and on relations between predictors and outcome variables (vulnerability model and stressor-model). These models have also influenced the statistical design and methods used in the study.

1.3 Previous research

Within the field of developmental psychopathology, numerous studies have focused on the development of emotional problems. Some of the central questions concern the underlying structure of emotional problems, and disentangling the developmental pathways to such problems is of major concern.

1.3.1 Dimensionality and construct validity of emotional problems

What is the underlying structure of emotional symptoms, is it a one-, two- or multi-dimensional construct? Anxiety and depression are in the current nomenclature of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1994) conceptually and empirically perceived as distinct phenomena. At the same time we know that anxious and depressive symptoms are highly correlated, often with comorbid

disorders (Cannon & Weems, 2006; Kendall, Kortlander, Chansky, & Brady, 1992). This raises the question of the underlying structure of anxiety and depression, and how useful a separation of symptom groups is. Some have argued for a single syndrome in children and early adolescence (Achenbach, 1991; Wadsworth, Hudziak, Heath, & Achenbach, 2001). Behavioural symptoms are only indicators of underlying constructs of psychopathology, and emotional-behavioural indicators used in symptom scales often lack specificity in identifying different emotional sub-groups. Previous research on the structure of anxiety and depression in children and adolescents indicate different levels of convergent and discriminant validity (e.g. Cole, Truglio, & Peeke, 1997; Lambert, McCreary, Joiner, Schmidt, & Ialongo, 2004; Cannon & Weems, 2006).

The younger a child is, the more common it is to classify emotional symptoms into one dimension. This may both be due to the difficulty of identifying distinct emotional symptoms in young children in general, and to the low frequencies of emotional symptoms in early childhood compared to later. In a review of comorbidity of anxiety and depression in children, anxiety was found to precede the onset of depression in 67% of the comorbid cases (Kovacs, Gatsonis, Paulauskas, & Richards, 1989). A hypothesis has been that childhood anxiety is a precursor of adolescent depression (Crick & Zahn-Waxler, 2003; Cicchetti & Toth, 1998). Studies of emotional symptoms have shown that anxious symptoms is more typical in childhood, while depressive symptoms are more common in adolescence (Cole, Peeke, Martin, Truglio, & Seroczynski, 1998; Pine, Cohen, Gurley, Brook, & Ma, 1998). This has led researches to suggest that anxiety may be the predominant expression of internalising symptoms in childhood, while depression is predominantly expressed in adolescence (Cannon & Weems, 2006).

In general, symptom scales used in preschool and school-aged samples have consistently shown a distinct internalising problem dimension (see e.g. Egger & Angold, 2006). This is supported by studies indicating that anxiety and depression are best considered as two facets of a single syndrome (Achenbach, 1991; Wadsworth et al., 2001). Clark and Watson (1991) have presented a theoretical model, the tripartite model, of the structure of anxiety and depression. Anxiety and depression are anticipated to share a common dimension, referred to as negative affectivity. The tripartite model was originally developed for psychopathology in adults, but several studies have supported an application of the model in children and adolescents (Cole et al., 1997; Chorpita, Albano, & Barlow, 1998; Lambert et al., 2004).

However, other studies have found anxious and depressive symptoms to cluster in distinct groups, and argue for separate syndromes in children and adolescents (Cannon & Weems, 2006; Ollendick, Seligman, Goza, Byrd, & Singh, 2003). Of the few studies that have examined the discriminative validity of anxious and depressive symptoms in children, one group concluded that their data showed successful convergent and discriminant validity for identifying clusters of anxiety and depression (Epkins & Meyers, 1994). Another group, Patterson, Greising, Hyland and Burger (1994), using the same data set, disagreed on this interpretation of the results. They reanalysed Epkins and Meyers' data and found that the measurements of anxiety and depression lacked adequate discriminant validity.

Cole and colleagues (1997) tested the relation between symptoms of anxiety and depression in third and sixth graders. They found that the underlying constructs of depression and anxiety were essentially indistinguishable among the youngest group, while there was some evidence of differentiation between anxiety and depression in the sixth graders. The construct validity of anxiety and depression measures is a major concern for epidemiological studies using symptom scales (Egger & Angold, 2006). Thus, there is a need for clarifying investigations of dimensionality in research on emotional symptoms in childhood and adolescence.

1.3.2 Multiple informants

Another major concern in the field is the validity and reliability of parent and self-reports. How reliable are self-reports for children and adolescents, how reliable are parental reports of emotional problems, and, in general, what are the criteria for a "gold standard"? Both self-report and parent-report of anxiety and depression are usually found to be quite reliable (Schniering, Hudson, & Rapee, 2000; Los Reyes & Kazdin, 2005). However, low levels of concordance between parent and child-reports of child adjustment are generally found, and, more specifically, within internalising behaviours (see e.g. Achenbach, McConaughy, & Howell, 1987; Kraemer et al., 2003; Offord et al., 1996, for reviews). The use of multiple informants is recommended, but how to combine data from different informants has been of major concern (Offord et al., 1996; Kraemer et al., 2003).

Relatively few researchers have integrated parent and child-reports on symptoms of anxiety and depression (Epkins & Meyers, 1994; Patterson et al., 1994). The use of structural equation modelling (SEM) and confirmatory factor analysis (CFA) procedures allow for the determination of the amount of trait, source and unique variance in the measures (see section 3.1 for a description of SEM). Separating the trait, source and unique effects make it possible to examine shared and unique contributions to symptom scores from multiple informants, as well as the impact of different sources. Even though the use of CFA procedures have been repeatedly recommended when analyzing continuous scores from symptom scales, few studies have applied these statistical methods when analyzing data from multiple informants (John & Benet-Martinez, 2000).

1.3.3 Predicting emotional problems

There is a wealth of literature examining the pathways to maladjustment from childhood to adolescence. Several global risk factors have been identified, but there is a pronounced need for knowledge on early predictors, and longitudinal relations between predictors contributing to development of emotional problems (Rutter, Kim-Cohen, & Maughan, 2006; Rutter, Moffitt, & Caspi, 2006; Essex et al., 2006; Rothbart & Bates, 2006). Predictors may act as either risk factors, protective factors, promotive factors or vulnerability factors (Gutman & Sameroff, 2004), and they may act through both mediating and moderating processes (Baron & Kenny, 1986; Kazdin, Kraemer, Kessler, Kupfer, & Offord, 1997). In order to be designated as a predictor, the potential impact (risk, protection, promotion) must precede the appearance of mental health symptoms (Cicchetti, 2006).

In other words, a *risk factor* allows the prediction of an incidence if the variable is positively related to a negative outcome later in time. Risk mechanisms specify the processes in which risk factors work through in order to generate an incidence. A *vulnerability factor* increases the probability of negative influence of risk processes (moderation). Factors with an enhancing impact may be separated into *promotive factors* that increase the probability of adequate development, and *protective factors* that reduce the probability of negative influence of risk processes (interaction/moderation). Predictors may have a direct impact on emotional problems, or their influence may work indirectly through other predictors (mediation), or by moderating or being moderated by the effect of other factors.

Longitudinal processes of moderation and mediation are indicators of developmental pathways to emotional problems. A developmental pathway perspective has as its ultimate aim to end in propositions of mechanisms that bring forward a specific outcome. The concept of a pathway focuses on "the possibility that different influences may operate at different times, or the same influence may operate differently at different times, and that discrete events may have long-term consequences" (Pickles & Hill, 2006), p. 216). Developmental periods, like the unfolding of puberty, and contextual transitions, such as change of day-care or schools and change of family status, may represent time windows in which maladaptive pathways may begin or be sustained in childhood and adolescence.

Gender

Studies reveal minimal gender differences in depression before puberty while the incidence of depression in adolescent girls has been found to be twice as high as among adolescent boys (see e.g. Crick & Zahn-Waxler, 2003; Zahn-Waxler, Crick, Shirtcliff, & Wood, 2006, for reviews). In a Norwegian study of a representative sample of adolescents aged 12-20, no gender differences in depressed mood were found at the age of 12, while girls scored 0.5 SD above boys from age 14 and onwards (Wichstrøm, 1999). Girls, more often than boys, report some type of anxiety symptoms, and already at age 6, twice as many girls have developed an anxiety disorder (Costello et al., 2005; Lewinsohn, Lewinsohn, & Gotlib, 1998). The symptom-level of anxiety among boys has been found to increase through the childhood years, but their trajectory was lower than the girls' (Essex et al., 2003).

A substantial amount of research has attempted to identify mechanisms contributing to higher levels of emotional symptoms in adolescent girls, but these studies have mainly used data from late childhood or adolescence (Lewinsohn et al., 1998; Wichstrøm, 1999). Already from preschool years and onwards, girls seem to have increased risk for developing symptoms of anxiety and depression as a result of exposure to maternal depression, family conflict and divorce (Essex et al., 2003). Even so, it is still unclear whether mechanisms from the early years contribute to later gender differences in emotional problems (Zahn-Waxler et al., 2006). There is also a lack of knowledge on how gender interacts with temperament traits in relation to development of internalising behaviour (Crick & Zahn-Waxler, 2003).

In the present study gender was included as a) a moderator in order to examine whether there are gender differences in other predictor effects on developmental outcomes; or b) a

predictor of symptoms of emotional problems in order to examine gender differences and to identify possible mediators of such differences.

Temperamental predictors

In the field of temperament research in childhood, three broad temperamental dimensions have gained wide acceptance (Rothbart & Bates, 2006; Rothbart & Bates, 1998; Sanson, Hemphill, & Smart, 2004; Shiner & Caspi, 2003). These higher-order dimensions are a) *Negative emotionality* (i.e. irritability, negative mood and high-intensity negative reactions), which can be differentiated into distress to limitations (irritable distress) and distress to novelty (fearful distress); b) *Positive affect,* which refers to the tendency to actively approach new people and prefer their company, and; c) *Conscientious/ constraint,* which has two subcomponents, the effortful control of attention (i.e. persistence, non-distractibility) and of emotions (i.e. the ability to inhibit one's behaviour if necessary).

In the present study temperament is defined as constitutionally based personality traits that are present in early childhood (Buss & Plomin, 1984). Temperament is operationalized with a measure of Buss and Plomin's four-dimensional EAS-model. This model includes two of the three higher-order dimensions, and four of the six lower-order dimensions, mentioned above: 1) *Emotionality* (the tendency to become negatively aroused easily and intensely), which is corresponding to irritable distress; 2) *Shyness* (the tendency to be inhibited and awkward in social situations) which is corresponding to fearful distress; 3) *Sociability* (the tendency to prefer the presence of others to being alone), which is a subcomponent of positive affect, and; 4) *Activity level* (preferred levels of activity and speed of action), which also is a subcomponent of positive affect (Rothbart & Bates, 1998; Rothbart & Bates, 2006). Within the field of developmental psychopathology, shyness and negative emotionality are found to be significant risk factors for development of internalising problems (e.g. Gilliom & Shaw, 2004; Mathiesen & Sanson, 2000; Mun, Fitzgerald, Von Eye, Puttler, & Zucker, 2001; Leve, Kim, & Pears, 2005; Rothbart & Bates, 1998).

Contextual predictors

Maternal depression, lack of social support, and family adversities are contextual risk factors that repeatedly are shown to be related to development and maintenance of emotional problems in childhood and adolescence (Essex et al., 2003; Leech, Larkby, Day, & Day, 2006; Ge, Natsuaki, & Conger, 2006; Shiner & Marmorstein, 1998; Silberg et al., 1999). These factors will be examined in the present study. However, most important risks do not exist in isolation and exposure to one risk is often continued by exposure to another risk (O'Connor, 2006). An emphasis on a certain set of risk and protective factors will, thus, be on expense of other factors.

Essex and colleagues (2003) found that maternal depression in infancy contributed to a preponderance of internalising symptoms in preschool-aged boys, while initial exposure of marital conflict in the toddler/preschool years contributed to a preponderance of internalising symptoms in girls. In a later study of the same sample, Essex et al (2006) found that prenatal maternal history of depression and family distress in infancy predicted mental health

problems in third graders in a high SES group. Effects of early levels of maternal distress were mediated through maternal distress measured at the age of 4 years.

In a study of predictors of anxious and depressive symptoms in 10 year-old children from a low-income population, prenatal maternal depressive symptoms and lack of social support were significant predictors, but these factors were not significant at later waves (18 moths, 3 and 6 years) (Leech et al., 2006). Life events and family conflicts were not found to be related to child symptoms at any wave.

Findings from a study of 220 preschool predictors of self-reported anxiety and depression in preadolescence revealed that only 5 and 8 parent-reported predictors were significantly related to respectively anxiety and depression (Mesman & Koot, 2000). Leve et al (2005) found that maternal distress and child shyness at age 5 predicted internalising problem from age 5 to 17, and that maternal distress also predicted increasing internalising trajectories for girls. They suggested that these two factors either had very powerful long-term effects, or they contributed to a series of environmental events that mediated early characteristics and later problems.

Identifying early markers of emotional problems might give important contributions to the field. However, our knowledge of early predictors is still inconsistent and we lack knowledge about long term effects of predictors present before the age of three. In addition, early identification raises several new research questions concerning how the markers impact later emotional problems. There are not indicators of the processes in subsequent age intervals, nor is it known whether the predictors are mediated by other variables (individual and/or contextual) in their relation to later emotional problems. For example, are the early effects of maternal distress mediated or moderated by dimensions in other contextual or individual risk domains?

Longitudinal relations between predictors

Longitudinal relations between predictors involve mediating and moderating processes. Based on the finding that maternal distress, family adversities, social support, child emotionality and shyness are among the most significant predictors of emotional problems, research on mediating and moderating processes involving these predictors will be summarised below.

Processes including maternal distress: In their study of impacts from risk factors on child mental health, Essex and colleagues (2006) found indications of transmission of risk among children of depressed mothers. They conclude that prenatal maternal depression predicted family distress in infancy. Further, family distress had a direct effect on symptom severity of both internalising and externalizing problem behaviours in third grade, and an indirect effect on symptom severity through both maternal distress and child distress and dysregulation. Only child temperament and sex predicted symptom directionality, with feminine gender and social inhibition and withdrawal related-negativity as predictors of internalising symptoms. The findings led them to present a pathway of preponderance of internalising symptoms in a high SES-sample, that were characterized by inhibited preschoolers who exhibited socially

withdrawn and anxious behaviour following social and academic impairments after the transition to primary school.

Processes including family adversity/stressful life events: Stressful life events are found to mediate the relation between family history of mood disorders and depression in preschoolers aged 3 to 5.6 years of age (Luby, Belden, & Spitznagel, 2006). A relation between family stress and internalising problems is found to be moderated by gender (Gaylord, Kitzmann, & Lockwood, 2003). Increasing number of stressors contributed to decreasing internalising behaviour among school-aged girls, but not boys. It is postulated that stressful life events may be generated by depression; referred to as the stress generation hypothesis (Hammen, 1991). When testing the longitudinal relations between stress and depression in children and adolescents, Cole and colleagues (2006) found evidence for both directions. However, while stress exposure predicted depression across age, the stress generation hypothesis received stronger support with increasing age.

Processes including social support: Lack of social support is found to mediate the effect of maternal depression on emotional problems in early adolescence (McCarty, McMahon, & Conduct Problems Prevention Research Group, 2003). Lack of social support is also found to increase maternal unresponsiveness to infants with a difficult temperament, while this effect was not so evident among mothers with less irritable babies (Crockenberg, 1986). Thus, contextual influences may have an impact on the reciprocal relationship between mother and child from early on. Social support may act as a buffer between stress and psychopathology. However, social relations can be negatively related to stress in that some social networks may be a greater source of stress and trouble than support (Thompson, Flood, & Goodvin, 2006). This complex linkage between support and stress in relation to development of problems further emphasizes the importance of studying such relations over time using prospective longitudinal research designs.

In addition, studies of longitudinal relations between predictors and emotional outcomes point to the mutual amplifying processes between the child and its environment. LaFreniere and Dumas (1992) found that children who experienced more negative reciprocity from their mothers were perceived as less competent and more anxious and withdrawn by their teachers. The authors interpreted this as an indication of a transaction process that had been internalized which the child carried forward into other settings.

Processes including child temperament: One of the main findings in studies of shyness is that the more shy a child is, the more difficulties he or she has in interpersonal relations, thus increasing the probability of developing internalising symptoms (Parker, Rubin, Erath.S.H., Wojslawowicz, & Buskirk, 2006). Greco and Morris (2002) emphasize the clinical importance of childhood shyness and related social difficulties and point out that we need to identify variables that serve a protective function to be able to decrease vulnerability and prevent maladjustment. Child characteristics that enhance social skills, and thereby interpersonal relations, may serve as protective factors for developing internalising symptoms. Physical activity is a basic and important part of young children’s play, and early play experiences enhances development of social skills (Pellegrini & Smith, 1998). Low levels of vigorous

activity and high levels of sedative activity in early adolescence have been found as risk factors for depressive symptoms (Sund, 2004).

Maternally reported family conflicts have been associated with teacher-rated internalising problems, but only for preschool children rated high on negative emotionality by their teachers (Tschann, Kaiser, Chesney, Alkon, & Boyce, 1996). In general, previous research supports the picture of child negative emotionality as an amplifier of environmental risk for development of psychopathology. However, most of these studies have been done with cross sectional data, within a limited age span, and mainly with methods not accounting for measurement error. Future research needs to investigate the processes supporting these effects across time, in order to: 1) understand the developmental pathways; 2) examine whether there are sensitive periods for negative effects of combinations of different temperament traits and/or contextual influences; and, 3) see whether there are selective pathways for anxious and depressive symptoms.

Differentiated prediction of anxiety and depression

The identification of unique predictors of anxiety versus depression has been examined in several studies. Early exposure (before age 5) to maternal prenatal stress, maternal marital discord and family adversities are shown to be significantly stronger related to anxiety disorders than to depressive disorders (Phillips, Hammen, Brennan, Najman, & Bor, 2005). The authors suggest that anxiety seems to be more related to early stress exposure, while depression may be related to more proximal stressors. This is supported by a study where Moffitt and colleagues (2007a) studied 18-32 year old individuals from the Dunedin Study to examine differential prediction of Major Depressive Disorder (MDD) and Generalised Anxiety Disorder (GAD). They report that adverse family environment, child behaviour problems and inhibited temperament in childhood predicted pure GAD, but not pure MDD. Pure MDD were uniquely related to family history of depression and low positive emotionality. In a study of the effect from 26 different risk factors within the domains of childhood adversities on psychiatric disorders, Kessler and colleagues (1997) found that mainly all adversities were significantly related to all of the broad classes of disorders, and not only to specific disorders.

The studies referred to above have examined predictors that differentiate between disorders of anxiety and depression. However, it is important to examine whether these results are confirmed when predicting *variation in symptoms* of such emotional problems. Such prediction will contribute to the confirmation of whether we are focusing on the same underlying construct when examining symptoms, as when we are studying disorders. In general, there is a paucity of research on specificity of anxious versus depressive symptoms (Phillips et al., 2005).

Knowledge needs on emotional problems in children and adolescents

An issue that has received limited attention is the underlying structure of emotional syndromes. Within the field of developmental psychopathology, it seems like symptom scales mainly have measured anxiety, depression or internalising problems without questioning the fruitfulness of separating or combining such symptoms. Scales assessing emotional symptom have generally had a limited focus on the underlying structures of the constructs, and

whether the transition from childhood to adolescence bring forward a one- or two dimensional constellation of emotional symptoms. If symptom scales measuring anxiety and depression are able to discriminate the two dimensions, this will support the use of differentiated scales. Identification of unique predictors would also support a separated perspective on anxiety and depression.

Grant and colleagues (2003) stress that longitudinal research measuring mental health outcomes, stressors and potential mediators and moderators at each of several time points are needed to test the relations among the variables over time. They recommended testing specific models of mediating and moderating mechanisms that lead to psychological distress. The lack of studies with potential to single out specific effects is pointed out (studies including more than one type of stressors and more than one type of outcomes) (Grant et al., 2003; McMahon, Grant, Compas, Thurm, & Ey, 2003). The importance of measuring contextual impact on depressive symptoms in early adolescence is underscored in a study of a Norwegian population-based sample of 2465 adolescents (Sund, Larsson, & Wichstrøm, 2003). Hence, there is still inconclusive knowledge regarding the underlying structure, early predictors and pathways of emotional problems in childhood and adolescence.

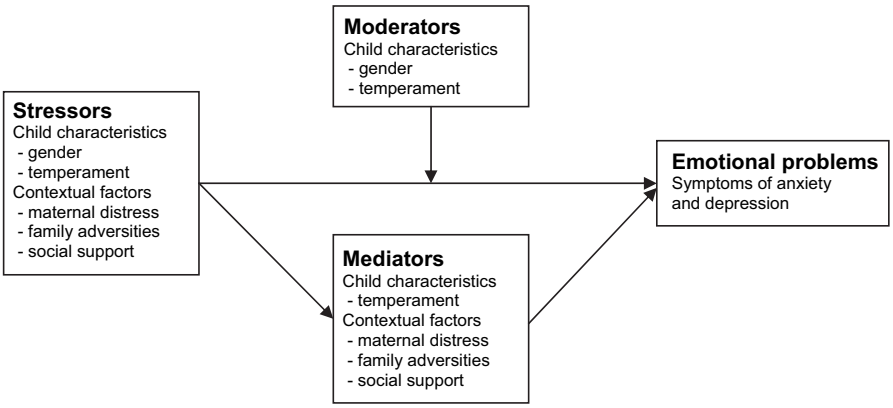

Figure 1. *Model of longitudinal relations between predictors and emotional problems*

The examination of developmental pathways to emotional problems in childhood and adolescence in the present study is based on the model in Figure 1. This model is influenced by Grant and colleagues' (2003) perspective on the relation between stressors in the development of child and adolescent psychopathology. The model is based on the following assumptions regarding the developmental pathways to emotional problems: a) Stressors such as particular child characteristics and contextual factors contribute to emotional problems, b) child characteristics and contextual factors explain (parts of) the relation between earlier predictors and emotional problems, c) child characteristics influence the relation between predictors and emotional problems. Thus, we assume that particular child characteristics and contextual predictors may act as both stressors and mediators in relation to emotional problems, while only child characteristics may act as moderators of the relation between stressors and emotional problems.

1.4 Aims of the present study

The present study aims to contribute to the understanding of development of emotional problems. The study seeks to use developmental theory and methodologically advanced analysis to illuminate pathways to childhood and adolescent emotional problems. Both the design and the data are well suited for investigating the dimensionality and the construct validity of emotional problems and to explore the moderating and mediating processes that contribute to such development in childhood and early adolescence. Specifically, the study aims to:

1) Investigate the dimensionality and construct validity of emotional problems
Subordinated aims encompass different investigations of self-reported and parent-reported measures of symptoms of anxiety and depression in 12-13 year old adolescents. More specifically, the sub-aims include examining: a) Measurement models across respondents and traits. b) Measurement invariance and agreement between parent-report and self-report. c) How well symptoms of anxiety and depression can be discriminated or how overlapping the symptoms are at the threshold of adolescence. d) A model that combines child- and parent-reports in a way that informs us of the underlying sources of variance.

2) Identify predictors, moderating and mediating pathways to emotional problems
Subordinated aims include examining: a) Relations among temperamental shyness, activity level and internalising problems from age 1.5 to age 8-9. We specifically intend to investigate whether activity level moderates the relation between shyness and internalising problems, and whether this relation was the same for boys and girls. b) Whether maternal distress, family adversities, social support, and temperamental emotionality and shyness from age 1.5 to age 8-9 predict emotional problems at age 12-13. c) Direct and indirect pathways of temperamental and contextual predictors to later covarying symptoms of anxiety and depression. d) Whether there are unique predictors of anxious versus depressive symptoms in early adolescence.

2. MATERIALS

The present study is part of the Tracking Opportunity and Problems (TOPP) study. The TOPP study is a longitudinal, prospective community-based project designed to investigate the influences of environmental risk and protective factors, child temperament, and maternal personality factors on mental health problems and social competence among children and their parents.

2.1 Sample and procedure

All families from 19 geographic health care areas in eastern Norway that visited a child health clinic in 1994 for the scheduled 18 month (t1) vaccination visit were invited to complete a questionnaire. More than 95% of all Norwegian families with children attend the public health program eight to twelve times during the first four years of the child’s life. The families who

participated at t1 received a similar questionnaire when the children were 2.5 years (t2), 4.5 years (t3), 8-9 years (t4) and 12-13 years old (t5). Of the 1081 eligible families, 939 (87%) participated at t1, 804 (86% of t1) families at t2, 760 (81%) families at t3, 535 (57%) families at t4 and 610 (65%) families at t5. The maternal reports at the different waves included 921 (t1), 784 (t2), 737 (t3), 512 (t4) and 594 (t5). 547 adolescents filled in their own questionnaires at t5 (58%). The questionnaires were administered by the health-care workers at t1-t3. At subsequent waves, questionnaires for mothers (t4) and mothers and children (t5) were sent by mail. The parents could choose if the mother or the father should complete the questionnaire at t1-t4, and at t5 the mothers were encouraged to answer (besides the adolescents). Since very few fathers participated across time, the paternal questionnaires have not been analysed in this thesis.

The 19 health care areas were overall representative of the diversity of social environments in Norway: 28% of the families lived in large cities, 55 % in densely populated areas and 17% in rural areas. The ages of the mothers ranged from 19 to 46 years at t1, with a mean of 30 years (SD = 4.7). The sample was predominantly ethnic Norwegian families from the middle class. Data from the child health clinics showed that non-respondents at t1 did not differ significantly from respondents with respect to maternal age, education and employment status, number of children or marital status. See Table 1 for a comparison of demographic sample characteristics at t1 between the remaining sample and the drop-out sample at t5.

Table 1. *Sample characteristics (in percent) at t1 between remaining and drop out sample*

	All at T1	Remain at T5	Drop-out at T5	Chi-sq test
Maternal demographic data				
Education: 11 years or less	37	31	47	
Education: 12-15 years	48	51	44	
Education: 16 years or more	15	18	9	P<.01
Employment: No paid work	37	32	45	
Employment: Part time work	32	35	27	
Employment: Full time work	31	33	28	P<.01
Economy: Doing poorly	6	5	8	
Economy: Neither good or bad	41	41	40	
Economy: Doing well	53	54	52	n.s.
Single status*	9	8	11	n.s.
Gender (Girls)	51	55	46	P<.05

* Not living with spouse or partner

See Table 2 for a comparison at t1 between mean levels of the predictors from the remaining sample and the drop-out sample at t5.

Table 2. *Differences in mean and standard deviations of predictors between remaining and drop out sample at t1*

Predictors	All at t1 M (SD)	Remain at t5 M (SD)	Drop-out at t5 M (SD)	T-test
Child shyness	2.16 (.72)	2.15 (.72)	2.18 (.72)	n.s.
Child emotionality	2.42 (.72)	2.39 (.73)	2.48 (.70)	n.s.
Child activity	4.24 (.61)	4.22 (.61)	4.28 (.61)	n.s.
Maternal distress	1.35 (.34)	1.35 (.32)	1.35 (.36)	n.s.
Family adversities	1.21 (.18)	1.21 (.18)	1.22 (.18)	n.s.
Social support	4.26 (.60)	4.28 (.58)	4.22 (.63)	n.s.

Analyses of sample attrition from t1-t4 showed that the remaining families were not significantly different at t1 from the drop-out sample regarding the predictors used in this study (maternal distress, family adversities, social support and child temperament). The remaining families at t4 had significantly higher levels of education and work employment at t1 compared to the drop-out sample. All predictors and outcome variables have less than 5% missing at each time-point, and generally most of the variables have less than 3% missing at each time-point (for missing data treatment see section 3.1.3).

2.1.1 Ethical considerations

The longitudinal data collection has been approved by The Data Inspectorate and the Regional Committee for Medical Research Ethics. The participants have given their written consent. Analyses have been conducted on anonymous data. General guidelines for research have been followed.

2.2 Measures

2.2.1 Outcome measures

Internalising problems t1-t3

Internalising behaviour problems from t1 to t3 were measured by forming an average of three items covering worrying, sad and fearful behaviour tendencies in the child. The parent was asked to rate the child's typical behaviour at the time being. The items 'Has many different worries, broods over things' and 'Is often frightened by loud noises and unexpected things' was taken from The Behaviour Checklist (BCL; Richman & Graham, 1971). The BCL measures problems related to the child's behaviour and adjustment to family life. We added a question about sadness ('Seems often, or for long periods, to be unhappy'), since the BCL does not cover this important symptom of internalising behaviour. Each of the behavioural categories were coded 0, 1, or 2 where '0' signifies no difficulties, '1' indicates moderate difficulties, and '2' substantial difficulties. The Cronbach's alpha for the internalising scale were .42 at t1, .48 at t2 and .47 at t3, with a mean corrected item-total correlation of respectively .26 (varying between .22 and .33), .31 (varying between .28 and .38), and .29 (varying between .22 and

.39). The average inter-item correlations are comparable to levels reported elsewhere for this type of scale and age of children (Mathiesen & Sanson, 2000).

Internalising problems t4

Internalising problems at t4 were measured by an average of the five items that form a subscale of emotional problems in the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1994). The parents were asked to rate the child's behaviour based on the last 6 months of the school-year. The items were rated on a 3-point scale ranging from 0 (not true) to 2 (very true). Three of the items in this scale ('Many worries or often seems worried', 'Many fears, easily scared', and 'Often unhappy, depressed or tearful') were equivalent to the worried, sad and fearful items from t1-t3, while the two other items covered somatic symptoms and nervousness/insecurity ('Often complains of headaches, stomach-aches or sickness' and 'Nervous in new situations, easily looses confidence'). The five items contributed almost equally to the .66 Cronbach's alpha. The SDQ have been applied to Norwegian samples within similar age range earlier, showing satisfactory psychometric properties (e.g. Van Roy, Groholt, Heyerdahl, & Clench-Aas, 2006; Rønning, Handegaard, Sourander, & Mørch, 2004).

Symptoms of depression t5

Both self and maternally reported symptoms of depression were measured with the Short Mood and Feeling Questionnaire (SMFQ; Angold et al., 1995). The SMFQ is a uni-dimensional self- and parent-reported scale designed for use in epidemiological studies of depression in children and adolescents, consisting of 13 items. The parent or child was asked to report on the child's feelings the two previous weeks. Two items, about restlessness and poor concentration, were omitted (due to space limitations in the questionnaire). The remaining 11 items addressed the affective and cognitive components of depression found to be the best predictors of depressive status (Angold et al., 1995). The child and the parent are asked to rate recent depressive symptoms on a 3-point scale (i.e. 'not true', 'sometimes true', and 'true'). The SMFQ consists of items from the Mood and Feeling Questionnaire (MFQ), which has been translated, back translated and validated in another Norwegian sample of adolescents (13-14 years) (Sund, Larsson, & Wichstrøm, 2001). Cronbach's Alpha was .83 for the maternal report, and .86 for the child-report.

Symptoms of anxiety t5

Symptoms of anxiety were measured with the Generalised Anxiety Disorder scale (GAD), a subscale of the Coolidge personality and neuropsychological inventory for children (CPNI; Coolidge, Thede, Stewart, & Segal, 2002). The GAD scale consisted of 12 parent-reported items derived from criteria from 3 different anxiety disorders in the DSM-IV (generalised anxiety disorder, separation anxiety disorder and social phobia). Of these 12 items, 6 items measure symptoms of separation anxiety disorder (SAD) in addition to GAD. Even though the CPNI does not include a social phobia scale, three items in the GAD scale are equivalent to DSM-IV criteria of social phobia. The self-reported items were constructed by changing the wording of the parent-reported items (i.e. 'My child worries too much' into 'I worry too much'). The parent or child was asked to report on what has been typical for the child the last

months. The items were rated on a 4-point Likert-type scale (i.e. 'not true', 'seldom true', 'sometimes true', and 'always true'). The CPNI has been translated and back-translated in another Norwegian study (Kristensen & Torgersen, 2007). Cronbach's Alpha was .78 for the maternal report, and .86 for the child-report.

Latent variables of anxiety, depression and internalising problems t5

Latent factors of anxiety and depression were represented by the shared variance of the maternal and self-reported measures. Core internalising problems were operationalised as the underlying construct of the latent factors of anxiety and depression. Thus, a higher-order latent factor accounting for the informant-consistent covariance between anxiety and depression was modelled to represent core internalising problems. This approach implies separation of the unique and common variance in anxiety and depression, and enables the potential prediction of each of these three sources of variance.

2.2.2 Predictors

Temperament

Shyness, emotionality and activity level was assessed by the EAS Temperament Survey for Children: Parental ratings for children aged 1-9 years (Buss & Plomin, 1984). Each temperament trait is measured by five items rated on a 5-point scale ranging from 1 (not typical) to 5 (very typical). Because of ambiguity in the translation, one item was deleted from each dimension. The items for each dimension are combined into a mean index.

Shyness refers to the tendency to be inhibited and awkward in new social situations. The items used for shyness were 'Tends to be shy', 'Is very sociable' (reversed), 'Takes a long time to warm up to strangers', and 'Is very friendly with strangers' (reversed). Cronbach's alpha for shyness was .75 (t1), .75 (t2), .77 (t3), and .77 (t4).

Emotionality refers to the tendency to become aroused easily and intensely. The items used for shyness were 'Cries easily', Often fusses or cries', 'Gets upset easily', and 'Reacts intensely when upset'. Cronbach's alpha for emotionality was .66 (t1), .68 (t2), .71 (t3), and .67 (t4).

Activity level refers to preferred levels of activity and speed of action. The items used for activity level were 'Is always on the go', 'Is off and running as soon as she wakes up in the morning', 'Is very energetic', and 'Prefers quiet, inactive games to more active ones' (reversed). Cronbach's alpha for activity was .68 (t1), .69 (t2), .75 (t3), and .75 (t4).

An examination of the factor structure, reliability and stability of the full EAS with this data set has shown that the temperament scales has acceptable psychometric properties (Mathiesen & Tambs, 1999).

Maternal distress

Maternal symptoms of anxiety and depression, here called maternal distress, were measured by the 25-item version of the Hopkins Symptom Check List (HSCL-25; (Hesbacher, Rickels, Morris, Newman, & Rosenfeld, 1980). The reliability of the HSCL has earlier been well established in a Norwegian sample (Tambs & Moum, 1993). Results indicate that the HSCL-25 is an acceptable screener for diagnoses of depression as defined by the ICD-10 criteria in the Composite International Diagnostic Interviw (CIDI) (Sandanger et al., 1998). Two items, "thoughts of ending your life" and "loss of sexual interest or pleasure", were excluded from the Norwegian questionnaire because some subjects in the pilot-project perceived them as offensive. Each of the 23 items was rated on a 4-point scale, and the overall mean was used. Cronbach's alpha for maternal distress at t1-t4 was .90, .89, .90, and .92.

Family adversities

The family adversity index was based on questions referring to experiences on enduring problems during the last 12 months in the following areas: Housing, employment, economy, their own and partner's physical health, use of alcohol, relationship to partner, childcare arrangements, children's illnesses, and child rearing (Mathiesen & Sanson, 2000). The answers were dichotomized and a mean composite measure was formed by the 10 items. Cronbach's alpha for family adversities at t1-t4 was .63, .64, .69, and .62.

Social support

Questions about social support tapped three aspects of the mothers' relationship to family, friends and partners, namely: 1) feeling attached and having contact; 2) getting respect and responsibility; and 3) feeling of belonging (Dalgard, Bjørk, & Tambs, 1995; Mathiesen, Tambs, & Dalgard, 1999). The social support index was formed by taking the mean of 9 items, each rated on a 5-point scale. Cronbach's alpha for social support at t1-t4 was .74, .78, .77, and .76.

3. STATISTICAL METHODS AND DESIGN

All analyses were done with questionnaire data. The predictors were derived from maternally reported items, and the outcome measures were derived from maternally and child-reported items. Statistical analyses were conducted with computer software SPSS for Windows Version 14, Mplus Version 4.0 (Muthén & Muthén, 2006) and S-Plus (Pinheiro & Bates, 2000). Analyses of means and standard deviations were applied to inform on central tendencies and variations, correlation analysis was applied to inform on bivariate associations, and reliability analyses was applied using Cronbach's alpha to report on the associations between the items in a scale or index.

3.1 Structural equation modelling

The longitudinal design made the data material especially suitable for structural equation modelling (SEM). SEM provides a tool for testing theoretical models that hypothesize how sets

of observed variables define constructs, and how these constructs are related to each other (Jöreskog & Sörbom, 1993; Muthén & Muthén, 2006). Regression, path and confirmatory factor models are integrated within a single data analytic framework. The main goal of SEM analysis is to determine to which extent a theoretical model is supported by sample data. This type of modelling displays several advantages when compared to more traditional multivariate approaches, such as: a) control of random error through the estimation of latent variables, b) combined estimation of design and structural models , c) test and comparison of alternative causality models, with overall modification indices that specify the ability of specific models in explaining observed covariance structures, and d) opportunity to test complex relationship structures, including both mediating and moderating variables (Loehlin, 1998).

Model fit between the observed data and the SEM models is evaluated with Satorra-Bentler scaled statistic (S-Bχ2), the robust comparative fit index (CFI), and the robust root-mean-square error of approximation (RMSEA). The CFI provides a measure of the fit of a particular model relative to the null model, while the RMSEA provides a measure of the model fit relative to the population covariation matrix where the complexity of the model is taken into account. To conclude that there is a good fit between the model and the observed data, a CFI value greater than .90 and a RMSEA value of .06 or less, are considered necessary (Hu & Bentler, 1998; Bentler & Bonett, 1980).

3.1.1 Latent growth curve modelling

The data material is especially suitable for latent growth modelling (LGC, (Rogosa, Brandt, & Willett, 1982; Muthén & Curran, 1997), a method through which both the stability and change in phenomena may be studied as separate latent variables (Stoolmiller, 1995). In the SEM approach to LGC the loadings of the observed variables are fixed on the latent variables. The model estimates a latent intercept (stability level) and slope (change rate) for each individual, thereby expressing within-subject growth. Estimated paths describe direct and indirect associations between the latent variables. The LGC analysis estimates to what extent the starting points and slopes of the curves vary as a function of one or several measured variables differentiating individuals (between-subject growth). The major advantage of LGC, in addition to estimating individual stability and change, is that it allows level and change in one variable to be predicted and to predict other variables, it accounts for measurement errors (and correlation of errors) in both predictors and outcome variables and it tests mediation hypothesis (Burchinal, Nelson, & Poe, 2007).

A LGC model may be seen as a form of a multilevel model, which is the method applied in paper 2. In a two-level model individuals would normally constitute the first level and the grouping of individuals would constitute the second level. If we then see repeated measures as a function of time, i.e. reflecting a developmental process, the model for individual growth would constitute the first level (within-subject model) and the model for the variation of growth parameters across the individuals would constitute the second level (between-subject model). By applying such a model we can test the initial status (intercept) and growth rate (slope) on both the mean level and individual level. Multi-level models are a general way of

handling correlated data so the levels can correspond to any sort of grouping that would generate correlation.

3.1.2 Missing data

Missing data across time was treated by employing missing data techniques that include cases with partial data. Such techniques increase power and decrease potential attrition bias by adjusting for bias related to model variables. The statistical modelling was carried out using the LME procedure in S-Plus (Pinheiro & Bates, 2000), and the MLR procedure in Mplus (Muthén & Muthén, 2006), both using full information maximum likelihood (FIML), which takes advantage of subjects with partial data. Assuming the data is missing at random conditional on covariates included in the model, the so called MAR assumption, FIML estimation eliminates attrition bias. Even if MAR is not literally true, FIML is still the recommended approach (Schafer & Graham, 2002) because it outperforms common alternative approaches like complete case analysis or single imputation strategies.

3.2 Multitrait-multimethod design

Paper 1 applied the multitrait-multimethod (MTMM) matrix originally developed by Campbell and Fiske (Campbell & Fiske, 1959). The MTMM is a correlation matrix arranged by concepts (or traits) within methods (or sources). It is assumed that each of, at least, two traits is measured by each of, at least, two methods or sources. In the present study (paper 1), we have two sources using the same method (two informants using different versions of the same scales). Therefore we will further mainly use 'sources' (see e.g. Gomez, Burns, Walsh, & de Moura, 2003). The design allows for an examination of variance due to traits and sources, and of unique variance. The trait effects represent systematic variance in a specific manifest variable associated with a latent characteristic or trait. Trait effects are independent of the specific source, i.e. representing behaviour viewed in a similar manner by different sources (Gomez et al., 2003). Source effects represent the specific manifest variable associated with a latent source, and is traditionally viewed as a form of bias associated with characteristics of the rater. Unique effects include residual systematic variance not associated with the trait or source factors, and non-systematic effects. A significant amount of trait variance in the measures of depression or anxiety indicates convergent validity, while more trait than method variance across sources indicates discriminant validity (Campbell & Fiske, 1959; John & Benet-Martinez, 2000).

4. RESULTS

4.1 Summary of paper 1

"Symptoms of anxiety and depression in early adolescence: A multitrait-multisource factor analytic approach"

The purpose of the study was to examine self-reported and parent-reported symptoms of anxiety and depression in 12-13 year old adolescents. More specifically, we investigated the

level of agreement between parent- and child-reports and the construct validity of both the anxiety and depression scales. The final objective was to develop a model that combines parent- and child-reports in a way that informs us of the underlying sources of variance. Confirmatory factor analysis (CFA) was used to test factorial invariance and parent-child agreement across traits and sources. We applied CFA models on MTMM data to differentiate the reported variance into trait, method and unique variance, and to determine the convergent and discriminant validity of the measures in question.

The key findings were firstly that all four CFA models of parent- and child-reported anxiety and depression displayed a satisfactory fit to the data, indicating the appropriateness of the scales. Parent-child agreement was high compared to previous research, and about the same for anxiety (r=.50) and depression (r=.49). There was factorial invariance between the two informants' reports, confirming the internal structure of the scales. Thirdly, the overlap between symptoms of anxiety and depression were high for both informants, and the latent factors of anxiety and depression correlated .83. The MTMM analysis showed high levels of trait variance in all four measures. The results suggest evidence of convergent validity for measures of anxiety and depression, but weak evidence of discriminant validity. Lastly, the full model serves as a good example of how to integrate data from multiple informants on symptoms of anxiety and depression. The methods applied separated trait variance, source variance and unique variance and, hence, took care of the contributions from both informants. The importance of using more than one informant is underscored.

4.2 Summary of paper 2

"Temperamental activity level moderates the effect of shyness for boys, but not girls, on internalising trajectories from infancy to 8 ½ years"

The purpose of this paper was to study the complex interplay of temperamental shyness and activity level, gender and child internalising problems across time. The study used multilevel analysis to investigate the interaction between gender, child temperamental shyness and activity level and their effect on the developmental trajectory of maternally reported internalising behaviour among children. The children were rated on internalising problems and temperamental traits when they were 1.5, 2.5, 4.5 and 8.5 years old.

As hypothesized, the results showed that shyness consistently co-varied with internalising problems, with higher levels of shyness predicting higher internalising scores over time. By itself, activity level did not have a significant impact on internalising scores. However, there was a significant three-way interaction of gender, activity and shyness in predicting internalising behaviour. This interaction showed that, for boys, the impact of shyness on internalising problems was moderated by activity level. No such moderation effect existed for girls. Thus, the results indicated that shy boys, but not shy girls, are more protected against developing internalising problems when they have high levels of temperamental activity. We argue that this finding can be understood through gender-specific relational mechanisms and processes occurring between infancy and 8.5 years. These results contribute to our

understanding of the impact of temperament traits in development of internalising problems in boys and girls.

4.3 Summary of paper 3

"Predictors and pathways from infancy to symptoms of anxiety and depression in early adolescence"

The purpose of the study was to identify early predictors and pathways from infancy and onwards to internalising problems at age 12-13, and to examine whether there were unique predictors of anxious versus depressive symptoms. Structural equation modelling was used to explore longitudinal relations between contextual and temperamental risk factors and their prediction of core internalising problems and unique symptoms of anxiety and depression. Core internalising problems consisted of informant-consistent co-varying symptoms of anxiety and depression. Temperamental predictors were child shyness and child emotionality and contextual predictors were maternal distress, family adversities and lack of social support.

The results show that the predictors accounted for 32% of the variance in internalising problems. The contextual predictors had persisting impact on adolescent problems already from age 1.5. Two main pathways to internalising problems were identified. One pathway was through temperament, as nearly all risk factors were partly mediated through child emotionality in mid-childhood. Another pathway was through early contextual risk factors, with all direct and indirect contextual effects from before age five. As expected, girls were more likely than boys to show internalising symptoms in early adolescence, but the gender differences were generally not accounted for by the other predictors. The results showed a direct effect from family adversity in mid-childhood to symptoms of depression four years later. There were no unique predictors of anxious symptoms. The findings underscore the persisting impact of early contextual risk factors, and have implications for identification of children at risk. The importance of early interventions to prevent internalising problems in adolescents is stressed.

5. Discussion

The primary goal of this study was to examine the underlying structure, early predictors and developmental pathways toward emotional problems in childhood and early adolescence. The results indicate that the construct of emotional problems, as measured by maternal and self-reported symptoms of anxiety and depression, is mainly one-dimensional in early adolescence, but with the two symptom groups as underlying sub-dimensions. Even though the scales measuring anxious and depressive symptoms showed satisfactory structural and convergent validity for both maternal and self-reports, they showed weak discriminant validity. The examination of the impact from predictors on latent factors of anxiety and depression support this notion by only identifying one unique predictor from the 20 possible predictions.

Further, the results confirm the contribution from early predictors, mediating and moderating processes on variation in emotional problems in childhood and early adolescence. Child temperamental shyness and emotional problems in childhood co-varies, in that higher levels of shyness predicted higher internalising scores from age 1.5 to age 8-9. High temperamental activity levels in boys, but not girls, reduced these effects of shyness on emotional problems, indicating a moderational process. Early contextual factors of maternal distress, family adversities and social support predicted informant-consistent co-varying symptoms of anxiety and depression in early adolescence. There were indications of two main pathways to adolescent emotional problems; one mediated through temperamental factors and one through contextual factors measured before the age of five. Also, being a girl indicated greater vulnerability for emotional problems at the age of 12-13 years.

5.1 Methodological issues

5.1.1 Reliability

Reliability is a necessary condition for construct validity, and refers to the consistency of a measurement procedure (John & Benet-Martinez, 2000). Indices of reliability describe the extent to which the measured scores on some variable are reproducible. Characteristics of the instrument, the participant, and the testing situation are aspects that may have affected reliability in the present measures.

Internal consistency refers to the estimation of errors associated with the selected items in a measure. It may be tested by examining multiple items at one time or by obtaining ratings from multiple informants on one form. In the papers of this study both predictors and outcome measures are constructed as mean score indices. When constructing a mean score index, the random errors of single items are partly cancelled out, thus, producing more reliable measures (Kerlinger, 1986). Cronbach's alpha is used as an index of internal consistency. As alpha is the mean of all split-half correlations, both the interrelatedness of the items in a test and the length of the test will influence the reliability coefficient. Increasing the number of items will generally account for lower levels of inter-item correlations, but a large spread in inter-item correlations may indicate multidimensionality (John & Benet-Martinez, 2000).

The alphas of the measures in the present study ranged generally from moderate to high. The predictor index of family adversities had moderate alphas, ranging from .62 to .69. This is a formative index, formed by many different stressful life events. Such a multifaceted index would not be expected to demonstrate very high levels of internal consistency, given the diversity of aspects that is covered.

The internalising measures at t1-t3 in paper 2 have the lowest alphas among the measures. These mean score indices are constructed on the basis of three items meant to capture three aspects of preschooler's emotional behaviour; sadness, worrying and anxiousness. Their mean level of inter-item correlations are relatively low spread; varying from .22 to .33. A large spread can be an indication of multidimensionality (John & Benet-Martinez, 2000). Regarding that only one item cover each aspect of internalising behaviour, these levels of the

inter-item correlations may be seen as acceptable. However, the implication of such a low alpha on the analysis may be that the relation between the variables is under-estimated. Further, few items limit the area of generalizations that can be made, and also limit the possibility of an examination of convergent and discriminant validity. At the early ages of 1.5, 2.5 and 4.5 one would usually apply a one-dimensional measure of internalising (Egger & Angold, 2006). Though, at age 8-9, a measure with enough items (representing symptoms) to examine a one versus two-dimensional structure would have been preferable.

In addition to a higher number of items and high alphas, the outcome measures in the other papers are latent factors that are corrugated for errors. The alpha does not account for dimensionality in the measure, thus, a factor analysis is crucial for establishing the dimensionality. The outcome measures in both papers I and III are constructed by means of confirmatory factor analysis (CFA). CFA within the SEM framework eliminates random error by the optimal extraction of common variance between every indicator, resulting in a purer form of constructs (latent variables) (Schumacker & Lomax, 2004). This is an improvement of more traditional index construction procedures, which assumes that there is an equal amount of random error in each item.

By including both maternal and self-report of the measures in question, we get another indication of reliability. The estimated correlations between parent and child-reports were .49 for depression and .50 for anxiety in early adolescence (paper 1). Even though this is only a moderate level of informant agreement, it is relatively high compared to parent-child agreement in general and specifically for emotional problems (see e.g. Achenbach et al., 1987, for a review). To control for bias related to characteristics of raters, the outcome measures in paper 3 are all based on the common variance between maternal and child report.

5.1.2 Construct validity

Construct validity refers to the measurement procedure as a whole and reflects various psychometric properties of a construct. Different types of validation may be seen as different sources of evidence of construct validity, but the main question is: Do we measure what we intend to measure? Most of the measures used in the papers have established validity in previous research (see section 2.2), for which this study provides further support. However, some of the measurement procedures used in the present study requires further examination.

Campbell and Fiskes's (1959) multitrait-multimethod (MTMM) design is one of the major procedures used to establish construct validity, in the form of convergent and discriminant validity. Convergent validation refers to confirmation of independent measurement procedures, i.e. the degree to which measures that should be related theoretically are related empirically. Discriminant validity evidence refers to the ability of a test to discriminate the construct in question from other constructs.

Interpretation of the MTMM matrix requires the researcher to use judgement. Some studies report evidence for discriminative validity because their measures contain more trait than source variance (Epkins & Meyers, 1994; Gomez, Burns, Walsh, & Hafetz, 2005), while other

studies focus on the correlation within sources to be larger than the correlation within traits in order to show evidence of discriminative validity (Patterson et al., 1994; John & Benet-Martinez, 2000). The MTMM matrix it is a reminder of methods and sources as potential confounders.

In paper 1 we found evidence for convergent validity for both the anxiety and depression scores, but weak evidence for discriminative validity of the scores of the two symptom groups. Our results showed that anxiety and depression correlated higher within each informant, than the similar traits correlated between informants. This may both be an indication of an informant bias (e.g. the child's symptoms look the same through the mother's eye because of reasons belonging to the mother), an indication of the (lack of) specificity in the symptom scales, and/or an indication of the similarity between anxious and depressive symptoms in general. The trait correlation between informants in the present study is both an aspect of reliability and an aspect of validity. A high level of trait variance indicates evidence of convergent validity, but is at the same time an indication of agreement between the informants.

In paper 1 we developed a model which separates three types of variance in the latent variables of maternally and self-reported anxiety and depression; trait variance, source variance and unique variance (see Figure 1, paper 1). This model integrates strategies from two different approaches to modelling of MTMM data, the correlated trait-correlated method approach and the correlated uniqueness approach (Kenny & Kashy, 1992; Gomez et al., 2003). In our model, the trait variance represents the proportion of variance that is shared with the other informant. The source variance represents the proportion that is common for both traits within each informant, but not shared with the other informant. The unique variance is the proportion of variance that is not shared with the other informant, and not common between traits.

Even though our results showed a relatively high level of trait variance, almost 50% of the variance in the parent and self-reported trait measures were accounted for by source and unique effects (see paper 1 for a more detailed discussion). The source effect estimated in paper 1 may be seen as partly representing biases related to rater characteristics, also called systematic error. The unique effects included in addition informant-specific information of anxiety and depression. These findings indicate how dependent the symptom ratings of anxiety and depression are on the specific respondent, and underscore the importance of using more than one informant in order to maximise the validity of the scores.

Structural validity is also an aspect of construct validity. Such validation requires that "the correlational (or factor) structure of the measure is consistent with the hypothesized internal structure of the construct domain" (John & Benet-Martinez, 2000), p. 353). By conducting a CFA on both maternal and self-reports it is possible to examine the factorial structure of the scales, as is done in paper 1. Both the symptom scales of anxiety and of depression showed factorial invariance between the different informants, thus, an indication of structural validity.

Except for the preliminary results from Coolidge and colleagues (2002), there have not been published studies that validate the scores of the parent-reported GAD scale. In addition, the

present study has extended the use by constructing a self-report. The results of paper 1 validate the psychometric properties of the scale by showing a satisfactory fit for both the maternal and self-reported models. The GAD scale includes items on criteria from three anxiety disorders; separation anxiety (SAD), social phobia (SP) and generalised anxiety (GAD) (recently been replaced by overanxious disorder, OAD, in children). When we modelled this scale with two sub-dimensions (SAD and SP), and the GAD/OAD items loading directly on the latent variable of the GAD scale, we got a good fit between the data and the model. Both the self-rated and the parent-rated measure had the same internal structure, confirming this structure of the scale and the use of self-report.

A methodological restriction when using latent growth curve models is the imposing of homotypic continuity of behavioural expressions. In general, the distinction between homotypic and heterotypic continuity refers to "whether behaviours of interest are manifested differently over time and, if so, whether different sets of behaviour reflect some common process" (Curran & Willoughby, 2003, p. 599). We might expect that higher levels of emotional symptoms in 18 months old infants are expressed rather differently from emotional problems in a nine year old child. At the same time, this is a classic critical comment on the use of scale scores in empirical tests of development in general. Another choice is to use questionnaires with changing items over years, or change of questionnaires at different ages. Changing items of questionnaires creates a measurement dilemma; how do you then know that you are measuring the same behavioural domain?

Paper 2 includes a change of symptom scales in the measurement of emotional problems. The items in the scale used at t4 are more specific and concrete compared to the items in the index used at t1 to t3. The internalising trajectory shows an increasing trend from t1-t3, and then a decreasing trend from t3-t4. Some of the decline seen in the internalising trajectory from t3 to t4 might be attributable to a measurement change going from a more general to a more specific measure of internalising problems, and is not necessarily due to a decline in internalising problems per se. How to measure the same concepts across many years is one of the main challenges in longitudinal studies. This is especially true for our sample since we started when the children were so young; 18 months and onwards is a period with rapid developmental changes.

All the predictors are based on maternally reported data. One of the main objections against maternal ratings is that both perspective and context may influence the reports. This is partly accounted for by using reports from different informants of the outcome variables. Further, there is a risk of inflated associations between variables due to shared method variance. This limitation is most relevant for paper 2, where there is only one informant. Previous research has repeatedly demonstrated that parental reports have the strongest relation with other measures of different child behaviours (see e.g. Asendorpf, 1990; Prior, Sanson, Smart, & Oberklaid, 1995; Kochanska, Murray, & Coy, 1997).However, the impact of shared method variance is still a relevant limitation to the validation of the maternal reports in this study.

5.1.3 Generalisability

Both reliability and validity are basically concerns of generalisability. The concept of generalisability refers to which extent we can make inferences across observers, raters, samples, items, measures, outcomes, and other relevant measurement factors (John & Benet-Martinez, 2000).

The main question hereof is whether findings from the sample in question can be generalised to a broader population (Shadish, Cook, & Campbell, 2002). Critical aspects of postal questionnaires are the lack of response, the inability to check the quality of the responses and the characteristics of non-respondents (Kerlinger, 1986). A response rate of 60% is typical for population-based studies (Sundet, Magnus, Kvalem, Samuelsen, & Bakketeig, 1992). In the present study, the response rate for the different waves ranged from 87% to 57%, with 65% for parents and 58% for adolescents in the last wave. Compared to other population-based and long-term longitudinal studies, these numbers are considered satisfactory. The information on non-respondents initially (t1) indicate that the sample were representative of the general population. Attrition analyses show that the sample remaining at t5 seem to have somewhat higher levels of SES compared to the t1 sample, making the sample relatively well functioning.

However, with regard to the predictors included in the study, there were no significant differences between drop-out and remainders, which is a central point when examining covariation between variables. Generalizations of relationships are less vulnerable to sample effects compared to generalizations of prevalence (Aaberge & Laake, 1984). Selection bias may occur both in the predictor and outcome variables. A restricted range in either of the variables may result in reduced effect estimates. In the present sample it would be expected that the predictors generally show lower levels of risk compared to at-risk samples. Thus, the results may be under-estimating the effects of the risk factors on internalising problems. Regarding the prevalence of internalising symptoms, the sample seems to be representative of the level of internalising symptoms that is reported elsewhere in population-based studies (Costello et al., 2003).

One concern is generalization to the target-population, and another concern is the generalisation across populations (Shadish, Cook & Campbell, 2002). Even though most of the findings from the TOPP study are consistent with international (western) research within the field of developmental psychopathology, some of the relationships may be specific to a selected Norwegian population. The sample mainly includes families with ethnic majority background. Further research is, thus, needed to see whether our findings transcend local conditions and ethnic variation.

A third concern is generalisation across methods. In the present study we have only used one method of data collection - rating scales. Even though we have two sources of information, raising the validity of the reports, the combination with other methods like interview or observational data would have increased the generalisability.

5.1.5 Missing data and attrition

Differential attrition and non-response represent a potential threat to the validity of the findings. The percentage of missing values per wave was under 5 %, and mainly under 3 %. Respondents with more than i.e. 5 values missing on a total of 12 selected items were excluded from the analysis. Missing data across time were handled with missing data modelling techniques (see section 3.1.2), where missing at random (MAR) is presumed. Modelling of biased estimates due to missing data have shown that missing data modelling gives a superior closeness to the true estimates, compared to listwise deletion and use of sample mean. Part of this difference is due to the listwise deletion and use of sample mean narrows the sample variance. Missing modelling takes care of the true variance in the population to a greater extent (Newman, 2003).

An important difference from imputation techniques, where each individual is given an estimated value, is that the MAR procedure ensures that the uncertainty of the missing data will be accounted for in the standard error and chi square. Ontologically, it is not assumed that we know what individuals may have answered (re imputation), but we rather estimate with a degree of uncertainty how the multivariate covariance matrix would have been over time. The degree of uncertainty that is included in the model is given by the level of missing data, and by the strength of the covariates.

The measures of temperamental and contextual predictors are maternally reported, and the outcome variables are symptoms of anxiety and depression measured by maternally and self-reported rating scales. Below I will mainly use a short form of the measures, such as "shyness" and "internalising problems", instead of using the more correct forms, such as "the measure of maternally reported child temperamental shyness" and "the measure of maternally reported child/adolescent symptoms of anxiety and depression". I am aware that "the measure of maternally reported child temperamental shyness" refers to a measure representing (for better or worse) the construct of shyness. However, I believe the discussion will be easier to understand and follow when I use the short forms.

5.2 The dimensionality in emotional symptoms

Continuous measures are preferred to categorical variables in this thesis, as one of the most important focuses is on individual differences and variations thereof. Continuous measures capture more information about differences between individuals (MacCallum, Zhang, Preacher, & Rucker, 2002). One of the main objections against the use of symptoms, as opposed to disorders, is that disorders might be qualitatively different than subclinical symptoms. Using categorical taxonomies like disorders are limited in the sense that they only capture information on the extreme levels of psychopathology, and it is not possible to examine how a disorder varies with variation in predictors. Both outcome scales used at t5 are based on DSM IV criteria, can be scored quantitatively, and are, thus, suitable as indicators for latent variable analyses.

5.2.1 Underlying structure of anxiety and depression

Two interpretations of the findings in this study may point in opposite directions. Results from paper 1 and 3 suggest that symptoms of anxiety and depression should be treated as one phenomenon in early adolescence, with correlation at .83 between the latent variables in paper 1 and with nearly all risk factors predicting co-varying levels of internalising problems in paper 3. However, the finding that one risk factor predicts depressive symptoms uniquely, indicates that we should not discard the usefulness of separating the symptoms.

The results indicate that the symptom scales used in this study do not provide a differential measurement of anxious and depressive symptoms. Is this because of inadequate scales or because emotional symptoms are hard to differentiate by means of parental and self-reported rating scales? Except for the discriminative validity, both the depression scale (SMFQ) and the anxiety scale (GAD) show satisfactory psychometric properties in this study. Previous research does also support the use of the SMFQ (Angold et al., 1995; Angold, Erkanli, Silberg, Eaves, & Costello, 2002), and the parentally reported anxiety scale (Coolidge, DenBoer, & Segal, 2003). The parent report of symptoms of anxiety was changed into a self-report of anxiety for this study, mainly by changing the first word in each item ("I" instead of "the child"). The analyses in paper 1 show adequate fit for both models of self-reported and maternally reported anxiety. Even though the anxiety scale includes items on criteria for Separation Anxiety Disorder and Social Anxiety Disorder which makes the estimated model more complex, the modelled internal structure is similar for both scales. Thus, the psychometric properties support the use of both scales.

However, the model with anxiety and depression as separate traits had a satisfactory fit, and the correlation between the higher order constructs was significantly different from 1 (paper 1). Even though it is argued that correlations over .80 suggest such overlap that a one-factor model should be preferred (John & Benet-Martinez, 2000), two latent variables can be highly correlated but still have important differences. The decision of one versus two factors has to consider current theory as well. For example, the tripartite model postulated by Clark and Watson (1991) indicate that we should view anxiety and depression as two dimensions of a more general factor of emotional symptoms or negative affectivity.

It might be that symptom scales describe anxious and depressive symptoms that typically generalize across contexts and informants. However, different behaviour in different contexts is also relevant for the interpretation of constructs. It seems like symptom scales on emotional problems are not specific enough for the selected traits to be discriminative across different perspectives. Context specific symptoms of anxiety and depression can be less visible and significant, and may require observational data or longitudinal data to be manifested.

5.2.2 The relation between psychopathology and temperament

In the ongoing dispute on the relation between temperament and psychopathology, the issue of measurement 'contamination' has been a concern (Rothbart & Bates, 2006). Specifically, it is indicated that the association between shyness and internalising problems is an artefact of

the conceptual overlap between measures of each domain. Sanson, Prior and Kyrios (1990) argued that some of the items designed to assess problem behaviour could just as well be construed as measures of temperament. Sheeber (1995), however, found that intervention can effect changes in parent ratings in behaviour problems without corresponding changes in temperament, and advances this in support of the notion of a unique component to each domain. The individual items for the two scales used in paper 2 seem at face value to tap different behaviour and emotions. The correlation between the internalising scales and shyness ranges from .15 to .35 in paper 2, and from .08 to .19 in paper 3, suggesting a significant amount of independence between the measures. The issue of conceptual overlap seems more relevant to main effects (i.e. paper 3 which had lower correlations) and less relevant to moderation and especially moderation involving gender (paper 2).

However, we can not exclude that some psychopathology may reflect an extreme expression of a temperament. Results from twin studies have indicated that temperament and psychopathology partly reflect a shared genetic diathesis (Watson et al., 2005), and several studies have documented that temperamental emotionality and symptoms of anxiety and depression is linked to a common genetic factor (Jardine, Martin, & Henderson, 1984; Kendler, Neale, Kessler, Heath, & Eaves, 1992). These findings are also consistent with a vulnerability approach, in that a predisposition to poorly cope with stress produces increased experiences of distress and negative affect, thus contributing to development of emotional problems.

In addition, the results from the present study support a vulnerability perspective. All predictors in paper 3 were mediated through child temperamental emotionality, indicating that the impact of contextual factors was partly accounted for by the vulnerability of the child. Further, the impact of temperamental shyness on internalising trajectories (paper 2) are hypothesized to work through contextual mechanisms like relationships with caretakers, peers and other people in the child's surroundings. Thus, certain temperamental traits seem to make the child more vulnerable for developing emotional problems when exposed to contextual stressors.

It is, however, important to note that the overall design of the present study did not allow exploration of genetic or biological material. Temperament dimensions can be seen as representing biological predispositions, and maternal distress may be an indicator of child genetic dispositions, but we should be cautious of any such generalisation in this study.

5.3 Pathways to emotional problems

Developmental pathways to emotional problems include numerous processes of moderation and mediation (Pickles & Hill, 2006). The findings in paper 2 and III are based on examinations of longitudinal relations between temperamental and contextual predictors of symptoms of anxiety and depression, and bring forward illustrations of moderational and mediating processes. These findings will be discussed below. It is noteworthy that even though both are "third variables", a moderator and a mediator have different functions. Moderation implies that the relation between a predictor and an outcome variable changes as a function of the moderator; while a third variable function as a mediator to the extent that it

accounts for the relation between the predictor and the outcome variable (Baron & Kenny, 1986). Since multiple mediators are operating in the present study, I refer to mediation where a significant part (but not all) of the relation between the predictor and the outcome are accounted for by a third variable (the mediator).

5.3.1 Moderation process

Increased levels of maternally reported child shyness were related to increased levels of maternally reported internalising behaviour scores (paper 2). For boys the effect of shyness on internalising was significantly moderated by activity level, in that internalising behaviour was more strongly related to shyness if temperamental activity was low than if it was high. For girls, however, the relationship between shyness and internalising seemed to be independent of activity level. These results are consistent with findings from a previous study showing that boys characterized by high levels of fear and low levels of activity in infancy showed increases in internalising scores from age 4 to 8 (Colder, Mott, & Berman, 2002). The results suggest that our measure of temperamental activity and shyness corresponds to their measure of temperament, and that our results extend their findings by showing that the interaction between temperament traits and internalising persisted after infancy. Contrary to their findings that girls who were reported to be high in temperamental fear and low in activity got declining internalising symptoms over the same period, we found that high levels of temperamental shyness predicted increasing levels of internalising symptoms in girls. Our finding on this relation was consistent with their expectations (for a discussion of gender differences, see section 5.3.5).

5.3.2 Mediating processes

Maternally reported temperamental and contextual predictors accounted for 32 % of the variance in covarying symptoms of anxiety and depression (internalising problems) in early adolescence, as rated by mothers and adolescents (paper 3). Two main pathways were indicated. One pathway was through temperament, as nearly all risk factors were partly mediated through child emotionality in mid-childhood. Another pathway was through early contextual risk factors, with all direct and indirect contextual effects from before age five.

The temperamental pathway indicated by shyness and emotionality supports the reported finding that shyness has substantial impact on variation in internalising symptoms (re paper 2). An even stronger emphasis is placed on temperamental emotionality, as the impact on internalising problems from nearly all other predictors across time were mediated through child emotionality. This pathway is consistent with the process postulated by Rothbart and Bates (2006) where temperament is proposed to heighten the response from a contextual factor. The impact of child temperament was not mediated by any of the contextual factors, thus, not acting as a stressor, but rather supporting the notion that elevated levels of shyness and emotionality represent a biological vulnerability towards later internalising problems.

A hypothesis has been that nonspecific environmental impact may contribute to the elicitation of psychopathology, while the specificity of expressed pathology grow out of individual differences in temperament and autonomic reactivity (endogenous factors) (Steinberg &

Avenevoli, 2000). Our finding that temperament traits have an impact as both moderators and mediators, but not as a stressor that are mediated by other predictors, are consistent with this perspective.

The results indicating the mediating effect of social support (paper 3) is consistent with earlier findings that low social support mediates the relation between both maternal distress and family adversities on internalising symptoms in preadolescence (Cummings & Davies, 1994; McCarty et al., 2003). These findings give an indication of how reciprocal and dynamic the longitudinal relationship between contextual risk factors is in predicting later internalising problems.

The contextual risk factors acted as both stressors and mediators for each other (paper 3). Impact from maternal distress on internalising is, after infancy, mediated through the contextual factors of family adversities and social support. Family adversities at age 2.5 mediated the earlier impact of maternal distress, thus supporting Luby and colleagues' (2006) finding that family adversities mediated the effect of parental depression on depression in preschoolers. The finding is also consistent with earlier research findings that maternal depressive symptoms are often stress generating, and predict more chronic stress (Cole et al., 2006). In general, parents or parent related factors are often both stressors and mediators of contextual risks. For example, maternal distress has in several studies been found to be mediated through parenting styles when affecting emotional problems in children (O'Connor, Heron, Golding, & Glover, 2003; Rapee, 1997). Parenting style represents one of many potential predictors that contribute to the complex interplay between contextual factors, child characteristics and development of emotional problems, but which is not part of the present study.

Predictors measured four to eleven years earlier account for nearly one third of the variance in the measure of internalising problems in early adolescence (paper 3). In comparison, Sund and colleagues (2003) found that six factors (mainly contextual) accounted for 43% of the variation in depressive symptoms in adolescents measures. In difference from the present study, their study showed cross-sectional association between self-reported predictors and outcome variables. Their results underscore the importance of present contextual predictors. However, we found that internalising problems at age 12-13 years were predicted by contextual factors present before the age of five. This may be because the predictors are maternally reported and not self-reported as in the study referred to above, and it may also be an indication of vulnerable periods in the child's life.

5.3.3 Early predictors and vulnerable developmental periods

Developmental periods in a child's life can represent vulnerable time-windows for the development of emotional problems. Such periods may be characterized by changes in psychological development or by changes in the child's surroundings. In our sample, it does not seem like age 8-9 is a specific vulnerable developmental period to be exposed to maternal distress and lack of social support when it comes to the level of emotional symptoms four years later. The results indicate that children are more vulnerable to maternal distress, family adversities and lack of social support in the period of early childhood.

Findings from this study indicate that maternal distress at age 1.5 predicts later internalising problems, even when accounting for later levels of maternal distress. Early childhood has is associated with less sleep and more stress for the mother, and it is postulated that this period is an particularly vulnerable period for children to experience in-adequate parent-child communication (Cicchetti & Toth, 1998). Studies on effects from early temperament traits, mother-child interaction and frontal brain asymmetry in children indicate increased risk for developing emotional problems (Dawson et al., 1999; Henderson, Fox, & Rubin, 2001). Children of depressed mothers are found to have increased levels of right frontal asymmetry in brain activity (Dawson et al., 1999; Forbes et al., 2006). This area of the brain is associated with affect regulation, social withdrawal and inhibition, factors that contribute in making young children vulnerable to later experiences (Henderson et al., 2001). It is not certain whether brain asymmetry is a result of genetic predisposition alone or if also environmental factors might impact the brain development of a young child (Forbes et al., 2006).

Another important finding from the current study is the impact of family adversities from age 2.5 on internalising in adolescence. Developmentally, the child is acquiring increased mastery of the object world and increased autonomy, while it still needs surveillance most of the time (Sroufe & Rutter, 1984). In Norway this is a period in the child's life which is associated with transitions in the family setting, i.e. mothers have returned to work and most children have started in some form of day-care. Thus, this may be a vulnerable period for exposure to stressful events within the family. This is supported by Wallerstein's (1985) proposal of a sleeper-effect of exposure to divorce in childhood. She argued that in addition to an immediate effect, later effects (i.e. in adolescence) were also expected because of a rekindling of the early developmental vulnerability.

The impact of early contextual risk factors on internalising problems is accounted for by effects from the same predictors at later ages. Considering the relatively high level of functioning in this Norwegian sample, these results support Essex and colleagues' (2006) finding that at-risk children from higher socio-economically conditions can be identified from early childhood.

In a discussion of vulnerable periods it is important to mention the potentially biased effect of maternally reported risk factors, in that the effects may reflect the reporter's mental status or contextual situation. Though in support of our findings, the mean level of the predictors is similar across time, and the outcome variable only refers to information that is shared between mother and child. Another limitation is that we do not have any predictors or measures from before child age 1.5 years. We can not be sure whether any of the effects found are caused by earlier events. Information from this early period is important in understanding the impact and interplay between environmental and genetic contributors to child development.

5.3.4 A transactional and life span perspective on the results

How do findings from this study illuminate the main assumption in the life span model, that psychological development rises from the child's profile of risk and protective experiences accumulated through time? If we view temperamental traits as genetic predispositions, the results from paper 2 and 3 indicate that small children with high levels of shyness and emotionality are vulnerable for developing later emotional problems. This is consistent with earlier findings on both shyness and negative emotionality (see Rothbart & Bates, 1998; 2006, for reviews). A vulnerable child needs, to a greater extent than other children, a caretaker that is responding adequately. Risk factors like emotional distress, stressful events and lack of social support may make the mother less responsive. It has been shown that mothers with elevated levels of distress more often display a passive interaction style, which again is associated with decreased ability of affect regulation in young children (Cohn, Matias, Tronick, Lyons-Ruth, & Connell, 1986; Eisenberg et al., 1996b).

The preschool years form the basis for later relational experiences, as social skills and peer relations get more and more important in the school years (Hay, Payne, & Chadwick, 2004). Shyness may reduce the child's ability to initiate friendship successfully, thereby lessen their opportunities to develop social skills (Hay et al., 2004; Fordham & Stevenson-Hinde, 1999). Preschool children of parents with mood disorders are found to show poorly regulated social exchange with peers (Zahn-Waxler et al., 2006). It is postulated that the emotional socialization conveyed by depressed mothers contributes to less adequate emotion regulation in children (Cicchetti & Toth, 1998). Poor emotion regulation may result in high levels of negative emotionality, which is found to be a strong predictor of anxious and depressive symptoms in children (Eisenberg, 1996; Eisenberg et al., 1996a).

Thus, the combination of maternal distress and temperamental shyness and negative emotionality (paper 3) seem to make the child vulnerable for developing later emotional problems. This may also be an indication of transactional processes between the child and its environment. Difficult temperament in children contributes to more demanding interaction between the child and its parents. A child with a different temperament profile may not be so sensible to contextual risk factors, as indicated in paper 2. High levels of temperamental activity in boys seem to decrease the effect of shyness on development of internalising problems. High levels of temperamental activity are often associated with positive affect and approach behaviour (Prior, Smart, Sanson, & Oberklaid, 2000; Rothbart & Bates, 1998). However, the protective effect of activity level was not significant for girls. What is the difference between shy boys and shy girls that may contribute to make high activity level an asset for boys only?

5.3.5 Gender differences in predictors and emotional problems

Peer interactions during early and middle childhood tend to be gender segregated (Zahn-Waxler et al., 2006). Preschool girls establish dyadic and emotionally oriented relationships, while boys in general seem to concentrate on instrumentality and physical dominance in social interactions at this age (Crick & Zahn-Waxler, 2003). Relational difficulties that occurred in friendships have been associated more strongly with internalising problems for girls than for

boys (Rose, 2002; Crick & Zahn-Waxler, 2003; Crick & Nelson, 2002). Based on this knowledge, it might be that activity level is more important for boys to be included in the peer group, while a high activity level does not buffer relational difficulties for shy girls.

Different parental socialization practices may foster less protective strategies for shy girls as opposed to shy boys. Parents, and particularly fathers, seem to encourage more stimulating and physical play in their sons than daughters, thereby contributing to sex differences in activity levels (Leaper, 2002). Mothers are found to be more engaged in socio-relational dyadic play with their daughters (Zahn-Waxler et al., 2006). Parents are also found to discourage girls more often than boys in exploration of the physical environment (Siegal, 1987), thus limiting potentially fruitful socialization experiences. Both gender segregated relational patterns and parents' role as socialization agents may contribute to explain why heightened activity level only is protective for shy boys.

That elevated activity level may buffer the negative effects of other risk factors on internalising problems is consistent with another study examining physical activity level. In a Norwegian sample of 12-15 year old adolescents, results indicated that vigorous exercise moderated the negative effect of stressful life events on self-reported depressive symptom levels (Sund, 2004). In addition, a low amount of time spent on vigorous activity and, for boys only, much time spent on sedentary activities was found to be predictive of depressive symptoms one year later. Whether temperamental activity level in childhood is related to adolescent vigorous exercise or sedentary activities are not known, but it should not be ruled out that early temperamental activity level is an indication of later levels of activity.

Findings from the present study indicate that girls have more symptoms of anxiety and depression at age 12-13 (paper 3). Being a girl predicted significantly higher levels of internalising problems, and the mean level of anxiety (maternally reported) and depression (self-reported) were significantly higher for girls than boys. A preponderance of internalising symptoms in adolescent girls is a well supported finding (e.g. Hankin et al., 1998; Wichstrøm, 1999). However, the increase in symptoms is generally found 1-2 years later. In a cross-sectional study of 12 000 Norwegian adolescents, Wichstrøm (1999) found significant gender differences at age 13-14. Ge and colleagues (1994) found significant differences in depressive symptoms after the age of 13. The internalising measure in our study includes symptoms of anxiety, and girl preponderance of anxiety symptoms is also found in adolescence (Costello et al., 2005; Lewinsohn, Gotlib, Lewinsohn, Seeley, & Allen, 1998). In addition to biological changes related to pubertal development, cognitive coping styles and self-esteem/self-worth are among the predictors of increased levels of emotional symptoms in girls (Roberts & Bishop, 2003; Wichstrøm, 1999). We have unfortunately not any of these measures in the present study. In addition, such measures are mainly self-reported factors that are less suitable for children aged 8 years or younger.

5.3.6 Unique prediction of symptoms of depression

There was limited evidence of unique predictors for anxious and depressive symptoms. Maternally reported family adversities at child age 8-9 predicted the unique variance in the informant consistent measure of depressive symptoms (paper 3). Our findings support the

effect of stressful life events on depressive symptoms that was found in Sund and colleagues' (2003) study. They used a self-reported measure of stressful life events, but it contained similar items to our family adversities measure regarding family health, major events and chronic stress. Our results extended these findings to be longitudinally relevant, with direct impact from adversities from age 4.5 (to internalising symptoms) and from age 8-9 (to depressive symptoms). The impact of family stress on depressive symptoms is consistent with Jaffee and colleagues' (2002) finding that family instability in childhood remained as a significant risk factor of juvenile-onset depression after controlling for co-morbidity with anxiety disorders. In this study, no risk factors had a unique effect on anxious' symptoms, a somewhat surprising finding since anxious symptoms are expected to show up earlier than depressive symptoms.

Phillips and colleagues (2005) found that contextual predictors from early childhood were stronger related to adolescent anxiety than depression, and suggesetd that while anxiety seems to be more related to early stress exposure, depression may be related to more proximal stressors. Moffitt et al. (2007) also reported that adverse family environment, child behaviour problems and inhibited temperament in childhood predicted pure GAD, but not pure MDD in late adolescence. In another study of differential prediction of adolescent disorders, Kessler and colleagues (1997) found that most of the risk factors were related to all of the broad classes of disorders. The present study is more consistent with the last study regarding specificity, but our adolescents are younger and we did not measure disorders.

Both previous research and our findings are rather inconclusive with regard to differentiated prediction of anxious or emotional symptoms. In this study, it might be a reflection of the outcome measures, which are in favour of a one-dimensional condition of emotional problems. Lower levels of overlap between symptoms are probably needed to find several unique predictors. The threshold of adolescence may also represent a developmental period where emotional symptoms are more undifferentiated. Longitudinal and intensive assessment of anxious and depressive symptoms is needed to illuminate the development of such symptoms in childhood and adolescence.

5.3.7 Prediction versus causation when analysing longitudinal relations

When we use the metaphor of a pathway we indicate that we know the direction and influences of development, i.e. we imply simultaneously prediction and causation (Pickles & Hill, 2006). Structural equation modelling is frequently used to operationalise developmental pathways. A statistical representation of a pathway can be both properly and improperly imposed on developmental data. When describing a developmental pathway, researchers often believe they are indicating causal relationships. In general, developmental pathways add no mechanisms to psychological development (Pickles & Hill, 2006). Rather, they provide a framework where several possible processes can be combined or integrated.

The use of the concepts of "direct/indirect effects" in this study is based on a statistical terminology, referring only to the statistically significant effects accounted for by the variables included in the analyses and not any other risk or protective factors. However, most

important risks do not exist in isolation and most risks are continuous in nature. Further, exposure to one risk often increases the likelihood of exposure to subsequent risks (O'Connor, 2006). In addition, individual differences in coping processes, social skills and other competence factors may differentiate among vulnerable and more robust children, thereby moderate or mediate the impact from risk exposure. Thus, it is hard to separate each individual risk and draw any causal relation between a specific risk at a particular point in time and maladjustment. To conclude that there is an independent effect from such a risk to an outcome would be to ignore the complex interplay between risks.

5.4 Future directions

The results highlight directions for future research in both methodological and substantial domains. Methodologically, the assessment of symptoms of anxiety and depression need further clarification. If we believe that anxious and depressive symptoms are different dimensions with separate symptoms, there is a need for scales that contain either more anxiety-specific and depression-specific symptoms or more context- and perspective-specific symptoms. Future research should try to identify unique correlates of anxiety and depression, in order to determine the efficacy of treating anxious and depressive symptoms as distinct groups in childhood and adolescence.

The use of self-report is common in research on emotional problems in adolescence. The present study has illuminated the impact of multiple respondents. Future research should include several informants, e.g. fathers and peers, as well as examine potential predictors of the trait, source and unique variance in their reports.

To make our theoretical assumptions about the different ways boys and girls relate to other persons into a valid gender-sensitive model, we should take peers, parent-child interaction and other socialisation factors into account. There is a need to test models with temperamental and environmental predictors across time to understand the interplay of individual differences and environment, and their impact on the development of internalizing behaviour problems.

Even though the present study has underscored the importance of certain contextual and temperamental factors regarding the development of emotional problems, future research should continue to identify which mediating and moderating mechanisms that contribute to maladjustment. Specifically is there need for more knowledge on gender specific pathways to both anxiety and depression. Further, future studies should examine which factors predict stability and change in symptoms of anxiety and depression across adolescence, and whether these are different for boys and girls. The impact of change in risk and protective factors across development, and whether potential effects are gender specific, should also be documented.

This study did not focus on the influence of individual factors other that temperament, such as self worth, social skills, life satisfaction, coping styles or other cognitive processes. Future studies should focus on such factors in relation to development of emotional problems. There is a need for studies documenting the impact of protecting and supportive factors, both in the

individual and in the environment. Do, for example, wellbeing and emotional problems have the same predictors, and if so, do predictors that stimulate the development of life satisfaction simultaneously inhibit the development of anxious and depressive symptoms in adolescence? More knowledge on relation between well being and anxious and depressive symptoms across development is needed.

The notion of time windows of vulnerability or opportunity in development should be further examined. As indicated by findings in the present study and previous research, early childhood seem to be a period that is more open for change. Are there times with more instability and openness to external influence, and what are the mechanisms that contribute to such development? Studies that try to identify phases in development around which future directions hinge are wanted.

The use of methodologically advanced studies is recommended when examining complex longitudinal relations. A structural equation framework has the potential of analysing processes involving mediation and moderation, as well as the stability and change in constructs across time.

5.5 Implications for prevention

The present study was not designed to investigate intervention, thus, implication for prevention will only be tentative and suggestive. Keeping these limits in mind, longitudinal data may be well suited to bring forward knowledge that informs prevention work and early intervention. By measuring phenomena over time, we have the possibility to investigate early signs of psychopathology and the nature of some relations, e.g. identify factors that predict well-adjusted versus maladjusted development in children and adolescents.
The findings from this study may be used as a foundation for designing preventive actions. A major concern in the field of prevention work is whether one should initiate primary or secondary prevention. Primary prevention is meant to reach out to all families, including families with increased risk for developing problems. The bonus of primary prevention is that everyone will benefit from such actions. Most of the children with emotional problems live in ordinary families, and we may reach out to at-risk groups that are hard to identify elsewhere. However, the objections have been that such prevention is too general, helping those who do not need the help and not helping those with needs.

Secondary prevention focuses on help towards at-risk groups. The advantage of secondary prevention is that we can target and specify our resources around a defined group, i.e. using more resources on fewer families that really need it in ways that are proven to be helpful. The main challenge for tertiary prevention is that at-risk families are hard to identify or reach.

Our findings are probably more suitable to inform primary prevention. Children are flexible, they are developing and changing, their parents are changing and the surroundings are changing. Thus, the challenge is both to develop general preventive actions that may have a positive impact on all families, and to give extra attention to children growing up under difficult conditions. Preventive interventions are postulated to have a greater impact if they

are effectuated early in development (Wise, da Silva, Webster, & Sanson, 2004). That is, before maladjusted behaviour has become a chronic part of children's behavioural pattern.

The results indicate that we can identify predictors of increased symptoms of emotional problems already from the child is 1 ½ years old. It seems like the impact of contextual factors works through the parents in early childhood (Mathiesen et al., 1999), indicating that actions should be done to identify and help distressed parents of small children. Maternal distress is often related to factors in the surroundings, and results from the present study are suggesting that family adversities and support from partners, family and friends are among these. Problems with finding child care, challenges around child rearing, partner conflict, economical worry and work stress are typical challenges in families with small children. These adversities often contribute to higher levels of maternal distress, especially if the mothers in addition have a small, or none, social network (Mathiesen et al., 1999; Nærde, Tambs, & Mathiesen, 2002).

Hence, preventive actions should be directed toward the parents of small children. In Norway we have a system that facilitates the contact with parents of young children. The health care centres, which most families with children aged 0-4 visit regularly, are ideal places to initiate both primary and secondary prevention. Primary preventive actions for emotional problems may be to distribute information on typical risk factors and to initiate social networks (as is done to a certain degree). Also, the results from the study can inform the content of a short screening questionnaire or checklist. Such a list may screen the most typical risk factors for development of psychopathology in children and adolescents, helping health care workers to identify at-risk groups.

6. Conclusions

The purpose of this study was to examine the underlying structure and early predictors of symptoms of emotional problems, and to investigate developmental pathways towards such problems in childhood and adolescence. The understanding of anxiety and depression within the field of developmental psychopathology is partly based on how we measure the constructs, how the symptoms develop and what predicts such development.

The underlying structure of anxious and depressive symptoms as measured in this study points to a unified construct of emotional problems, consisting of two sub-dimensions of anxiety and depression. Compared to earlier research, the parent-child agreement on both anxious and depressive symptoms was relatively high. We believe the use of equivalent scales for parent- and child-reports contribute to the agreement level. By partitioning the variance of the responses into trait, source and unique variance, we obtain differentiated information that illuminates what we actually have measured. We recommend the use of confirmatory factor analysis to examine both what the informants agree on and their unique contributions. The significance of having more than one trait and one informant when using rating scales is underscored.

The multitrait-multisource design made it possible to evaluate the construct validity of the scales. The ratings of anxiety and depression demonstrate evidence of convergent validity. However, it is shown that symptoms of anxiety and depression in 12-13 year olds are hard to discriminate across parent and children in the measures used. If we believe that anxious and depressive symptoms are different dimensions with separate symptoms at this age, there is a need for scales that contain more context and perspective-specific symptoms.

The examinations of longitudinal relations between temperamental and contextual predictors of symptoms of anxiety and depression illustrate processes of both moderation and mediation. The findings on developmental pathways suggested two main paths; one through temperament and one through early contextual factors. The impact of child temperament and gender was not mediated by any of the contextual factors, thus, not acting as stressors, but rather supporting the notion that certain child characteristics represent a biological vulnerability towards later internalising problems. Elevated levels of temperamental shyness and emotionality seem to heighten the impact from contextual factors towards development of emotional problems in early adolescence.

The results did also indicate that a temperament trait might protect against the negative effect of another temperament trait. High levels of activity were found to moderate the negative influence of shyness on internalising trajectories for boys, but not girls. It is argued that one of the reasons for this gender difference may be the difference in relational focus in the preschool and early school years. Because girls seem to have a stronger interpersonal orientation while boys are more focused on physical activity in their play with peers, high temperamental activity may be more important for shy boys than shy girls when responding to relational situations and stress.

The contextual risk factors acted as both stressors and mediators for each other. We found lasting effects of family exposure to maternal distress, family adversities and lack of social support on adolescent internalising problems over and above the subsequent risk factors measured. An important contribution of this study is that a few important early risk factors account for a substantial amount of the variance in internalising problems in early adolescence. When trying to identify who is at risk for internalising problems in childhood and adolescence, a special focus should be on the contextual factors of maternal distress, adversities and social support in families with children under the age of five. In addition, the vulnerability of children with high levels of temperamental shyness and especially emotionality is underscored.

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** Re Appendix: The questionnaire is from the 6th wave because this questionnaire includes both similar predictor scales as t1-t4, and the same anxiety (GAD) and depression (SMFQ) scales as t5.*