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**Stress and health in adolescents:
The role of potential
protective factors**

Thesis for the degree of Philosophiae Doctor

Trondheim, February 2011

Norwegian University of Science and Technology
Faculty of Social Sciences and Technology Management
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NTNU – Trondheim
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The inspiration to this thesis came from the work with my master thesis about stress in adolescence and the first testing of the originally Australian questionnaire, The Adolescent Stress Questionnaire (ASQ). This led my interest into further exploring and developing the knowledge about the nature of adolescent stressors and the role of stress experience for adolescent health and well-being. The present work was carried out at the Norwegian University of Science and Technology (NTNU) during the years 2007 – 2010. The project was financed by Faculty of Nursing, Sør-Trøndelag University College. I am grateful for the financial support and for giving me the opportunity to carry out this thesis. I also wish to thank all the students who answered the questionnaires and the schools for their cooperation. Without their contribution this work would not have been possible.

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Unni Karin Moksnes

Summary

Adolescence is a developmental period characterized by multiple changes in virtually every aspect of an individual's life, calling for new psychological adaptations. Exposure to different stressors caused by these changes represents a central and normal part of the process of growth and development during adolescence. However, experience of cumulative and simultaneous negative stressors remains central as a potential threat to the well-being and healthy development during adolescence. Meanwhile, when faced with identical stressors, the stress process and the health outcomes of stress vary individually; the outcome depends on the role of different vulnerabilities and protective factors, in the individual as well as in the environment.

The present thesis comprises an investigation of the role and nature of adolescent stressors and the association between stress and different health outcomes (emotional states, self-esteem and subjective health complaints). Gender and age differences on stress and the health outcome variables are also assessed. The thesis further considers the role of three potential protective factors with importance for stress and coping processes, as well as for health and well-being during adolescence; leisure time physical activity, self-esteem and sense of coherence (SOC). The factor structure and psychometric properties of the Norwegian version of the Adolescent Stress Questionnaire (ASQ-N), a questionnaire assessing stressors common in adolescence, are also investigated. The thesis is based on three cross-sectional samples of Norwegian adolescents 13-18 years, attending public elementary and secondary schools in rural and urban areas in the two counties of the middle part of Norway.

The findings support a reliable and valid nine-factor structure of the ASQ-N. Moreover, girls seem to report higher levels of stress, more emotional symptoms and subjective health complaints than boys, especially in the age group 15-16 years. Conversely boys score higher on self-esteem. Both total sum stress and domain specific stress, especially in interpersonal contexts, is related to more emotional problems, lower self-esteem and more subjective health complaints in both boys and girls. The thesis has also revealed the positive role of leisure time physical activity, sense of coherence and self-esteem, controlled for experience of stress, in association with adolescents' health outcomes. Methodological, theoretical and practical implications of the results are discussed.

Norsk sammendrag

Ungdomstiden er en utviklingsperiode i livet der den unge må tilpasse seg mange ulike forandringer, både fysiske, psykiske og sosiale. Å utsettes for ulike stressorer, forårsaket av disse store endringene, utgjør en sentral og normal del av vekst og utvikling hos ungdom. Imidlertid representerer opplevelse av mange negative og samtidige stressorer en potensiell trussel mot ungdoms helse og velvære. Når ungdom utsettes for samme type stressor, vil stressprosessen og utfallet av stresspåvirkningen for de unges helse, gi individuelle variasjoner. Resultatet av stressprosessen og stresspåvirkningen på helse vil være avhengig av ulike sårbarhets- og beskyttende faktorer, både i individet og i omgivelsene.

Ph.d. avhandlingen omfatter en undersøkelse av hvilken rolle og betydning stressorer har i ungdoms hverdagsliv; hvordan stress er relatert til ungdoms psykiske helse, selvfølelse, og subjektive helseplager. Kjønn- og aldersforskjeller på stress og de ulike helsevariablene er også undersøkt. Avhandlingen vurderer betydningen av tre faktorer med potensiell betydning for prosesser knyttet til stress, mestring og helse hos ungdom; fysisk aktivitet i fritiden, selvfølelse og opplevelse av sammenheng. Ph.d. avhandlingen omfatter videre en undersøkelse av faktorstrukturen og de psykometriske egenskapene til den norske versjonen av The Adolescent Stress Questionnaire (ASQ-N), et spørreskjema som måler vanlig forekommende stressorer i ungdoms hverdagsliv. Avhandlingen baserer seg på tre tverrsnittsutvalg av ungdom i alderen 13-18 år og inkluderer ungdomsskoler og videregående skoler fra lands- og by områder i Trøndelag.

Resultatene av valideringen av ASQ-N støtter en faktorstruktur bestående av ni pålitelige og gyldige stressdimensjoner. Jenter, spesielt i 15-16 årsalderen, rapporterer høyere stressnivå, så

vel som mer emosjonelle og subjektive helseplager sammenlignet med gutter. Gutter derimot rapporterer i alle aldersklasser høyere grad av selvfølelse. Høyere skåre både på total sum stress og områdespesifikt stress, spesielt i mellommenneskelig kontekst, er funnet å være relatert til mer emosjonelle problemer, mer subjektive helseplager og lavere selvfølelse både hos gutter og jenter. Avhandlingen har videre avdekket at fysisk aktivitet, opplevelse av sammenheng og høy grad av selvfølelse har positiv betydning for ungdoms helse, kontrollert for opplevelse av stress. Metodologiske, teoretiske og praktiske implikasjoner av funnene er diskutert.

Abbreviations

ASQ	= The Adolescent Stress Questionnaire
ASQ-N	= The Norwegian version of The Adolescent Stress Questionnaire
GRR	= General Resistance Resources
LPA	= Leisure Time Physical Activity
MANCOVA	= Multivariate Analysis of Covariance
MANOVA	= Multivariate Analysis of Variance
PCA	= Principal Component Analysis
RSES	= The Rosenberg Self-Esteem Scale
SHC	= Subjective Health Complaints
SOC	= Sense of Coherence
STAI	= The Spielberger State-Trait Inventory

List of papers

This thesis is based on the following four papers, which will be referred to in the text by their Roman numerals.

I. Moksnes, U.K., Byrne, D.G., Mazanov, J., & Espnes, G.A. (2010). Adolescent stress: Evaluation of the factor structure of the adolescent stress questionnaire (ASQ-N). *Scandinavian Journal of Psychology*, *51*, 203-209.

II. Moksnes, U.K., Moljord, I.E.O., Espnes, G.A., & Byrne, D.G. (2010). Leisure time physical activity does not moderate the relationship between stress and psychological functioning in Norwegian adolescents. *Mental Health and Physical Activity*, *3*, 17-22.

III. Moksnes, U.K., Moljord, I.E.O., Espnes, G.A., & Byrne, D.G. (2010). The association between stress and emotional states in adolescents: The role of gender and self-esteem. *Personality and Individual Differences*, *49*, 430-435.

IV. Moksnes, U.K., Rannestad, T., Espnes, G.A., Byrne, D.G. The association between stress, sense of coherence and subjective health complaints in adolescents: Sense of coherence as a potential moderator. *Manuscript accepted for publication, August 29th, 2010 in Stress and Health*.

Introduction

Adolescence is conceptualized as a transitional period, which begins with the onset of puberty and ends with the acceptance of adult roles and responsibilities. Of all life-stages, except childhood, adolescence is the one most marked by rapid and potentially tumultuous transition (Williams, Holmbeck, & Greenly, 2002). This is to be seen in the domain of biological development where the changes are physically externally manifest as well as in the progression of both cognitive and psychosocial maturity from that of childhood to that of the fully functioning adult (Byrne, Davenport, & Mazanov, 2007). While the transition through adolescence is inevitable the speed and magnitude of these changes overtax the capacity of many young people to cope and the resulting phenomenon of adolescent stress is now well recognized (Byrne, et al., 2007). The focus of the present thesis was to extend our knowledge of the nature of adolescent stressors by assessing the applicability of the Adolescent Stress Questionnaire for use in Norway, investigate the association between stress and different health outcomes as well as the role of potential protective factors in this context (the aim of the thesis is described more detailed below).

Adolescence has historically been a developmental period of relative neglect with respect to research on both mental and physical health intervention and outcome although research on growth and development during adolescence has expanded during the past years (Williams et al., 2002). Perhaps such neglect has occurred because most adolescents compared with other developmental periods are healthy when assessed by traditional medical markers such as the presence or absence of chronic disease, use of health care services and hospitalization (Ozer, & Irwin, 2009; Williams, et al., 2002). However, adolescence is a pivotal period of development with respect to health and illness. Most adolescents transverse this developmental period successfully resolving the challenges they face to become

competent, productive adult members of society. Meanwhile, adolescence also marks the increase in the incidence of a number of mental health problems and threats to physical health (Compas & Reeslund, 2009, pp. 561). Further, many health habits and behaviours are consolidated, and important health risk behaviours are first evident during this life stage. These patterns affect not only the immediate health of adolescents, but lay the foundation for health throughout the lifespan (Grant et al., 2003).

Exposure to stressful events (stressors) represents significant sources of risk to the healthy development of adolescents, and stressors are experienced in different intensities and durations of arousal in adolescence (Compas & Reeslund, 2009). However, when faced with the same stressor(s), the stress process and the impact from stress vary individually and lead to different health outcomes; this depends on individual and environmental vulnerabilities and resources, as well as the ability to cope effectively with the stressors (Compas & Reeslund, 2009).

Understanding the role and nature of stressors in the lives of adolescents, how experience of stress is associated with different health outcomes, as well as identifying potential protective factors in this context is crucial for helping adolescents capitalize on the many changes taking place in their lives, and equip them with tools to make their journey through adolescence a positive growth-oriented experience (Grant et al., 2006).

Understanding the role of stress is also important to the identification of those adolescents most in need of early intervention, whereas clarification of factors that promotes health and well-being and moderate the negative health effects of stress can be used to form interventions to strengthen adolescent development in general, as well as to support those with potential risk (Compas & Reeslund, 2009; Grant et al., 2003).

The past decade and a half has witnessed substantial activity in all areas of research on child and adolescent stress (Grant et al., 2003). However, in spite of the potential significance

of stressors, reviews of the child/adolescent stress literature present a picture of a field early in its development (Grant et al., 2003; Grant, Compas, Thurm, McMahon, & Gipson, 2004, McMahon, Grant, Compas, Thurm, & Ey, 2003). The reviews of Grant et al. (2003) and Grant et al. (2004) concluded that there is still inconsistency in the field about the way stress is defined and measured. The reviews called for clarity of the significance of specific stressors in relation to specific outcomes of psychopathology, and research on possible mediators and moderators on the association between stressors and psychopathology. At last, the review of Grant et al. (2004) highlighted the need for reliable and valid stress measures.

The overall research interest of this thesis was to obtain and extend our understanding of the nature of adolescent stressors and the degree to which these can be assessed by means of an Australian measure focusing on common stressors that adolescents may experience in their daily life. Further, the thesis investigated how stress (both total stress and different stress domains) was associated with emotional states, self-esteem and subjective health complaints. A major source of variation in the effects of stress on adolescents' psychological health and well-being is the result of the ways that adolescents cope with stress (Compas & Reeslund, 2009). The thesis did not have the process of coping with stress as an area of special attention, but rather assessed the potential protective role of some behaviours and personal resources with possible impact on stress and coping processes; physical activity, self-esteem and sense of coherence in relation to emotional states and subjective health complaints, either through main effects on health or as potential moderators on the relation between stress and health outcomes.

Theoretical and empirical background

The adolescent period

In all societies, adolescence is about growing up, about moving from the immaturity of childhood into the maturity of adulthood, of preparation for the future (Steinberg, 2008). The word *adolescence* derives from the Latin verb “*adolescere*”, which means “*to grow up*” or “*to grow to maturity*” (Lerner & Steinberg, 2009). The founding of the scientific study of adolescence as an academic discipline is generally dated from 1904 by G. Stanley Hall in his publication of the two-volume work *Adolescence*. His view was mainly framed by an evolutionary (Darwinian) conception of the basic process accounting for change across this period of life. Hall made adolescence a period of “*storm and stress*,” a time of universal and inevitable upheaval (Lerner & Steinberg, 2009). Although other scholars of this period rejected Hall’s view, theorists of adolescent development used a conceptual lens comparable to Hall’s, at least insofar as his biological reductionism and his deficit view of adolescence were concerned (Lerner & Steinberg, 2009). Erik Erikson (1959) viewed the period as one wherein an inherited maturational ground plan resulted in the inescapable psychosocial crisis of identity versus role confusion. The developmental theory of cognition proposed by Piaget (1972) focused on the emergence of formal logical structures and not on the adolescent period per se. The absence of concern in Piaget’s theory with the broader array of biological, emotional, personality, social and societal concerns that had engaged other theorists’ discussion of adolescence did not stop a relatively minor and historically transitory interest in Piaget’s ideas as a frame for empirical understanding of the adolescent period (Lerner & Steinberg, 2009).

Current perspectives on adolescent development have evolved significantly since early conceptualizations of adolescence as a period of stress and turmoil for most or all adolescents

(Lerner & Steinberg, 2009). The search for universal descriptions for adolescents has been replaced by recognition of the wide variability that characterizes development during the second decade of life and to one of opportunities for growth and positive development. These observations have contributed to interest in individual differences in the paths and trajectories of development from childhood through adolescence to adulthood (Santrock, 2008; Lerner & Steinberg, 200; Susman & Dorn, 2009).

Although the age range of adolescence can vary with cultural and historical circumstances, in western societies, the adolescent period begins at approximately 10 to 13 years of age and ends between the ages of 18 and 22 (Santrock, 2008). However, the exact ages that mark the beginning and end of this period are not precisely defined. The stage of adolescence has lengthened, both at the beginning and the end, because young people mature earlier physically and because most delay entering into work and marriage until their mid-20s (Coleman & Hendry, 1999; Steinberg, 2008).

The adolescent period involves a number of biological, cognitive, and psychosocial changes (Susman & Dorn, 2009). The biological changes involve physical changes in an individual's body with extraordinary growth and change in physical appearance and biological functioning. The pubertal changes also affect the adolescents psychologically, in different ways, and with different intensities and timing. Support is found for that adolescents, especially girls who are "off-time" (earlier or later) in their pubertal development experience more stress and emotional problems than adolescents who are "on-time" (Ge, Conger, & Elder, 2001; Graber & Sontag, 2009; Hankin & Abela, 2005; Susman & Dorn, 2009). The cognitive processes is one of the most striking changes to take place during adolescence and involve the development of far more sophisticated thinking abilities and reasoning ability (Kuhn, 2009). The implications of these cognitive changes are also far-reaching. The ability to think more capably in hypothetical and abstract terms affects the way adolescents think

about themselves, their relationships, and the world around them. The rapid development of psychosocial processes during adolescence involve changes in emotions, personality, relationships with others, and social contexts (McElhane, Allen, Stephenson, & Hare, 2009). A critical task of adolescence is the establishment of a stable sense of identity as a part of achieving autonomy. Adolescents must learn to deal with an expanding social universe and must develop the social skills to find friendship, romance, employment, and social standing within multiple social spheres (Cote, 2009). In sum, the transition from childhood to adolescence is complex and multidimensional, involving change in many different aspects of an individual's life. While the transition through adolescence is inevitable for a sound development, the speed and magnitude of these changes may overtax the capacity of many young to cope and result in a potential experience of stress. Adolescents must therefore develop a range of mechanisms which allow them to function effectively in the face of the stress which comes about from the transition of adolescence (Byrne et al., 2007).

Conceptualization of stress

Few constructs in health psychology have been as important, yet at the same time as difficult to define, as the concept of "stress". A common characteristic of all definitions are that they focus on environmental circumstances or conditions that threaten, challenge, exceed, or harm the psychological or biological capacities of the individual (Grant et al., 2004). In this sense, all definitions of stress include an environmental component. However, the definitions differ in the degree to which they emphasize psychological processes that occur in response to the environmental stressor (Grant et al., 2003).

Stress has traditionally been conceptualized in three ways; as a stimulus (an event or accumulation of events); as a response (a psychophysiological reaction); or as a transactional

process, in which a person and the environment interact to produce an appraisal of threat or loss (Caltabiano, Sarafino, & Byrne, 2008). The present thesis has focus on *perceived stress*. Thus, “stress” is used to describe the subjective experience of pressure, implying an evaluation of the outcome of a process. This is in line with the transactional view of stress as a relationship between environmental events or conditions, and the individual’s cognitive appraisals of the degree and type of challenge, threat, harm or loss (Lazarus & Folkman, 1984). The most widely accepted definition of stress is the transactional definition offered by Lazarus and Folkman (1984): “*Psychological stress involves a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being*” (p. 19). According to this definition, stress is subjective by nature, since it involves an appraisal of individual experiences.

Lazarus and Folkman (1984) recognized that people use three kinds of appraisal to assess situations. The individual initially appraises the event itself - defined as *primary appraisal*. There are three possible ways that the event can be appraised: 1) irrelevant, 2) benign positive or 3) stressful. At the same time that primary appraisal of stressful circumstances is occurring, *secondary appraisal* is initiated. Secondary appraisal is the assessment of one’s coping abilities and resources: whether they will be sufficient to meet the harm, threat, and challenge of an event. Ultimately, the subjective experience of stress is a balance between primary and secondary appraisal. The third type of appraisal is *reappraisal*. Appraisals change constantly as new information becomes available. Reappraisal does not always result in more stress; sometimes it decreases stress (Caltabiano et al., 2008). Whether events are appraised as stressful is influenced by two types of factors – those that relate to the person and those that relate to the situation. According to Lazarus (1999), the more confident we are of our capacity to overcome obstacles and dangers, the more likely we are to be

challenged rather than threatened and vice versa. An important ingredient in Lazarus's theory of stress is thus the ability or inability to cope with a stressful situation and coping is interwoven with the appraisal process. Whereas at any one point in time secondary appraisal is influenced by the persons perceived ability to cope with the event, over time the actual coping activities and their efficacy play into the appraisal process in an important way. Yet theoretically it is important to keep separate the concept of coping from that of appraisal (Monroe and Kelly 1995).

A criticism of this theory is that given that the cognitive appraisal processes are likely to vary substantially with development, a definition of stress that relies on cognitive appraisal processes is problematic for research on children and adolescents (Grant et al., 2004). Research indicates that cognitive appraisal processes do not interact with stressful events in the prediction of symptoms until late childhood or early adolescence, and that appraisals increase in their significance during this period (Compas & Reeslund, 2009). Present studies of stress are, however, often based on a conceptually unclear definition of stress (Hobföll, 1989). Consequently, the difficulties in conceptualizing stress are a challenge for every area of research attempting to build upon this concept.

Stressors in adolescence

The situations and pressures that cause stress are known as *stressors*. Although S. Hall and others overdramatized the extent of "storm and stress" in adolescence, many adolescents today experience numerous potential stressors throughout the process of growth and development (Compas & Reeslund, 2009). Stressors of both an acute and chronic nature are important in the course of normal as well as disrupted development during adolescence. Stressors are defined according to Grant et al. (2003, p. 449) as: "*Environmental events or*

chronic conditions that objectively threaten the physical and/or psychological health or well-being of individuals of a particular age in a particular society.”

The types of stressors experienced in adolescence can broadly be divided into three categories. These categories are *normative events*, *non-normative events* and *daily hassles* (Suldo, Shaunessy, & Hardesty, 2008). The focus in this thesis is mainly on normative events and daily hassles.

Normative events refer to events that are experienced by most adolescents, but usually within a relatively predictable timescale. Examples of these includes internal and external changes related to pubertal development, psychosocial changes related to school, family, peers and academically demands. One important aspect here is that these are events which all young people have to confront, but usually within a relatively predictable timescale (Coleman & Hendry, 1999; Suldo et al., 2008). Non-normative events are different in the way that they are events affecting one adolescent or only a smaller group of adolescents, and can occur at less predictable points in the life course (Grant et al., 2003). Such events can include for example divorce, illness, injury or natural disasters. The last category is daily hassles. Daily hassles differ from major life events in that they are defined as minor, irritating, and frustrating events that are typical of daily interactions between individuals and their environments. Even though these events are minor in scale, the sum and duration of these events may result to have negative impact on adolescents' well-being (Carter, Garber, Ciesla, & Cole, 2006). Research has established that overall number of stressors tend to increase from preadolescence to adolescence (Rudolph, 2002). Girls tend to perceive higher levels of stress than boys, especially in relation to interpersonal stressors, e.g. peers, romantic partners, and family relationship (Charbonneau Mezulis, & Hyde, 2009; Hankin, Mermelstein, & Roesch, 2007; Rudolph, 2002; Shih, Eberhart, Hammen, & Brennan, 2006).

The association between stress and health in adolescence

Although exposure to some stressful negative events is considered a normal part of development, stressors remain central as a potential threat to the well-being and healthy development of children and adolescents (Grant et al., 2003).

A number of models may be relevant in explaining the association between stress and different negative psychological outcomes through the life span, for instance diathesis-stress models and differential sensitivity models (Graber & Sontag, 2009). Models of cumulative and simultaneous events are central for the present thesis and posit that when individuals experience major stressful events or transitions given the nature of adolescent development (e.g. academical demands or change in social relationships) either in close sequence (cumulatively) or simultaneously, they are more likely to have negative behavioural and emotional outcomes as a result of the confluence of events (Graber & Brooks-Gunn, 1996; Graber & Sontag, 2009). Cumulative events may also be characterized by increasing numbers of stressful events that occur for adolescents commensurate with changes in peer groups, friendships, parental relationships, and school demands. In this model, coping resources may be overwhelmed by the experience of multiple changes in close proximity, which lead to negative health outcomes. In essence, the individual's assessments of the importance of the stressful events and their timing, and whether the event is controllable or not are all factors affecting whether stressful events are associated with negative health outcomes in this model (Graber & Sontag, 2009). In sum, this model can be used as a conceptual frame for the empirical evidence of the association between adolescent stressor experience and different health outcomes which will be assessed more thoroughly in the next section.

Stress and psychological functioning in adolescents

The transition into adolescence seems to be the starting point for an increase in psychological problems like depression and anxiety (Graber & Sontag, 2009; Hankin & Abela, 2005; Kessler, Avenevoli, & Merikangas, 2001), especially among girls (Costello, Foley, & Angold, 2006; Hankin & Abela, 2005; Bouma, Ormel, Verhulst, & Oldehinkel, 2008). Studies have shown that the occurrence of different levels of depression among adolescence has varied and some studies have indicated that approximately 25% to 40% of adolescent girls experience significant depressed mood, compared with 20% to 35% of boys, with a smaller group adolescents (2-3%) experiencing depressive disorder (Graber & Sontag, 2009; Hankin & Abela, 2005). Despite differences in overall developmental trends, anxiety and depression share symptoms and have substantial co-occurrence (Avenevoli, Knight, Kessler, & Merikangas, 2008; Graber & Sontag, 2009; Hankin & Abela, 2005; Hankin, Abramson, Miller, & Haeffel, 2004).

A review of Grant, et al. (2004) identified more than 1500 empirical investigations of the relation between stressors and psychological symptomatology among youth (Grant et al., 2004). This review found that of 60 studies that had examined the association between stressful events and measures of psychological symptoms using a prospective design, a significant effect of stressors on psychological symptomatology was found in 53 of the studies (Grant et al., 2004). Studies have also reported support for a reciprocal relation between stressors and psychological symptoms (Grant et al., 2003; Kim, Conger, Elder, & Lorenz, 2003). Thus, evidence indicates that the cumulative effect of stressful events meets the criterion for a risk factor.

Relations between stressors, especially those in an interpersonal context (e.g. peers, family, romantic relationships) (Rudolph, 2002; Hankin & Abela, 2005) and symptoms of depression in childhood and adolescence have been well established in cross-sectional and

prospective longitudinal studies (Bouma, et al., 2008; Grant et al., 2003, Garber, 2006; Hankin, et al., 2007; McLaughlin, Hatzenbuehler, & Phil, 2009; McLaughlin & Hatzenbuehler, 2009; Waktaar, Borge, Fundingsrud, Christie, & Torgersen, 2004). The same association is found between stress and symptoms of anxiety (Grant, et al., 2004; Kim et al., 2003; McLaughlin & Hatzenbuehler, 2009). In this regard, girls appear to be more vulnerable to the negative psychological effects of interpersonal stress, than boys (Bouma et al., 2008; Charbonneau et al., 2009; Hankin et al., 2007; Shih et al., 2006).

Stress and subjective health complaints (SHC)

In this thesis, the term “subjective health complaints” refer to self-rated somatic or psychological symptoms experienced by the individual with or without a known aetiology (Haugland & Wold, 2001). Subjective health complaints include common somatic complaints such as headache, abdominal pain, stomach-ache and backache as well as psychological complaints such as nervousness, feeling low, irritability, and sleeping difficulties (Eriksen & Ursin, 2004; Haugland & Wold, 2001). For many symptoms the subjective report is the only measure that both clinicians and researchers rely upon, as these are largely “unmeasurable” in clinical sense.

Studies have found support for that adolescent exposure to multiple independent and cumulative stressors, especially in the school context, is associated with the development of subjective health complaints (also referred to as psychosomatic complaints/symptoms) (Diepenmaat, van der Wal, de Vet, & Hirasing, 2006; Gerber & Pühse, 2008; Hjern, Alfvén, & Östberg, 2008; Murber & Bru, 2004; Sundblad, Jansson, Saartok, Renström, & Engström, 2008). Previous studies show that a large number of adolescents report health complaints every week (Torsheim et al., 2006). Reported symptoms increase between the ages of 11 and

15 years (Torsheim et al., 2006) and girls consistently tend to report higher levels of health complaints than boys do (Hjern et al., 2008; Torsheim, et al., 2006).

Stress can also adversely affect physical health and this connection has been demonstrated in studies with diverse populations of adults showing considerable support for an association between stress and e.g. coronary heart disease (Rozanski, Blumenthal, Davidson, Saab, & Kubzansky, 2005) and inflammatory bowel disease (Caltabiano et al., 2008). The time course over which stress might be expected to influence the development of significant physical pathology is probably too great for any reliable association between stress and somatic illness to become evident in adolescence (Byrne et al., 2007). However, studies have found support for an association between psychosocial stress and rates of illness and impaired immune functioning in children (Caserta et al., 2008; Shirtcliff, Coe, & Pollak, 2009), as well as higher levels of inflammation markers in adolescents, which is a key indicator of cardiovascular risk during the teenage years (Fuligni, et al., 2009).

Protective factors / potential moderators of stress

To fully understand the relation between stress and health outcomes in adolescents, it is necessary to consider the nature of the stressors and potential protective factors that may promote health and/or moderate the association between stress and health outcomes (Compas & Reeslund, 2009; Grant et al., 2006). This section will focus on the role of leisure time physical activity, self-esteem and sense of coherence, as these have shown to be positive behaviours and personal resources for adolescents' health and well-being and to function as potential moderators of stress. A moderator has been defined as "a variable that affects the direction and/or strength of the relation between a predictor and a criterion variable" (Baron & Kenny, 1986, p. 1174). Moderators may be conceptualized as vulnerabilities or protective factors, as they represent pre-existing characteristics that increase or decrease the likelihood

that stressors will lead to negative health outcomes (Compas & Reeslund, 2009). The notion that moderators influence the relation between stress and psychological problems has been examined in numerous studies (see Grant et al., 2006, for a review). However, there is little consistent evidence of particular moderating effects (Grant et al., (2006) emphasizing that more research is needed. The authors concluded that knowledge of individual/environmental characteristics that reduce or protect adolescents from the negative effects of stressors, would be helpful in designing effective prevention and intervention programs for youth exposed to stressors (Grant et al., 2006).

Leisure time physical activity

Previous studies have shown that daily physical activity, regular exercise and a sufficient level of physical fitness protect against a variety of negative physical (Sundblad et al., 2008) and psychological conditions (Hallal, Victoria, Azevedo, & Wells, 2006; Piko & Keresztes, 2006), and promote positive perceived health, and well-being during adolescence (Edwards, 2006). Physical activity has shown to be beneficial in relation to depression (Jerstad, Boutelle, Ness, & Stice, 2010), anxiety (Salmon, 2001), and self-esteem (Ekeland, Heian, & Hagen, 2005; Schmalz, Deane, Birch, & Davison, 2007). In the present thesis physical activity is defined as “physical activity associated with formal physical training and recreational activities involving elevated breathing frequency and sweating” (Malina, Bouchard, & Bar-Or, 2004, p. 12). In adolescence, such activity mainly takes place out of school hours and both play and leisure time sports are important sources (Haugland, Wold, & Torsheim, 2003).

Gerber & Pühse (2009) suggest several mechanisms that may explain how physical activity alleviates the effects of stress. First, it can be assumed that physical activity results in reduced arousal (mood enhancement due to cognitive distraction or biochemical changes) or more positive health behaviours during periods of high stress (i.e. decreased smoking,

healthier eating habits). Second, physical activity may bring about higher levels of fitness and – as an indirect consequence – a more efficient physiological and psychological stress regulation (i.e. reduced secretion of hormones, lowered blood pressure) or enhanced recovery processes. Besides preventive effects, physical activity may strengthen other protective personal resources (i.e. self-esteem) (Ekeland et al., 2005; Schmalz et al., 2007) and social resources (i.e. social support), which in turn have the potential to influence the stress-health relationship (Gerber & Pühse, 2009). In the review of Gerber & Pühse (2009) which summarizes the literature from 1982 to 2008, 16 studies fully supported the validity of an exercise-based stress-buffer hypothesis, where six studies were based on adolescent samples. In contrast, 15 investigations (five in adolescent samples) did not support the stress-buffering hypothesis. The variability in results was explained by diversity of sample characteristics, study designs and measurements. This global analysis thus points to a great variability regarding the potential of physical activity and exercise to buffer stress so further research is needed to explain these different findings.

Sense of coherence

The medical sociologist Aron Antonovsky introduced the salutogenic perspective which focuses on what are the sources for people's resources and capacity to create health (Salutogenesis) rather than the classic focus on risk, ill health and disease (Pathogenesis). Fundamental in the salutogenic theory is to consider health as a position on a health ease/disease continuum and the movement in the direction towards the health end. Antonovsky tried to find the solution to salutogenic question why some people, regardless of major stressful situations stay healthy, while others do not. The answer was formulated in terms of Sense of Coherence (SOC) and General Resistance Resources (GRR) (Antonovsky, 1979; Eriksson, 2007). SOC is defined as "a global orientation that expresses the extent to which one has a

pervasive, enduring though dynamic feeling of confidence that 1) the stimuli deriving from one's internal and external environments in the course of living are structured, predictable and explicable, 2) the resources are available to one to meet the demands posed by these stimuli; and 3) these demands are challenges, worthy of investment and engagement" (Antonovsky, 1987 p. 107). This combination of cognitive, behavioural and motivational aspects form the concept of SOC and the three components are named comprehensibility, manageability and meaningfulness. The other key factors are the resources available to make such a movement towards health possible. The GRRs can be found within people as resources bound to their person and capacity but also to their immediate and distant environment as of both material and non-material qualities from the person to the whole society. The key factor is not what is available but to be able to use and re-use them for the intended purpose. The GRRs provide a person with sets of meaningful and coherent life experiences thanks to the resources at the person's disposal (Eriksson, 2007).

The body of knowledge about SOC has been accumulated in the literature over the last 15 years in adult samples while much less progress in the field has been made in regard to adolescents (Buddeberg-Fischer, Klaghofer, & Schnyder, 2001; Torsheim, Aaroe, & Wold, 2001). Antonovsky (1987) claimed that SOC develops during childhood and early adulthood and becomes more or less stabilized in the period of early adulthood. However, findings have shown that development of a person's SOC is a lifelong process (Eriksson, 2007), making it important to investigate SOC in adolescent populations more thoroughly.

A strong SOC is found to be associated with positive perceived health (Eriksson & Lindström, 2006; Honkinen, Suominen, Välimaa, Helenius, & Rautava, 2005), and is found to be beneficial in relation to psychological symptoms (Buddeberg-Fischer et al., 2001; Skirka, 2000) and subjective health complaints (Nielsen & Hansson, 2007; Simonsson, Nilsson, Leppert, & Diwan, 2008; Torsheim et al., 2001). Further, in stressful situations SOC has

found to have a moderating role on the negative health outcomes of stress. Individuals with a strong SOC, it is postulated, will have a general confidence that resources are available to meet the demands posed by stressful situations, and will thus consider a stressor more as a challenge than as a threat. This confidence increases the likelihood of positive coping expectancies, which will prevent stress from turning into potentially harmful tension (Antonovsky, 1987). Adult people with high SOC seem to be more resilient under stress than people with a low SOC (Eriksson & Lindström, 2006; Gana, 2001; Jorgensen, Frankowski, & Carey, 1999; Richardson & Ratner, 2005). However, few and inconsistent findings of the moderation effect of SOC has been found in adolescent populations (Nielsen & Hansson 2007; Torsheim et al, 2001), indicating that further research on this subject is needed.

Self-esteem

Self-esteem is a large part of adolescents' self-understanding (Baldwin & Hoffman, 2002; Rätty, Larsson, Söderfeldt, & Larsson, 2005). Rosenberg (1965) defined self-esteem as an individual's set of thoughts and feelings about his or her own worth and importance. This definition reflects the notion of "global" or "general" self-esteem or self-worth.

The importance of self-esteem for the well-being of adolescents is underscored by decades of theory and research supporting its link with psychological health and well-being during adolescence (Greene & Way, 2005; Muris, Meesters, & Fijen, 2003; Trzesniewski et al., 2006). Furthermore, the numerous biological, psychological and cognitive changes that occur during adolescence highlight the importance of examining self-esteem during this period (Baldwin & Hoffman, 2002; Boden, Fergusson, & Horwood, 2008; Cote, 2009; Greene & Way, 2005).

Low self-esteem has been considered an important factor in relation to symptoms of depression (Bos, Huijding, Muris, Vogel, & Biesheuvel, 2010; Hammen, 2005; Orth, Robins,

& Roberts, 2008; Orth, Robins, Trzesniewski, Maes, & Schmitt, 2009), and anxiety (Boden et al., 2008; Bos, et al., 2010). Especially in the face of stressful events, adolescents with low self-esteem is considered to have fewer coping resources and are therefore more vulnerable for the development of psychological symptoms, whereas those with high self-esteem are buffered against this effect (Abela, Webb, Wagner, Ho, & Adams, 2006; Orth, Robins, & Meier, 2009). Orth, Robins, & Meier (2009) state that “following stressful events, protective factors such as high self-esteem, may prevent the outcome of depressive symptoms by decreasing the negative impact of depressogenic thoughts on the affective, cognitive, behavioural, and physiological symptoms of depression” (p. 308). However, previous research testing the moderating effect of self-esteem has yielded inconsistent results, addressing a need for further investigation on this issue (Abela et al., 2006; Orth, Robins, & Meier, 2009).

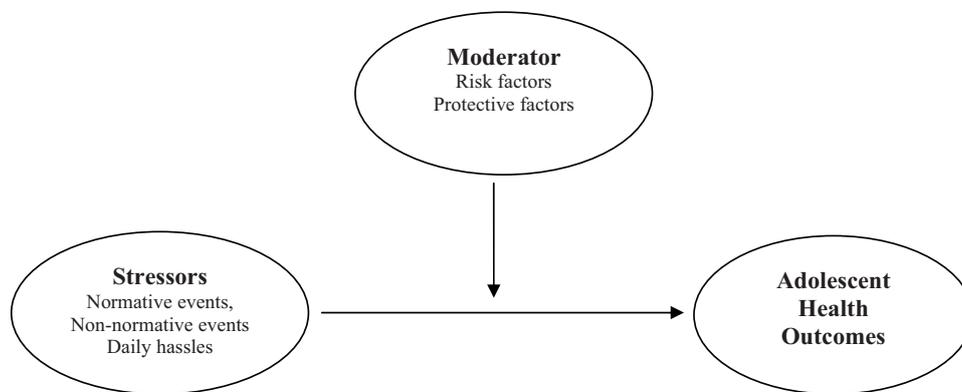


Figure 1

General conceptual model of the role of stressors and moderators in association with adolescent health outcomes.

Stress assessment

The measurement concerning stress has long been controversial and this applies just as strongly to studies of adolescents (Grant et al., 2004) as it does to the more widely researched area of adult stress. The two primary methodological approaches in the assessment of stress are the check-list approach and personal interview. Meanwhile, the self-report checklist is the most widely used method in measuring adolescent stress. The checklists vary in the extent to which they focus on width or depth. The general checklists are all similar in that they present respondents with a sample of negative and in some cases positive events that are representative of stressful events and experiences in childhood and adolescence. Some advances have been made in the development and refinement of general stressor checklists for adolescents (Bagley, 1993; Cheng 1997; Compas, Davis, Forsynthe, & Wagner, 1987; Masten, Neeman, & Andenas, 1994; Newcomb, Huba, & Bentler, 1981; Swearingen & Cohen, 1985, Yeaworth, York, Hussey, Ingle, & Goodwin, 1980), but less progress has been made in the development of checklists for children (for a review, see Grant et al., 2004).

The specialized stressor checklists have typically been developed with two related issues in mind: the need for specific measures for specific populations or the need for measures of specific types of events. With some notable exceptions, measures of cumulative life stressors have been developed on European American middle-class samples. These measures have been criticized for lacking items pertinent to individuals belonging to other ethnic or social groups, particularly those living in disadvantaged urban communities (Grant et al., 2004). A small number of measures have been developed on predominantly white middleclass samples exposed to specific stressors, for example measures of events related to parental alcoholism (Roosa, Sandler, Gehring, & Beals, 1988) affecting children and adolescents and school-related stressors (Burnett & Fanshawe, 1997). Measures developed for specific populations offer the advantage of being more comprehensive and sensitive in

measuring the types of stressors experienced by these groups. On the other hand, the limited range of events included on these measures prohibits their use in comparative studies across samples exposed to various types of stressful events and circumstances.

There have been some critiques to the check-list approach. Most check-lists have been developed with a focus on the researchers' *opinion* of what is regarded as stressful life events for adolescents, or general agreement about the nature of threatening experiences for people (Compas & Reeslund, 2009; Grant et al., 2004). Thus, the items have not been empirically generated from adolescents themselves. Further, some checklists have derived from the adaptation of existing inventories of adult stressors and modified to a greater or lesser extent to inquire into the experience of adolescents (Coddington, 1972). This approach is flawed since it indirectly equates stressors common in adult life with those evident in adolescence, leaving potentially crucial areas of stressor exposure in adolescence largely unmeasured (Byrne et al., 2007). An area of concern centres also on the lack of standardization of stressor measurement, where the review of Grant et al. (2004) revealed that fewer than 10% using cumulative stress scales used a well-validated measure and psychometric data on most measures were not provided. A general concern also involves possible confounding of stressors and psychological symptoms due to similar items appearing on measures of both constructs. This runs the risk of confusing consequences with causes, and therefore of producing associations which may be spurious (Byrne et al., 2007).

Grant, et al. (2004) pointed among other things out that one important step in improving stress assessment is to develop psychometric valid measures and to focus on identifying a representative set of environmental changes, events, and situations that are stressful for adolescents involving use of structured interviews for the assessment of stressors experienced by adolescents.

The Adolescent Stress Questionnaire (ASQ)

One attempt to make a scale addressing some of the methodological issues presented in the previous section was undertaken in the construction of The Adolescent Stress Questionnaire (ASQ) (Byrne & Mazanov, 2002; Byrne et al., 2007). The ASQ is an inventory made up of items originally designed to measure common stressors that adolescents may experience in their daily life. The scale was developed with the intention to ensure that the list of stressors was based on adolescents' individual experience and broadly salient to the contemporary issues facing young people at that time. The scale has been developed since the 1990's based on focus groups with adolescents, their teachers and their parents (Byrne & Mazanov 2002). The first version consisted of 31 items reflecting seven dimensions of adolescent stressors. However, the later validation process of the inventory (Byrne and Mazanov, 2002) showed that the ASQ was not as stable across time as would be required to have a complete on-going utility. Further, adolescents commented informally on the contemporary relevance and language used in the items and the absence of other areas of inquiry they would see as more relevant (Byrne & Mazanov, 2002). This first ASQ scale was therefore revised with new item content and language derived from focus group methodology led by a clinical psychologist, asking adolescents themselves about the nature of common stressors that they might experience in the course of their daily lives. The scale has been extensively psychometrically redeveloped and now consists of 58 items and has shown considerable utility as a comprehensive measure of stress both in research and clinical contexts (Byrne et al., 2007). Since the capacity of scales of adolescent stress to cross boundaries of culture is not yet well understood, the assessment of the current 58 item ASQ in Norway has potential to inform the further empirical use of the ASQ as well as the theoretical nature of adolescent stress.

Aims and research questions

Aims

The aim of the present thesis was to extend our knowledge about the nature of adolescent stressors by assessing the factor structure and psychometric properties of The Adolescent Stress Questionnaire. Further, the aim was to investigate how stress is associated with different health outcomes in adolescents and to investigate the role of potential protective factors in this context, either through main effects on health, or as potential moderators on the relation between stress and health. The aims in the four papers that the thesis is based on, have a combination of open research questions and hypotheses. The concepts used for the description of the different health outcomes varies somewhat in the aims and in the presentation of the results, as the concepts are in line with those used in the papers. The following specific aims were formulated:

Paper I

- Explore the factor structure of the Norwegian version of the Adolescent Stress Questionnaire (ASQ-N)
- Investigate gender and age differences in the nature and levels of stress using the ASQ-N
- Investigate the relation between ASQ-N and measures of state depression, state anxiety and self-esteem in order to independently validate the ASQ-N; following the identical methodology employed in the original instrument development

Paper II

- Investigate gender and age differences on psychological functioning (state depression, state anxiety and self-esteem)

- Investigate how total stress and leisure time physical activity is associated with psychological functioning
- Investigate the potential moderating role of leisure time physical activity on the relation between total stress and psychological functioning

Paper III

- Investigate gender differences on domains of stress and on state depression, state anxiety and self-esteem. [We expected that girls scored higher on stress, depression and anxiety and that boys scored higher on self-esteem]
- Investigate how domains of stress and self-esteem are related to state depression and state anxiety. [It is assumed that stress is positively and self-esteem negatively related to state depression and anxiety]
- Investigate the potential moderating role of self-esteem and gender on the relation between each of the stress domains and state depression and state anxiety. [It was expected that a moderation effect would be found]

Paper IV

- Investigate how stress domains and sense of coherence is associated with subjective health complaints
- Investigate sense of coherence as a potential moderator on the relation between domains of stress and subjective health complaints

Methods

Participants

Sample 1 (paper I)

The cross-sectional sample presented in paper I comprises students attending public elementary and secondary schools in the two counties in the middle part of Norway. Totally 752 students were asked to participate and 723 students; 352 boys (48.7%) and 362 girls (50.1%), (9 missing responses to the gender question) responded on the questionnaire and were included in the analyses (response rate 96.9%). The age ranged from 13–18 years. The data was collected during September and October 2005.

Sample 2 (paper II and III)

This cross-sectional sample is derived from a study called “Growing up in rural settings.” We were allowed to include the ASQ-N and the scales measuring state depression, The Rosenberg Self-Esteem Scale, and The Spielberger State-Trait Anxiety Inventory (see further description of the scales in the section “Measurements”). Totally 2341 students attending public elementary and secondary schools from six municipalities in the middle part of Norway were asked to participate in the study (693 from elementary school and 1648 from secondary school). A total of 1862 completed questionnaires were returned, giving an overall response rate of 79.5%. The sample was restricted to pupils 13 – 18 years, and the data analyses were therefore undertaken for $n = 1508$; 769 (51%) were girls and 735 (48.7%) were boys (gender was not identified for four participants). The data was collected during September and October 2006.

Sample 3 (paper IV)

The third cross-sectional sample comes from a survey involving the participation of public elementary and secondary schools in the two counties in the middle part of Norway. Of a total of 25 schools approached, six (three urban and three rural) agreed to participate. Totally 1229 questionnaires were distributed (593 in elementary schools and 636 in secondary schools) and 1209 completed questionnaires were returned giving an overall response rate of 98.4 %; 617 (51.0%) were girls and 586 (48.5%) were boys (gender was not identified for six participants). The age range of the sample in the present study was restricted to pupils 13 – 18 years and (n=26) were therefore excluded, leaving 1183 cases in the analyses. The data was collected during September and October 2008.

Procedure

All the data collections were approved by The Norwegian Social Science Data Services (NSD) and the 2008 data collection also from the Regional Committees for Medical Research Ethics (REK). The rector from each of the schools had approved the content of the questionnaire prior to agreeing to participate in the survey. Passive consent from the participants was found to be sufficient because no sensitive data was collected. The adolescents and their parents received an information letter which briefly explained the purpose of the study. It was emphasized that participation was voluntary and anonymous, that participants were free to withdraw from the study and that the collected information was confidential. Questionnaire administration was completed in one section, in whole class groups during one regular school hour of 45 minutes. The small number who did not respond were either not at school that day or declined to answer the questionnaire. Ethically, children and adolescents were seen as potentially vulnerable groups requiring protection. School

nurses were therefore made available for students if they needed someone to consult after they had answered the questionnaire.

Measurements

Adolescent stressor experience (paper I-IV)

In all papers adolescent stressor experience was measured using The Norwegian version of the Adolescent Stress Questionnaire (ASQ-N) (Byrne et al., 2007). This is an Australian 58-item inventory of common adolescent stressors, reflecting 10 dimensions of stress. The ASQ has been continuously developed and psychometrically validated on adolescent samples since the middle of the 1990's, and has now established validity and reliability for measuring stressor experience (Byrne, et al., 2007). Internal consistencies of the Australian ASQ scales using Cronbach's alpha coefficient has ranged from 0.62 (Stress of emerging adult responsibility) to 0.92 (Stress of home life) with 8 of the 10 scales having internal consistency above 0.80 (Byrne et al., 2007). Scale test-retest correlations over a single week time period ranged between 0.68 (Stress of financial pressure) and 0.88 (Stress of home life). The inventory has also shown sufficient criterion validity with measures of self-esteem, state anxiety and depression (Byrne et al., 2007). The adolescents were asked to indicate how stressful each of the experiences or situations reported in the items had been during the last year. The items are rated on a 5-point Likert scale 1 = *not at all stressful (or is irrelevant to me)*; 2 = *a little stressful*; 3 = *moderately stressful*; 4 = *quite stressful*; and 5 = *very stressful*. The internal consistency of the stress sub-scales in the present thesis showed Cronbach's α varying between 0.70 and 0.89 (papers I, III, IV). The internal consistency of the total sum stress scale showed Cronbach's α 0.97 (paper II).

Translation of the instrument

The measure was translated from English to Norwegian using a four-step translation procedure (Cull et al., 2002). The measure was first translated from English to Norwegian by three native bilingual Norwegian translators which completed this procedure independently. The measure was back-translated from Norwegian to English by two other translators who had not seen the original version. One was native Norwegian and the other had English as native language. In all stages of the translation the different versions were compared to ensure that the translations were as precise and complete as possible with reference to semantic and conceptual equivalence. The Norwegian version was pilot-tested before the first data collection. The items were tested again before the third data collection by using two focus groups with eight adolescents (gender and age balanced) to evaluate the semantic meaning and the wording of the items. Of the 58 original items, all were found to be relevant, but 17 items were reformulated to make them more intelligible. The semantic meaning of the items was not changed.

Self-esteem (paper I-III)

One of the most extensively used measures to assess self-esteem is the Rosenberg Self-Esteem Scale (RSES) (Rosenberg, 1965). The RSES is a one-dimensional measure elaborated from a phenomenological conception of self-esteem that captures the subjects' global perception of its own worth. Respondents were asked to indicate the extent to which the items best described the way they feel about themselves on a four-point Likert scale ranging from (0) *strongly disagree*, (1) *disagree*, (2) *agree* (3) *strongly agree*. The scale yields a single overall score of self-esteem with high scores indicating high levels of self-esteem. The measure is found to be a reliable and valid measure of global self-esteem through all ages, including adolescence (Gray-Little, Williams, & Hancock, 1997) and has been used in Norwegian

populations (Dieserud, Røysamb, Ekeberg, & Kraft, 2001; Sam, 2000, Vittersø, 1998). It has shown high internal consistency with Cronbach's α : 0.88 (Martin-Albo, Nunes, Navarro, & Grijalvo, 2007); Cronbach's α : 0.94 (Orth, Robins, Trzesniewski, et al., 2009) and test-retest correlation of 0.84 (Martin-Albo et al., 2007). The internal consistency of RSES in the present thesis showed Cronbach's α varying between 0.86 and 0.94 (papers I-III).

State anxiety (paper I-III)

The Spielberger State-Trait Anxiety Inventory (STAI) (Spielberger, 1983) is a 20 item questionnaire measuring respondents' level of state (current) anxiety. It was initially conceptualized as a research inventory for the study of anxiety in adults. "State anxiety" is conceptualized as a transitory emotional state or condition of the human organism that is characterized by subjective, consciously perceived feelings of tension and apprehension, and heightened autonomic nervous system activity" (Spielberger et al., 1970, p. 3). The state subscale consists of 20 items, rated on a four-point Likert scale, ranging from (1) *not at all*, (2) *somewhat*, (3) *moderately so*, (4) *very much so*. Individual items are scored from 1-4 to 4-1, depending on the direction of the wording of the items. Examples of some items are: "I feel calm," "I feel frightened," "I feel nervous." The STAI has been used extensively in adolescent populations (Barnes, Harp, & Jung, 2002; Byrne et al., 2007; Hishinuma et al., 2000). Internal consistency is high ranging from 0.83 to 0.96 (Barnes et al., 2002; Hishinuma et al., 2000).

The Norwegian version has also shown high internal consistency (Haseeth, Hagtvet & Spielberger, 1990). State anxiety may fluctuate over time and can vary in intensity. The STAI state scale-retest reliability is therefore low, from 0.16 to 0.33 (Spielberger, 1983). However, a study by Barnes et al., (2002) showed test-retest of 0.70. Test-retest reliability of the STAI on adolescents before and after a stressful situation showed internal consistency of 0.40 (Rule & Traver, 1983). In a meta-analysis of studies using the STAI, the mean internal consistency

was 0.91 (Barnes et al., 2002). The internal consistency in the present thesis showed Cronbach's α varying between 0.91 and 0.98 (papers I-III).

State depression (paper I-III)

A non-clinical depression scale was used to assess state depression. The scale is constructed by Byrne et al., (2007) for the validation of the Adolescent Stress Questionnaire (ASQ). It consists of a short, 15-item questionnaire measuring respondent's level of current depressive mood. Item choice was informed by reference to commonly experienced depressive features outlined in the Diagnostic and Statistical Manual – Fourth Edition TR (American Psychiatric Association, 2000). Reference was also made to the Zung Self Rating Depression Scale (Zung, 1965). The items describe a number of commonly experienced but essentially non-clinical depressive attributes, and respondents were asked to indicate the extent to which they had experienced these symptoms in the past week using a 5-point Likert scale ranging from (0) *never*, (1) *rarely*, (2) *sometimes*, (3) *very often*, (4) *always*. Example of some items are: "I feel like crying," "I feel guilty without knowing why," "I have felt like things always go wrong, no matter how hard I try." The internal consistency of the scale is found to be high showing Cronbach's α of 0.91 and is found to correlate positively and significantly with the measure of STAI ($r = 0.67$) and negatively and significantly with measures of RSES ($r = -0.63$) (Byrne et al., 2007). Exploratory factor analysis of the scale in the present thesis found support for that the scale can be used as one-dimensional. The internal consistency of the scale in the present thesis showed Cronbach's α ranging between 0.94 and 0.96 (paper I – III).

Sense of coherence (paper IV)

To measure sense of coherence (SOC), a Norwegian 13-item short version of the originally 29-item Orientation to Life Questionnaire based on Antonovsky's conceptualization of SOC was used (Antonovsky, 1987). The 13-item SOC scale is derived from a theoretical model designed to explain the maintenance or improvement of one's position on a health-ease/disease continuum and measures the three main elements comprehensibility, manageability and meaningfulness. The scale has been used both in adult and adolescent samples (Eriksson & Lindström, 2005). The respondents are requested to mark their response to each item on a 7-point scale with two anchoring verbal responses, for example "very seldom or never" and "very often." One example is: "Do you have the feeling that you don't really care about what goes on around you?" and "Has it happened that people whom you counted on disappointed you?" The total sum ranges from 13 to 91. The higher score, the stronger the SOC (Antonovsky, 1987; Eriksson & Lindström, 2005). Antonovsky did however not identify the range of normative values of SOC (Eriksson & Lindström, 2005). The SOC questionnaire has been used in at least 33 languages and seems to be a cross-culturally, valid and reliable instrument (Eriksson & Lindström, 2005). The 13-item SOC scale has been reported to have psychometric properties comparable to the original version with Cronbach's α ranging from 0.70 to 0.92. (Eriksson & Lindström, 2005; Hittner, 2007). Test-retest correlations of the SOC-13 show stability and range from 0.69 to 0.72 (Eriksson & Lindström, 2005). Cronbach's α for the SOC scale in paper III was 0.84.

Subjective health complaints (paper IV)

Subjective health complaints were measured by a 12-item scale including a list of common health complaints, with seven somatic (headache, back pain, pain in arms/legs, stomach-ache, cold, asthma and skin problems) and five psychological symptoms (felt

nervous/worried/scared, felt loneliness, sadness, been irritable or been in a bad mood). The students are asked: “Have you had any of the following complaints during the four last weeks?” Each health complaint is rated on a five-point scale: (1) *have not had any problems*, (2) *have not been bothered*, (3) *a little bothered*, (4) *quite bothered*, (5) *very bothered*. Previous information about psychometric properties of the scale is not available. The scale is however equivalent to other measures like the Health Behaviour in School-aged Children (HBSC) measuring subjective health complaints, reporting satisfactorily reliability and validity (Haugland & Wold, 2001). The study reported that the complaints were interpreted as negative states with consequences for daily life and well-being (Haugland & Wold, 2001). Exploratory factor analysis of the scale in the present thesis found support for that the scale can be used as one-dimensional. The summed scores of the scale in the present thesis ranged from 12 to 56, with higher summed scores indicating higher symptom levels. Cronbach’s α coefficient for the scale in the present thesis was 0.81 (paper IV).

Leisure time physical activity (paper II)

Leisure time physical activity was measured by one item where the students were asked: “During the last four weeks, how many days a week have you participated in sports or physical activity so hard that you had high respiratory frequency, sweated, or had an increased heart rate for 20 min (or more)?” The response categories were 1 (never), 2 (less than one day per week), 3 (about one day per week), 4 (two to three days per week) and 5 (most days per week). Self-report methods have been the most frequently validated method of physical activity assessment among children and adolescents (Corder, Ekelund, Steele, Wareham, & Brage, 2008; Kohl, Fulton, & Caspersen, 2000) and a number of previous studies have measured frequency of physical activity by using one single item (Gerber & Pühse, 2008; Gerber & Pühse, 2009; Haugland et al., 2003). Previous authors have questioned the ability to

accurately report level of physical activity below the age of 15-16 years, but findings have shown satisfying validity and reliability of self-report of physical activity in adolescents down to 10 years of age (Kohl et al., 2000; Sallis, & Saelens, 2000).

Summary of papers and main results

Paper I

Title: *Adolescent stress: Evaluation of the factor structure of the adolescent stress questionnaire (ASQ-N)* (*Scandinavian Journal of Psychology*, 2010, 51, 203–209)

Background: In spite of the potential significance of stressors, the past decades have yielded only limited and incremental progress in the field of the development of valid and reliable stress instruments for adolescents. The main aim of this study was to investigate the factor structure and the psychometric properties of the Norwegian version of the Adolescent Stress Questionnaire (ASQ-N). The study also investigated gender and age differences on the stress domains found.

Methods: The sample consisted of 723 adolescents 13-18 years. The adolescents reported scores on The Adolescent Stress Questionnaire (ASQ-N), State Depression, The Spielberger State-Trait Anxiety Inventory (STAI), and Rosenberg Self-esteem Scale (RSES). Principal component analysis (PCA) with oblimin rotation was used to investigate the factor structure of the 58 ASQ-N items. The stress dimensions were tested for internal consistency, using Cronbach's coefficient alpha (α). Independent samples t-test (two-tailed) investigated gender differences on the stress dimensions. Pearson product moment correlation was used to test the inter-correlation between the stress dimensions, the construct validity of the stress dimensions with measures of state depression, anxiety and self-esteem as well as the associations between the stress dimensions and age.

Results: The PCA resulted in nine dimensions of stress, consisting of 52 items and explaining 60.7 % of the variance. The factors reflected stress of: (1) Teacher/adult interaction (6 items, $\alpha = .85$), (2) Peer pressure (8 items, $\alpha = .85$), (3) Home life (10 items, $\alpha = .89$), (4) Adult

responsibility (3 items, $\alpha = .70$), (5) Romantic relationships (4 items, $\alpha = .79$), (6) School attendance (5 items, $\alpha = .72$), (7) School/leisure conflict (7 items, $\alpha = .86$), (8) School performance (5 items, $\alpha = .81$), (9) Financial pressure (4 items, $\alpha = .79$). Five items were excluded from the factor solution. All stress factors (dimensions) were modestly inter-correlated and all dimensions correlated significantly and positively with the measures of state depression (r ranging between 0.39 and 0.54) and state anxiety (r ranging between 0.36 and 0.55) and negatively with self-esteem (r ranging between -0.25 and -0.45), indicating that the construct validity was satisfactory. Significant gender differences in self-reported adolescent stress were evident on seven of the nine stress dimensions (significance value ranging between $p < .05$ and $p < .001$), where girls scored higher than boys. A significant and weak to moderate positive correlation was found between age and stress of adult responsibility ($r = 0.14$), romantic relationships ($r = 0.12$), school performance ($r = 0.09$), and financial pressure ($r = 0.22$) (for more detailed information, see paper I).

Paper II

Title: Leisure time physical activity does not moderate the relationship between stress and psychological functioning in Norwegian adolescents (Mental Health and Physical Activity, 2010, 3, 17-22)

Background: Studies have shown that daily physical activity benefits health and protect against a variety of physical and psychological conditions. However, there is mixed evidence that physical activity can moderate the stress and mental well-being relationship among adolescents. The main aim of the study was to investigate the potential moderating role of leisure time physical activity (LPA) on the relation between total stress and psychological functioning (state depression, state anxiety and self-esteem). The study also

investigated gender and age differences on psychological functioning and the association between stress and psychological functioning.

Methods: The sample consisted of 1508 adolescents 13-18 years. The adolescents reported scores on The Adolescent Stress Questionnaire (ASQ-N), State Depression, The Spielberger State-Trait Anxiety Inventory (STAI), Rosenberg Self-esteem Scale (RSES) and one item measuring frequency of LPA. Two-way between groups MANOVA was used to investigate gender and age differences on psychological functioning. Two-way between groups MANCOVA was used to investigate how stress and LPA was associated with psychological functioning controlled for gender and age, as well as the potential moderating role of LPA on the relation between stress and psychological functioning.

Results: The results from the MANOVA showed that girls scored significantly higher on state depression ($p < .001$) and state anxiety ($p < .001$) and boys scored significantly higher on self-esteem ($p < .001$). Age showed a non-significant main effect on the outcome variables ($p > .05$). A significant interaction effect of gender by age was however found on all outcome measures (significance value ranging between $< .01$ and $p < .001$). Girls scored significantly higher than boys in all age groups on state depression, especially in the age group 15-16 years. Boys scored consistently higher on self-esteem in all age groups where the gender differences increased with age. When looking at state anxiety, girls scored significantly higher than boys only in the age group 15-16 years. The results from the MANCOVA showed a significant main effect of stress on all outcome variables, where higher mean-group scores of stress related to higher scores on state depression ($p < .001$) and state anxiety ($p < .001$) and lower scores on self-esteem ($p < .001$). A significant main effect of LPA was found on all outcome variables, where higher mean group scores on frequency of LPA related to significantly lower scores on state depression ($p < .01$) and state anxiety ($p < .001$) and higher scores on self-esteem ($p < .001$). There were significant mean group differences between all LPA groups on

the outcome variables, except from on moderate and high frequency of LPA in relation to state depression. No support was found for LPA moderating the relation between stress and psychological functioning ($p > .05$) (for more detailed information, see paper II).

Paper III

Title: The association between stress and emotional states in adolescents: The role of gender and self-esteem (Personality and Individual Differences, 2010, 49, 430–435)

Background: Stress, self-esteem and emotional health are highly related constructs and likely to show changes during adolescence because of the many transitions that occur during this period. High self-esteem has been considered as a positive factor in relation to depression and to protect against the deleterious consequences of stressful life events, but the findings are inconsistent. The study investigated gender differences on seven domains of stress, self-esteem and emotional states (depression and anxiety). The study also investigated the association between stress, self-esteem and emotional states and the potential moderating role of self-esteem and gender on the relation between stress and emotional states.

Methods: The sample consisted of 1508 adolescents 13-18 years. The adolescents reported on the Adolescent Stress Questionnaire (ASQ-N), State Depression, The Spielberger State-Trait Anxiety Inventory (STAI), and Rosenberg Self-esteem Scale (RSES). Independent samples t-test was used to compare means between genders. Hierarchical multiple regression analysis controlled for gender and age investigated the association between each of the seven stress domains, self-esteem and the outcome of state depression and state anxiety.

Results: The initial results showed that girls scored significantly higher on all stress domains ($p < .001$) and on emotional states ($p < .001$) compared with boys. Conversely, boys scored significantly higher on self-esteem ($p < .001$). A significant association was found between

stress related to peer pressure, home life, school performance, adult responsibility and higher levels of negative emotional states when controlling for gender, age and self-esteem (significance level ranging between $p < .05$ and $p < .01$). A significant and strong, inverse association was found between self-esteem and emotional states ($p < .001$), controlled for gender, age and stress. A significant but weak moderation effect of self-esteem was found on the association between stress related to peer pressure, romantic relationships, school performance and negative emotional states (significance level ranging between $p < .05$ and $p < .01$). No support was found for gender moderating the association between any of the stress domains and emotional states (for more detailed information, see paper III).

Paper IV

Title: The association between stress, sense of coherence and subjective health complaints in adolescents: Sense of coherence as a potential moderator (Manuscript accepted for publication, August 29th, 2010 in Stress and Health)

Background: Previous findings have shown a positive association between stress and subjective health complaints (SHC) during adolescence. There has been a growing interest for factors that promote health and buffer the adverse health impact from stress. Sense of coherence (SOC) has been considered a positive factor in this context. However, few and inconsistent findings of the moderating role of SOC on the relation between stress and SHC has been found in adolescent populations. The present study investigated how domains of stress and SOC are associated with SHC, as well as the possible moderating role of SOC on the relationship between stress and SHC.

Methods: The sample consisted of 1183 adolescents 13-18 years. The instruments used were the Adolescent Stress Questionnaire (ASQ-N), the 13 item-version of The Orientation to Life

Questionnaire assessing SOC, and 12 items assessing subjective health complaints (SHC).

Independent samples t-test was used to compare means between genders. Hierarchical multiple regression analysis was the main statistical analysis used.

Results: When controlling for gender and age, a significant association was found between increasing stress related to each of peer pressure, home life, adult responsibility, school attendance and higher level of SHC (significance value ranging between $p < .01$ and $p < .001$). When including SOC, the strength of the association between the stress dimensions and SHC was reduced but still significant, however, adult responsibility lost its significant association with SHC. SOC showed a significant inverse association with SHC ($p < .001$). SOC did not moderate the relationship between stress and SHC, indicating that the association between stress and subjective health complaints does not depend on the strength of SOC in adolescents. (for more detailed information, see paper IV).

Discussion

The overall aim of this thesis has been to increase knowledge about the nature of adolescent stressors by investigating the factor structure and psychometric properties of an inventory assessing adolescent stressors (ASQ-N). Further, the aim has been to learn more about the association between adolescent stress and different health outcomes and to clarify the role of potential protective factors in this context, either through main effects on health, or as potential moderators on the relationship between stress and different health outcomes.

The nature of adolescent stressors

One of the main findings of this thesis is that the Norwegian version of the Adolescent Stress Questionnaire (ASQ-N) consist of nine dimensions of stress, where none were completely identical to the Australian factor structure. However, most of the items in the factors were similar in content and could therefore be labeled similar to the Australian factor structure. The dimensions were modest and positively inter-correlated, which was expected given the method of factor rotation (oblique); a finding also recognized in the study of Byrne et al. (2007). It is not surprising, for example, that stress arising from peer pressure (Scale 2) is positively correlated with stress arising from stress of home life (Scale 3) since acquiescence to peer pressure may in turn promote disruptive interactions in home life. The factors reflected dimensions of adolescent stressors which are qualitatively consistent with the contemporary literature on the stressfulness related to adolescence (McNamara, 2000; Suldo, et al., 2008; Rudolph, 2002) and with the original Australian factor structure (Byrne et al., 2007). The reason for why the Norwegian factor structure showed minor differences compared to the Australian factor structure may have different explanations. Both countries

are influenced by Western culture and may not differ much in life style generally. However, small differences may account for variations in how the adolescents respond on the inventory. A broader conceptual view of the nature of adolescent stressors reflects the prevailing social context at any point in time (Plunkett, Radmacher, & Moll-Phanara, 2000), and supports the idea that Norwegian and Australian adolescents may experience some different stressors and different levels of stressor exposure in their daily life. Another aspect is the language and jargon that adolescents choose to report and describe when referring to different stressors; which may be somewhat different between the two adolescent cultures, with consequences for the translation of the inventory. However, the factor structure did not differ remarkably between the two countries, supporting the applicability of the ASQ-N for measuring stress among Norwegian adolescents.

Psychometric validation is the process by which an instrument is assessed for reliability and validity by mounting a series of defined tests on the population group from whom the instrument is intended (Bowling, 2005). Reliability refers to the reproducibility and consistency of the instrument. It refers to the homogeneity of the instrument and the degree to which it is free from random error (Bowling, 2005). Internal consistency involves testing of homogeneity and is the extent to which the items relating to a particular dimension in a scale tap only this dimension and no other (Bowling, 2005). The psychometric properties of the ASQ-N were within an acceptable range where all the stress dimensions showed acceptable internal consistency. A Cronbach's alpha coefficient above .70 is normally considered an indication of acceptable internal consistency (Tabachnick & Fidell, 2007). Cronbach alpha values are, however, quite sensitive to the number of items in the scale and the sample size (Pallant, 2007; Tabachnick & Fidell, 2007). Validity concerns how well a variable measures what it claims to measure (Cozby, 1996) and there are different ways to examine validity. One assumption for validity is acceptable reliability (Bowling, 2005). Construct validity is the

extent to which the instrument provides a good reflection of its own theoretical underpinning (Banyard & Grayson, 2000). A widely used and accepted method for assessing construct validity is to examine both positive and negative associations with other established scales (Bowling, 2005). In line with the results in Byrne et al., (2007), the analyses supported the construct validity of the ASQ-N, with significant and positive correlations with two measures of affect (depression and anxiety) and significant and negative correlations with self-esteem. Associations between the experience of adolescent stress and depression are now well established in the literature (Garber, 2006; Grant et al. 2004). Similar findings have been found for stress and anxiety (Kim, et al., 2003; McLaughlin & Hatzenbuehler, 2009) and stress and self-esteem (Baldwin & Hoffman, 2002). In sum, these findings indicate that the ASQ-N has potential as a valid and reliable inventory to measure adolescent stressors. The fact that the Norwegian ASQ-dimensions operate in a way which is consistent with the original Australian version gives confidence that these dimensions are meaningful for the assessment of adolescent stressor experience. Although the nine dimensions found in ASQ-N are consistent with theoretical and empirical findings, the reliability and validity of the instrument needs to be tested further across samples.

Demographic differences on the ASQ-N stress dimensions

The thesis shows that girls overall scored higher on stress level than boys. In paper I significant gender differences were evident on seven of the nine stress dimensions (peer pressure, home life, adult responsibility, romantic relationships, school/leisure conflict, school performance, financial pressure), with girls reporting higher levels of stress in each case than boys. As shown in paper III, girls reported significantly higher stress levels on all stress dimensions compared with boys. The same gender difference was evident in paper IV, except

from on “stress of romantic relationships”, where no significant difference was found. The gender differences found is consistent with the results reported for the original Australian version of ASQ (Byrne et al. 2007) and with other findings on gender and stress (Hampel & Peterman, 2006; Hankin, et al., 2007). Studies have shown that there are gender differences in stress appraisal where girls are especially more likely to internalize the causes to stress and to report higher perceived stress in relation to interpersonal conflict e.g. the home situation, the peer group and in reference to social networks (Hampel & Peterman, 2006; Rudolph, 2002). Boys have been found to report higher levels of non-interpersonal stressors related to e.g. achievement and academic failure (Shih et al., 2006; Sund, Larsson, & Wichstrøm, 2003), but these findings are not consistent (Shih et al., 2006). Adolescent girls’ relationships and friendships seem to be characterized by greater levels of intimacy, emotional support, and self-disclosure, whereas such relationships among boys tend to be grounded in companionship and shared activities (Hankin et al., 2007). Because of girls’ tendencies to rely heavily on peer relationships for emotional support and intimacy, conflict or pressure in the peer group may elicit more experience of stress in girls, especially for girls with vulnerabilities in interpersonal relationships (Rudolph, 2002). Findings in adult samples also show that women overall report higher levels of perceived stress than men (Weekes, MacLean, & Berger, 2005).

The results in this thesis show that age related far less broadly to the ASQ-N dimensions than did gender. Findings have shown that levels of stress seem to increase from preadolescence to adolescence (Rudolph, 2002). A significant but weak association was evident between age and four of the dimensions in paper I, reflecting stress of adult responsibility, romantic relationships, school performance and financial pressure. Only peer pressure and adult responsibility was significantly and weakly related to age in paper III. The results do not allow drawing strong conclusions, although, the findings reflect that what may

be a minor concern for younger adolescents may become a greater challenge when approaching adulthood (Byrne et al., 2007).

Stress and health in adolescents

Adolescence is recognized as a period with an increase in emotional problems like depression and anxiety, especially in girls (Compas, Connor-Smith, & Jaser, 2004; Kim, 2003; Ranta et al., 2007). Conversely, boys seem to score higher on self-esteem during the time of adolescence (Baldwin & Hoffmann, 2002; Frost & McKelvie, 2004). Overall, the results in this thesis (paper I – III), are in line with these previous findings. Paper II showed that girls scored higher on state depression across all age groups, and especially in the age group 15-16 years. Boys scored consistently higher on self-esteem in all age groups and the gender differences increased with age. The only significant gender difference on state anxiety was found for those 15-16 years. The results highlight that there is an increase in emotional problems around age 15-16 years, indicating a need to identify and support especially girls – with emotional problems, individually or in groups.

Although exposure to some stressors is considered as a normal part of development and may be stimuli for growth and development, the effect of cumulative and simultaneous stressors can threaten the well-being and healthy development of children and adolescents (Grant et al., 2004; McLaughlin & Hatzenbuehler, 2009). According to the transactional theory of stress, the personal evaluations of individual and environmental resources, as well as the importance of the stressor are fundamental for the individuals' perception of the stressor and for the response to take place, which has further impact on the health outcomes of stress. In considering the events that may be a source of stress in adolescence, the number of

stressors, the timing of events and the synchronicity of these events are all key features of any one's experience (Graber & Sontag, 2009).

The results presented in paper II show that total sum stress was significantly and positively associated with state depression and state anxiety and negatively related to self-esteem, controlled for gender and age. When looking at the different stress domains in paper III, stress of home life and school performance were significantly associated with state depression and stress of peer pressure, and adult responsibility were significantly related to higher levels of state anxiety when controlled for gender, age and self-esteem. However, the association between stress and emotional symptoms was not moderated by gender. Paper IV showed that when controlling for gender, age and SOC, stress related to peer pressure and home life, as well as school attendance was related to higher levels of subjective health complaints. In sum, the results show that total sum stress as well as domain specific stressors in interpersonal contexts (peers and home) and in the school environment are important stressors in relation to adolescents' psychological functioning and in the experience of subjective health complaints. The findings in the present thesis are supported by previous research, where especially interpersonal stressors are found to be associated with depression (Charbonneau et al., 2009; Compas et al., 2004; Garber, 2006; Shih et al., 2006) and anxiety (Kim et al., 2003; McLaughlin & Hatzenbuehler, 2009). Support for an inverse association between stress and self-esteem is also found (Wilburn & Smith, 2005). However, in contrast to some previous findings (Charbonneau et al., 2009; Hankin et al., 2007), the results indicate that the strength of the associations between each of the stressors and adolescents' emotional health outcome did not differ remarkably between boys and girls.

The adolescent period is associated with establishment of new relationships, more interaction with the opposite sex and start dating; their social relationships become more complex. Peers and friends increase in importance and the wish to conform to the peer group

peaks during this time (Rudolph, 2002). Failure to adjust to the change process in social relationships may lead to rejection or isolation. Moreover, adolescence may be a time of heightened stress within parent-child relationships, owing to a mismatch between the child's perception of increased autonomy from parents and parents' reluctance to grant this autonomy (Granic, Dishion, & Hollenstein, 2003). The school or educational environment is also of crucial importance in the lives of adolescents (Sund et al., 2003) and school-related stressors are found to be related to emotional problems (Hjern et al., 2008; Undheim & Sund, 2005) as well as subjective health complaints (Gerber & Pühse, 2008; Torsheim & Wold, 2001). Adolescents may have little choice regarding interaction, and the implications of a satisfactory negotiation with the environment for future success are self-evident (Byrne et al., 2007). In sum, high expectations from adolescents themselves and others might, in the long run, give youngsters a chronic feeling of insufficiency and stress and contribute to the development of negative health outcomes.

The role of leisure time physical activity, self-esteem and sense of coherence in relation to adolescent health and well-being – potential stress moderators?

Public health concepts emphasize the importance of personal and social protective factors that are associated with positive outcomes despite the experience of stressful events. Stress alone is not sufficient to explain individual differences in people's health. Consequently, stress research has shifted from the analysis of main effects to investigation of interaction-effect models (Gerber & Pühse, 2009).

The findings in paper II showed that leisure time physical activity is a positive factor for adolescents' psychological functioning. Higher frequency of leisure time physical activity

was weakly associated with lower level of state depression and state anxiety as well as with higher level of self-esteem, controlled for gender and age. The study did however not find empirical evidence for a moderating role of leisure time physical activity, showing that individuals who engage in regular leisure time physical activity were not less susceptible to negative psychological functioning related to stress than are those who are less active. Although the associations found regarding the role of leisure time physical activity were not strong, the significant results are in line with previous studies showing that physical activity benefits health and protects against a variety of emotional problems (Gerber & Pühse, 2009; Jerstad et al., 2010; Sagatun, Sjøgaard, Bjertness, Selmer, & Heyerdahl, 2007). Previous findings have also shown that physical activity is considered as a core feature in relation to self-esteem (Ekeland et al., 2005; Fox 2000). The review of Gerber & Pühse (2009) concluded that there were inconsistent results regarding the stress-moderating role of physical activity in relation to both physical and psychological conditions among adolescents, where about half of the studies supported a moderator effect of physical activity. The review also concluded that although physical activity may not always help, high levels of physical activity in times of increased stress experience do not generate additional stress (Gerber & Pühse, 2009). The results in sum underscore the positive role of leisure time physical activity in association with psychological functioning in adolescents. Physical activity can thus be used as a health promoting strategy throughout adolescence and into adulthood and strengthen personal and social resources, which in turn may influence on health and well-being. Accordingly, efforts should be made to identify how much physical activity (e.g. dose, intensity) is necessary to trigger potential stress-buffer effects. Moreover, the setting and circumstances under which physical activity takes place should be considered more closely (Gerber & Pühse, 2009).

Self-esteem is a large part of adolescents' self-understanding and is likely to be a fluctuating and dynamic construct, susceptible to internal and environmental influences during adolescence (Baldwin & Hoffmann, 2002). Self-esteem has been found to be the most important factor for retaining psychological and social functioning during adolescence (Räty et al., 2005). Low self-esteem has been strongly associated with especially depression (Orth et al., 2008; Orth, Robins, Trzesniwski et al., 2009) and also anxiety (Boden et al., 2008; Kim, 2003). The self-esteem buffering hypothesis has been tested in numerous studies; however, previous research testing the moderating role of self-esteem has yielded inconsistent results (see Orth, Robins, & Meier, 2009).

In line with the previous findings, the results in the present thesis showed a strong and inverse relation between self-esteem and state depression and state anxiety, controlled for gender, age and stress (paper III). Further, a weak moderating role of self-esteem was found on the association between stress of peer pressure and state depression and anxiety, as well as between each of stress of school performance and romantic relationships in association with state anxiety. However, none of the interaction terms explained much of the variance in emotional states. From this point of view, it seems inappropriate to overstate the substantive significance of the moderating role of self-esteem. It should be noted that interaction effects are difficult to identify and that, therefore, also small effects can be of practical significance (McClelland & Judd, 1993). In line with the findings in the present thesis, it would be logical to assume that facilitating self-esteem, as one factor among an array of forces is central for preventing emotional problems during adolescence (Kim, 2003).

The thesis also supports the positive role of SOC in association with adolescents' health. Paper IV showed a strong and negative association between SOC and SHC, controlled for gender, age and stress. The negative relation between SOC and SHC among adolescents is supported by previous studies (Nielsen & Hansson, 2007; Simonsson et al., 2008).

Meanwhile, none of the interaction terms with each of the stress domains and SOC were significant in association with SHC. Previous findings have shown inconsistent results regarding the moderating role of SOC (Nielsen & Hansson, 2007; Torsheim et al., 2001). Antonovsky (1987) emphasized that the SOC concept is a dispositional orientation rather than a personality trait or a coping strategy reflecting a person's resources and capacity to respond to stress. During adolescence, people are repeatedly exposed to tension states requiring that they actively respond to stressors by mobilising appropriate resources (Eriksson & Lindström, 2005; Richardson & Ratner, 2005; Nielsen & Hansson, 2007). A person with a strong SOC is less likely to perceive a situation as potentially stressful and is more likely to select a coping strategy that is efficient for dealing with the stressor(s). The person will therefore not experience the same level of tension associated with impact from stress, leading to the positive end of the ease/disease continuum (Antonovsky, 1996).

In sum, the results overall demonstrate the positive role of leisure time physical activity, self-esteem and SOC in relation to adolescents' psychological and subjective health, despite the experience of stress. The present findings provide us with information which can be used to form interventions to promote adolescent psychological functioning in general, as well as to support those with potential risk for psychological problems.

Limitations

Although the results of the present thesis provide insight into the nature of adolescent stressors and the association between stress and different health outcomes as well as protective factors in this context, the findings and conclusions should be considered with some methodological limitations in mind.

Since the present study employed a cross-sectional design, it is not possible to determine causal direction among the variables, and the associations found are possible to represent a series of reciprocal relations (Kim et al., 2003; McMahon et al., 2003). This implies that one must remain open to alternative explanations for the findings.

Although adolescents having higher levels of stress also reported higher levels of state depression, state anxiety, subjective health complaints and lower level of self-esteem, having more emotional and subjective health complaints might also lead to more sensitivity to stressors or more exposure to stressors. Prospective, longitudinal data would have strengthened the thesis by allowing associations be investigated over time.

All findings are based on self-report data from questionnaires. The major criticism of self-report data is that of subjectivity. However, with a focus on subjective phenomena, subjectivity is also the strength of such data, since they reflect personal evaluations of health and health correlates. Further, the sample size of the present study can protect against the influences of potential random error related to self-report (Rothman, 2002).

The thesis combines both “state constructs” and scales measuring more temporally stable constructs. This should, however be counter-balanced by the fact that the time of reference was more or less the same for all scales used. Leisure time physical activity was measured by one item focusing on frequency of physical activity which represents a potential threat to validity. Physical activity dimensions include intensity, frequency, and duration, which make up the total volume of activity (Corder et al., 2008) and the thesis would have been strengthened if a scale had been used covering all these dimensions. This would reduce potential bias related to possible varying levels of comprehension of the question. However, promising evidence has been shown by studies using one single item (Gerber & Pühse, 2008; Haugland et al., 2003). The thesis would also have been strengthened if potential confounders like socio-economic status, smoking, alcohol intake and ethnicity had been controlled for in

the relationship between leisure time physical activity and psychological functioning (Gerber & Pühse, 2008; Haugland et al., 2003; Sagatun et al., 2007).

Also, the results do not allow for firm conclusions with regard to clinical levels of stress, emotional affect or disorder. First, the measures of emotional states rely on self-report and conclusions about more clinical disorder should be based on clinical interviews. Second, the results of our analyses are based on non-clinical samples, which, even if a nontrivial proportion of the sample experienced relatively high levels of stress or emotional problems, do not allow for valid conclusions in clinical populations. Nevertheless, we believe that the results are relevant for levels of emotional affect that represent a significant impairment of the individual's psychological well-being (Orth et al., 2009).

Implications

ASQ-N is a comprehensive measure which allows adolescents to report their own exposure to a wide span of stressors and to report, as well, the extent to which any stressor experience has constituted a psychologically challenge for them as individuals (Byrne et al., 2007, p. 411). On the basis of the present data it can be claimed that the ASQ-N has potential utility as a measure of adolescent stress both in the research setting and perhaps in the context of clinical investigation (Byrne et al., 2007).

The identification of the link between stressful life events and negative health outcomes represents an important step toward developing preventive interventions for children and adolescents targeting stress-related health problems. One target for preventive interventions could certainly be to reduce the burden on children and adolescents by decreasing their exposure to stress. These might include efforts to reduce stressors in the family environment as well as in the school environment. However, given the limited control

that can be gained over young people's exposure to many forms of stressful situations, an even more important intervention is to increase children's and adolescents' abilities to cope with stress (Grant, Behling, Gipson, & Ford, 2005).

The results in this thesis have identified the role of some potential protective factors which show that an important target for prevention of negative health outcomes as well as for positive adolescent development is to strengthen adolescents' individual resources, in order to handle the challenges that one may experience during the adolescent period, and to equip them with tools to make their journey through adolescence a positive growth-oriented experience (Compas, Champion, & Reeslund, 2005). Previous studies suggest that effective health promotion is multifaceted, and is most successful when integrated into several arenas such as schools, families, school-health services as well as organisations where adolescents meet with peers to provide a supportive context which facilitate development of a number of protective factors in adolescents (Haugland, 2001; Natvig, Hanestad, & Samdal, 2006).

One way of promoting a good school environment is to create meeting points where students can enjoy being part of, and having a role in a group through activities as well as meeting points without the requirement to participate in specified activities. Furthermore, pedagogical methods might be used to improve notions of support among students through for example project work, where strengthening the individual's capacity to work with e.g. stressful situations is the central outcome of the group process (Natvig et al., 2006). However, the groups may be formed also to have other outcomes, and it is important that the group facilitators pay attention to all these issues. An equally important aspect is to include parents, family and afterschool programs to integrate all environments that adolescents are part of. Parents need to be in close dialog with both their child and to be seen as crucial actors in relation to their children's healthy development through adolescence (Compas et al., 2005). After-school programs are also important as supportive and health promoting arenas where

adolescents can form and develop a set of protective resources. Participation in physical activity, both in the school environment and in after-school arenas is one strategy that may promote social interaction as well as self-esteem and well-being among adolescents. It is important however, if successful, that the type of activity is in accordance with the adolescents' individual interests and preferences, and that the environment is adjusted for different activities. The discussion above shows that within health promotion among adolescents lay both personal, social and environmental conditions. A systematic approach that aims to reduce high levels of negative stress and to develop adolescent resources may facilitate positive developmental outcomes in adolescence.

Conclusion and suggestions for future studies

The ASQ-N represents nine stress dimensions which are qualitatively consistent with the contemporary literature on the stressfulness of adolescence. The psychometric properties were acceptable with regards to internal consistency, and the construct validity was also satisfactory, with expected associations with relevant constructs. However, the factor structure and the psychometric properties of the ASQ-N still needs to be tested across cohorts and over time to see how stable the instrument is for use on Norwegian adolescents.

The thesis shows that both total sum stress and domain specific stress, especially in interpersonal contexts relates to more emotional problems and to subjective health complaints, as well as to negative self-perception. Moreover, girls reported higher levels of stress and more negative health problems than boys, especially in the age group 15-16 years; however, the association between stress and emotional problems was not moderated by gender. The thesis has also revealed the positive role of leisure time physical activity, sense of coherence and self-esteem despite the experience of stress in association with adolescents',

health. However, the thesis did not find thoroughly support for a moderating role of these variables, except from self-esteem.

The associations found between different domains of stress and the different health outcomes should be further elaborated. In particular, longitudinal research allowing the association between stressors and health outcomes to be assessed and compared over time are suggested. More research is also needed to understand what variables are actually effective in protecting against negative health outcomes from stressful experiences in young people. Future studies investigating the role of potential moderators might assess the characteristics of stressful events in more detail, in that moderators might have a significant effect only for specific subtypes of stressful events.

Erratum

Paper I

Moksnes, U.K., Byrne, D.G., Mazanov, J., & Espnes, G.A. (2010). Adolescent stress:

Evaluation of the factor structure of the Adolescent Stress Questionnaire (ASQ-N).

Scandinavian Journal of Psychology, 51, 203–209.

The aims of the paper were unfortunately excluded during the printing of the paper in the journal. The aims are included in the thesis.

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Paper I

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Paper II



Leisure time physical activity does not moderate the relationship between stress and psychological functioning in Norwegian adolescents

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ABSTRACT

A number of variables have been shown to moderate the relationship between stress and psychological functioning. Physical activity (PA) has the potential to influence some of these variables but there is mixed evidence that PA can moderate the stress and mental well-being relationship among adolescents. The aim of this cross-sectional study was to investigate if leisure time physical activity moderates the relationship between stress and psychological functioning (depression, anxiety, self-esteem) among Norwegian adolescents 13–18 years old ($n = 1508$). The data were analysed using analysis of variance (MANOVA and MANCOVA). In preliminary analyses, girls reported higher scores of depression and anxiety and boys scored higher on self-esteem. Interaction effects of gender by age were found on all outcome variables. Stress was positively associated with depression and anxiety, and negatively associated with self-esteem. Higher frequency of leisure time physical activity was weakly associated with lower levels of depression and anxiety, and higher levels of self-esteem. The primary analyses revealed no support for leisure time physical activity as a moderator of the association between stress and psychological functioning. The differences between the present study and similar ones were discussed.

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1. Introduction

Several moderator variables have been identified which influence the strength of the observed relationship between stress and psychological functioning among adolescents (Grant et al., 2006). However, the review by Grant and colleagues did not consider the moderating role of physical activity (PA) which has the potential to impact on some of these variables, such as resilience. PA has also been shown to moderate the cross-sectional relationship between stress and psychological symptoms (Brown & Lawton, 1986; Carmack, Boudreaux, Amaral-Melendez, Brantley, & de Moor, 1999; Haugland, Wold, & Torsheim, 2003) with a weaker association among the more active. However, not all cross-sectional studies have supported a moderating effect (e.g., Gerber & Pühse, 2008, 2009), so further research is needed to explain these different findings. Also, only one study has investigated the moderator effect of leisure time physical activity on the relation between

school-related stress and subjective health complaints in Norway (Haugland et al., 2003).

Studies have shown that daily physical activity benefits health and protect against a variety of physical and psychological conditions (Gerber & Pühse, 2009). Leisure time physical activity can be defined as “physical activity associated with formal physical training and recreational activities involving elevated breathing frequency and sweating” (Malina, Bouchard, & Bar-Or, 2004, p. 12). Physical activity has been found to be a positive factor in the promotion of perceived health (Piko, 2007; Piko & Noemi, 2006; Sundblad, Jansson, Saartok, Renström, & Engström, 2008) and well-being (Edwards, 2006; Ussher, Owen, Cook, & Whincup, 2007). Physical activity has also been shown to be beneficial in relation to the control of stress (Nguyen-Michel, Unger, Hamilton, & Spruijt-Metz, 2006), depression (Hallal, Victoria, Azevedo, & Wells, 2006; Motl, Birnbaum, Kubik, & Dishman, 2004; Penedo & Dahn, 2005; Sallis, Prochaska, & Taylor, 2000), anxiety (Salmon, 2001) and self-esteem (Ekeland, Heian, & Hagen, 2005; Schmalz, Deane, Birch, & Davison, 2007). Unfortunately, the frequency of leisure time physical activity and physical exercise decreases during adolescence, and girls’ overall participation is consistently lower than boys’ (Lasheras, Azbar, Merino, & Lopez, 2001; Sagatun, Sogaard,

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Bjertness, Selmer, & Heyerdahl, 2007). The present study will further our understanding of the moderating role of leisure time physical activity on the association between overall stress and psychological functioning.

The initial aims of the present study were to:

- (1) Investigate gender and age differences on psychological functioning (anxiety, depression and self-esteem).
- (2) Investigate the association between stress and psychological functioning.
- (3) Investigate the association between leisure time physical activity and psychological functioning.

Finally, the primary aim was to:

- (4) Investigate if physical activity moderates the association between stress and psychological functioning.

2. Method

2.1. Participants

The analyses are based on cross-sectional data from a larger study called "Growing up in rural settings," where public schools in six rural municipalities in Norway participated. A total of 2341 students were asked to participate in the study (693 from elementary school and 1648 from secondary school). A total of 1862 completed questionnaires were returned, giving an overall response rate of 79.5%. Missing responses were mainly due to non-cooperation of classes or students being absent when the questionnaire was administered. In the present study the sample was restricted to junior and senior high school and the data analysis was therefore undertaken for $n = 1508$ (81%); 769 (51.1%) were girls and 735 (48.9%) were boys (gender was not identified for four participants). Participants had an age range of 13–18 years; the mean age for the whole sample was 14.9 ($SD = 1.5$). The mean age for boys was 14.8 ($SD = 1.5$), and for girls, the mean age was 14.9 ($SD = 1.6$).

2.2. Procedure

Permission to carry out the study was obtained from The Norwegian Social Science Data Services (NSD). Consent was given from the municipalities and the schools. The adolescents and their parents received an information letter which explained the purpose of the study. In all stages of the data collection, it was emphasised that participation was voluntary and anonymous, and that all information was confidential. Questionnaire administration was completed in whole class groups during one regular school hour of 45 min, in 2006. Researchers on the project were present during the data collection to inform students about the survey and to administer the questionnaires.

2.3. Measures

Demographics included questions about gender and age.

Adolescent stress was assessed using the Adolescent Stress Questionnaire (ASQ-N). This is a 58-item questionnaire concerning common adolescent stressors rated on a 5-point Likert scale: 1 (*not at all stressful or is irrelevant to me*) to 5 (*very stressful*). Examples of some items are: "lack of respect from teachers," "arguments at home," and "keeping up with school work." The ASQ has been continuously developed and validated since the middle of the 1990s (Byrne, Davenport, & Mazanov, 2007) and the instrument has been successfully tested for use in a Norwegian adolescent sample

(Moksnes, Byrne, Mazanov & Espnes, in press). As in the study of Mazanov and Byrne (2008), the responses were summarised to give a total stress score (range 58–287). Cronbach's alpha coefficient for the scale in the present study was .97.

State anxiety was measured using the Spielberger State-Trait Anxiety Inventory (STAI; Spielberger, 1983). The questionnaire consists of 20 items rated on a 4-point Likert scale ranging from 1 (*not at all*) to 4 (*very much so*). Examples of some items are: "I am tense," "I feel secure," and "I am worried." The sum score of the scale ranged from 20 to 79 and a higher score indicates greater state anxiety. Cronbach's alpha coefficient for the scale in the present study was .91.

State depression was measured using a scale appropriate for measuring non-clinical (state) depressive symptoms developed and used in the study of Byrne et al. (2007). The scale consists of a 15-item questionnaire measuring adolescents' level of current depressive mood. Item choice was informed by reference to commonly experienced depressive features outlined in the Diagnostic and Statistical Manual-Fourth Edition TR (DSM; American Psychiatric Association, 2000). Reference was also made to the Zung Self-Rating Depression Scale (Zung, 1965). The items are measured on a 5-point Likert Scale ranging from 0 (*never*) to 4 (*always*). Examples of some items are: "I have felt sad or unhappy," "I feel guilty without knowing why," and "I have felt uneasy, restless, or irritable." The sum scores of the scale ranged from 0 to 60 and a higher sum score indicates more symptoms of depression. Cronbach's alpha coefficient for the scale in the present study was .94.

Self-esteem was measured using the Rosenberg Self-Esteem Scale (Rosenberg, 1965), a 10-item questionnaire assessing global self-esteem measured on a 4-point Likert scale, ranging from 0 (*strongly disagree*) to 3 (*strongly agree*). Examples of some items are: "On the whole I am satisfied with myself," "At times, I think I am not good at all," and "I take a positive attitude to myself." The sum score ranged from 0 to 30 and a higher sum score indicates higher self-esteem. Cronbach's alpha coefficient for the scale in the present study was .86.

Leisure time physical activity was measured by one item: "During the last four weeks, how many days a week have you participated in sports or physical activity so hard that you had high respiratory frequency, sweated, or had an increased heart rate for 20 min (or more)?" The response options were: 1 (*never*), 2 (*less than one day per week*), 3 (*about one day per week*), 4 (*two to three days per week*) to 5 (*most days per week*).

2.4. Statistics

All statistical analyses were carried out using the SPSS, version 14.0 (SPSS Inc., Chicago, IL). For respondents with up to 10% missing responses within a scale, missing responses were replaced with modes (Mazanov, 2003). For respondents with more than 10% missing responses within a scale, no score was calculated. In the subsequent analyses, pair-wise deletion of missing data was employed where applicable. The active sample size therefore varied between $n = 1237$ and $n = 1381$. Descriptive statistics of frequencies, means and standard deviations were calculated for all continuous variables in the study. Cronbach's alphas were computed to estimate the internal consistency of the instruments used. Moderation hypotheses are commonly examined by including an interaction term in analysis of variance or regression analyses (Baron & Kenny, 1986). Two-way between-groups multivariate analysis of variance (MANOVA) was performed to investigate whether socio-demographics (age, gender), were associated with psychological functioning (depression, anxiety and self-esteem served as outcome variables). In the case of significant

results in the multivariate analyses, univariate analyses (ANOVAs) were then performed separately for each dependent variable. Two-way between-groups multivariate analysis of covariance (MANCOVA) was performed to investigate if stress and leisure time physical activity were associated with psychological functioning and to investigate the potential moderation effects of leisure time physical activity. Bonferroni's post hoc test was applied for comparisons of mean values between groups, with alpha level being adjusted by means of the Bonferroni's technique for multiple comparisons of three groups ($p < .017$). In order to investigate the interaction effect further, simple effect analyses were used. To analyze possible age differences, three age groups were imposed on the sample: 13–14 years, 15–16 years and 17–18 years. The stress scale was divided into three statistically equal sized groups: low stress: 58–100; moderate stress: 101–149 and high stress 150–287. Leisure time physical activity variable was divided into three groups: Low = 1 day per week or less; Moderate = 2–3 days per week; High = most days per week. These categories were based on frequency distributions and an understanding of these categories as reflecting low, moderate and high levels of physical activity.

3. Results

3.1. Descriptive analyses

Table 1 shows the frequency distribution, as well as mean scores and standard deviations for the variables in the study.

3.2. Socio-demographics and psychological functioning

The first aim was to study gender and age differences on psychological functioning (self-esteem, anxiety and depression). The multivariate test of gender was significant (Wilks' $\lambda = 0.94$, $F(3, 1281) = 28.69$, $p < .001$). The results in Table 2 show a significant main effect of gender on all outcome variables, where boys reported higher scores on self-esteem and girls scored higher on depression and anxiety. The multivariate test also showed a significant result for age (Wilks' $\lambda = 0.99$, $F(6, 2562) = 2.60$, $p < .05$), but the main effects of age were non-significant (Table 2). When looking at the interaction effects, the multivariate test showed a significant interaction of gender by age on the combined

Table 1
Frequencies, means and standard deviations for the variables in the study.

Group variables	Anxiety			Depression			Self-esteem		
	n	M	SD	n	M	SD	n	M	SD
Gender									
Girls	713	37.6	10.7	720	19.4	12.3	692	17.8	5.3
Boys	653	35.2	10.6	657	14.2	11.2	630	20.1	5.2
Age									
13–14	622	36.4	10.6	632	16.0	12.1	590	19.0	5.4
15–16	496	37.0	11.2	501	17.7	12.3	491	18.8	5.4
17–18	252	35.6	9.9	248	17.8	11.3	244	18.8	5.6
Stress									
Low	440	30.8	4.9	444	9.0	8.1	427	21.1	4.9
Medium	446	36.3	9.3	446	17.2	10.4	430	19.1	4.8
High	423	42.5	10.6	425	25.0	11.7	406	16.3	5.4
LPA									
1 day per week or less	408	38.7	11.0	411	19.0	12.8	397	17.4	5.4
2–3 days per week	591	36.1	10.2	599	16.4	11.7	571	18.9	5.1
Most days	362	34.5	10.6	362	15.3	11.6	349	20.6	5.5

Note: LPA = leisure time physical activity.

Table 2
Main effects and interaction effects of gender and age on psychological functioning

	Anxiety			Depression			Self-esteem		
	df	F	η^2	df	F	η^2	df	F	η^2
Gender	1	17.70**	.01	1	55.68**	.04	1	67.09**	.05
Age	2	1.65	.00	2	3.41	.01	2	0.29	.00
Gender \times Age	2	5.44*	.01	2	7.39**	.01	2	6.38*	.01

Note: η^2 indicates effect sizes.

* $p < .01$, ** $p < .001$.

dependent variables (Wilks' $\lambda = 0.99$, $F(6, 2562) = 3.45$, $p < .001$), and the interaction effects for each dependent variable were also significant (Table 2). However, the effect sizes of the main effects and interaction effects were not strong (small: $\eta^2 = .01$; medium: $\eta^2 = .09$; large: $\eta^2 = .25$; Cohen, 1988). In order to investigate the interaction further, simple effects were analysed. For self-esteem, there was a significant gender difference in all age groups ($p < .001$) and the gender differences increased with age. There were also significant gender differences in all age groups on depression scores ($p < .001$), where the biggest gender difference was found in the age group 15–16 years. For anxiety, the only significant gender difference was found in the age group 15–16 years ($p < .001$).

3.3. Stress, leisure time physical activity and psychological functioning

A two-way between-groups MANCOVA was performed (1) to investigate the association between stress and psychological functioning, (2) to investigate the association between leisure time physical activity and psychological functioning, and (3) to investigate whether leisure time physical activity moderated the association between stress and psychological functioning. Since there were significant gender \times age interactions on all outcome variables in the preceding analyses, gender and age served as covariates in the present analyses. For stress, the multivariate test was significant (Wilks' $\lambda = 0.71$, $F(6, 2448) = 77.47$, $p < .001$). Significant main effects of stress were found on anxiety, depression and self-esteem (Table 3). The Bonferroni post hoc test showed that there were significant differences between all the stress groups on all the outcome variables ($p < .001$). For leisure time physical activity, the multivariate test was significant (Wilks' $\lambda = 0.96$, $F(6, 2448) = 7.88$, $p < .001$), and significant main effects of leisure time physical activity were found on all outcome variables (Table 3). The effect sizes were however not strong. Again, the post hoc test showed a significant difference between all the physical activity groups ($p < .001$), except for the moderate and high physical activity groups on depression ($p > .50$). Finally, the multivariate test showed no significant interaction effects of stress by leisure time physical activity, indicating that leisure time physical activity did

Table 3
Main effects and interaction effects of stress and leisure time physical activity on psychological functioning.

	Anxiety			Depression			Self-esteem		
	df	F	η^2	df	F	η^2	df	F	η^2
Stress	2	134.97**	.18	2	237.30**	.28	2	75.98**	.11
LPA	2	9.63**	.02	2	5.17*	.01	2	23.07**	.04
Stress \times LPA	4	1.34	.00	4	1.03	.00	4	0.31	.00

Note: η^2 indicates effect sizes.

LPA = leisure time physical activity.

Controlled for gender and age.

* $p < .01$, ** $p < .001$.

not moderate the relation between stress and psychological functioning (Wilks' $\lambda = 0.99$, $F(12, 3238) = 0.67$, $p > .05$) (see Table 3).

4. Discussion

The first initial aim was to investigate gender and age differences in psychological functioning. The results showed that girls reported higher scores on depression and anxiety, and boys scored higher on self-esteem. However, a significant interaction effect of gender by age was also found on all the outcome variables, where boys scored significantly higher on self-esteem in all age groups, and girls scored higher on depression in all age groups. The biggest differences were found in the 15–16 age group. The only significant gender difference on anxiety was found in the 15–16 age group, where girls scored higher than boys. The effect sizes were relatively weak for all of the main effects and interaction effects, indicating that the group differences were not strong. However, the results showed that there is a notable gender difference in symptoms, especially in the 15–16 age group. The present results are in line with previous studies, suggesting that there is an increase in negative psychological functioning during adolescence, and moreover, girls seem to report more psychological complaints than boys (Jose & Ratcliffe, 2004; Marcotte, Fortin, Potvin, & Papillon, 2002; Rudolph, 2002; Waaktaar, Borge, Fundingsrud, Christie, & Torgersen, 2004). During adolescence there is also an increase in self-consciousness, which leads to adolescents beginning to develop an understanding of themselves. Self-esteem is a large part of adolescents' self-understanding. The relationship between gender and self-esteem has been well-researched. Studies have typically found that males have a higher self-esteem than females, particularly during adolescence (Baldwin & Hoffmann, 2002; Jose & Ratcliffe, 2004; Quatman & Watson, 2001). Explanations for why young girls report more negatively on psychological functioning, and especially on depression, have among others included early pubertal transition, dissatisfaction with body image, vulnerability to stressful events and deficits in coping abilities, and challenges regarding social roles (Garber, 2006; Ge, Conger, & Elder, 2001; Hayward & Sandborn, 2002; Sweeting & West, 2003). The reason for why girls report more negatively on the outcome variables in the present study may be related to a higher level of problems for girls, but could also result from the fact that girls have a lower threshold for evaluating and reporting experiences as problematic. The differences may therefore partly result from gender differences in self-reporting styles (Heyerdahl, Kvernmo, & Wichstrøm, 2004). In sum, the results highlight the need to provide support for girls especially, as they seem to be more vulnerable to psychological problems during the adolescent period.

The second initial aim was to investigate the association between stress and psychological functioning. When controlled for gender and age, the results showed a significant association between stress and negative psychological functioning. That is, adolescents who experienced higher levels of stress also reported higher levels of depression and anxiety and lower self-esteem than those who reported experiencing lower stress levels. The significant association clearly reflects the function of stressful life events as conspicuously related to negative psychological functioning.

The possibility of bi-directionality of associations with stress and the outcome variables of the present study cannot, of course, be discounted. Experience of psychological complaints can influence both reporting of stressor experience and assessment of stressor impact, in that adolescents who score higher on emotional problems may perceive the situation as more stressful. Indeed, it is likely that both these types of factors contribute to explanations of the relationships between stress and the psychological outcome variables in the present study (Carter,

Garber, Ciesla, & Cole, 2006; Grant et al., 2003; Kim, Conger, Elder, & Lorenz, 2003). The results are consistent with previous studies (Jose & Ratcliffe, 2004; Murberg & Bru, 2005; Sund, Larsson, & Wichstrøm, 2003; Waaktaar et al., 2004) and underscore the importance of focusing on resources for coping with stressful situations during adolescence, as stress is clearly related to adolescent health and well-being.

The third initial aim was to investigate the association between leisure time physical activity and psychological functioning. The results showed that higher frequency of leisure time physical activity was significantly associated with higher level of self-esteem and lower level of depression and anxiety, when controlled for gender and age; the effect sizes were however not strong. This is in line with the findings of a Norwegian longitudinal study which found that physical activity was weakly associated with mental health at three-year follow-up (Sagatun et al., 2007). Although the associations in the present study were not strong, the significant results give some support to earlier studies investigating physical activity in relation to psychological health and well-being (Edwards, 2006; Ussher, et al., 2007), and more specifically in relation to depression (Hallal, et al., 2006; Nabkasorn et al., 2005; Penedo & Dahn, 2005), anxiety (Penedo & Dahn, 2005; Salmon, 2001), and self-esteem (Ekeland et al., 2005; Schmalz et al., 2007; Twisk, 2001). This underscores the importance of promoting leisure time physical activity in the broader adolescent group. The origin of a healthy lifestyle starts early in life (Twisk, 2001). Children and adolescents are, therefore, especially interesting as target populations for disease preventive and health promotional strategies aimed at an increase in physical activity (e.g., report from The Ministry of Health and Care Services, 2008).

Finally, the primary aim of the study was to investigate if leisure time physical activity was a potential modifier of the association between stress and psychological functioning. The results showed no significant interaction effects, indicating that the impact of stress on negative psychological functioning is not dependent on whether adolescents are more or less physically active. Although both physical activity and stress have separate main effects on each outcome variable, they do not interact. These results stand in contrast to previous studies (Brown & Siegel, 1988; Carmack et al., 1999; Haugland et al., 2003; Norris, Carrol, & Cochrane, 1992), but are supported by recent findings (Gerber & Pühse, 2008).

Explanations for the present results are not straightforward. The focus of the study was on overall stress and not on specific stress domains like the study by Haugland et al. (2003), who assessed school-related stress. Stress is a multifaceted construct and is affected by a large number of factors (Byrne et al., 2007). It is plausible to believe that there may be other factors not assessed in the present study that interact with the associations found. But specific criteria that would define this relationship as well as the specific mechanisms by which it would occur still remain unexplored and continued research is needed in this area. It is also important to underline that the present study used other outcome measures than the study of Haugland et al. (2003). Further, while many adolescents in the present sample participated in organized forms of leisure time physical activity, the training schedules were rather fixed, with physical activity taking place irrespective of the student's stress level (Gerber & Pühse, 2008). Also the item used for measuring leisure time physical activity might have accounted for some of the results. This is discussed in more detail in the section headed "Strengths and limitations." It is reasonable to conclude that the non-significant interaction effects in the present study may indicate that there are other, more important moderators in the relation between stress and psychological functioning in adolescents' daily life than physical activity. Previous findings have shown that, e.g., moderators like social support, social competence,

positive peer relationships and positive events/activities are significant protective moderators on the relation between stressors and psychopathology (Grant et al., 2006).

In view of the present findings, one target for preventive interventions will be to reduce adolescents' exposure to potential stressors and help young people develop protective contexts which facilitate development of a number of particular protective factors. Given the limited control that can be gained over young people's exposure to many forms of stressful situations, an important target is to increase children's and adolescents' abilities to cope with stress. Improved skills in problem solving, emotion regulation and access to adequate social support may increase resilience in the face of stress (Compas, Champion, & Reeslund, 2005). This may provide a useful avenue for preventive interventions aimed at improving the lives of adolescents. Resource building can be achieved through school-based health promotion actions, in cooperation with teachers and health nurses in order to reach most of the adolescent group. It is equally important to include parents, family and after-school programs to integrate all environments that adolescents are part of. These interventions could be incorporated in e.g. in physical education classes and in after-school programs where physical activity can be organized in different forms from games to team sport. This may promote social interaction as well as self-esteem and well-being among adolescents. It is however important that the type of physical activity is in accordance with the adolescents' individual interests and preferences, and that the environment is adjusted for different activities. As the discussion sets out, from the perspective of health promotion, lay personal, social and environmental factors all play important roles here. But ultimate success will depend on collaboration between adolescents, school nurses, teachers and parents.

4.1. Strengths and limitations

One strength of the present study is its large sample size. Given the findings of associations between stress and negative psychological functioning among adolescents in the present study and in previous research (Grant et al., 2003; McMahon, Grant, Compas, Thurm, & Ey, 2003), the topic also has high social relevance. However, the study also has some limitations. First, since it used a cross-sectional design, causal direction among the variables cannot be determined. Second, the study combines both "state-constructs" and scales measuring more temporally stable constructs. This should, however be counter-balanced by the fact that the time of reference was more or less the same for all scales used in the study. Third, physical activity was studied by using one single item, which may have contributed to misclassification and self-report bias because of possible varying levels of comprehension of the question. The use of scales or composite measures might have led to an increase in reliability. However, a number of previous studies have measured physical activity by using one single item (Gerber & Pühse, 2008; Gerber & Pühse, 2009; Haugland et al., 2003). The ideal measure of physical activity would include items of frequency, intensity, and duration (Sallis & Saelens, 2000). The one-item index solely assessed frequency and did not distinguish between different intensities of various physical activities. Further, the semantic item formulation (sweating or high respiratory frequency) is a subjective experience, which does not provide objective information about the intensity of a particular activity. This may have resulted in higher reported rates of leisure time physical activity for unfit adolescents. Fourth, all findings were based on self-report data. It is, however, accepted that adolescents are able to evaluate and give reliable information about physical activity (Boot, Okely, Chey, & Bauman, 2001), and subjective health by the use of questionnaires (Haugland & Wold, 2001). The large

sample size of the present study can protect against the influences of potential random error related to self-report (Rothman, 2002). Finally, the study was not able to control for important potential confounders of the relationship between leisure time physical activity and psychological functioning like socio-economic status, smoking, alcohol intake and ethnicity, since these variables were not included in the data set. Including these variables would have strengthened the present findings (Gerber & Pühse, 2008; Haugland et al., 2003; Sagatun, et al., 2007), but would also have added considerably to the length of the questionnaire.

5. Conclusions and future studies

The present research revealed that girls scored higher on depression and anxiety, and boys reported higher scores on self-esteem. A significant interaction effect of gender by age was found on all outcome variables (depression, anxiety and self-esteem). Adolescents, who perceived higher levels of stress, also reported significantly higher scores on depression and anxiety and lower scores on self-esteem. Higher frequency of leisure time physical activity was weakly but significantly associated with lower levels of depression and anxiety and higher levels of self-esteem. The study did not find empirical evidence that individuals who engage in regular leisure time physical activity were less susceptible to negative psychological functioning related to stress than are those who were less active. More research is needed to understand what factors are actually effective in protecting against negative psychological outcomes from the influence of stressful experiences in young people. More emphasis should also be put on different types and intensities of physical activity (competitive vs. recreational, individual vs. team) in relation to specific stressors, and psychological functioning and on valid assessment of physical activity. The associations found in the present study should be investigated further in longitudinal studies designed to provide further insight into the associations between leisure time physical activity, stress and psychological functioning.

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Paper III



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The association between stress and emotional states in adolescents: The role of gender and self-esteem

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ABSTRACT

This cross-sectional study investigated gender differences on domains of stress, self-esteem and emotional states (depression and anxiety) as well as the association between stress, self-esteem and emotional states using a sample of Norwegian adolescents ($N = 1508$). The results showed that girls had significantly higher mean scores on all stress domains and on emotional states compared with boys. Conversely, boys scored significantly higher on self-esteem. The hierarchical multiple regression analysis showed a significant association between increasing stress related to peer pressure, home life, school performance and adult responsibility and higher levels of emotional states. Moreover, the associations between stress and emotional states were not moderated by gender. A strong, inverse association was found between self-esteem and emotional states. A weak moderation effect of self-esteem was found on the association between stress related to peer pressure, romantic relationships, school performance and emotional states. The identification of the potential protective role of self-esteem in relation to adolescents' emotional outcomes represents an important step toward developing preventive interventions for children and adolescents.

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1. Introduction

Of all life-stages adolescence is arguably the one most marked by rapid and potentially tumultuous transition, including biological, social, and psychological changes as well as shifting self-concepts (Byrne, Davenport, & Mazanov, 2007). Investigating the association between stress, self-esteem and emotional outcomes as well as gender differences on these constructs are helpful for health promotion as well as preventive strategies during adolescence.

Research has established that overall levels of stress tend to increase from preadolescence to adolescence (Rudolph, 2002). A growing body of research confirms that girls during adolescence experience higher levels of stress than boys; this is specifically related to interpersonal stressors, including negative events and problems related to, e.g., peers, romantic relationships, and family (Hampel & Peterman, 2006; Hankin, Mermelstein, & Roesch, 2007). Girls are also found to exhibit more emotional problems in adolescence than boys, including symptoms of depression and anxiety. This gender difference seems to increase in middle to late adoles-

cence (Compas, Connor-Smith, & Jaser, 2004; Kim, 2003; Ranta et al., 2007). Conversely, boys seem to score higher on self-esteem during adolescence (Baldwin & Hoffmann, 2002; Frost & McKelvie, 2004).

Evidence suggests that adolescent exposure to multiple independent and cumulative stressors, especially those in an interpersonal context (Rudolph, 2002), is related to psychological symptomatology of clinical significance, including symptoms of depression (Charbonneau, Mezulis, & Hyde, 2009; Compas et al., 2004; Garber, 2006; Shih, Eberhart, Hammen, & Brennan, 2006; Waaktaar, Borge, Fundingsrud, Christie, & Torgersen, 2004) and anxiety (Kim, Conger, Elder, & Lorenz, 2003; McLaughlin & Hatzenbuehler, 2009). In this regard, girls appear to be more vulnerable to the negative psychological health effects of stress than boys (Charbonneau et al., 2009; Hankin et al., 2007). Studies also provide evidence that stressful life experiences predict increases in psychological problems over time (Carter, Garber, Ciesla, & Cole, 2006; Hankin et al., 2007; Waaktaar et al., 2004).

Self-esteem is a large part of adolescents' self-understanding and is likely to be a fluctuating and dynamic construct, susceptible to internal and external influences during adolescence (Abela, Webb, Wagner, Ho, & Adams, 2006; Baldwin & Hoffmann, 2002). Self-esteem is widely recognized as a central aspect of

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psychological functioning during adolescence. Previous studies have found clear inverse associations between self-esteem and symptoms of depression (Orth, Robins, & Meier, 2009; Orth, Robins, & Roberts, 2008) and anxiety (Boden, Fergusson, & Horwood, 2008; Kim, 2003). Especially in the face of challenging life circumstances, individuals with high self-esteem are assumed to have better coping resources and are thus protected against the deleterious consequences of stressful life events (and, conversely, individuals with relatively low self-esteem are more vulnerable to this effect) (Orth et al., 2009). However, previous research testing the moderating effect of self-esteem has yielded inconsistent results, addressing a need for further investigation on this issue, Orth et al. (2008, 2009) have addressed these issues in more detail).

The present research adds to the literature in several ways. As described in the introduction, stress, self-esteem and emotional outcomes are highly related constructs and likely to show changes during adolescence because of the many transitions that occur during this time. In light of developmental shifts and gender differences in the salience and impact of various social contexts, developing a more thorough understanding of the association between stress, self-esteem and emotional states may require distinguishing among different specific domains of stress (McMahon, Grant, Compas, Thurm, & Ey, 2003). Orth et al. (2009) further emphasise that self-esteem might have a buffering effect only for specific subtypes of stressful events, addressing the need to test the potential moderating role of self-esteem on different domains of stress in more detail.

Based on the empirical findings presented above, the aim of this study is threefold.

- (1) To investigate gender differences on domains of stress and on state depression and anxiety, and self-esteem. We assumed that girls scored higher on stress, depression and anxiety, and that boys scored higher on self-esteem.
- (2) To investigate the association between the predictor variables of stress and self-esteem and the outcome of state depression and anxiety. It is expected that stress is positively and self-esteem negatively related to state depression and anxiety.
- (3) To investigate the potential moderation effect of self-esteem and gender on the relationship between each of the stress domains and the outcome of state depression and anxiety. Based on previous empirical findings, we expected that a moderation effect would be found.

2. Methods

2.1. Participants

A total of 2341 students attending public schools from six municipalities in the middle of Norway were asked to participate in the study (693 from elementary school and 1648 from secondary school). Of these participants, 1862 completed questionnaires were returned for an overall response rate of 79.5%. Missing responses were mainly due to the lack of cooperation of classes or students being absent when the questionnaire was administered. In the present study the sample was restricted to pupils in junior and senior high schools, and the data analysis was therefore undertaken for $n = 1508$ (81%); 769 (51.1%) were girls and 735 (48.9%) were boys (gender was not identified for four participants). Participants ranged in age from 13 to 18 years, and the mean age for the entire sample was 14.86 ($SD = 1.51$), 14.76 for boys ($SD = 1.46$) and 14.95 for girls ($SD = 1.55$). There was no significant gender difference in age.

2.2. Procedures

Permission to carry out the study was obtained from The Norwegian Social Science Data Services (NSD), with consent granted from both the municipalities and the schools. Passive consent from the participants was allowed because no identity data was collected. The adolescents and the parents received an information letter that briefly explained the purpose of the study. In all stages of the data collection, it was emphasized that participation was voluntary, anonymous, and confidential, and that the participants were free to withdraw from the study. Administration of the questionnaire was completed in whole class groups during September and October of 2006. Researchers on the project were present during the data collection and provided instruction and supervision on how to complete the questionnaire.

2.3. Instruments

Adolescent stress was assessed using the Adolescent Stress Questionnaire (ASQ-N). This was originally a 58-item scale with items concerning common adolescent stressors rated on a 5-point Likert scale: 1 = *not at all stressful (or is irrelevant to me)* to 5 = *very stressful*. The ASQ has been continuously developed and validated since the mid 1990s (Byrne et al., 2007), and the instrument has been translated and tested for use in a Norwegian adolescent sample (Moksnes, Byrne, Mazanov, & Espnes, in press) reflecting nine dimensions of stress. However, because of strong correlations between some of the stress domains, only seven were included in the present study: peer pressure, home life, romantic relationships, school attendance, school performance, adult responsibility, and financial pressure. Sum scores were calculated where higher scores reflecting higher levels of stress.

State anxiety was measured using the Spielberger State-Trait Anxiety Inventory (STAI; Spielberger, 1983). The questionnaire consisted of 20 items rated on a 4-point Likert scale ranging from 1 = *not at all* to 4 = *very much so*. The sum of the scale in the present study ranged from 20 to 79, where a higher sum score indicates more symptoms of anxiety.

State depression was measured using a non-clinical depression scale appropriate for measuring (state) non-clinical depressive attributes (see Byrne et al., 2007). It consisted of a short, 15-item questionnaire that measured the respondents' levels of current depressive moods. Item choice was informed by reference to commonly experienced depressive features outlined in the Diagnostic and Statistical Manual—Fourth Edition TR (DSM: American Psychiatric Association, 2000). Reference was also made to the Zung Self Rating Depression Scale (Zung, 1965). The items were measured on a 5-point Likert Scale ranging from 0 = *never* to 4 = *always*. The sum scores of the scale in the study ranged from 0 to 60, where a higher sum score indicated more symptoms of depression.

Self-esteem was measured using the Rosenberg Self-Esteem Scale (RSE; Rosenberg, 1965), a 10-item questionnaire measuring global self-esteem on a 4-point Likert scale, ranging from 0 = *strongly disagree* to 3 = *strongly agree*. The sum score in the present study ranged from 0 to 30, where a higher sum score indicated higher self-esteem.

2.4. Statistics

All the statistical analyses were carried out using the Statistical Package for Social Sciences (SPSS) version 14.0 for Windows (SPSS Inc., Chicago, IL, 2003). The data file originally had 1862 cases. Those who were older than 18 or younger than 13 years old were excluded ($n = 354$), leaving 1508 cases remaining in the analysis. The response rate was good, and only a small number of cases

(6–9%) missed one or two responses across each of the scales in the study. Missing variables were treated according to the guidelines set out by Mazanov and Byrne (2008). For respondents with up to 10% missing responses within a scale, the missing responses were replaced with modes. For respondents missing more than 10% of the responses within a scale, no score was calculated. 'Missing' was treated listwise in the analyses.

Cronbach's alphas were computed to estimate the internal consistency of all instruments used. Descriptive statistics including means and standard deviations were calculated for the continuous variables and independent samples *t*-test was used to compare means between genders. Effect sizes with Cohen's *d* was used, where small ($d = 0.20$), medium ($d = 0.50$), and large ($d = 0.80$) (Cohen, 1988). Pearson product–moment correlation was used to test bivariate associations between variables in the study. Hierarchical multiple regression analyses controlled for gender and age were used to evaluate the association between the predictor variables of stress and self-esteem and the criterion variables of state depression and anxiety. The moderation effect was tested with two-way interaction effects between gender \times stress and stress \times self-esteem. The variables in the interaction terms were centred before being entered in the regression analysis. There were no indications of multicollinearity, with VIF values <10 and tolerance ranging between .36 and .92 for the regression model with depression and between .33 and .92 for the regression model with anxiety (Tabachnik & Fidell, 2007). The predictor variables were included in five steps: (1) gender, (2) age, (3) stress (4) self-esteem and (5) stress \times gender, stress \times self-esteem. *p*-Values $\leq .05$ were considered statistically significant.

3. Results

3.1. Gender differences on stress, self-esteem and emotional states

The results presented in Table 1 show that girls scored significantly higher on all the stress domains. Girls also had significantly higher mean scores on state depression and anxiety, while boys scored significantly higher on self-esteem. The effect sizes show that the gender differences were weak to moderate. The results presented in Table 2 show significant and medium to strong correlations between all the stress domains, but none of the variables indicated significant multicollinearity ($r > .90$) (Tabachnik & Fidell, 2007). The correlations between the stress domains and the adolescents' scores on state depression, anxiety, and self-esteem were moderate to strong, where all stress domains showed significant and positive correlations with depression and anxiety and significant and negative correlations with self-esteem. Self-esteem was inversely correlated with both state anxiety and depression. Age showed weak correlations with all the scales, indicating that the adolescents' scores on stress, self-esteem and emotional states did not differ remarkably with age.

3.2. Relationships between stress, self-esteem and emotional states

Results following the last step of the multivariate hierarchical regression analysis for variables predicting state depression and anxiety are presented in Table 3. When looking at the model with depression, gender added a significant increment in R^2 when entered in the first step, but showed a non-significant

Table 1
Gender differences on stress, self-esteem and emotional states.

	Girls mean (SD)		Boys mean (SD)		Range	<i>t</i> -Value	Cohen's <i>d</i>
Peer pressure	17.56	(7.50)	14.43	(6.22)	8–40	8.26***	.45
Home life	23.39	(10.07)	19.45	(8.07)	10–50	7.84***	.43
Romantic relationships	8.80	(4.73)	7.44	(3.76)	4–20	5.73***	.32
School attendance	11.89	(4.68)	10.92	(4.55)	5–25	3.77***	.21
School performance	11.54	(4.11)	9.77	(4.16)	5–25	7.66***	.43
Adult responsibility	8.25	(3.37)	6.85	(3.04)	3–15	7.92***	.44
Financial pressure	9.64	(4.31)	7.97	(3.67)	4–20	7.57***	.42
Depression	19.41	(12.28)	14.23	(11.18)	0–60	8.20***	.44
Anxiety	37.63	(10.65)	35.18	(10.56)	20–79	4.27***	.23
Self-esteem	17.75	(5.33)	20.14	(5.23)	0–30	-8.21***	.45

Note:

*** $p \leq .001$.

Table 2
Correlation between age, stress, self-esteem and emotional states.

	PP	HL	RR	SA	SP	AR	FP	Age	Depression	Anxiety	Self-esteem
Peer pressure PP	–	.69**	.62**	.63**	.59**	.62**	.67**	-.10*	.52**	.45**	-.38**
Home life HL	.71**	–	.44**	.66**	.62**	.60**	.70**	-.03	.51**	.41**	-.34**
Romantic relationships RR	.63**	.58**	–	.49**	.45**	.42**	.51**	.03	.34**	.25**	-.21**
School attendance SA	.62**	.67**	.50**	–	.69**	.66**	.60**	-.01	.43**	.33**	-.25**
School performance SP	.55**	.58**	.39**	.73**	–	.67**	.57**	.03	.44**	.31**	-.22**
Adult responsibility AR	.56**	.60**	.38**	.62**	.65**	–	.63**	.09*	.44**	.36**	-.25**
Financial pressure FP	.66**	.72**	.56**	.65**	.55**	.58**	–	-.02	.45**	.37**	-.30**
Age	-.12**	.01	.04	.00	.04	.17**	.06	–	-.03	-.10**	-.09*
Depression	.50**	.52**	.36**	.54**	.51**	.52**	.47**	.11**	–	.54**	-.51**
Anxiety	.46**	.42**	.31**	.46**	.39**	.41**	.38**	.02	.71**	–	-.63**
Self-esteem	-.40**	-.37**	-.24**	-.36**	-.33**	-.34**	-.34**	-.09*	-.64**	-.62**	–
Cronbach's α	.87	.89	.82	.74	.84	.76	.82		.94	.91	.86

Note: Correlations for boys are above the diagonal and correlations for girls are below the diagonal.

The Cronbach's alphas refer to the whole sample.

* $p \leq .05$.

** $p \leq .01$.

Table 3
Summary of the hierarchical regression analysis for variables predicting emotional states.

	Depression				Anxiety			
	B	SE B	β	ΔR^2	B	SE B	β	ΔR^2
Constant	12.26	2.94			50.51	2.83		
Step 1. Gender	.65	.52	.03	.05***	-.97	.49	-.05	.01***
Step 2. Age	.31	.16	.04	.00	-.26	.16	-.04	.00
Step 3. Peer pressure	.18	.10	.11	.34***	.22	.09	.15*	.24***
Home life	.21	.07	.16**		.13	.07	.11	
Romantic relationships	.02	.12	.01		-.04	.12	-.02	
School attendance	.07	.12	.03		-.05	.12	-.02	
School performance	.28	.10	.12**		.03	.10	.02	
Adult responsibility	.32	.18	.09		.36	.17	.11*	
Financial pressure	.03	.15	.01		.02	.15	.01	
Step 4. Self-esteem SE	-.81	.05	-.37***	.13***	-.97	.05	-.49***	.21***
Step 5. Gender \times peer pressure	-.23	.12	-.11	.02***	-.17	.12	-.09	.02***
Gender \times home life	-.10	.09	-.07		-.11	.09	-.08	
Gender \times romantic relationships	.06	.16	.02		.07	.15	.02	
Gender \times school attendance	.24	.18	.07		.41	.17	.13*	
Gender \times school performance	-.03	.15	-.01		-.01	.14	-.00	
Gender \times adult responsibility	.24	.23	.05		-.06	.22	-.01	
Gender \times financial pressure	.09	.20	.03		-.04	.19	-.01	
Peer pressure \times SE	-.03	.01	-.12**		-.03	.01	-.12**	
Home life \times SE	.00	.01	.02		.01	.01	.03	
Romantic relationships \times SE	-.01	.01	-.02		-.03	.01	-.08*	
School attendance \times SE	.01	.02	.01		.00	.02	.01	
School performance \times SE	.01	.01	.01		.03	.01	.08*	
Adult responsibility \times SE	-.02	.02	-.03		-.01	.02	-.01	
Financial pressure \times SE	-.01	.02	-.00		.01	.02	.01	
R^2				.53				.46

Note: Results from the final regression equation.
Reference category – boys.

ΔR^2 : Change in R^2 for each subsequent step.

* $p \leq .05$.

** $p \leq .01$.

*** $p \leq .001$.

association with state depression, when controlling for the other variables. Age was not significantly associated with state depression. Stress added a significant increment R^2 when added in step three, where stress of home life and school performance were significantly and positively associated with state depression controlled for the other variables in the final step. Self-esteem was significantly and inversely related to depression. The moderation effects of gender \times stress and self-esteem \times stress were added in the final step. Self-esteem was found to moderate the association between peer pressure stress and state depression. However, the moderation effect was marginal, accounting for a small increment in R^2 .

In the regression model predicting anxiety, gender was entered in the first step and made a significant increment in R^2 , but showed a non-significant association with anxiety when controlling for age, stress and self-esteem in the final step. Age was not a significant predictor of state anxiety. The stress factors added a significant increment to the model in step three, where stress of peer pressure and adult responsibility were significantly and positively related to anxiety controlled for the other variables in the final step. Self-esteem was strongly and inversely associated with anxiety. When adding the moderation effects in step five, this added a significant but weak increment to the model. A significant moderation effect of gender was found in relation to school attendance, indicating that the association between school attendance and anxiety is impacting differently in boys and girls. Further, self-esteem moderated the association between stress related to peer pressure, romantic relationships and school performance and the outcome of anxiety. However, none of the moderator effects were strong, indicating that the strength of the association between stress and state anxiety is not highly dependent on self-esteem.

4. Discussion

The findings of the present study present a more comprehensive picture of domain specific stress, self-esteem and emotional states in adolescents than the previous literature on the area. In line with the hypothesis, the results showed that girls scored significantly higher on all stress domains where the effect sizes were mainly weak to moderate (Cohen, 1988). The results found support from other studies (Hankin et al., 2007; Rudolph, 2002). Girls may have a greater psychological and emotional investment in interpersonal success and are more concerned about possible negative evaluation by peers than are boys (Rose & Rudolph, 2006; Rudolph, 2002). Further, the finding that girls reported higher stress related to school performance and increasing adult responsibility also support previous findings (Byrne et al., 2007). However, these findings are not consistent across studies, underscoring the importance of investigating domain specific stressors (Rudolph, 2002).

In line with our hypothesis, the findings clearly showed that girls scored higher on state depression and anxiety and boys scored higher on self-esteem, where the effect sizes were small to moderate (Cohen, 1988). During adolescence there is an increase in self-consciousness, and self-esteem is a large part of adolescents' self-understanding. The relationship between gender and self-esteem has been well-researched and studies have typically revealed that boys have a higher self-esteem than girls during adolescence (Baldwin & Hoffmann, 2002; Frost & McKelvie, 2004). The finding that adolescent girls reported higher scores on state depression and anxiety than boys is also in line with previous research (Compas et al., 2004; Kim, 2003; Ranta et al., 2007), showing that girls may be especially vulnerable during the adolescent period and indicate a need to identify potential problems and to provide support especially to girls.

The results supported our hypothesis that stress in everyday life was related to negative emotional states. When controlled for the other variables, stress of home life and school performance were positively associated with state depression, and stress of peer pressure and adult responsibility were positively related to state anxiety. However, in contrast to what we suggested in our hypothesis, the only moderator effect of gender was found on the association between stress of school attendance and state anxiety, where a stronger association was found for girls than for boys. Thus, overall, the results show that each of the stressors has similar impact on boys' and girls' emotional outcome. Relations between stressors and symptoms of depression and anxiety in childhood and adolescence have been well established in cross-sectional and prospective longitudinal studies (Kim et al., 2003; Shih et al., 2006). In line with the present result, previous studies have suggested that stress within an interpersonal context may be especially strongly related to emotional distress. However, in contrast to previous findings, the strength of these associations did not differ remarkably between boys and girls (Charbonneau et al., 2009; Hankin et al., 2007; Rudolph, 2002; Shih et al., 2006).

In line with our suggestions, the results showed that self-esteem was strongly and negatively related to state depression and anxiety, controlled for the effect of stress. The findings thus support the strong, protective role of self-esteem in association with adolescents' psychological health, despite the experience of stressful events. The results further showed that self-esteem moderated the association between stress related to peer pressure, romantic relationships and school performance and increases in negative emotional states. However, it should be noted that the moderation effects did not explain much of the variance in the outcome variables. From this point of view, it seems inappropriate to overstate the substantive significance of the present moderation effects. Support for the inverse association between self-esteem and negative emotional outcomes has been shown in previous findings (Boden et al., 2008; Kim, 2003; Orth et al., 2008; Trzesniewski et al., 2006). However, previous research testing the moderating effects of self-esteem has yielded highly inconsistent results (Orth et al., 2009).

Self-esteem is shaped by individuals' appraisals of their own self and how they are perceived by significant others, and is likely to vary during adolescence as a function of individual and environmental factors (Abela et al., 2006; Baldwin & Hoffmann, 2002; Kim et al., 2003). In line with the findings of the present study, it would be logical to assume that facilitating self-esteem in adolescence is crucial for promoting positive psychological functioning (Kim, 2003; Wilburn & Smith, 2005). An important focus for preventive intervention is also to increase children's abilities to cope effectively with stress and improve skills in problem solving, emotion regulation, and access to adequate social support. This may increase resilience in the face of stress and promote positive psychological functioning among adolescents.

The study should be interpreted with some limitations in mind. Since the present study employed a cross-sectional design, it is not possible to determine causal direction among the variables, and the associations found are possible to represent a series of reciprocal relations (Kim et al., 2003; McMahon et al., 2003). This implies that one must remain open to alternative explanations for the findings. Moreover, all findings were based on self-reports. The results therefore do not allow for firm conclusions with regard to clinical emotional affects. Nevertheless, we believe that the results are relevant for levels of emotional affect that represent a significant impairment in the individual's psychological well-being (Orth et al., 2009). It is also accepted that adolescents as young as 11–15 years old are able to give detailed and reliable information in questionnaires (Haugland & Wold, 2001). The large sample size of the present study can protect against the influences of potential random error related to self-reporting (Rothman, 2002).

In conclusion, girls reported higher mean scores on all stress domains and higher mean scores on state depression and anxiety compared with boys. Boys scored higher on self-esteem. A clear association was found between increasing stress of home life and school performance and higher levels of state depression. Stress of peer pressure and adult responsibility were positively associated with state anxiety. Self-esteem was strongly and inversely associated with both state depression and anxiety, and weak support was found for self-esteem moderating the association between domain specific stress and emotional states. However, further elaboration of the associations is warranted. In particular, longitudinal research of reciprocal and dynamic relations among stressors, self-esteem and emotional outcomes are suggested. The identification of the link between stressful life events, self-esteem and emotional states represents an important step toward developing preventive interventions for children and adolescents targeting stress-related health problems.

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Paper IV

The association between stress, sense of coherence and subjective health complaints in adolescents: Sense of coherence as a potential moderator

Moksnes, U.K., Rannestad, T., Espnes, G.A., Byrne, D.G. *Manuscript accepted for publication, August 29th, 2010 in Stress and Health.*

Summary

The present study investigated the association between domain-specific stress, sense of coherence (SOC) and subjective health complaints (SHC), as well as the possible moderation effect of SOC on the relationship between stress and SHC. The study is based on responses from 1183 adolescents 13-18 years old. The initial results showed that girls scored higher than boys on all stress domains and on SHC. Conversely boys reported stronger SOC. Results from the hierarchical multiple regression analysis showed a significant association between increasing stress related to each of the stress domains of peer pressure, home life, school attendance, as well as to a higher level of SHC. SOC was inversely related to SHC. However, no moderation effect of SOC was found. The findings in the present study thus show that stress and SOC are separately associated with SHC. The results support the importance of improving coping efficacy with stress during adolescence. The results also give some preliminary support for the view that promoting salutogenic factors has positive implications in relation to subjective health in adolescents.

Keywords

Domain specific stress, youth, buffer, health complaints

Introduction

Adolescence represents an important developmental transition from childhood to adulthood and involves momentous biological, social and psychological changes (Williams, Holmbeck, & Greenley, 2002). This period of accelerated development therefore brings with it varying amounts of potential stressors such as changes in responsibilities, higher school demands, and challenges in interpersonal relationships (Byrne, Davenport, & Mazanov, 2007; Moksnes, Moljord, Espnes, & Byrne, 2010). There is evidence to support the view that adolescent exposure to multiple independent and cumulative stressors, especially school-related stressors and those in an interpersonal context, is associated with the experience of subjective health complaints (SHC) (Diepenmaat, van der Wal, de Vet, & Hirasing, 2006; Gerber & Pühse, 2008; Murber & Bru, 2004; Torsheim & Wold, 2001). SHC is a descriptive term that refers to “unexplained symptoms” (Eriksen & Ursin, 2004), that is, relatively vague health complaints experienced by the individual, with or without a defined diagnosis, e.g. headache, backache, nervousness or sleeping difficulties (Haugland & Wold, 2001). Girls tend to report higher stress levels than boys, especially in relation to interpersonal stressors (Byrne *et al.*, 2007; Rudolph, 2002), and also report higher levels of SHC (Haugland, Wold, Stevenson, Aaroe & Woynarowska, 2001; Karvonen, Vikat & Rimpelä, 2005; Torsheim *et al.*, 2006). Torsheim *et al.* (2006) found that among 15-year old adolescents, 63% of the girls and 46.2% of the boys reported SHC at least weekly.

However, although a relatively large proportion of adolescents experience symptoms and report complaints (Gerber & Pühse, 2008; Torsheim *et al.*, 2006), many adolescents do not. This has directed researchers’ attention to factors that moderate the perception of stress, and the adverse health impact of stress (e.g. Torsheim, Aaroe, & Wold, 2001). Further, there has been a growing interest in factors that promote health and protect against health problems (Moksnes *et al.*, 2010 a). The salutogenic theory, developed by Antonovsky (1979, 1987),

focuses on resources for health rather than risk for disease. Antonovsky created the theory as a human global orientation, and claimed that the way people view their life has influence on their health. He introduced the concept of Sense of Coherence (SOC) to give clarity to this view. The concept may be seen as part of the concept of resilience and reflects an individual's resistance in the face of stress which is decisive for maintaining good health (Nielsen & Hansson, 2007). Antonovsky (1987, p. 19) described SOC as "A global orientation that expresses the extent to which one has a pervasive, though dynamic feeling of confidence, that (1) the stimuli deriving from one's internal and external environments in the course of living are structured, predictable and explicable (comprehensibility); (2) the resources are available to meet the demands posed by these stimuli (manageability); and (3) these demands are challenges worthy of investment and engagement (meaningfulness)". Individuals with a strong SOC, it is postulated, will have a general confidence that resources are available to meet the demands posed by stressful situations, and will thus consider a stressor more as a challenge than as a threat. Further, having a strong SOC effectively promotes good and effective coping mechanisms by focusing on finding solutions. This resolves tension in a health promoting manner, and leads toward the salutary health end of the health ease/dis-ease continuum (Eriksson & Lindström, 2005; Nielsen & Hansson, 2007).

Among children and young people, the relationships between SOC and health are reported to be similar to those found in adult populations (Eriksson & Lindström, 2006). The stronger the SOC, the better the level of health is perceived (Eriksson & Lindström, 2006), and simultaneously the lower the reported SHC will be (Buddeberg-Fischer, Klaghofer, & Schnyder, 2001; Nielsen & Hansson, 2007; Simonsson, Nilsson, Leppert, & Diwan, 2008). Among Norwegian 15 year old school children, SOC accounted for more than 50% of the variance in SHC (Torsheim et al., 2001). In stressful situations, a strong SOC seems to have a moderating role across different health outcomes in adult samples (Eriksson & Lindström,

2005; Gana, 2001; Richardson & Ratner, 2005). However, less consistent findings of the moderation effect of SOC has been found in adolescent populations. Torsheim et al. (2001) found only a weak moderation effect of SOC on the association between school-related stress and SHC; and Nielsen & Hansson (2007) found a moderating effect of SOC on the relation between stress and recent illness, but no interaction was found in relation to psychosomatic symptoms.

Antonovsky (1987) believed that a person's SOC would be built up from experiences during childhood and adolescence, and would first achieve stability only during young adulthood, after which SOC would fluctuate marginally (Buddeberg-Fischer *et al.*, 2001). However, empirical findings show that the development of the SOC is a lifelong process extending over the whole life span (Eriksson, 2007). These aspects make it important to investigate SOC in adolescent populations more thoroughly. A considerable amount of work has investigated the association between school-related stress and SHC (e.g. Gerber & Pühse, 2008; Torsheim *et al.*, 2001). However, in light of developmental shifts and the impact of various potential stressors associated with the nature of adolescent development, generating a more thorough understanding of the association between stress, SOC and SHC may require distinguishing among a variety of stress domains (McMahon, Grant, Compas, Thurm, & Ey, 2003), for instance the family, peer and school context. The present study adds to the literature by investigating these aspects more thoroughly. Previous findings have shown that especially adolescents with strong SOC and high stress experience lower SHC than the adolescents with weak SOC and high stress (Eriksson & Lindström, 2006), an association which is postulated in the present study. Further, given the developmental importance of this early period of life, children and adolescents weak in SOC and high on risk or vulnerability to illness may also benefit from preventive interventions aimed at increasing their positive adaptation to adversity. Based on the empirical evidence, the aims of the present study were to:

- 1) Investigate the association between different domains of stress and SHC
- 2) Investigate the association between SOC and SHC and the potential moderation effect of SOC on the association between domains of stress and SHC.

Method

Participants

This cross-sectional study examined data from a survey involving the participation of public elementary and secondary schools in the two counties in the middle of Norway. Of a total of 25 schools approached, six (three urban and three rural) agreed to participate. The schools that did not participate were either not interested or did not have time to participate. A total of 1229 questionnaires were distributed (593 in elementary schools and 636 in secondary schools). Some 1209 completed questionnaires were returned giving an overall response rate of 98.4 %; 606 (51.2%) were girls (gender was not identified for six participants).

Participants' age ranged from 13 to 18 years. Those who were older or younger than 13-18 years ($n=26$) were excluded, leaving 1183 cases in the analysis. The mean age for the whole sample was 15.6 ($SD = 1.8$); for boys 15.6 ($SD = 1.8$) and for girls 15.6 ($SD = 1.8$). There was no significant gender difference in age.

Procedure

Permission to carry out the study was obtained from The Norwegian Social Science Data Services and Regional Committees for Medical Research Ethics. Consent was given from the Rectors on each school and passive consent from the participants was found to be sufficient because no sensitive data were collected. The adolescents and their parents received an information letter which briefly explained the purpose of the study. It was emphasized that participation was voluntary and anonymous, that participants were free to withdraw from the

study at any time, and that the collected information was confidential. Ethically, children and adolescents were regarded as potentially vulnerable groups requiring protection. School nurses were therefore available for students if they needed someone to talk to after they had answered the questionnaire. Questionnaire administration was completed in one section, in whole class groups during school hours in October and November 2008. The small number who did not respond were either not at school that day or declined to answer the questionnaire.

Measures

In addition to completing the scales described below, the participants reported both gender and age.

Adolescent stress was assessed using the Norwegian version of the Adolescent Stress Questionnaire (ASQ-N) (Moksnes, Byrne, Mazanov, & Espnes, 2010). This is originally a 58 item questionnaire concerning common adolescent stressors. The adolescents were asked to indicate how stressful each of the items had been during the last year on a 5-point Likert scale: 1 = *not at all stressful (or is irrelevant to me)*, 2 = *a little stressful*, 3 = *moderately stressful*, 4 = *quite stressful*; and 5 = *very stressful*. If they had not experienced the stressors referred to, they reported 1 = not at all stressful (or irrelevant to me). Examples of some items are: “Disagreements between you and your parents,” “Keeping up with the school work” and “Being hassled for not fitting in.” The ASQ has been continuously developed and psychometrically validated on adolescent samples since the middle of the 1990’s, and has now established validity and reliability for measuring stressor experience (Byrne *et al.*, 2007). The instrument has been translated and tested for use in a Norwegian adolescent sample, with use of principal component analysis (Moksnes, Byrne et al., 2010) reflecting nine dimensions of stress. However, because of strong correlations between some of the stress domains (teacher/adult interaction, school/leisure conflict, $r > .80$), only seven were included in the present study reflecting stress of: peer pressure (8 items), home life (10 items), romantic

relationships (3 items), school attendance (5 items), school performance (5 items), adult responsibility (3 items), and financial pressure (4 items). Sum scores were calculated, where higher scores reflected higher levels of stress. Cronbach's α coefficients for the sub-scales in the present study are reported in Table 1.

Sense of coherence was assessed by the Norwegian 13-item version of the Orientation to Life Questionnaire (Antonovsky, 1987). This scale has been reported to have psychometric properties comparable to the original 29-item version (Eriksson & Lindström, 2005; Hittner, 2007). Items are rated on a 7-point Likert scale and the higher the score, the stronger the SOC (Antonovsky, 1987). Examples of some items are; "*Do you have the feeling that you don't really care about what goes around you?*", "*Has it happened that people whom you counted on disappointed you?*" The SOC scale has been found to be a reliable, valid, and cross-culturally applicable instrument (Eriksson & Lindström, 2005). The internal consistency of the SOC-13 scale is evident in Cronbach's α coefficients in the range of .70 to .92, and the instrument has been used both in adult and adolescent samples (Eriksson & Lindström, 2005). For the present study, summed scores of the whole scale were calculated with a minimum of 13 and maximum of 91 for the 13 items. Cronbach's α coefficient for the scale in the present study is also reported in Table 1.

Subjective health complaints were assessed by twelve questions concerning psychological (e.g. felt nervous, worried, or scared, felt loneliness, sadness, been irritable or been in a bad mood) as well as somatic symptoms (headache, back pain/ pain in arms/legs, stomach-ache, cold, asthma and skin problems). The instrument is closely related to other measures of subjective health complaints, reporting satisfactory reliability and validity (Haugland & Wold, 2001). Respondents were asked if they had experienced any of the symptoms during the previous four weeks. Responses were measured on a 5-point scale ranging from 1 = *have not had any problems*, 2 = *have not been bothered*, 3 = *a little*

bothered, 4 = *quite bothered*, 5 = *very bothered*. The summed scores of the scale in the present study ranged from 12 to 56, with higher summed scores indicating higher symptom levels. Cronbach's α coefficient for the scale in the present study is again presented in Table 1.

Statistical analyses

All statistical analyses were carried out using SPSS, version 14.0 (SPSS Inc., Chicago, IL, 2003). Missing variables were treated according to the guidelines set out by Mazanov and Byrne (2008). For respondents with up to 10% missing responses within a scale, the missing responses were replaced with modes. For respondents missing more than 10% of the responses within a scale, no score was calculated. Descriptive statistics of frequencies, including percentages, means and standard deviations were calculated for continuous and categorical variables. Independent samples t-test analysis was used to compare means between genders. Effect sizes with Cohen's d were used, where small ($d = 0.20$), medium ($d = 0.50$), and large ($d = 0.80$) (Cohen, 1988). Pearson product-moment correlation analysis was used to test bivariate associations between variables in the study. Cronbach's α were computed to estimate the internal consistency of all instruments used. Moderation hypotheses are commonly examined by including an interaction term in analysis of variance or regression analyses (Baron & Kenny, 1986). Hierarchical multiple regression analysis controlled for gender and age was used to investigate the association between the predictor variables of stress and SOC on the criterion variable SHC. The moderation effect was tested with two-way interactions between each of the stress domains and SOC. The variables in the interaction terms were centred before being entered in the regression analysis, to avoid problems with multicollinearity. There were no indications of multicollinearity, with VIF values < 4 and tolerance ranging between .33 - .92 (Tabachnik & Fidell, 2007). The predictor variables were

included in five steps: 1) gender, 2) age, 3) stress, 4) SOC, and 5) stress x SOC. *P*-values $\leq .05$ were considered statistically significant.

Results

Correlation analysis

The results from the correlation analysis and cronbach's α are presented in Table 1. There were significant correlations between SOC, the stress domains, and SHC. The SOC correlated negatively with all stress domains and with SHC, and the stress domains correlated positively with SHC. The correlations, where significant, were typically moderate to strong. Age showed weak to moderate, negative correlations with the other scales (Table 1).

Table 1

Correlation between stress, age, SOC and SHC										
	PP	HL	AR	RR	SA	SP	FP	Age	SOC	SHC
Peer pressure (PP)	-	.65**	.50**	.51**	.57**	.53**	.58**	-.07*	-.48**	.47**
Home life (HL)		-	.51**	.43**	.60**	.53**	.62**	.02	-.43**	.43**
Adult responsibility (AR)			-	.28**	.59**	.63**	.53**	.30**	-.42**	.37**
Romantic relationships (RR)				-	.42**	.31**	.46**	.06*	-.20**	.22**
School attendance (SA)					-	.66**	.60**	.16**	-.40**	.40**
School performance (SP)						-	.52**	.15**	-.38**	.36**
Financial pressure (FP)							-	.14**	-.37**	.33**
Age								-	-.03	-.03
Sense of coherence (SOC)									-	-.55**
Subjective health complaints (SHC)										-
Cronbach's α	.85	.89	.72	.87	.67	.82	.81		.84	.81

Note. * $p \leq .05$; ** $p \leq .01$.

Descriptive statistics

The results from the independent samples t-tests in Table 2 show that girls scored significantly higher than boys on all stress domains except from on romantic relationships. Girls also scored significantly higher on SHC than did boys, and conversely, boys reported having stronger SOC.

Table 2

Gender differences on stress, SOC and SHC

	Girls		Boys		Range	t – value	Cohen’s d
	Mean	SD	Mean	SD			
Peer pressure	18.87	7.03	16.20	6.60	8 - 40	6.59***	.39
Home life	24.29	9.36	20.80	7.83	10 - 50	6.84***	.41
Adult responsibility	8.62	3.17	7.56	2.96	3 - 15	5.82***	.35
Romantic relationships	8.68	5.02	8.28	4.84	4 - 20	1.37	.08
School attendance	12.31	4.34	11.78	4.37	5 - 25	2.05*	.12
School performance	14.63	4.76	13.36	4.80	5 - 25	4.49***	.27
Financial pressure	9.79	4.38	8.62	4.16	4 - 20	4.59***	.27
Sense of coherence SOC	62.13	11.75	64.67	11.77	13 - 91	-3.68***	.21
Subjective health complaints SHC	26.97	6.93	23.00	6.34	12 - 56	10.18***	.60

Note. * $p \leq .05$; *** $p \leq .001$.

Regression analysis for variables predicting subjective health complaints (SHC)

Table 3 presents the results following the hierarchical multiple regression analysis investigating the association between stress, SOC and SHC, controlled for gender and age. Gender was entered in the first step and showed a significant positive association with SHC in all steps of the model, where girls scored higher than boys. Age did not make a significant increment in R^2 when added in step two, but showed a significant and weak negative association with SHC when controlling for stress and SOC, indicating that age in combination with stress and SOC is significantly associated with SHC. The stress domains made a significant increment in R^2 when added in step three, where peer pressure, home life, adult responsibility and school attendance were significantly associated with increased level of SHC. The beta weights for all the stress domains were reduced, but still significant when

adding SOC in step four, while stress of adult responsibility lost its significant association with SHC at that step. SOC showed a significant and strong, inverse association with SHC when added in step four and was also significant in the last step of the model. Finally, no significant moderation effects of SOC were found, indicating that the strength of the association between domain specific stress and SHC does not depend on SOC.

Table 3
Summary of the hierarchical regression analysis for variables predicting SHC

		Subjective health complaints				
		B	SE B	β	F	Adjusted R ²
Step 1	Constant	23.04	.29			
	Gender	4.02	.40	.29***	101.36***	.08
Step 2	Constant	24.92	1.78			
	Gender	4.02	.40	.29***		
	Age	-.12	.11	-.03	51.27	.08
Step 3	Constant	16.91	2.07			
	Gender	2.71	.36	.20***		
	Age	-.24	.11	-.06*		
	Peer pressure	.24	.04	.24***		
	Home life	.11	.03	.13***		
	Adult responsibility	.22	.08	.10**		
	Romantic relationships	-.06	.04	-.04		
	School attendance	.26	.06	.16***		
	School performance	.01	.05	.10		
	Financial pressure	-.06	.06	-.04	55.60***	.31
Step 4	Constant	37.05	2.07			
	Gender	2.69	.33	.19***		
	Age	-.25	.10	-.07**		
	Peer pressure	.12	.04	.12***		
	Home life	.06	.03	.08*		
	Adult responsibility	.08	.08	.04		
	Romantic relationships	.03	.04	.02		
	School attendance	.21	.06	.13***		
	School performance	-.00	.05	-.00		
	Financial pressure	-.07	.05	-.05		
	SOC	-.24	.02	-.40***	81.91***	.42
	Step 5	Constant	36.80	2.07		
Gender		2.68	.33	.19***		
Age		-.25	.10	-.06*		
Peer pressure		.10	.04	.10**		
Home life		.08	.03	.10**		
Adult responsibility		.08	.08	.04		
Romantic relationships		.02	.04	.01		
School attendance		.19	.06	.12***		
School performance		.01	.05	.01		
Financial pressure		-.10	.06	-.06		
SOC		-.24	.02	-.40***		
Peer pressure x SOC		-.00	.00	-.02	48.92	.42
Home life x SOC		.00	.00	.05		
Adult responsibility x SOC		.00	.01	.02		
Romantic relationships x SOC		.01	.00	.04		
School attendance x SOC		-.01	.01	-.05		
School performance x SOC		-.01	.00	-.04		
Financial pressure x SOC		-.00	.01	-.03		

Note: * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Gender: value 0 = girls, 1 = boys

Discussion

The aim of the present study was to investigate associations between stress, SOC and SHC, and the potential moderation effect of SOC. The reason for investigating the role of SOC was firstly because the literature indicates that many adolescents experience stress in their daily lives and SOC is found to be a protective factor in this context. And secondly, measures of perceptions in stress and SOC are found to predict variance in SHC (Eriksson & Lindström, 2006, Torsheim *et al.*, 2001). Factors that prevent stressful appraisals and thus impede the development of health complaints may be potential targets for future preventive and health promoting strategies in the adolescent group.

The initial results showed that girls scored higher than boys on all stress domains, and on SHC. Conversely boys reported having a stronger SOC. These results are in line with previous findings investigating adolescent gender differences on stress (Byrne *et al.*, 2007; Moksnes *et al.*, 2010 a), SHC (Karvonen *et al.*, 2005; Torsheim *et al.*, 2006) and SOC (Buddeberg-Fischer *et al.*, 2001; Natvig, Hanestad, & Samdal, 2006). The main results showed that when controlling for gender and age, a positive association was found between stress related each of peer pressure, home life, adult responsibility and school attendance, and higher levels of SHC. However, when adding SOC, the beta weights for the stress domains were reduced and stress of adult responsibility lost its significant association with SHC. Adolescence may especially be a time of heightened stress within the peer group and in the family environment (Rudolph, 2002). Therefore, relationships are likely to play a critical role in the adolescent's well-being, and disruptions or stress in relationships may give rise to SHC (Murber & Bru, 2004). Experiences of higher demands in the school context are also prominent in the lives of adolescents (Gerber & Pühse, 2008; Torsheim & Wold, 2001). High expectations from adolescents themselves and others might, in the long run, give youngsters a chronic feeling of inadequacy in the face of stress, and contribute to the development of SHC.

However, although reported stress was associated with SHC in our sample of adolescents, a causal relationship cannot be assumed. Just as stress predicts increases in SHC, SHC among adolescents may just as easily predict increases in their reports of stressors (Murberg & Bru, 2004).

The results showed a negative association between SOC and SHC, controlling for gender, age and stress. However, the results did not indicate any support for the view that SOC moderated the association between any of the stress domains and SHC. Thus, the present research provides support for the view that SOC is both inversely and independently associated with SHC, and that domains of stress in adolescents are positively associated with SHC, where the strength of the relationship does not depend on level of SOC. Previous research testing the moderating effects of SOC has yielded highly inconsistent results and the lack of moderation effects of SOC on the relation between stress and SHC in the present study is in line with other findings (Nielsen & Hansson, 2007; Torsheim *et al.*, 2001). The present research thus shows that most of the variance accounted for by SOC could be attributed to the direct relationship between SOC and SHC which is in line with previous findings (Nielsen & Hansson, 2007; Simonsson *et al.*, 2008; Torsheim *et al.*, 2001; Torsheim & Wold, 2001), and with the conclusions drawn in the review of Eriksson and Lindström (2005). Antonovsky (1987) emphasized that the SOC concept is a dispositional orientation rather than a personality trait or a coping strategy reflecting a person's capacity to respond to stress. A person with a strong SOC is less likely to perceive a situation as potentially stressful and will therefore not experience the same level of tension associated with impact from stress. Further, Antonovsky (1987) proposed that individuals with strong SOC are more likely to select the coping strategy that is efficient for dealing with the stressor. Over time, individuals with a strong SOC will experience shorter periods of harmful tension associated with stressful experiences than individuals with a weak SOC, leading toward the salutary health end of the

health ease/dis-ease continuum (Simonsson *et al.*, 2008; Torsheim, et al., 2001). Apparently, there may be individual variability in the SOC that correlates with physical and psychological symptoms (Buddeberg-Fischer *et al.*, 2001). On the one hand, unstable SOC within an individual may result in uncertainty and tension, and thereby to more SHC; but on the other hand, SHC may create greater variation in the SOC as a consequence (Buddeberg-Fischer *et al.*, 2001).

A major strength of the present study is the large sample size and the high response rate. Further, the study builds on a strong theoretical foundation with use of well-established instruments. The findings of the present study also present a more comprehensive picture of domain specific stress, SOC and SHC in adolescents than the previous literature in the area. However, the study has some limitations. It should be noted that the cross-sectional design of our study does not allow for conclusions regarding causality. It is possible that the associations found between stress and SHC, as well as between SOC and SHC, are reciprocal, and that there are possible confounding variables like socioeconomic status and family structure that might influence on the associations found (Haugland, Wold, & Torsheim, 2003). A longitudinal design would have strengthened the study by allowing changes to be assessed and compared over time. All findings were based on self-reports and therefore subject to potential reporting bias. Questions about somatic and psychological symptoms may be challenging to validate in a cross-sectional study, with potential for under- as well as over-reporting (Simonsson *et al.*, 2008). It is however accepted that adolescents are able to evaluate and give reliable information about their subjective health by use of questionnaires (Haugland & Wold, 2001). Furthermore, the large sample size of the present study can protect against the influences of potential random error related to self-report (Rothman, 2002).

The results show that stress and SOC are independently associated with SHC, where stress of peer pressure, home life and school attendance were positively associated with SHC

while SOC was inversely associated with SHC. No support was found for the view that SOC moderates the association between domain-specific stress and SHC. Importantly, the findings were established in relation to the expected kinds of stress and of health complaints that the general population of adolescents are exposed to during transition into adulthood. The cross-sectional design does not permit us to draw strong practical implications from the study, but it gives some support for the view that salutogenic factors have implications in relation to a health protective role in adolescents. The associations found between stress related to each of peer pressure, home life, school attendance and SHC consequently also provide insight into the importance of successfully managing interpersonal stressors as well as school related stressors encountered in adolescence. Strategies that promote resilience and enhance effective coping will contribute to personal, health-promoting resources in this context (Eriksson & Lindström, 2006). Future research should examine the cross-cultural generalizability and replicability of the results. Studies should also scrutinize the causal relationships longitudinally to test potential influences of SOC on a causal relationship from stress to SHC, but also investigate how other mediators (stress appraisal, coping) can influence upon the relationship between SOC and SHC.

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Appendices

1. Brev til skolene (Letter to the schools)
2. Brev til elevene (Letter to the participants)
3. Questionnaire instruments employed in the thesis

Subjektive helseplager (Subjective Health Complaints)

Opplevelse av sammenheng (SOC-13 - Orientation to Life Questionnaire)

Spørsmål om stress (The Adolescent Stress Questionnaire - ASQ-N, version 1)

Spørsmål om stress (The Adolescent Stress Questionnaire - ASQ-N, version 2)

Om fysisk aktivitet og idrett (Physical Activity)

Dine følelser den siste uka (Byrne State Depression Inventory)

Selvfølelse (Rosenberg Self Esteem Scale - RSES)

Appendix 1

Brev til skolene (Letter to the schools)



Til skolene

Dato: 15.09.08

Søknad om gjennomføring av en spørreundersøkelse blant elevene om deres helse

Vi henvender oss til Deres skole med ønske om å gjennomføre en spørreundersøkelse blant skolens elever. Hovedhensikten er å validere et spørreskjema som omhandler stress i barn og ungdoms hverdagsliv. Skjemaet vil også inneholde spørsmål om de unges helse, mestring og motstandsressurser. Det er ønskelig at elever i 8.- 10.klasse i ungdomsskolen og elever fra videregående skole deltar.

Det er frivillig å delta i undersøkelsen, og det innhentes passivt samtykke fra deltakerne. Det vil si at dersom eleven selv eller foresatte til elever under 18 år ikke ønsker at eleven deltar i undersøkelsen, må det på forhånd meldes ifra muntlig til undersøkelsens kontaktperson på skolen. Det å fylle ut skjemaet er et samtykke i seg selv og det skal være anonymt. Siden undersøkelsen er anonym er det umulig å trekke seg fra undersøkelsen i ettertid. Reservasjon fra deltagelse har ingen form for konsekvenser og det er viktig at ingen av elevene/foreldrene føler seg presset til å samtykke.

Det skolen bes om å hjelpe til med er selve administreringen av skjemaene (utdeling av skjemaene til deltakerne og også innsamlingen). Ansvarlig for undersøkelsen vil organisere trykking og sending av skjemaene til skolen. Spørreskjemaet vil bli sendt til skolen på forhånd slik at elever og foresatte har mulighet til å vurdere om man ønsker å delta eller ikke. Gjennomføringen vil ta maks en skoletime, og det er behov for at noen av skolens personell er tilgjengelig for å gi evt. veiledning under selve gjennomføringen av undersøkelsen. Det er liten fare for uheldige reaksjoner ved å bli utsatt for disse spørsmålene, men det er likevel rimelig at skolehelsetjenesten blir informert om undersøkelsen.

Det er viktig at skolen merker seg hvor mange elever som blir spurt om å delta og hvor mange som besvarer skjemaet for å kunne si noe om svarprosent.

Prosjektet er godkjent av Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste A/S og Regional etisk komité for medisinsk og helsefaglig forskningsetikk, midt-Norge (REK).

Kontaktperson for undersøkelsen ved NTNU er PhD-student Unni Karin Moksnes. Vi håper at den som lurer på noe vil ta kontakt enten pr. e-post unni.moksnes@svt.ntnu.no eller pr. telefon 971 14 742 eller 73 59 19 28

Med vennlig hilsen

Unni Karin Moksnes
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Appendix 2

Brev til elevene (Letter to the participants)

INVITASJON TIL Å DELTA I EN UNDERSØKELSE OM BARN OG UNGES HELSE

Til elever/foresatte

Du/ditt barn inviteres til å delta i en spørreundersøkelse høsten 2008 der hovedhensikten er å undersøke hvor godt et australsk-utviklet spørreskjema som omhandler stress i barn og unges hverdagsliv fungerer blant norske ungdommer. Undersøkelsen inkluderer også spørsmål om helse, motstandsressurser og mestring. Spørsmålene besvares ved at man fyller ut et spørreskjema.

Vi ønsker svar på spørsmålene fra elever i 8.- 10. klasse i ungdomsskolen og elever fra videregående skole. Å fylle ut skjemaet vil ikke ta mer enn en skoletime, og gjennomføringen vil skje i samarbeid med skolens ansatte. Besvarelsene i undersøkelsen er helt anonyme og vil bli behandlet konfidensielt. Svarene vil bli presentert slik at ingen enkeltpersoner kan gjenkjennes.

Det er frivillig å delta i undersøkelsen, og det innhentes passivt samtykke fra deltakerne. Det betyr at dersom du selv som elev, eller dine foreldre ikke ønsker at du deltar i undersøkelsen, gir du muntlig tilbakemelding til undersøkelsens kontaktperson på skolen. Å fylle ut skjemaet er et samtykke i seg selv, og det skal være anonymt. Merk at dette også betyr at når du har besvart og levert fra deg spørreskjemaet, er det ikke mulig å reservere seg. Ønske om ikke å delta vil ikke ha noen konsekvenser. Det er viktig at ingen elever eller foresatte føler seg presset til å samtykke. Spørreskjemaet vil bli sendt til skolen på forhånd slik at elever og foresatte har mulighet til å vurdere om man ønsker å delta eller ikke.

Studien er godkjent av Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste AS og Regional etisk komité for medisinsk og helsefaglig forskningsetikk, Midt-Norge (REK).

Kontaktperson for undersøkelsen ved NTNU er PhD-student Unni Karin Moksnes. Vi håper at de som lurere på noe tar kontakt enten pr. e-post unni.moksnes@svt.ntnu.no eller pr. telefon 971 14 742 eller 73 59 19 28.

Vennlig hilsen

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Appendix 3

3. Questionnaire instruments employed in the thesis

7. Er dine dagligdagse aktiviteter en kilde til ...
- 1 2 3 4 5 6 7
- glede og tilfredsstillelse? smerte og kjedsomhet?
8. Har du veldig motstridende tanker og følelser?
- 1 2 3 4 5 6 7
- Veldig ofte Veldig sjelden eller aldri
9. Skjer det at du har følelser som du helst ikke vil føle?
- 1 2 3 4 5 6 7
- Veldig ofte Veldig sjelden eller aldri
10. Alle mennesker vil kunne føle seg som tapere iblant. Hvor ofte føler du deg slik?
- 1 2 3 4 5 6 7
- Aldri Veldig ofte
11. Hvor ofte opplever du at du over- eller undervurderer betydningen av noe som skjer?
- 1 2 3 4 5 6 7
- Du over- eller undervurderer Du ser saken i rett sammenheng det som skjer
12. Hvor ofte føler du at de tingene du gjør i hverdagen er meningsløse?
- 1 2 3 4 5 6 7
- Veldig ofte Veldig sjelden eller aldri
13. Hvor ofte har du følelser du ikke er sikker på at du kan kontrollere?
- 1 2 3 4 5 6 7
- Veldig ofte Veldig sjelden eller aldri

SPØRSMÅL OM STRESS (THE ADOLESCENT STRESS QUESTIONNAIRE - ASQ-N, VERSION 1)

Her kommer noen utsagn om ting eller situasjoner som du kan oppleve stressende. Vær snill og fortell oss hvor stressende hver av disse tingene eller situasjonene har vært for deg i løpet av **det siste året**.

Vær snill og svar på alle utsagnene/spørsmålene.

- 1 – Ikke stressende i det hele tatt
- 2 – Litt stressende
- 3 – Moderat stressende
- 4 – Ganske stressende
- 5 – Veldig stressende

- | | 1 | 2 | 3 | 4 | 5 |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 1. Uenigheter mellom deg og faren din | <input type="checkbox"/> |
| 2. Å ikke bli tatt alvorlig. | <input type="checkbox"/> |
| 3. Å stå opp tidlig om morgenen | <input type="checkbox"/> |
| 4. Å ha lite eller ingen kontroll over ditt eget liv | <input type="checkbox"/> |
| 5. Å være nødt til å lese ting du ikke forstår | <input type="checkbox"/> |
| 6. Lærere som forventer for mye av deg | <input type="checkbox"/> |

	1	2	3	4	5
7. Bekymringer om framtida di	<input type="checkbox"/>				
8. Å bli ertet for ikke å passe inn	<input type="checkbox"/>				
9. Å henge med i skolearbeidet	<input type="checkbox"/>				
10. Arbeidsgiveren forventer for mye av deg	<input type="checkbox"/>				
11. Å måtte ta mer familieansvar når du blir eldre	<input type="checkbox"/>				
12. Vanskeligheter med noen skolefag	<input type="checkbox"/>				
13. Å adlyde uviktige regler hjemme	<input type="checkbox"/>				
14. Å måtte konsentrere seg for lenge av gangen i løpet av skoletida	<input type="checkbox"/>				
15. Utilstrekkelige skoleressurser	<input type="checkbox"/>				
16. Å måtte lese ting du ikke er interessert i	<input type="checkbox"/>				
17. Å bli oversett eller avvist av en person du har lyst til å gå ut sammen med	<input type="checkbox"/>				
18. Uenigheter mellom deg og lærerne dine	<input type="checkbox"/>				
19. Ikke nok tid til å ha det gøy	<input type="checkbox"/>				
20. Presse deg selv for å nå målene dine	<input type="checkbox"/>				
21. Uenigheter med brødrene og søstrene dine	<input type="checkbox"/>				
22. Press om å jobbe for å tjene penger	<input type="checkbox"/>				
23. Ikke nok tid til fritidsaktiviteter	<input type="checkbox"/>				
24. For mye hjemmelekse	<input type="checkbox"/>				
25. Ikke nok tilbakemelding på skolearbeidet tidsnok til at det er hjelp i det	<input type="checkbox"/>				
26. Ikke nok tid til aktiviteter utenom skoletid	<input type="checkbox"/>				
27. Å få forholdet til kjæresten til å fungere	<input type="checkbox"/>				
28. Å bli bedømt av vennene dine	<input type="checkbox"/>				
29. Uenigheter mellom foreldrene dine	<input type="checkbox"/>				
30. Forandringer i fysisk utseende ved å vokse	<input type="checkbox"/>				
31. Krangling hjemme	<input type="checkbox"/>				
32. Press for å passe inn blant jevnaldrende	<input type="checkbox"/>				
33. Obligatorisk oppmøte på skolen	<input type="checkbox"/>				
34. Å måtte ta avgjørelser om framtidig arbeid eller utdannelse	<input type="checkbox"/>				
35. Å bo hjemme	<input type="checkbox"/>				
36. Fornøyd med hvordan du ser ut	<input type="checkbox"/>				
37. Uenigheter mellom deg og mora di	<input type="checkbox"/>				
38. Ikke nok penger til å kjøpe de tingene du vil ha	<input type="checkbox"/>				
39. Å gå på skolen	<input type="checkbox"/>				
40. Ikke nok tid til kjæresten din	<input type="checkbox"/>				

	1	2	3	4	5
41. Lærere som erter deg for hvordan du ser ut	<input type="checkbox"/>				
42. Å måtte adlyde uviktige regler på skolen	<input type="checkbox"/>				
43. Press i forhold til skolearbeid	<input type="checkbox"/>				
44. Mangel på tillit fra voksne	<input type="checkbox"/>				
45. Å ikke bli hørt på av lærere	<input type="checkbox"/>				
46. Foreldre som forventer for mye av deg	<input type="checkbox"/>				
47. Å måtte ta mer økonomisk ansvar ettersom du blir eldre	<input type="checkbox"/>				
48. Mangel på forståelse fra foreldre	<input type="checkbox"/>				
49. Foreldre som erter deg for hvordan du ser ut	<input type="checkbox"/>				
50. Arbeid som virker inn på skole og sosiale aktiviteter	<input type="checkbox"/>				
51. Ikke nok penger til å kjøpe de tingene du trenger	<input type="checkbox"/>				
52. Å komme overens med kjæresten din	<input type="checkbox"/>				
53. Mangel på frihet	<input type="checkbox"/>				
54. Jevnaldrende som erter deg for hvordan du ser ut	<input type="checkbox"/>				
55. Mangel på respekt fra lærere	<input type="checkbox"/>				
56. Uenigheter mellom deg og dine jevnaldrende	<input type="checkbox"/>				
57. Å komme overens med lærerne dine	<input type="checkbox"/>				
58. Å slå opp med kjæresten	<input type="checkbox"/>				

SPØRSMÅL OM STRESS (THE ADOLESCENT STRESS QUESTIONNAIRE - ASQ-N, VERSION 2)

Her kommer en liste med ting eller situasjoner som du kan oppleve som stressende. Vær snill og fortell oss hvor stressende hver av disse tingene eller situasjonene har vært for deg i løpet av det siste året. Vennligst svar på alle utsagnene/spørsmålene. Sett bare ett kryss i ruten som passer for hvert utsagn.

NB: Hvis det er noe du ikke har opplevd, krysser du i rute nr. 1 (Ikke stressende).

Hvor stressende er ...	<i>Ikke stressende</i>	<i>Litt stressende</i>	<i>Moderat stressende</i>	<i>Ganske stressende</i>	<i>Svært stressende</i>
	1	2	3	4	5
1. ... uenigheter mellom deg og faren din?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. ... å ikke bli tatt alvorlig?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. ... å stå opp tidlig om morgenen?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. ... å ha lite eller ingen kontroll over ditt eget liv?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. ... å være nødt til å lære ting du ikke forstår?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. ... å ha lærere som forventer for mye av deg?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. ... å ha bekymringer om framtida di?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. ... å bli ertet?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. ... å henge med i skolearbeidet?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. ... at arbeidsgiver forventer for mye av deg?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	<i>Ikke stressende</i>	<i>Litt stressende</i>	<i>Moderat stressende</i>	<i>Ganske stressende</i>	<i>Svært stressende</i>
	1	2	3	4	5
11. ... å måtte ta mer ansvar hjemme etter hvert som du blir eldre?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. ... å ha vanskeligheter med noen skolefag?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. ... å følge regler du er uenig i hjemme?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. ... å måtte konsentrere seg for lenge av gangen i løpet av skoledagen?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. ... å ikke ha nok skoleutstyr?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. ... å måtte lese ting du ikke er interessert i?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. ... å bli oversett eller avvist av en person du er interessert i?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. ... uenigheter mellom deg og lærerne dine?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. ... å ikke ha nok tid til å ha det gøy?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. ... å presse deg selv for å nå målene dine?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. ... uenigheter med søsknene dine?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. ... press om å jobbe for å tjene penger?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. ... å ikke ha nok tid til å drive med fritidsaktiviteter?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. ... å ha for mye hjemmelekser?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. ... å ikke få nok tilbakemelding på skolearbeidet tidsnok til at det er hjelp i det?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. ... å ikke ha nok tid til aktiviteter utenom skoletid?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. ... å få forholdet til kjæresten til å fungere?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. ... å bli nedvurdert av vennene dine?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. ... uenigheter mellom foreldrene dine?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. ... forandringer i fysisk utseende ved å vokse?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. ... uenigheter hjemme?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. ... press for å passe inn blant jevnaldrende?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. ... å ha for mye fravær fra skolen?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. ... å måtte ta avgjørelser om framtidig arbeid eller utdanning?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. ... å bo hjemme?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. ... hvordan du ser ut?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. ... uenigheter mellom deg og mora di?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. ... å ikke ha nok penger til å kjøpe de tingene du vil ha?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. ... å gå på skolen?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. ... å ikke ha nok tid til kjæresten din?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. ... lærere som erter deg?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. ... å adlyde regler du er uenig i på skolen?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. ... press i forhold til skolearbeid?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. ... mangel på tillit fra voksne som betyr noe for deg?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. ... å ikke bli hørt på av lærere?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. ... foreldre som forventer for mye av deg?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. ... å måtte ta mer økonomisk ansvar etter hvert som du blir eldre?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. ... mangel på forståelse fra foreldre?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. ... foreldre som plager deg på grunn av utseendet ditt?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50. ... at arbeid går ut over skole og sosiale aktiviteter?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	<i>Ikke stressende</i>	<i>Litt stressende</i>	<i>Moderat stressende</i>	<i>Ganske stressende</i>	<i>Svært stressende</i>
	1	2	3	4	5
51. ... å ikke ha nok penger til å kjøpe de tingene du virkelig trenger?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. ... å ikke komme overens med kjæresten din?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. ... mangel på frihet?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54. ... jevnaldrende som erter deg for hvordan du ser ut?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. ... mangel på respekt fra lærere?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
56. ... uenigheter mellom deg og dine venner?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
57. ... å ikke komme overens med lærerne dine?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58. ... å slå opp med kjæresten?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

OM FYSISK AKTIVITET OG IDRETT

Hvor ofte i løpet av de 4 siste ukene deltok du i idrett, sport eller fysisk aktivitet hardt nok til at du pustet fort, svettet eller at hjerter banket fort i 20 minutter?

	<i>Aldri</i>	<i>En dag i uka</i>	<i>2-3 dager i uka</i>	<i>4-5 dager i uka</i>	<i>6-7 dager i uka</i>
	1	2	3	4	5
.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

DINE FØLELSER AKKURAT NÅ (SPIELBERGER STATE TRAIT ANXIETY INVENTORY - STAI)

Til høyre finner du en del utsagn som folk har brukt for å beskrive seg selv. Kryss av for hvert utsagn i den ruten som best beskriver hvordan du føler deg akkurat nå, altså, i dette øyeblikket. Det er ingen «riktige» eller «gale» svar. Ikke bruk for lang tid på hvert utsagn, men gi det svaret som best beskriver dine følelser akkurat nå.

Ett kryss på hver linje.

	<i>Ikke i det hele tatt</i>	<i>Litt</i>	<i>En del</i>	<i>Svært mye</i>
	1	2	3	4
1. Jeg føler meg rolig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Jeg føler meg trygg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Jeg er anspent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Jeg føler at jeg er under press... ..	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Jeg føler meg vel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Jeg føler meg oppskaket	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Akkurat nå tar jeg sorgene på forskudd	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Jeg føler meg tilfreds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Jeg føler meg skremt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Jeg har det behagelig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Jeg er sikker på meg selv	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Jeg føler meg nervøs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Jeg er skvetten	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Jeg er ubestemt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Jeg er avslappet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Jeg er fornøyd	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Jeg er bekymret	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Jeg føler meg forvirret	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Jeg føler meg stabil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Jeg har det bra	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

DINE FØLELSER DEN SISTE UKA (BYRNE STATE DEPRESSION INVENTORY)

Vennligst les hvert utsagn nøye, og kryss av for det alternativet som best beskriver hvordan du har følt deg i løpet av den siste uka, inkludert i dag.

Ett kryss på hver linje.

	Aldri 1	Sjelden 2	Noen ganger 3	Ofte 4	Nesten alltid 5
1. Jeg har følt meg trist eller ulykkelig.....	<input type="checkbox"/>				
2. Jeg har følt meg på gråten	<input type="checkbox"/>				
3. Jeg har følt skyld uten å vite hvorfor	<input type="checkbox"/>				
4. Jeg har mistet interessen for ting som har vært viktige for meg før	<input type="checkbox"/>				
5. Jeg har sluttet å like aktiviteter som jeg likte før	<input type="checkbox"/>				
6. Jeg har følt meg engstelig, rastløs eller irritabel	<input type="checkbox"/>				
7. Jeg har mistet troen på meg selv eller undervurderer meg selv	<input type="checkbox"/>				
8. Jeg har hatt konsentrasjonsvansker	<input type="checkbox"/>				
9. Jeg har hatt vanskelig for å ta avgjørelser	<input type="checkbox"/>				
10. Jeg har følt det som om jeg har mislykkes.....	<input type="checkbox"/>				
11. Jeg har følt at ting alltid går galt, uansett hvor hardt jeg prøver.....	<input type="checkbox"/>				
12. Jeg har hatt søvnforstyrrelser – sovnet mer eller mindre enn vanlig, eller hatt avbrudd i søvnen.....	<input type="checkbox"/>				
13. Appetitten min har vært unormal – jeg har spist mer eller mindre enn vanlig.....	<input type="checkbox"/>				
14. Jeg har følt at det krever større innsats å gjøre ting	<input type="checkbox"/>				
15. Jeg har følt meg trøtt eller har hatt veldig lite energi.....	<input type="checkbox"/>				

SELVFØLELSE (ROSENBERG SELF-ESTEEM SCALE - RSES)

Sett ett kryss på hver linje for det alternativet som stemmer best for deg.

	Sterkt uenig 1	Uenig 2	Enig 3	Sterkt enig 4
1. Jeg er stort sett fornøyd med meg selv.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Noen ganger synes jeg at jeg ikke er god for noen ting.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Jeg synes jeg har flere gode kvaliteter/egenskaper.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Jeg er i stand til å gjøre ting like godt som folk flest.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Jeg føler at jeg ikke har mye å være stolt av	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Noen ganger føler jeg meg ubrukelig.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Jeg føler at jeg er en verdifull person, i det minste på samme nivå som andre	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Jeg skulle ønske jeg hadde mer respekt for meg selv	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Alt i alt er jeg tilbøyelig til å føle meg mislykket.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Jeg har en positiv innstilling til meg selv	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>