Stuck on repeat

To Hillevi & Elliot

Örebro Studies in Psychology 41

MALIN ANNIKO

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Adolescent stress and the role of repetitive negative thinking and cognitive avoidance

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Abstract

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Stress and stress-related mental health problems such as anxiety and depressive symptoms are common in adolescents and seem to be increasing, especially in mid- to late-adolescent girls. Although adolescence, as a period of rapid growth and profound change, is often marked by an increase in normal stressors (e.g. conflicts with parents, fitting in with peers, increased academic demands), most adolescents do not develop more persistent problems with stress. To be able to develop effective preventive interventions there is a need to understand both what adolescents are ascribing their stress to, how different stressor domains relate to outcomes, and why some adolescents go on to develop stress-related mental health problems while others do not.

This dissertation aimed to answer some of these questions by investigating the role of cognitive avoidance and repetitive negative thinking (RNT) in the development of stress-related mental health problems (Study I & III). It also aimed to develop and validate a shortened version of a questionnaire designed to measure stressor load within different life domains in adolescence (Study II). Findings show that the shortened version of the Adolescents Stress Questionnaire seems to be a valid measure of stressor load within different domains in adolescence. School-related stressors were the most prevalent sources of stress, but social stressors seem to have a stronger link to increases in mental health symptoms. Also, adolescents who report higher levels of distress and stressor load tend to increase their engagement in cognitive avoidance and RNT over time which in turn predicts further increases in mental health symptoms. This suggests that cognitive avoidance and RNT may be important mechanisms in the development of stress-related mental health problems in adolescence.

Keywords: adolescents stress, cognitive avoidance, repetitive negative thinking, anxiety, depression.

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My Facebook update from the 5th of April 2013 reads: *"The decision is made! Fortfarande inte helt ångestfritt, men vad tusan det är fredag, solen skiner och vissa vägar bara måste vandras när tillfälle bjuds helt enkelt"*[1]. Five years have passed since then and I'm happy to say that I'm glad I chose to travel down the at times quite winding road of a PhD. However, this journey has by no means been a one woman's job and I would like to take the time to acknowledge and thank all of you who have played a role in me pursuing this path, helping me stick to it when I wanted to leave, believing in me when I did not, and made it not only worthwhile but even great fun.

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[1] The decision is made! Still a bit anxiety provoking but what the h**ll, it's Friday, the sun is shining and some roads you simply just have to travel down when opportunity arises.

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List of studies

This dissertation is based on the following studies which hereafter will be referred to in the text by their Roman numerals:

I. Anniko, M. K., Boersma, K., & Tillfors, M. (2018). Investigating the mediating role of cognitive emotion regulation in the development of adolescent emotional problems. *Nordic Psychology*, 70(1), 3-16.

II. Anniko, M. K., Boersma, K., van Wijk, N. P. L., Byrne, D., & Tillfors, M. (2018). Development of a Shortened Version of the Adolescent Stress Questionnaire (ASQ-S): construct validity and sex invariance in a large sample of Swedish adolescents. *Scandinavian Journal of Child and Adolescent Psychiatry and Psychology*, [Manuscript in production].

III. Anniko, M. K., Boersma, K., & Tillfors, M. (2018). *Stress-related Mental Health Problems in Adolescence: What are Adolescents Stressed About and Could Worry be a Potential Target in Prevention? A Longitudinal Investigation.* Manuscript submitted for publication.

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Introduction

Stress and stress-related mental health problems such as anxiety and depression have been increasing in Sweden and other western countries over the last decades. The largest increase has been found amongst adolescents, especially in girls (Hagquist, 2010; Socialstyrelsen, 2017). This is problematic given that clinical as well as sub-clinical problems developed in adolescence have been related to a range of negative outcomes in adolescence, but also later in life. For example, adolescents who report elevated levels of stress, depressed mood and anxiety early on have been found to have lower educational level, more difficulties with employment and family formation and greater risk of suicide attempts later in life (Socialstyrelsen, 2013).

Considering the rapid and dramatic biological, cognitive and social changes taking place in adolescence, periods of high perceived stress and negative affect may not be surprising. These changes can give rise to an increased amount of potential stressors such as conflict with parents, trying to fit in with peers, managing romantic relationships and increased academic demands (Arnett, 1999; Larson & Ham, 1993). Stressors, also these normative stressors, have been consistently linked to the development of stress-related mental health problems (Asselmann, Wittchen, Lieb, & Beesdo-Baum, 2017). However, although this increase in stressors is part of normal development and something that most adolescents will experience to a greater or lesser extent, far from all adolescents develop stress-related mental health problems. Why is that?

One explanation is that it is not necessarily stressors in and of themselves that determine whether psychological stress arises, but rather how people appraise the stressful encounter and what they do in response to it (Lazarus & Folkman, 1984). Thus, how adolescents deal with stressors and the negative emotions they elicit, so-called coping and emotion regulation, may be important to study to understand why some adolescents develop stress-related mental health problems. Two cognitive emotion regulation strategies that have been found to be used excessively in people suffering from a range of stress-related disorders are *cognitive avoidance* (e.g., efforts to supress or not think about a stressful situation) and *repetitive negative thinking (RNT;* e.g., worry, rumination, and catastrophizing) (Ehring & Watkins, 2008; Ottenbreit & Dobson, 2004). These strategies have also been found to increase in early adolescence, especially amongst girls (Jose & Brown, 2008).

Thus, excessive use of these cognitive emotion regulation strategies in response to stressors may be an important mechanism in the development of stress-related mental health problems. Identifying such mechanisms is an essential step in understanding why some adolescents develop problems while others do not. This understanding is crucial for the development of effective programs for prevention and early intervention.

The overall aim of this dissertation is thus to further our understanding of adolescent stress and how cognitive emotion regulation strategies may be involved in the development of stress-related mental health problems over the course of adolescence.

Adolescence and stress

Adolescence stems from the Latin word *adolecere* meaning "to grow up" and is, apart from infancy, the developmental phase most characterized by rapid and dramatic change. From a biological perspective, adolescence begins with the onset of puberty. Puberty is characterized by rapid physical growth as well as maturation of both primary and secondary sex characteristics. The timing and duration of puberty varies, but it typically starts around the ages of 10-14 and lasts anywhere from about 1.5-6 years (Steinberg, 2014). However, the cognitive, social and emotional development that in many cultures is considered a hallmark of adolescence usually continues over a longer time period. Thus, the onset of adolescence is often defined by ages roughly comparing to the onset of puberty, whereas the transition into adulthood is often defined by ages roughly comparing to a combination of important social, psychological and physiological milestones signaling the transitions to adulthood. The World Health Organization defines adolescence as the ages from 10-19. Within developmental psychology, adolescence is often further divided into early adolescence (roughly age 10-13), middle adolescence (age 14-17) and late adolescence (18 until the early twenties) (Smetana, Campione-Barr, & Metzger, 2006). In this dissertation, the focus will be on the time period from early to late adolescence as Study I covers the period from mid- to late adolescence, whereas Study II and Study III focus on the period from early to mid- adolescence.

Adolescence brings about important changes in virtually all contexts. Apart from physical growth and bodily changes, cognitive abilities such as reasoning, abstract thinking and meta-cognitive skills also develop rapidly (Steinberg, 2014). The physical and cognitive development in turn sets in motion a range of changes in the social context such as increasing autonomy

from parents and with peers and romantic relationships becoming more important. At the same time, there are very concrete changes taking place in the environment such as school transitions (e.g., transitioning from primary to secondary school). Academic demands also increase and performance in school will, over the course of adolescence, begin to set the stage for the opportunities available in adulthood. All these changes confront the adolescent with a variety of new situations and experiences to be handled and learned from, giving rise to an increase of potential stressors (Arnett, 1999; Larson & Ham, 1993).

Simultaneously, recent research suggests that the adolescent brain might not be ideally equipped to deal with this increase in stressors. More specifically, subcortical regions of the brain that process emotional reactions, reward seeking, and pleasure seeking go through a developmental burst at early adolescence. However, regions important for regulation, planning and decision-making mature more slowly (Casey et al., 2010; Somerville, Jones, & Casey, 2010; Steinberg, 2010). Also, the physiological stress-response, such as the Hypothalamic-Pituitary-Adrenal (HPA) axis, becomes more reactive in adolescence compared to childhood (Dahl & Gunnar, 2009; Gunnar, Wewerka, Frenn, Long, & Griggs, 2009; Stroud et al., 2009). Thus there seem to be a developmentally induced gap between reactivity and regulation in the adolescent period (e.g. Steinberg, 2005). This gap, coupled with the rapid and profound changes taking place, may make adolescence a particularly vulnerable developmental period when it comes to the development of stress-related mental health problems.

Self-reported complaints about perceived stress, somatic symptoms and mental health issues are common and have increased over the last decades amongst Swedish adolescents (Socialstyrelsen, 2017). A similar trend has been reported in other both western and eastern countries (Aggarwal & Berk, 2015; Bor, Dean, Najman, & Hayatbakhsh, 2014; Fink et al., 2015; Ottová-Jordan et al., 2015). Although both boys and girls seem to be affected, the problem is more widespread among girls, with up to 30% of Swedish girls and 10-20% of Swedish boys in mid- to-late adolescence reporting some kind of problem with stress, depressed mood, anxiety, sleeping difficulties or somatic complaints (Friberg, Hagquist, & Osika, 2012; Hagquist, 2010; Socialstyrelsen, 2013). The increase in self-reported complaints is mirrored in a similar increase in clinical stress-related mental health problems. This increase is primarily driven by an increased incidence and prevalence of anxiety and depressive disorders (Socialstyrelsen, 2017). In light of the growing body of evidence that mental health problems

developed in adolescence often persist as well and sometimes develop into clinical problems in adulthood, the high prevalence of stress and stress-related mental health complaints has been recognized as a major public health concern. For example, in looking at the adult population, stress-related mental health problems are amongst the top causes of long-term sick leave in Sweden and other countries (Alexanderson et al., 2012; Försäkringskassan, 2017; Koopmans et al., 2011). Similarly, according to the World Health Organization, stress-related mental health problems, such as anxiety and depression, are the number one cause of disability worldwide.

To summarize, stress and stress-related mental health problems are prevalent in the adolescent as well as adult population. Given that adolescence is where many stress-related mental health disorders such as depression and anxiety disorders have their onset, adolescence may be an especially important time period in which to study the development of these problems.

Defining stress

Although widely used in both everyday language and research, stress has proven difficult to define. It is frequently pointed out that the term stress is too inclusive and vague, making it difficult to operationalize and measure (Grant et al., 2003; Lazarus & Folkman, 1984). One reason for the difficulties may lay in the history of the concept and the related yet distinct disciplines (e.g., medicine, psychology, sociology) where different levels of analysis have been applied to the study of stress and its consequences.

The term 'stress' was originally borrowed from mechanics, where stress is a measure of forces acting on material objects producing load which can lead to strain (i.e., deformation). When stress was introduced into medicine, psychology and sociology in the early 1920s, it was used to describe analogue processes in biological, psychological and social systems (Lazarus, 1993). However, the emphasis on different parts of the concept has differed both between and within disciplines adding to the vagueness of the construct. For example, 'stress' is often simultaneously used to describe both the stimulus (e.g., stressful events or noxious stimulus) and the response (e.g., the physiological stress-response or perceived psychological stress). In general, the natural sciences such as medicine have taken the response approach in the study of stress, whereas the social sciences have more often taken the stimulus approach.

The inconsistent use of the term 'stress' between and within disciplines has led to several different definitions and conceptualizations. However, most definitions share some basic features, such as that the stress process is understood as consisting of: (1) a causal agent (often referred to as *load*, *stress* or *stressor*); (2) an evaluation of threat; (3) coping processes (behavioral or physiological); (4) physiological and psychological effects or stress reactions (Lazarus, 1993). Lazarus and Folkman (1984) argued that the term 'stress' should not be used to refer to any one of these parts of the process, but rather to refer to the process as a whole: "Stress, then, is not a variable, but a rubric consisting of many variables and processes" (Lazarus & Folkman, 1984, pp. 11-12).

Although the main focus in this dissertation is psychological stress, a short overview of the physiological stress response will be given before the theoretical framework used in this dissertation around psychological stress is introduced.

The physiological stress response

The physiological stress-response involves both a short-term response, aimed at speedy reactions towards imminent threat, and a long-term response focused on endurance in case the threat persists for longer periods. The short-term response involves the Sympathetic Adrenal Medullary (SAM) axis, whereas the long-term response involves the Hypothalamic Pituitary Adrenal (HPA) axis.

Upon perceiving a threat (e.g., a car speeding towards you) the amygdala, a part of the brain that contributes to emotional processing, sends a distress signal to the hypothalamus. The hypothalamus then activates the sympathetic nervous system by prompting the release of epinephrine and norepinephrine into the bloodstream, triggering what Cannon (1929) named the *fight-or-flight response*. The fight-or flight response is immediate and provides the body with a burst of energy so that it can respond quickly to perceived danger (e.g., jumping out of the way of the car). Physiological changes include increasing heart rate and blood pressure, pushing oxygen to the muscles and suppression of energy-demanding functions such as digestion and the immune system. This response is instant, but subsides quickly.

Almost simultaneously with the autonomic activation, the hypothalamus activates the HPA axis. The HPA axis is slower and works by another set of hormonal signals (e.g., cortisol) whose effects are longer lasting than the hormones produced by the SAM axis. Thus, the long-term stress response

is more about endurance than speed. When a threat subsides (e.g., you managed to avoid being hit by the car), the cortisol levels drops and the parasympathetic nervous system is activated to dampen the stress response and preserve energy. This response is sometimes called 'rest and digest'. However, if the threat does not abate or is turned on continuously, this can lead to a prolonged HPA axis activation, not allowing the body to go into the recovery phase. Thus, the physical stress response is, in and of itself, an adaptive response aimed at securing physical survival. However, if the response becomes dysregulated and recovery doesn't happen, this will lead to a depletion of resources ultimately resulting in damage and disease.

Psychological stress

Around the mid-20th century, when the study of stress became of interest within psychology, stress was mostly studied in simple terms of input and output, similarly to the way it is used within physics. This view of stress was in line with positivism and behaviorism, the dominant scientific stances within psychology at the time. However, experimental research on individual stress responses made it obvious that such a focus failed to explain the relationship between stress and dysfunction. Instead, there was considerable individual variation in how people responded in the face of stressful stimuli. In response to this, and parallel to 'the cognitive revolution' within psychology (roughly 1950-1980), Lazarus formulated his transactional theory of stress, where individual covert behaviors (e.g., appraisal and motivation) plays an important role in modulating the stress process (Lazarus & Folkman, 1984).

The transactional model of stress (see Figure 1) can be seen as a theoretical framework for the study of the stress process. From this framing, psychological stress is understood as "*..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*" (Lazarus & Folkman, 1984, p. 19). From this definition, it is clear that the transactional definition takes a relational approach to stress, that stress isn't defined as *either* the stimuli *or* the response, but rather by the interplay between the person and the environment. As can be seen from the model, stress is considered a process with antecedent, mediators and outcome factors. Antecedent factors are environmental events, but are also within-person factors. The stress response is activated first when an event is appraised as challenging or threatening. This appraisal is dependent upon the antecedent factors. Upon appraising an event as threatening or

challenging, a second appraisal is made consisting of an evaluation of internal and external recourses available for handling the situation. Upon this appraisal, some coping efforts are initiated. If the available forms of resources are, or are perceived as insufficient, psychological stress arises.

This model suggests that the overarching term 'stress' can be sub-divided into the term *stressor* – that is, the triggering stimulus, and the physiological, cognitive, emotional and behavioral *stress responses*. These stress responses may, if the individual is ineffective at removing or altering the stressor, become prolonged and cause *symptoms of psychological stress*. These may be physiological, cognitive, emotional or behavioral (e.g., aches and pains, sleeping difficulties, anxiety, depressed mood, etc.) and in this dissertation, will be referred to as stress-related mental health problems.

This definition of stress, stressors, stress-responses and stress-related mental health problems is indeed very broad and could include diverse stressors ranging from breaking up with a partner to experiencing a natural disaster. Similarly, stress-related mental health problems refer to an inclusive collection of highly overlapping symptoms (i.e., sleeping difficulties, aches and pains, anxiety or depressed mood) and disorders such as stressor-related- anxiety-, mood- and somatic symptom disorders. However, in this dissertation, the primary focus will be on normal, everyday stressors, in the adolescent period (i.e., keeping up with school, fitting in with peers, arguments with parents) and on stress-related mental health problems, defined as depressive symptoms and anxiety.

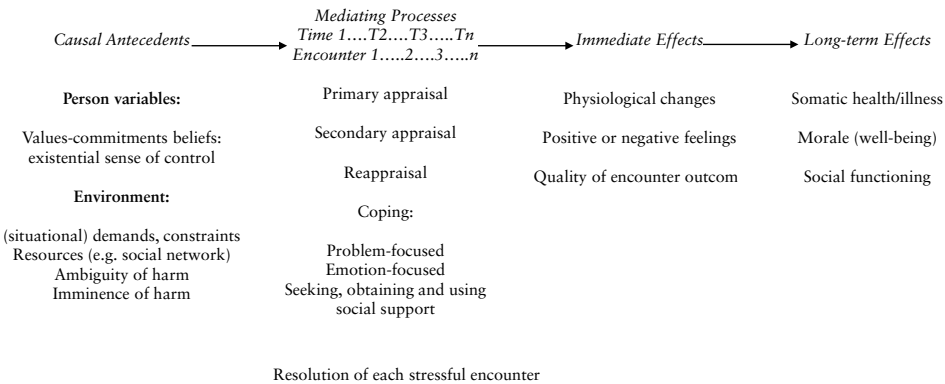

Figure 1. The transactional model of stress. Reproduced from Lazarus & Folkman (1984) with permission.

Stressors in adolescence

Stressful events, or *stressors*, can be of different dignity (e.g., major life events or daily hassles) and duration (e.g., chronic or acute and transient). They can further be divided into events and situations that are considered developmentally normal (e.g., school transitions, relationship break-ups) and events that only happen to a small portion of individuals (e.g., death of a parent). Research into child and adolescent stress has to a large extent focused on the impact of more severe or chronic stressors. Thus, there is ample evidence of the relationship between chronic adversities (Green et al., 2010; Heleniak, Jenness, Vander Stoep, McCauley, & McLaughlin, 2016; McLaughlin et al., 2012), traumatic events (Asselmann, Wittchen, Lieb, Perkonigg, & Beesdo-Baum, 2018; Ballard et al., 2015) and major life events (Asselmann, Wittchen, Lieb, Höfler, & Beesdo-Baum, 2015, 2016; Compas, 1987) and a wide variety of mental health problems. However, the cumulative effect of minor stressors of everyday life have also been suggested to be important determinants of adolescent adjustment (Compas, 1987). There is also some evidence that these minor everyday stressors may have more of a direct effect on mental- and somatic health than less frequent and more serious stressors (Asselmann et al., 2017; Kanner, Coyne, Schaefer, & Lazarus, 1981; Kanner, Feldman, Weinberger, & Ford, 1987; Sim, 2000). Hence, these daily stressors are important to study to increase our understanding of healthy as well as problematic development in adolescence. In this dissertation, the focus will be on developmentally normal stressors of everyday life, or *daily hassles*. Daily hassles can be defined as "…the irritating, frustrating, distressing demands that to some degree characterize everyday transactions with the environment" (Kanner et al., 1981, p. 3). Examples of such stressors in adolescence include arguments with parents and siblings, managing school work, fitting in with peers and managing romantic relationships (Byrne, Davenport, & Mazanov, 2007).

Measuring stressor load

Within developmental psychology, the most common way of measuring stress in adolescence is by self-report checklists (Grant, Compas, Thurm, McMahon, & Gipson, 2004). Most checklists are designed to measure the presence of chronic or specific environmental stressors with a list containing several situations or events (e.g., poverty, parental divorce, arguments with friends) that may be considered threatening to the well-being of the adolescent. As such, many of these self-report checklists are measures of

stressors and not the experience of stress, and thus align with the stimuli definition of stress. However, the most prevailing conceptualization of stress in the child and adolescent stress research is the transactional model by Lazarus and Folkman (1984) (Grant et al., 2003).

Measuring stressors instead of the broader concept of stress has many advantages when it comes to longitudinal investigations of the stress process and its' long-term consequences. For example, in research of the causes and consequences of stress, as well as which mechanisms are important between these causes and consequences, operationalizing stressors apart from appraisals, responses and other processes set in motion by them, are crucial to avoid confounding (Grant et al., 2003). However, there has also been some important criticism regarding the true "objectivity" of such scales.

First, even though it could be considered more objective to measure the mere presence of a stressor, there is also a risk of loss of important information (Grant et al., 2004). For example, if a person reports that an event has happened to them, there is really no way of knowing whether this was actually a stressful experience to this individual or not. It might very well be that this individual did not find the event stressful for a range of reasons. This might be an even larger issue when measuring minor and normative stressors and daily hassles, such as the ones that often increase in adolescence, instead of more extreme life-stressors (e.g., death of a parent, poverty) (Lazarus, 1999; Lazarus & Folkman, 1984). Second, there has been criticism as to whether the choice of events included in checklists really is a reflection of what can be considered "objective threats" in adolescence (for a thourough discussion see Byrne et al., 2007; Grant et al., 2004; Lazarus & Folkman, 1984). In fact, many checklists for stressors in adolescence are adaptions of adult versions (Byrne et al., 2007; Grant et al., 2003). Third, as there is no real consensus of what should be considered "objective" stressors, a large variety of different measurements have been used in child and adolescent stress research, a few which would be considered well validated and with known psychometric properties. This is problematic since it hampers comparison between studies and replication. Another issue concerning the psychometric properties of self-report questionnaires is whether they truly measure the same constructs between different populations, i.e., measurement invariance across different groups (Vandenberg & Lance, 2000). Considering the rather large gender differences commonly reported in the stress literature with girls in general reporting considerable more stress and stressors than boys, it would be important to have assurance that the measures used truly assess the same

constructs across genders. If measurement invariance across genders has not been established, it is problematic to interpret identified gender differences as these might be due to biased reporting. However, measurement invariance is not commonly investigated in stressor measurements. Fourth, several frequently used checklists were created several decades ago, putting into question their relevance for today's adolescents (Byrne et al., 2007). Thus, there is a need for well-designed and validated measures of stressors important in the specific developmental period of adolescence.

A questionnaire that was developed and more recently updated partly as a response to these critiques is the Adolescents Stress Questionnaire (ASQ; ASQ-2; Byrne et al., 2007; Byrne & Mazanov, 2002). The ASQ-2 also has the advantage of combining a stimuli definition of stress with the importance of appraisal since it incorporates a rating of how stressful the given situation has been. However, as many stressor lists, the ASQ-2 is quite extensive, limiting its usefulness in research and clinical practice where space and time is limited. Also, like most stress measurements, it has not been tested whether the ASQ-2 is indeed invariant across genders. This was addressed in Study II, where a shortened version of the ASQ-2 was developed, validated and tested for measurement invariance in a large sample of Swedish adolescents.

Coping with stress

In line with the transactional definition of psychological stress, today there is vast consensus that the relationship between stress and health is not a simple one. Rather individual vulnerabilities, appraisals and what people do in response to a stressor and the emotions it elicits can impact this relationship. When it comes to normative stressors and daily hassles that are focused in this dissertation, this individual variation might be even more pronounced.

How people deal with stressors and stressful emotion elicited by them are often referred to as *coping* and *emotion regulation*. Despite considerable conceptual overlap, research into coping and emotion regulation has to a large extent been conducted separately (Compas, Jaser, et al., 2014). Coping was defined by Lazarus and Folkman (1984) as "Constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (p.141). Later definitions of coping have specified that the management of demands include "Conscious and volitional efforts to regulate emotion, cognition, behavior, physiology, and the environment

in response to stressful events or circumstances" (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001, p. 89). Emotion regulation, in turn, has been defined as, "the extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions, especially their intensive and temporal features, to accomplish one's goals"(Thompson, 1994, pp. 27-28). From these definitions, it is clear that both coping and emotion regulation are outlined as regulatory processes. However, there are also some distinct differences. For example, as pointed out by Compas et al. (2017), coping is both a narrower and broader concept than emotion regulation. In coping the regulatory processes occur exclusively in response to stressors. In contrast, emotion regulation can occur as a response to any emotion whether it was elicited by a stressful encounter or not. However, coping includes regulation of other processes than emotions, for example, regulation of the sources of stress, whereas emotion regulation is specifically aimed at regulating emotions (Compas et al., 2017). In this dissertation, the term 'emotion regulation' is used to refer to the specific strategies under study in Study I, Study II, and Study III, since these are conceptualized at strategies to regulate emotions in the face of stressors. However, given the substantial overlap of the concepts together with the intimate relationship between stress and coping, the term coping will sometimes be used to refer to effort to manage and deal with stressful experiences.

In general, adolescents become increasingly adept at handling stressful situations and difficult emotions on their own, with a broader and more flexible repertoire of coping and emotion regulation strategies compared to children (for a review see Zimmer-Gembeck & Skinner, 2011). They also become more skilled at adapting their strategies to the specifics of the situation (Zimmer-Gembeck & Skinner, 2011). This is to a large extent due to the cognitive development taking place, which allows adolescents to make use of more complex cognitive strategies. Metacognitive skills, abstract thinking and the ability to self-reflect are important examples of such cognitive developments (Steinberg, 2005, 2014). Thus, adolescents become better at taking multiple aspects into account and to reflect upon the meaning and longer-term consequences of their own and others' behavior. However, these abilities may also have some downsides (Skinner & Zimmer-Gembeck, 2011). More specifically, less effective forms of cognitive emotion regulation (e.g., rumination, worry and cognitive avoidance) increase in adolescence, especially amongst girls (Cracco, Goossens, & Braet, 2017; Jose & Brown, 2008; Zimmer-Gembeck

& Skinner, 2008, 2011). Importantly, this increase has been found to precede the increased prevalence of stress-related mental health problems such as depression in adolescence (Jose & Brown, 2008).

Cognitive emotion regulation

Less effective forms of cognitive emotion regulation manifest in different ways (i.e., cognitive avoidance, rumination, worry, etc.), however, their underlying function may be similar, that is, to avoid distressing cognitions, emotions and/or situations. Within both the stress and coping literature and the emotion regulation literature, avoidance strategies have long been considered maladaptive responses to stressors and distressing emotions in their inefficiency in altering the stressor. It should be noted though that it is in general also recognized that the adaptiveness and functionality of any strategy depends on the specific circumstances of the situation. For example, avoiding to think about or distancing oneself from a stressor that is beyond ones' direct control or is unchangeable (e.g., terminal illness) can be helpful on a shorter-term basis (Goldbeck, 1997; Moos & Holahan, 2007). However, when such responses are used excessively and inflexibly in more controllable situations, such as with minor and controllable stressors that are focused in the studies of this dissertation, they may instead hinder effective problem-solving and in the long-term, exacerbate the very same emotions they attempt to avoid.

Cognitive avoidance

Cognitive avoidance involves actively trying not to think about or engage in a stressful situation or the distress it elicits. It is conceptualized as an active and voluntary avoidance strategy with the aim of distancing oneself cognitively or emotionally from the stressor (Compas, Champion, & Reeslund, 2005). High levels of cognitive avoidance have been repeatedly linked to stress-related mental health-problems (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Blalock & Joiner, 2000; Dickson, Ciesla, & Reilly, 2012; Holahan, Moos, Holahan, Brennan, & Schutte, 2005; MacDonald, Linton, & Jansson-Fröjmark, 2008; Moulds, Kandris, Starr, & Wong, 2007). Several explanations for this link have been proposed. First, consistent with a stress generation perspective (Hammen, 1991), cognitive avoidance of stressors may worsen the situation and generate more stressors. For example, by cognitively avoiding the stressor (e.g., a term paper) one is not engaging in efforts to deal with the stressor (e.g. starting to research the topic area, write etc.). Not actively dealing with the stressor

could worsen the stressor (e.g., not enough time to write the paper) or create additional stressors (e.g., failing the course). Consistent with this, the relationship between cognitive avoidance in response to current stressors and later stress-related mental health problems has been found to be mediated by the generation of new stressors (Holahan et al., 2005).

Another explanation for the negative effects of cognitive avoidance can be found within the literature on thought suppression (Wenzlaff & Wegner, 2000). Actively trying to suppress thoughts has consistently been found to have the opposite effect. That is, the very same thoughts and emotions one is trying to suppress are instead intensified and increased in frequency (for an overview see Wenzlaff & Wegner, 2000). This suggests that cognitive avoidance may also have a maladaptive effect in that by trying not to think about a stressor or the emotions it elicits, this may instead keep the stressor cognitively active, and even increase its salience. If active efforts to deal with the stressor are not undertaken, this may lead to a prolonged physiological, cognitive and emotional response. In sum, engaging in cognitive avoidance in response to stressors and distress may both increase the frequency and intensity of the very thoughts and emotions one is trying to avoid and result in additional stressors, thus contributing to the development of stress-related mental-health problems.

Repetitive negative thinking

In contrast to cognitive avoidance strategies, rumination and worry involves repeatedly thinking about a real or potential stressor. Worry is an anticipatory cognitive process revolving around future events whose outcomes are uncertain but could potentially be negative (Sibrava & Borkovec, 2006). Rumination in turn, often revolves around past events and failure, repeatedly going over the possible meaning and consequences of a stressful event and the emotion it elicits. As worry and rumination share many core features, they are sometimes subsumed under the umbrella term of *Repetitive Negative Thinking* (RNT; Ehring & Watkins, 2008). RNT can be defined as a thinking process that is "(a) *repetitive*, (b) *passive* and/or *relatively uncontrollable* and (c) focused on *negative content*" (Ehring & Watkins, 2008, p. 193). Thus, RNT involves repeated cognitive engagement with the stressor.

Although engagement with the stressor does not intuitively suggest avoidance, RNT is commonly conceptualized as avoidance (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Sibrava & Borkovec, 2006). More specifically, conscious motives for RNT often involve the anticipation

of or preparations for threat (i.e., worry) or to understand the meaning of events and solve problems (i.e., rumination). Thus, these motives involve cognitive efforts to avoid possible future negative outcomes and to learn from past experiences to prevent similar situations from happening (Borkovec & Roemer, 1995; Papageorgiou & Wells, 2001, 2003; Sibrava & Borkovec, 2006). However, there are also less conscious secondary avoidance functions involved in the reinforcement of RNT. For example, in experimental studies, RNT (i.e., worry) have been found to dampen somatic and physiological arousal as well as negative emotional experiences to stressful and emotional stimuli (Borkovec & Hu, 1990; Sibrava & Borkovec, 2006). This effect is hypothesized to be explained by the highly verbal and abstract mode of thinking that is characteristic of RNT. Abstract thought is less inclined to provoke vivid imagery than concrete thinking. Less vivid imagery of emotional events have been hypothesized to interfere with emotional processing (Anderson & Borkovec, 1980; Foa & Kozak, 1986). Thus, from a learning theory perspective, RNT is conceptualized as a learned, habitual behavior, reinforced by offering a seemingly active way to address situations that are found stressful and by dampening uncomfortable physical sensations and emotions that stressors may elicit.

Although RNT can at times be adaptive (Watkins, 2008), as with cognitive avoidance it often leads to the stressor or the emotions it elicits not being dealt with or processed properly. In line with this, RNT has also been consistently linked to stress-related mental health problems, cross-sectional and longitudinal, in adults as well as adolescent samples (Abela, Brozina, & Haigh, 2002; Broderick & Korteland, 2004; Garnefski & Kraaij, 2006; Garnefski, Kraaij, & van Etten, 2005; Kuyken, Watkins, Holden, & Cook, 2006; Nolen-Hoeksema, Stice, Wade, & Bohon, 2007; Schäfer, Naumann, Holmes, Tuschen-Caffier, & Samson, 2017; Silk, Steinberg, & Morris, 2003; Watkins, 2008). Similarly, there is emerging evidence that RNT is related to slower physiological recovery from stress (Aldao, McLaughlin, Hatzenbuehler, & Sheridan, 2014; Brosschot, Gerin, & Thayer, 2006; Ottaviani et al., 2016; Verkuil, Brosschot, Gebhardt, & Thayer, 2010). As suggested by the perseverative cognition hypothesis (Brosschot et al., 2006) this prolonged activation is thought to come about due to RNT keeping the stressor cognitively active long after it has passed (e.g., ruminating about an argument with a friend) or before it has happened (worrying about an upcoming exam).

One prominent theory of the negative effects of RNT is the Response Styles Theory of depressive rumination (RST; Nolen-Hoeksema, 1991).

RST proposes that rumination prolongs and exacerbates negative mood primarily via three pathways. First it enhances the effect of depressed mood on thinking, biasing thinking and memories towards negative content. Second it interferes with effective problem-solving by making thinking more pessimistic (e.g., "there is no point, I'm just not good enough"). Third, rumination interferes with motivation and instrumental behavior, thus increasing the risk of additional stressors, in line with the stress generation hypothesis mentioned earlier (Lyubomirsky & Tkach, 2004; Nolen-Hoeksema et al., 2008).

Another competing hypothesis of the negative effects of RNT on problem-solving is worth mentioning. The reduced concreteness theory (Stöber, 1998; Stöber, Tepperwien, & Staak, 2000; Watkins & Moulds, 2005) suggests that it is not so much the focus on negative mood but rather the mode or style of processing commonly used in RNT that interferes with problem solving. Recurrent RNT is generally carried out in an abstract and general level (e.g., "I'm such a failure") in contrast to a more concrete and specific thinking mode (e.g., "On this specific test, I failed because I hadn't studied hard enough"). The abstract thinking mode is less useful in coming up with possible solutions to a problem, since such an overgeneralized problem formulation will be less meticulous and elaborated. This gives few clues as to concrete solutions and actions that could be taken (Watkins & Moulds, 2005). Both RST and the reduced concreteness theory has received substantial empirical support and can thus be useful ways of understanding how RNT may prolong and exacerbate distress (Lyubomirsky & Tkach, 2004; Nolen-Hoeksema et al., 2008; Sibrava & Borkovec, 2006; Watkins, Moberly, & Moulds, 2008; Watkins & Moulds, 2005).

To summarize, the use of cognitive strategies to regulate emotions increase in adolescence as a consequence of the cognitive development taking place. Although this development allows for more complex and sophisticated methods of coping and regulating emotions, it also opens up for strategies that have been linked to a prolonged stress-response and various stress-related mental health symptoms and disorders. Avoidance strategies such as RNT and cognitive avoidance can be quite effective on a short-term basis in that they tend to reduce distress and uncomfortable physical sensations elicited by emotions such as anxiety. However, they also tend to maintain and exacerbate negative affect in the long term. Moreover, when used inflexibly and excessively, they also tend to worsen stressful situations by hindering effective problem solving. In line with this, both cognitive avoidance and RNT have consistently been linked to a variety of

stress-related mental health problems in adults, but also in adolescents. The engagement in these emotion regulation strategies tends to increase in early adolescence, especially in girls. This increase has moreover been found to precede a similar increase in incidence and prevalence of depression and depressive symptoms, again especially in girls.

This suggests that adolescence may be a crucial time where the use of these types of strategies are learnt and practiced until they become a habitual response to stressors. From a learning theory perspective, cognitive avoidance and RNT are believed to be negatively reinforced by an initial decrease in autonomic arousal and negative emotions. Considering that adolescence is characterized by an increase in stress-reactivity, this initial relief may make the adolescent more inclined to make use of the strategy again in other stressful situations. By doing so, these strategies can become habitual means of dealing with stressful encounters. However, as they have also been found to interfere with emotional processing and effective problem-solving, the long-term consequences are often increased duration and intensity of negative emotions and arousal. Therefore, the studies in this dissertation hypothesize that these cognitive emotion regulation strategies may play an important role as a mechanism in the development of stress-related mental health problems. There is growing evidence to suggest this, still more longitudinal studies, are needed. This thesis aims to contribute to this need by studying RNT and cognitive avoidance as mediators in the development of stress-related mental health problems in adolescence (Study I and Study III).

A transdiagnostic framework: multifinality and divergent trajectories

To understand how adolescent stress can lead to different symptom presentations (e.g., anxiety, depressive symptoms), this dissertation makes use of a transdiagnotic framework. Transdiagnostic theoretical frameworks have an explicit focus on commonalities underlying disorders and can be useful in understanding multifinality (i.e., risk factors related to several different outcomes) and comorbidity (Barlow, 2000; Brown, Chorpita, & Barlow, 1998; Clark & Watson, 1991; Hankin et al., 2016; Nolen-Hoeksema & Watkins, 2011).

Stress could be considered one of the most well established transdiagnostic risk-factors, given that it has been linked to a variety of physical diseases and virtually all psychological disorders. However, it is also widely recognized that stress is rarely a causal risk factor. As described

by the transactional model of stress, people differ in their appraisals of stressors as well as how they respond and regulate their emotions in response to stress: a difference that makes some people develop problems in the face of stressors, whereas others do not. The transdiagnostic framework offers important suggestions as to why stress might be related to a variety of different problems by identifying cognitive and behavioral processes underlying several disorders (e.g., RNT, attentional biases): some of which have been identified as problematic ways to cope with and regulate emotions in stressful situations as outlined previously. Transdiagnostic processes or mediators of the stress process may be especially important to focus on to understand multiple problem development over the course of adolescence. Study I and Study III specifically focus on the role of two such transdiagnostic processes (i.e., cognitive avoidance and RNT).

One problem that has been identified for the transdiagnostic framework is how to explain divergent trajectories, that is if the same transdiagnostic risk-factor (e.g. RNT) is an underlying mechanism in several disorders, why is it then that some people develop depression whereas others develop anxiety disorders? In an attempt to begin to address this problem, Nolen-Hoeksema and Watkins (2011) suggested that this may be due to differential current concerns. For example, an individual that tends to worry a lot who faces a social stressor (e.g., peer rejection) may display symptoms commonly seen in social anxiety disorder. Another person who has the same tendency but that faces another stressor (e.g., the loss of an important relationship) may instead display symptoms more common in depression. The hypothesized moderating role of stressor specificity has also been suggested as an explanation for why some types of disorders are more common in some developmental periods (e.g., anxiety in childhood, depression in adolescence) (Hankin et al., 2016). This may be understood as a consequence of different types of stressors being more or less salient in different developmental periods (Hankin et al., 2016). However, few studies have investigated the relative importance of different stressor domains over time across adolescence or the specificity of stressor domains in mental health problems.

Study II addresses this by investigating how different stressor domains related to increases in depressive symptoms and anxiety over one year in a sample of early adolescents. Similarly, Study III aimed to contribute to the knowledge of the relative importance of different stressor domains by investigating changes in these over the years from the 7th through the 9th grade.

Summary

Adolescence is a developmental period characterized by profound physiological, psychological and social change. These changes put the adolescent in front of a variety of novel situations and experiences to be handled, reflected in the accumulation of stressors that have been found in adolescence (Larson & Ham, 1993; Rudolph & Hammen, 1999). Although these are vital opportunities for growth and development, the increase of stressors in adolescence may tax the coping abilities of some adolescents, putting them at risk for stress-related mental health problems. Indeed, stress and stress-related mental health problems tend to sharply increase in prevalence over the course of adolescence. Although the exposure to stressors has been linked to various stress-related mental health problems, not all adolescents develop problems in the face of stress. Instead, how adolescents cope and regulate emotions in response to stressors has critical implications for long-term mental health outcomes.

Certain types of cognitive emotion regulation strategies, such as cognitive avoidance and repetitive negative thinking (RNT) have been consistently linked to the onset and maintenance of stress-related mental health problems (Aldao et al., 2010; Watkins, 2008). As the engagement in these strategies tends to increase in adolescence, adolescence may be an important time period to study the potential role of these strategies in the development of stress-related mental health problems. Also, to increase our understanding of adolescent stress, there is a need for valid and reliable measures of common stressors in adolescence. Such measures should incorporate common sources of stress within different domains (e.g., school, family, peers, and romantic relationships) over the adolescent period to allow for studies investigating the relative importance of different stressor domains over the course of adolescence. This is also important to allow for investigations of specificity in stressor domains in the prediction of various forms of stress-related mental health problems.

Aim

The overall aim of this dissertation is to increase our understanding of the nature of stressors in adolescence and of mechanisms between stressors and stress-related mental health problems to identify potential targets for prevention. This aim was approached in several different ways. First in Study I, cognitive avoidance and RNT were investigated as potential mechanisms in the development of stress-related mental health problems

(i.e. anxiety and depressive symptoms) over time. Second in Study II, with the aim of extending our understanding of important sources of stress in adolescents and how these relate to different outcomes, the psychometric properties of a shortened version of a questionnaire aimed to measure subjective stressor load within several life domains in adolescence was evaluated. Third in Study III, the relative importance of different stressor domains over the course from early- to mid-adolescence was investigated. Further, RNT in the form of worry was tested as a mechanism between subjective stressor load and stress-related mental health problems over time. The moderating role of gender was explored in this mediational model.

Specific aims

Study I

To investigate whether cognitive emotion regulation in the form of cognitive avoidance and RNT mediate the development of depressed mood and anxiety over the time period from mid- to late adolescence.

Study II

To develop and evaluate a shortened version of the Adolescent Stress Questionnaire in a Swedish sample of adolescents.

Study III

To investigate the relative importance of different domains of stress from the 7th through the 9th grade. A second aim was to investigate whether RNT in the form of worry mediates the relationship between overall stressor load in the 7th grade and anxiety and depressive symptoms in the 9th grade. A possible interaction between gender and subjective stressor load in the prediction of worry within the mediational model was also explored.

Short description of studies

Study I

Investigating the mediating role of cognitive emotion regulation in the development of adolescent emotional problems.

Introduction

What people do when they experience distress affects emotional health. When used inflexibly and excessively, cognitive emotion regulation strategies such as cognitive avoidance and repetitive negative thinking (RNT) have consistently been linked to the development and maintenance of emotional problems in both adult and adolescent samples (Watkins, 2008). Some studies have also shown that the relationship between emotional symptoms and cognitive emotion regulation may be reciprocal (Burwell & Shirk, 2007; Nolen-Hoeksema et al., 2007). That is, emotional health may also affect what people do when experiencing distress. However, there is lack of longitudinal studies with adolescent samples, and we need to know more about how this relationship unfolds over time.

Aim

The aim was to examine whether cognitive emotion regulation (cognitive avoidance and repetitive negative thinking) mediated the relationship between baseline levels of anxiety and depressive symptoms and reported anxiety and depressive symptoms two years later. We hypothesized that depressed mood and symptoms of anxiety would be positively related to cognitive emotion regulation strategies concurrently and prospectively. Based on previous findings (e.g. Avenevoli, Swendsen, He, Burstein, & Merikangas, 2015; Jose & Brown, 2008) we also hypothesized that girls would report higher levels of both symptoms and cognitive emotion regulation strategies. We also hypothesized that cognitive emotion regulation would mediate the relationship between baseline and subsequent levels of emotional symptoms.

Design

The study used a prospective design with three yearly measurement points over a two-year period.

Participants

Participants were 10th grade students (n = 149, 53 % girls) in a Swedish upper secondary school. Participants filled out questionnaires at school with the baseline measurement point in 10th grade and were followed up in the 11th and 12th grade.

Measures

Emotional problems

To assess levels of depressed mood, the 'depressed mood' subscale of the Swedish version of The Center for Epidemiological Studies Depression Scale for Children was used (CES-DC; Olsson & von Knorring, 1997). To assess anxiety symptoms the anxiety subscale from the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) was used.

Cognitive emotion regulation strategies

To assess cognitive avoidance, the 'avoidant safety behaviors of a cognitive nature' subscale of the Safety Behaviors and Catastrophizing Scale (SBCS; MacDonald et al., 2008) was used. To asses RNT, two items from the 'Catastrophizing' subscale of the same instrument was used. The two items specifically address repetitive thought in relation to symptoms ("I cannot stop thinking about it" and "I constantly think about how much I would like to be rid of the problem") and these were used to measure repetitive negative thinking. Previous research into the specificity of maladaptive cognitive emotion regulation strategies has found that these strategies load onto one shared factor (Aldao & Nolen-Hoeksema, 2010). Therefore, we conducted a factor analysis (oblique rotation) of the items from the 'avoidant safety behaviors of a cognitive nature' subscale together with the two items of repetitive thought. This was done to assess whether they were best represented as unique constructs or as an overarching construct of cognitive emotion regulation. Based on an inspection of the scree plot and Kaiser's criterion, one factor was extracted, explaining 54 % of the variance (loadings ranged from .63-.78). The single factor construct was labeled cognitive emotion regulation and was used in all subsequent analyses.

Analyses

Measures were summarized using descriptive statistics and relations between gender and the target variables were investigated. Two mediation models were tested using the PROCESS macro v 2.13 for SPSS with 5,000

bootstrap samples (Hayes, 2013). We first ran one model with cognitive emotion regulation as a mediator in the development of anxiety and then a second model with cognitive emotion regulation as a mediator in the development of depressed mood. Baseline symptoms were controlled for in both models.

Results

All target variables were significantly related to each other and girls reported significantly higher levels of both symptoms and engagement in cognitive emotion regulation (Table 1). Both anxiety and depressed mood were found to predict increases in cognitive emotion regulation as well as emotional symptoms over time. Further, the effect of baseline levels of anxiety (Figure 2) and depressed mood (Figure 3) on subsequent symptoms was mediated by cognitive emotion regulation. The indirect effects through cognitive emotion regulation were small (anxiety model: b = .06 BCa CI [.008; .141], P_M = .11; depressed mood model: b = .04 BCa CI [.003; .115], P_M = .08).

Table 1

Descriptive statistics at baseline (T1) and follow-up (T3) for anxiety and depressed mood, and at baseline (T1) and follow-up (T2) for cognitive emotion regulation (ER) for the total sample and for girls and boys separately.

	Total	Girls	Boys		
	Mean (SD)	Mean (SD)	Mean (SD)	Df	t
Anxiety 1	5.1 (3.4)	5.9 (3.8)	4.0 (2.4)	128.7	3.6**
Anxiety 3	5.7 (3.8)	6.7 (4.3)	4.2 (2.2)	121.7	4.4**
Depressed mood 1	4.5 (4.0)	6.0 (4.1)	2.3 (2.8)	130.0	6.3**
Depressed mood 3	4.9 (4.5)	6.6 (4.6)	2.5 (3.0)	129.5	6.2**
Cognitive ER1	10.9 (4.8)	12.2 (4.9)	9.2 (4.1)	130	3.6**
Cognitive ER2	10.6 (4.8)	12.2 (4.5)	8.4 (4.4)	130	4.9**

Note. **p < .01. n = 134.

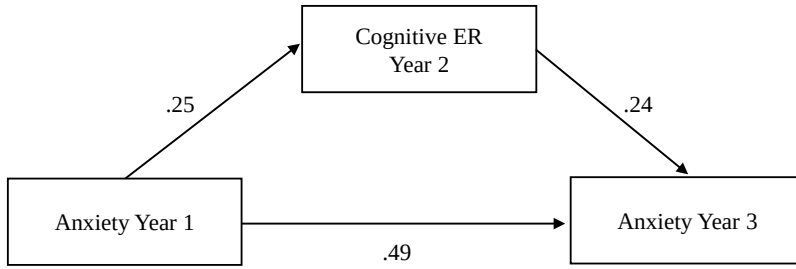

Figure 2. Model of anxiety year 1 as predictor of anxiety year 3, mediated by cognitive emotion regulation year 2. Cognitive emotion regulation year 1 was controlled for. Unstandardized coefficients.

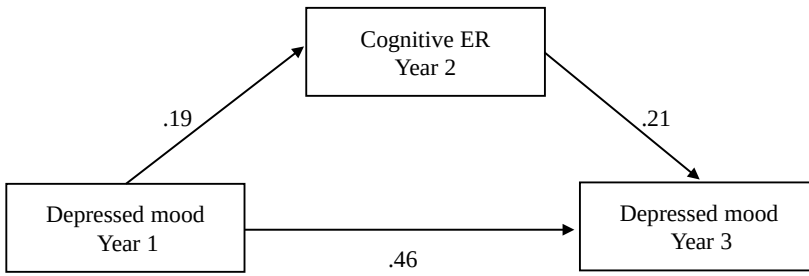

Figure 3. Model of depressed mood year 1 as predictor of depressed mood year 3, mediated by cognitive emotion regulation year 2. Cognitive emotion regulation year 1 was controlled for. Unstandardized coefficients.

Conclusions

Our results lend support to the growing body of evidence that cognitive emotion regulation may be an important transdiagnostic mechanism in the development of emotional problems in adolescence. This suggest that tailoring preventive interventions that specifically target strategies such as cognitive avoidance and repetitive negative thinking may be a parsimonious and effective alternative in the prevention of stress-related mental health problems in adolescence.

Study II

Development of a shortened version of the Adolescent Stress Questionnaire (ASQ-S): Construct validity and sex invariance in a large sample of Swedish adolescents

Introduction

Stressor experience is an important topic of research concerning adolescent health and ill health. However, stressor measurements have often been developed with regard to a specific stressor that are of interest to the researcher or have just been adapted from stressor measurements for adults. This is problematic in that many measures do not reflect the broad array of everyday stressors relevant for adolescents. One instrument that was developed with this in mind is the Adolescent Stress Questionnaire 2 (ASQ-2; Byrne et al., 2007). However, it is quite extensive, which may render its use in large cohort studies, where several aspects of adolescent health are also being investigated, inconvenient and problematic. Also, in consideration of the gender differences previously reported for the instrument with girls in general reporting a higher stressor load than boys, it is important to know whether the instrument measures the same construct across genders (i.e., is gender invariant). However, this has not been previously evaluated for the ASQ-2.

Aim

The aim of the study was to evaluate a shortened version (ASQ-S) of the ASQ-2 with regard to factor structure and psychometric properties in a large sample of Swedish adolescents. We also wanted to investigate whether the ASQ-S was gender invariant, i.e., whether the measure works similarly in boys and girls, considering that gender differences are common, with girls in general reporting more stress than boys.

Design

This study is part of a larger prospective study (Three Cities Study), where adolescents from three Swedish communities are followed over five years (yearly questionnaires) with the aim of investigating risk- and protective factors for mental and behavioral disorders and how these can be targeted in preventive efforts. This study used a prospective design with data from the first two waves in the Three Cities Study.

Participants

Participants were adolescents in the 7th and 8th grade from 18 public schools in three Swedish communities (N= 2,768, 47.5% females, mean age 13.65). A second assessment took place one year later with a retention rate of 91%. Participants filled in questionnaires during school hours.

Measures

Although the questionnaire is large and covers several concepts, the measures used for this study were, apart from the ASQ-S, depressive symptoms, anxiety, trait worry, and self-esteem.

Adolescent stress

To assess subjective levels of stressor load within different areas, a shortened version of the Adolescent Stress Questionnaire 2 (ASQ-2; Byrne et al., 2007) was used.

Emotional symptoms

To assess levels of depressed mood, The Center for Epidemiological Studies Depression Scale for Children was used (CES-DC; Weissman, Orvaschel, & Padian, 1980). To assess levels of anxiety, the Overall Anxiety and Impairment Scale was used (OASIS; Norman, Hami Cissell, Means-Christensen, & Stein, 2006).

Worry

To assess levels of worry, the Penn State Worry Questionnaire for Children was used (PSWQ-C; Chorpita, Tracey, Brown, Collica, & Barlow, 1997).

Self-esteem

To assess self-esteem, the Rosenberg Self-Esteem Scale (RSE; Rosenberg, 1965) was used.

Analyses

A Confirmatory Factor Analysis (CFA) with nine factors was conducted in Mplus version 7 using the Maximum Likelihood Estimation with Robust standard errors (MLR). The Full Information Maximum Likelihood (FIML) function in Mplus was used to handle missing data. Concurrent validity was tested with correlations of the ASQ-S subscales with depressive symptoms, anxiety, trait worry and self-esteem. Predictive validity was tested with hierarchical regression in SPSS, where age and gender were entered as

predictors in the first step, baseline symptoms were entered in the second, and the nine subscales of the ASQ-S were entered as predictors at the last step. Three separate hierarchical regressions were run, with depressive symptoms, anxiety and trait worry as outcome. To investigate measurement invariance across genders, we tested for configural, metric and scalar invariance using Multiple Group Analysis in Mplus.

Results

The hypothesized CFA model with nine factors showed an acceptable model fit. Factor loadings were in general high and all nine subscales showed adequate internal consistency (Figure 4). Factor correlations ranged from r = .28 (p<.01) to r = .73 (p<.01). The factors of 'School Performance', 'School Attendance', 'School/Leisure Conflict', and 'Future Uncertainty' showed the highest proportions of shared variance. For gender invariance, results showed that the ASQ-S is scalar invariant across gender, supporting the notion that boys and girls construe the items and response scale in the same manner. All nine sub-scales showed acceptable concurrent validity, correlating positively with measures of depressive symptoms, anxiety, and trait worry, and negatively with self-esteem. Gender differences were found for all subscales except for the scale of 'Romantic Relationships', with girls reporting more stress than boys. As for predictive validity, different stressor domains predicted different problems one year later, with more domains being relevant for anxiety and worry than for depression (Table 2).

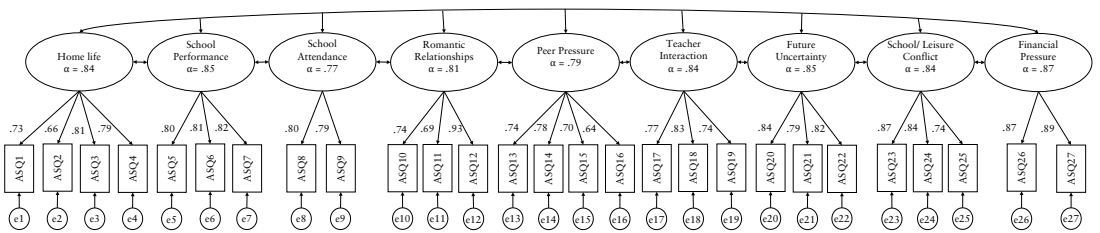

Figure 4. Nine-factor CFA model of the ASQ-S

Table 2.

Results from three separate multiple regression analyses with the ASQ-S subscales as predictor variables and depressive symptoms (CES-DC), anxiety (OASIS) or worry (PSWQ-C) one year later (T2) as dependent variables. Baseline symptoms (T1) symptoms were controlled for.

	Depressive symptoms T2 (N = 2043)			
	B	SE B	β	t
Gender	-3.15	.42	-.14**	-7.60
Age	-.22	.30	-.01	-.75
T1 depressive symptoms	.38	.02	.50**	15.98
F1: Stress of Home Life	.41	.52	.02	.80
F2: Stress of School Performance	.48	.48	.04	.97
F3: Stress of School Attendance	.57	.40	.05	1.43
F4: Stress of Romantic Relationships	1.72	.66	.06**	2.61
F5: Stress of Peer Pressure	.73	.59	.04	1.24
F6: Stress of Teacher Interaction	.34	.55	.02	.62
F7: Stress of Future Uncertainty	-.35	.42	-.03	-.82
F8: Stress of School/Leisure Conflict	.20	.39	.02	.51
F9: Stress of Financial Pressure	.05	.33	.003	.14
	Anxiety T2 (N = 2372)			
	B	SE B	β	t
Gender	-1.25	.14	-.16**	-8.80
Age	-.11	.10	-.02	-1.05
T1 Anxiety	.46	.03	.40**	15.86
F1: Stress of Home Life	.41	.19	.07*	2.23
F2: Stress of School Performance	.12	.18	.03	.69
F3: Stress of School Attendance	.25	.14	.06+	1.78
F4: Stress of Romantic Relationships	.28	.23	.03	1.23
F5: Stress of Peer Pressure	.53	.21	.08*	2.54
F6: Stress of Teacher Interaction	-.30	.20	-.04	-1.51
F7: Stress of Future Uncertainty	-.13	.15	-.03	-.83
F8: Stress of School/Leisure Conflict	.27	.15	.07+	1.82
F9: Stress of Financial Pressure	-.06	.12	-01	-.49
	Worry T2 (N = 2107)			
	B	SE B	β	t
Gender	-3.37	.37	-.17**	-9.15
Age	.03	.25	.002	.10
T1 Worry	.56	.03	.49**	18.99
F1: Stress of Home Life	.16	.44	.01	.37
F2: Stress of School Performance	.84	.44	.08+	1.90
F3: Stress of School Attendance	-.13	.35	-.01	-.36
F4: Stress of Romantic Relationships	.60	.50	.03	1.20
F5: Stress of Peer Pressure	.96	.42	.06*	2.28
F6: Stress of Teacher Interaction	-1.04	.42	-.06*	-2.44
F7: Stress of Future Uncertainty	.50	.38	.05	1.32
F8: Stress of School/Leisure Conflict	.22	.33	.02	.65
F9: Stress of Financial Pressure	-.33	.28	-.03	-1.18

Note. Sample sizes vary since variables that were missing on the independent or on all dependent variables were excluded from the FIML method. *p < 0.05, **p < 0.01, +p < 0.10

Conclusions

The ASQ-S shows adequate psychometric properties and seems to be a valid and reliable measure of adolescent subjective stressor load in Swedish adolescents. Although considerably shortened, it seems to possess similar psychometric properties as the full instrument. The ASQ-S also possesses scalar invariance across gender, indicating that it measures the same construct in both genders.

Study III

Stress-related mental health problems in adolescence: what are adolescents stressed about and could worry be a potential target in prevention? A longitudinal investigation.

Introduction

Stress and stress-related mental health problems such as anxiety and depressive symptoms are common and seem to be increasing in adolescents, especially in adolescent girls. Identifying common sources of stress and assessing their relative importance across development is important to increase our understanding of when and where to intervene. Similarly, identifying mechanisms linking stressor load to mental health problems is important to the process of identifying potent targets for preventive interventions. One such potential mechanism is worry. As girls have been consistently found to both report higher levels of stressor load and worry than boys, it's also important to investigate whether gender might moderate the link between stressor load, worry and stress-related mental health outcomes.

Aim

To investigate what the most prominent sources of stress are in adolescent boys and girls and whether they change over time from early- to mid-adolescence. We also aimed to investigate worry as a potential mediator in the relationship between subjective stressor load and stress-related emotional problems (e.g., depressive symptoms and anxiety). Further the moderating role of gender was tested in this mediation model.

Design

This study is part of a larger prospective study (Three Cities Study) were adolescents from three Swedish communities are followed over five years (yearly questionnaires) with the aim to investigate risk- and protective

factors for mental and behavioral disorders and how these can be targeted in preventive efforts. This study used a prospective design with data from the first three waves in the Three Cities Study.

Participants

Participants were all students in the 7th grade from 18 public schools in three Swedish communities (N = 1,137, 46% girls, mean age 13.2). Participants filled in questionnaires at school and were followed-up in the 8th and 9th grades.

Measures

Subjective stressor load

To assess subjective stressor load within several life domains the Adolescent Stress Questionnaire-Short Version (ASQ-S; Anniko, Boersma, van Wijk, Byrne, & Tillfors, 2018) was used. The ASQ-S is a shortened version of the Adolescent Stress Questionnaire-2 (ASQ-2; Byrne et al., 2007). For the first aim of this study, the domains of stress of home life, romantic relationships and peer pressure were selected to capture interpersonal stressors. The domain of school performance was selected to capture school-related stress. For the second aim of this study, the total score of the full ASQ-S was used.

Emotional symptoms

To assess depressive symptoms the Center for Epidemiological Studies Depression Scale for Children (CES-DC; Weissman et al., 1980) was used. To assess levels of anxiety the Overall Anxiety and Impairment Scale (OASIS; Norman et al., 2006) was used.

Worry

To assess levels of worry the Penn State Worry Questionnaire for Children (PSWQ-C; Chorpita et al., 1997) was used.

Analyses

Descriptive statistics were used to graph the means of subjective stressor load due to arguments at home, peer pressure, romantic relationships and school performance in the 7th through the 9th grade for girls and boys separately. Repeated analysis of variance (rANOVA) was used to investigate changes over time for each stressor domain for girls and boys separately. To investigate gender differences and associations between

stressor load, worry, anxiety and depressive symptoms, t-tests and Pearson correlations were used. Two mediation analyses using the PROCESS macro (Hayes, 2013) were performed to test whether worry mediated the relationship between subjective stressor load and anxiety and depressive symptoms over time. Baseline levels of worry as well as emotional symptoms were controlled for in all steps. In a final step gender was added as a moderator, in a moderated mediation model.

Results

For both boys and girls, stress due to school performance was most common at all time-points (Figure 5). There was also an increase in reported stress due to school performance, arguments at home and romantic relationships for both genders. Girls reported more stress, worry, anxiety and depressive symptoms than boys. Worry was found to mediate the relationship between subjective stressor load and depressive symptoms (Figure 6) as well as anxiety (Figure 7) over time. Gender was not found to interact with stressor load, thus indicating that both boys and girls were found to worry more over time in response to reported stressor load.

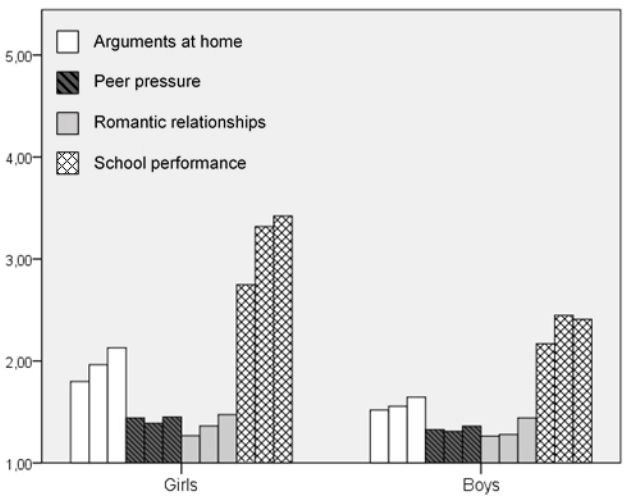

Figure 5. Mean-level subjective stressor load in the 7th, 8th and 9th grade due to arguments at home, peer pressure, romantic relationships and school performance for girls and boys. For each life domain, the left bar displays mean levels in the 7th grade, the middle displays them in the 8th grade and the right displays them in the 9th grade.

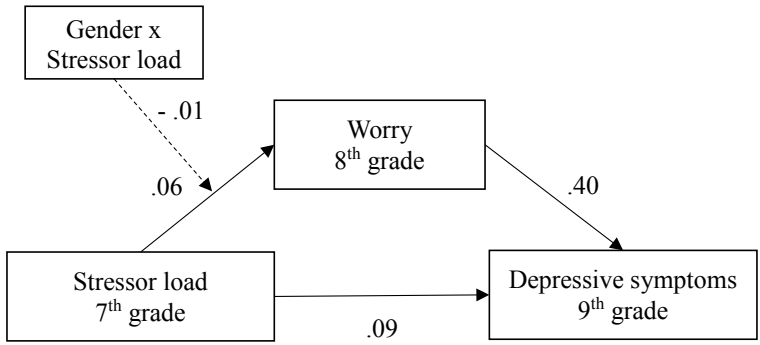

Figure 6. Final moderated mediation model of depressive symptoms. Numbers represent unstandardized regression coefficients. Paths drawn with broken lines were not significant. Depressive symptoms and worry at baseline was controlled for in all paths.

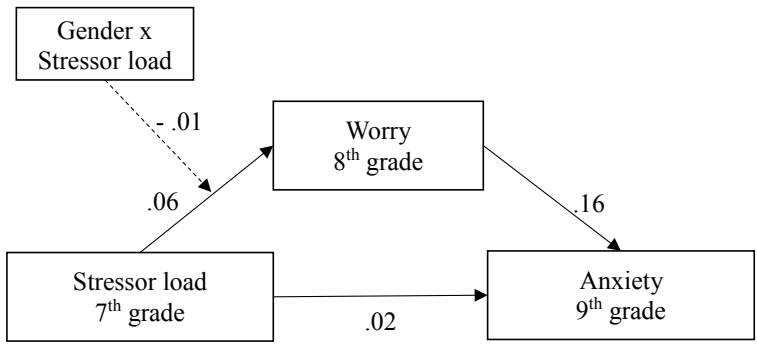

Figure 7. Final moderated mediation model of anxiety. Numbers represent unstandardized regression coefficients. Paths drawn with broken lines were not significant. Anxiety and worry at baseline was controlled for in all paths.

Conclusions

School is the most common source of stress for boys and girls in the 7th through the 9th grade, with girls reporting considerably higher levels of both subjective stressor load, worry and emotional symptoms at all time points. Subjective stressor load in the 7th grade is related to emotional symptoms in

the 9th grade and increases in worry seem to explain part of this relationship. Thus, school might be a well-suited arena for stress-prevention in this age group and worry could be a promising target in prevention.

General discussion

The overall aim of this dissertation was to further our understanding of adolescent stress and how cognitive emotion regulation strategies may be involved in the development of stress-related mental health problems over the course of adolescence. This aim was approached by testing the mediating role of cognitive avoidance and repetitive negative thinking (RNT) in the development of stress-related mental health problems (Study I), developing and evaluating a shortened version of the Adolescents Stress Questionnaire 2 (Study II) and finally exploring the relative importance of different domains of stress (home, peer, romantic relationships, and school) in adolescents in the 7th through 9th grade, and testing whether the relation between overall subjective stressor load and stress-related mental health problems was mediated by increases in worry over time (Study III). Overall results showed that cognitive avoidance and repetitive negative thinking (RNT) mediate the development of stress-related mental health problems (i.e. anxiety and depressive symptoms) from mid- to late adolescence (Study I). RNT in the form of worry was further found to mediate the relationship between subjective stressor load and stress-related mental health problems from early- to mid-adolescence (Study III). Results also revealed school as a major contributor to subjective stressor load (Study III). Last, high levels of subjective stressor load and stress-related mental health problems seems to primarily be a problem for adolescent girls (Study II and Study III).

These results have implications for the assessment and prevention of stress and stress-related mental health problems in adolescence. First, the results suggest that school may be an important context to involve in preventive efforts. Second, excessive use of cognitive emotion regulation strategies such as cognitive avoidance and worry could be used for identifying adolescents at risk of developing stress-related mental health problems. The same strategies could then also be targeted in preventive interventions.

Answers to the research questions

Study I aimed to investigate the role of cognitive emotion regulation strategies in the development of stress-related mental health problems from mid- to late adolescence. Specifically, cognitive emotion regulation in the form of cognitive avoidance and RNT was tested as a mediator of depressed mood and anxiety in mid-adolescence and depressed mood and anxiety two years later. Results showed that cognitive emotion regulation did mediate

the development of both anxiety and depressed mood over time. These results are in line with previous findings on the role of cognitive emotion regulation and stress-related mental health problems. Adolescents who report higher use of cognitive avoidance and RNT in the form of worry and rumination have been found to also report higher levels of anxiety and depressive symptoms concurrently and longitudinally (Abela et al., 2002; Dickson et al., 2012; Rood, Roelofs, Bögels, Nolen-Hoeksema, & Schouten, 2009; Schäfer et al., 2017; Watkins, 2008). Some studies have also shown that the relationship between especially rumination and depressive symptoms may be reciprocal (Nolen-Hoeksema et al., 2007) and that rumination may mediate the development of depressive symptoms over time (Burwell & Shirk, 2007). The results in Study I add and extend these findings by showing that cognitive emotion regulation in the form of cognitive avoidance and RNT mediates not only the development of depressive symptoms over time, but also anxiety. However, given that RNT and cognitive avoidance were modelled as one construct, no conclusions can be drawn about whether one strategy is more important for any of the outcomes.

The aim of Study II was to develop and validate a shortened version of the Adolescent Stress Questionnaire 2 (ASQ-2; Byrne et al., 2007). A second aim was to test whether the measure works similarly across genders. The main results showed that the factor structure was maintained in the shortened version (ASQ-S) and that the measure seems to possess similar psychometric properties as those of the full version. The nine stressor domains correlated in the expected direction with symptoms of anxiety and depression and with worry and self-esteem and these correlations were of similar size to those previously reported for the full instrument (Byrne et al., 2007; Moksnes, Byrne, Mazanov, & Espnes, 2010). Through the longitudinal design, the results of Study II further extended these findings by showing that some of the stressor domains also have predictive validity. More specifically, stress in the interpersonal domains were found to predict depressive symptoms (romantic relationships), anxiety (home life & peer pressure) and worry (peer pressure and teacher interaction) over a one-year period. Some of the school-related domains were also marginally (*ps* <.10) related to anxiety and worry. Thus, predictive validity was supported for some of the stressor domains, but there seem to be some specificity in how the different stressor domains relate to outcomes.

As for gender, girls reported more stress within all domains except for romantic relationships. The largest differences were found within the school

performance and school/leisure conflict domains. These results are in line with an abundance of research supporting a gender difference in the experience of adolescent stress (e.g. Byrne et al., 2007; Hampel & Petermann, 2006; Jose & Ratcliffe, 2004). However, Study II also makes a unique contribution to the literature of stressor measurement in adolescence as the results indicate that the ASQ-S possesses measurement invariance across genders. This finding adds support for the notion that the gender differences in stress actually reflect real differences and are not solely a result of biased reporting. In sum, the results of Study II indicate that the considerably shortened ASQ-S is a valid and reliable measure of adolescent stressor experience among Swedish adolescents with similar psychometric properties as the full version. This suggests that the ASQ-S could be a valid option to measure adolescent stress within different stressor domains in research and clinical settings where resources and time are limited.

The aims of Study III were two-fold. The first aim was to investigate the relative importance of common stressors within the interpersonal and school context over the years from early to mid-adolescence. This was done by using the instrument validated in Study II. A second aim was to extend the findings in Study I by investigating the role of cognitive emotion regulation in the form of worry in the development of stress-related mental health problems in the face of common minor stressors. Gender was further examined as a moderator of this development. Specifically, adolescents' ratings of subjective stressor load within four different domains (home, romantic relationships, peers, and school) were examined over the period from the 7th to 9th grade. Worry was then tested as a mediator of the relationship between overall subjective stressor load in the 7th grade and anxiety and depressive symptoms in the 9th grade. In a final step, gender was investigated as a moderator of the mediational role of worry. Results showed that stress related to school performance was by far the largest contributor to subjective stressor load for both boys and girls at all time-points. These results are in line with previous findings where the stress of academic performance has been found to dominate in mid-to-late adolescent samples (e.g. de Anda et al., 2000; Lin & Yusoff, 2013). Study III further adds to these finding by showing that the relative importance of school and achievement-based stress is already evident early on in adolescence and then increases. This suggests that preventive efforts aimed at reducing school-related stress would need to be implemented early on in adolescence.

The results of Study III also supported the idea that worry seems to play a key role in the development of stress-related mental health problems in the face of daily stressors. This is in line with theory and research of worry as an important cognitive mediator of prolonged stress (Brosschot et al., 2006; Brosschot, Pieper, & Thayer, 2005). It is also in accordance with previous studies where worry and other forms of RNT such as rumination have been implicated in the development of various forms of stress-related mental health problems (e.g. Michl, McLaughlin, Shepherd, & Nolen-Hoeksema, 2013; Schäfer et al., 2017; Watkins, 2008). However, in contrast to our hypothesis, gender was not found to moderate the relationship between subjective stressor load and worry. This suggests that the gender differences in stress-related mental health problems in adolescence cannot be explained by girls being more cognitive reactive to stressors. Previous studies have found that when it comes to the similar cognitive process of rumination, boys are as likely to ruminate in response to stressors as girls (Hamilton, Stange, Abramson, & Alloy, 2015; Michl et al., 2013; Stange, Hamilton, Abramson, & Alloy, 2014). The finding that girls reported higher levels of worry and stress-related mental health could instead be understood in relation to girls also reporting higher levels of subjective stressor load than boys (Hamilton et al., 2015). Clearly more research is needed to fully delineate the origins of the gender difference in the prevalence of stress-related mental health. For example, it would be important to investigate whether the gender difference in reported stressor load precedes gender differences in cognitive emotion regulation. Another possibility is to investigate reciprocal relationships in cognitive emotion regulation and stressor load over an extended developmental period and the possible influence of gender in this model.

Results in relation to theoretical frameworks

The main theoretical framework of this dissertation is the transactional model of stress and coping (Lazarus & Folkman, 1984) coupled with a transdiagnostic framework (e.g. Conway, Starr, Espejo, Brennan, & Hammen, 2016; Hankin et al., 2016; Nolen-Hoeksema & Watkins, 2011) on stress and health.

According to the transactional model, stress is to be understood as a transaction between the individual and the environment. Thus, the stress process is dependent upon the specifics of the context as well as on how the individual interprets and appraises the situation. This in turn affects what the individual then does to cope with the situations and regulate the

emotions it elicits. Hence, both short- and long-term consequences of a stressful encounter are largely dependent on individual factors such as appraisals, coping and emotion regulation. The studies of this dissertation specifically addressed the role of cognitive emotion regulation strategies in response to distress and subjective stressor load due to minor stressors in the development of stress-related mental health problems in adolescence. Our result are in line with a transactional model in that some of the relation between stressor load and long-term consequences (i.e., anxiety and depressive symptoms two years later) was mediated by individual variation in the use of cognitive emotion regulation strategies. The effects of the mediation were in general small. However, according to the transactional model, this would be expected considering that the stress process is seen as a complex phenomenon affected by social, physiological as well as psychological factors at every stressful encounter. Thus, any test of specific pathways in the stress process, especially over a longer time period, would not be expected to yield large effects (Lazarus & Folkman, 1987).

The results of Study II and Study III are especially interesting since they investigated the effect of stressor load from minor developmentally salient stressors on stress-related mental health outcomes. Much of the empirical evidence on the role of stress in the development of mental health problems have focused on more severe stressors or negative life events. However, as supported by the results of Study II and Study III, these everyday stressors may be important to take into consideration in the study of adolescent stress and stress-related mental health problems. Also, as a recent report in Sweden (Socialstyrelsen, 2017) suggests that the increase in stress-related mental health problems is evident in the whole population of adolescents and not just in groups with psychosocial challenges (e.g., immigrant youth, low SES), this suggests that normative stressors may be driving this general increase.

The results from Study I also fit well with the Response Styles Theory (RST) of depression (Nolen-Hoeksema, 1991). The RST proposes that depressed mood is maintained and exacerbated by excessive focus on the depressed mood, depressive symptoms and their implications (i.e., a ruminative response style) as opposed to redirecting attention to other things (Nolen-Hoeksema, 1991). There is extensive empirical evidence that a ruminative response style predicts depressive symptoms and disorders in adults. Similarly, longitudinal studies with adolescent samples have consistently found that rumination predicts increases in depressive symptoms (Nolen-Hoeksema et al., 2008; Watkins, 2008). However,

research into how exactly such a response style develops have been sparser. The finding in Study I that cognitive emotion regulation (RNT and cognitive avoidance) mediated the relationship of depressed mood at baseline and depressed mood two years later adds to the existing evidence base of RNT as a risk-factor for depressive symptoms. However, the findings also add to the evidence base of how a ruminative response style may develop. More specifically, the results of Study I suggest that high levels of distress in mid-adolescence predict increased engagement in cognitive emotion regulation strategies such as RNT. This fits well with the vicious cycle proposed by Nolen-Hoeksema et al. (2007). More specifically, she suggested an ongoing reciprocal process across adolescence where depressed mood may contribute to increased engagement in rumination which in turn increases depressed mood and so on and so forth, thus fostering the development of a ruminative response style. However, there has been limited empirical support to this vicious cycle. The results of Study I are in line with such a vicious cycle, and they further suggest that this cycle may also be active in terms of other negative emotional states such as anxiety. These results suggest that adolescence may be a particularly important time period in which to intervene in terms of interrupting this cycle before it stabilizes and becomes more resistant to change. An important effort in terms of future research would be to delineate when particular response styles, such as a more habitual use of RNT stabilizes. There have been a few attempts to do so (e.g. Hankin, 2008). Results indicate that some cognitive vulnerabilities (e.g., negative cognitive style) show more stability in early and mid-adolescence whereas others (e.g., rumination) still show change, especially in early adolescence (Hankin, 2008). However, more longitudinal research is needed for clear conclusions to be drawn.

Results from Study I, Study II and Study III are also in line with a transdiagnostic theoretical framework in that subjective stressor load as well as the cognitive emotion regulation processes were found to be important both for the development of anxiety and depressive symptoms over time. This is in line with a large body of evidence linking stress and cognitive emotion regulation strategies such as cognitive avoidance and RNT to various internalizing symptoms and disorders (Aldao et al., 2010; Compas et al., 2017; Klemanski, Curtiss, McLaughlin, & Nolen-Hoeksema, 2017; Schäfer et al., 2017; Stikkelbroek, Bodden, Kleinjan, Reijnders, & van Baar, 2016; Watkins, 2008). This is important as it suggests that it may be possible to target both disorders by targeting these cognitive processes. Study II also showed some interesting results with

regard to specificity of different stressor domains that may suggest possible explanations for divergent trajectories (e.g. why one adolescent high on RNT may develop depressive symptoms in the face of stress whereas another develops problems with anxiety). For example, we found that stress due to romantic relationship predicted increases in depressive symptoms over time, whereas the stress of peer pressure and arguments at home predicted anxiety. As suggested by transdiagnostic models of psychopathology, the different stressor domains may indicate different current concerns that may explain multifinality and divergent trajectories (Hankin et al., 2016; Nolen-Hoeksema & Watkins, 2011). However, the results from Study II should be interpreted cautiously since we did not investigate interactions between stressor domains and RNT in predicting outcome. Still, they can be viewed as preliminary support for the idea that different domains of stress may be relevant to explore in explaining divergent trajectories (Hankin et al., 2016; Nolen-Hoeksema & Watkins, 2011).

The finding that the school-related domains were by far the largest contributors to stress in both boys and girls (Study III) is interesting in relation to the results of the predictive validity test in Study II. Subjective stressor load within the school domains was not found to be a significant predictor of increases in worry or stress-related mental health problems. By contrast, subjective stressor load within the interpersonal domains was. This suggests that although school may be the largest contributor to a sense of load and stress in adolescents, it is not necessarily the most problematic one. Instead, interpersonal stress, although considerably less prevalent at a mean level, may be especially detrimental to the well-being of adolescents. Adolescents may be especially susceptible to interpersonal stressors given the profound changes taking place in the family and peer context in this developmental period (Hankin et al., 2015; Rudolph, 2002). This may be especially true for girls, who tend to form more intimate close friendships and rely more heavily on close friends for emotional support than boys (Maccoby, 1990; Rudolph, 2002). This might make girls especially vulnerable to disruptions in the peer context. Indeed, girls tend to report more stress in the interpersonal domain and have been found to react more strongly to interpersonal stressors in terms of internalizing symptoms (Hankin, Mermelstein, & Roesch, 2007; Hankin et al., 2015; Rudolph, 2002). Girls' higher exposure and reactivity to interpersonal stress has been suggested to play a key role in the gender difference in depression rates emerging in adolescence (Avenevoli et al., 2015; Rudolph, 2002; Rudolph

& Hammen, 1999). None of the studies in this dissertation specifically tested the peer stress exposure and/or reactivity hypothesis in explaining the gender differences found in the use of RNT and mental health problems. However, Study III did investigate whether gender interacted with overall stressor load in predicting increases of RNT over time, which would be in line with a general stress reactivity model. The findings, however, did not support the reactivity hypothesis. Instead, overall subjective stressor load seemed to increase the tendency to worry in both girls and boys in line with previous research (e.g. Hamilton et al., 2015; Michl et al., 2013). Considering that girls reported a higher overall stressor load, one interpretation of these results could be that girls' higher overall stressor load leads to greater engagement in RNT which in turn leads to increases in anxiety and depressive symptoms. Indeed, girls' greater exposure to stressors, in particular interpersonal stressors, have been related to their higher engagement in RNT which in turn relates to higher levels of depressive symptoms (Hamilton et al., 2015). However, taking the results of Study II into consideration, it may be that investigating an interaction of domain-specific stressor load and gender in the mediational role of RNT would have yielded different results. This would be interesting to explore in future studies.

Similarly, RNT has also been studied as an interpersonal process, i.e., co-rumination (Rose, 2002). Co-rumination has been found to be more common in girls and to contribute to the feelings of intimacy and closeness in girls' friendships (Rose, Carlson, & Waller, 2007). However, as with RNT, co-rumination is also predictive of increases in internalizing symptoms (Rose et al., 2007). Still, the positive effects on friendship quality may reinforce the use of rumination in girls, which may be another pathway to girls' higher tendency to engage in RNT. This would also be interesting to investigate in future studies. Preferably, such studies would make use of a combination of a longitudinal and network design to be able to discern reciprocal relationships between rumination, co-rumination and internalizing symptoms and possible spreading/socializing effects in peer networks.

Overall, the consistent gender differences found within all three studies included in this dissertation highlight stress and stress-related mental health problems as primarily a problem in adolescent girls. This is well in line with a wealth of existing evidence of the preponderance of these problems in females. A similar gender difference has not been found or is at least considerably less profound before the onset of adolescence (Hankin &

Abramson, 2001; Hankin et al., 2015). Instead, these differences seem to emerge between early- and mid-adolescence to then reach the well-established 2:1 female-to-male ratio in adulthood. Although gender differences in stress exposure or the use of the cognitive emotion regulation strategies under study in this dissertation could offer part of the explanation, many factors (e.g., biological, social, etc.) are likely to interact in this development (Hyde, Mezulis, & Abramson, 2008).

Clinical implications

There are several important clinical implications from the three studies included in this dissertation. One noteworthy finding in Study II and Study III was that school-related domains of stress dominated among both boys and girls. These results are in line with other studies where different sources of stress have been investigated (de Anda et al., 2000; Lin & Yusoff, 2013) and the general picture in Sweden in particular (Schraml, Perski, Grossi, & Simonsson-Sarnecki, 2011; Östberg et al., 2015). Also, recent reports about the prevalence and incidence of stress-related mental health problems in Swedish children and youth show that the increase of mental ill-health stems from the whole group of children and adolescents. That is, the increase is not predominately from children and adolescents with a higher psychosocial burden (Socialstyrelsen, 2017). This suggests that factors important for the observed increase may lay in the contexts where children and youth spend most of their time, such as the school context (Socialstyrelsen, 2017). However, results from Study II showed that although subjective stressor load within the school-related domains where dominant, stress within interpersonal domains (peers, romantic relationship, home) seem to be more potent predictors of stress-related mental health problems and of engagement in RNT. This can be interpreted in several ways. One interpretation would be, as suggested in the previous section that although school and performance stress contribute to a general sense of load, pressure and having too much to do, it does not have detrimental effects on the emotional well-being of adolescents. At least not within the timespan and age group measured in Study II (one year). Interpersonal stress however, although less frequently reported, does. Another interpretation would be that school is the major arena in children and adolescents' life, not only in terms of work, but also in terms of peer relations and relationships with adults outside the immediate family. Thus, school stress may, apart from a sense of overload in terms of workload, also be indicative of social climate in school (e.g., levels of bullying, etc.). For example, in a study of Swedish

6th and 9th graders, the social climate in schools was found to be related to reports of mental health problems, as was also the case in adolescents that had not been victimized themselves (Socialstyrelsen, 2012). Additionally, in reports of mental health problems, adolescents reported that these problems mostly affected their function in terms of schoolwork. Although this study was cross-sectional, it offers some interesting suggestions. It may be that interpersonal stressors are more potent risk factors for stress-related mental health problems. However, when such problems develop, they negatively affect schoolwork. This may then create more stress in relation to school and performance. Although this specific pathway has not been investigated, there is substantial empirical evidence to the reciprocal relations between stressors and mental health symptoms (e.g. Asselmann et al., 2018). Either way, the finding that school is a major contributor to subjective stressor load suggests that school may be an important arena and may be a target to facilitate the prevention of stress-related mental health problems in adolescence.

The finding that cognitive avoidance and RNT play a crucial role in the development of stress-related mental health problems in adolescence suggests that it is important to target these processes in preventive interventions. There are several cognitive and behavioral (CBT) treatment protocols and techniques that have at least some support for their effectiveness in targeting excessive levels of RNT (Topper, Emmelkamp, & Ehring, 2010). For example, metacognitive therapy as well as mindfulness-based therapy have been found to reduce RNT in clinical samples (Kingston, Dooley, Bates, Lawlor, & Malone, 2007; Wells et al., 2009). Also, one cognitive behavioral intervention that was recently developed with the specific aim of targeting excessive levels of RNT is Rumination Focused Cognitive and Behavioral Therapy (RFCBT; Watkins et al., 2011; Watkins et al., 2007). RFCBT is based on a behavior-analytic approach coupled with a specific focus on the distinction between dysfunctional RNT and more functional thought processes. More specifically, RFCBT teaches clients to recognize the difference between a more abstract, evaluative and general thinking mode and a more functional, concrete, and non-evaluative thinking mode. RFCBT has been found to effectively reduce rumination and depressed mood in adults with residual depressive symptoms (Watkins et al., 2011; Watkins et al., 2007). Importantly, a preventive intervention inspired by RFCBT was more recently developed for adolescents and young adults (Topper, Emmelkamp, Watkins, & Ehring, 2017). Besides incorporating the techniques from RFCBT to specifically target excessive

levels of RNT (e.g., concreteness training), the prevention program also teaches several other, more effective methods of regulating difficult emotions and coping with stress. For example, the program incorporates behavioral activation strategies which have been suggested to be effective methods to improve mood, disengage from RNT and may facilitate a shift towards reappraisal or problem-solving (Nolen-Hoeksema et al., 2008). Teaching alternative strategies to regulate difficult emotions and responses to stressors may be especially valuable for girls. More specifically, there are some findings suggesting that having a wider range of effective emotion regulation strategies can buffer against the negative effects of excessive rumination (Nolen-Hoeksema, 2012). However, this effect has only been found to hold for women and additional research into adolescent samples would be needed to confirm this in adolescents. Still, this preventive intervention has shown an initial promising result in reducing RNT and symptoms of anxiety and depression as well as reducing the 12-mont incidence rates of depression and generalized anxiety disorder in comparison to a wait-list control (Topper et al., 2017). The effects of this preventive intervention has also been tested within a subsample of the cohort in the larger prospective study (Three Cities Study) that Study II and Study III of this dissertation are based on. However, as the final results from that study were not available within the time frame of this dissertation, it was not included here. Still, preliminary results of this study are promising with post-interventions reductions in RNT, perceived stress, anxiety and depression in the intervention group. However, it remains to be seen whether these results will hold when they are compared to the control group at the one and two year follow-ups.

Apart from that, cognitive avoidance and RNT may be important targets in the prevention of stress-related mental health problems, they may also be used as markers for identifying adolescents at risk in more targeted preventive interventions, such as indicated prevention. Similarly, the findings of Study II suggest that the ASQ-S is a valid option for the full ASQ-2 in assessing subjective stressor load in research, but also in clinical practice where resources and time may be limited, such as in schools. As some of the stressor domains were found to possess predictive validity both in terms of symptoms and RNT, the ASQ-S could possibly also be used to identify adolescents at risk for stress-related mental health problems. However, more research is needed to further assess which stressor domains are relevant for which outcomes.

Methodological limitations

There are some methodological limitations restricting the conclusions to be drawn from the studies in this dissertation. First, all studies relied on self-report questionnaires. Self-report questionnaires are known to be sensitive to responder biases such as ordering effects and social desirability (Kazdin, 2010). Similarly, solely relying on one measurement method can introduce bias in the form of common method variance (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). In an attempt to counteract issues with social desirability, teachers were asked to leave the classrooms at the time of data collection and participants were ensured of the confidentiality of their responses. In Study II and Study III, the ordering of questionnaires was also randomized to buffer against ordering effects. The questionnaire was divided into two parts where half of the participants started with part one and the other half with part two. Moreover, questionnaires with different response scales and different item anchors were mixed in the full questionnaires. The data in study II and Study III was also extensively screened for improbable responses (e.g., no variation within or between questionnaires, extreme responses, missing reversed items, etc.). Also, as most of the concepts of interest in the three studies are inherently subjective and internal experiences, it can be argued that the adolescents themselves would be the preferred informants. Moreover, adolescent- and other informant reports of these constructs have been found to be highly correlated (e.g. Compas, Desjardins, et al., 2014; Compas et al., 2017). In Study II and Study III, instruments with established sound psychometric properties, some of which are considered the gold standard, were used. For the stressor measure that was considerably shortened specifically for this project, the psychometric properties were extensively studied and reported within Study II.

Second, all studies made use of samples from the normal population. Thus, the results of the studies cannot be generalized into clinical samples. However, in taking a dimensional viewpoint where stress-related mental health problems are seen as existing on a continuum from sub-clinical to clinical problem manifestation, investigations into what makes adolescents move up or down along this continuum are informative.

Third, the small sample size in Study I affects the statistical power and possibly also the robustness of the results. Also, the measures of cognitive emotion regulation strategies used were not optimal and the results should thus be interpreted with caution. Still, although the effects of the results were considerably smaller than results from similar studies using cross-

sectional designs (Burwell & Shirk, 2007), they were well in line with similar prospective studies (Nolen-Hoeksema et al., 2007).

Fourth, a point should be made about the potential conceptual overlap of the concepts of interest in the studies. In asking participants to rate how much stress they've experienced, this rating is essentially a grading of distress which would most likely entail feelings of anxiety and negative mood. Similarly, the measures of anxiety and depressive symptoms also share common features with measures of the cognitive emotion regulation strategies. Still, cognitive emotion regulation strategies have been shown to explain unique variance in emotional symptoms (Moulds et al., 2007; Nolen-Hoeksema, 1991; Stöber & Joormann, 2001; Weems, Silverman, & La Greca, 2000). In line with this, subjective stressor load, anxiety, depressive symptoms and cognitive emotion regulation strategies were all moderately related in the studies included in this dissertation. However, they also explained unique variance when controlling for previous levels in symptoms.

Fifth, although the longitudinal design of the three studies, especially when controlling for previous levels of symptoms and cognitive emotion regulation strategies should be considered a strength, it should be noted that no claims of causation can be made given the observational nature of the studies. Also, the one year time-lag between measurements can be considered problematic considering that levels of depressive symptoms and anxiety are known to fluctuate. It would have been interesting to know what happens in between measurement points. Thus, adding periods of more frequent measurements of stressors, mood and emotion regulation strategies (for example daily or weekly measurements) for a sub-set of the sample could have strengthened the design. To explore causation, experimental elements would need to be incorporated where the proposed mechanisms are manipulated to see whether this results in changes in the outcome. As previously mentioned, such an element was added to the prospective study (The Three Cities Study) that Study II and Study III of this dissertation are based on, however the results from this were not available within the time frame of this dissertation. More specifically, a preventive intervention targeting RNT was implemented in a subset of the cohort displaying elevated levels of RNT. This will allow for investigation into whether changes in RNT in the intervention group results in shifts in the developmental pathways compared to adolescents that did not receive the intervention. If this would be the case, this would offer a stronger case for causality.

Lastly, as some of the variables under investigation in particularly Study II and Study III were found to be related to attrition, this opens up for bias in the follow-up assessment. Specifically, higher rates of depressive symptoms and stressor load, in addition to having an immigrant background, were associated with attrition. Thus, it may be that the results from these studies do not apply to adolescents with these characteristics.

Despite these limitations, the studies included in this dissertation also have considerable strengths. First, the studies made use of two different samples as the sample in Study I was from a rural area, whereas the sample in Study II and Study III consisted of a large sample of adolescents from both rural and urban areas. Also, the studies spanned over different age groups with mid- to late adolescents in Study I, early adolescents in Study II, and early- to mid-adolescents in Study III. The relatively large and diverse samples used strengthen the external validity of the overall conclusions in this dissertation. Further, all three studies made use of prospective designs allowing for more firm conclusions to be drawn with regard to predictive power and to investigate increases in symptoms and in engagement of cognitive emotion regulation strategies over time. Lastly, specifically in Study II and Study III, high quality measures were used and the response rate was high, which further strengthens the conclusion's validity.

Some ethical aspects of the studies are also worth mentioning. All three studies were approved by the regional ethics board and followed the declaration of Helsinki. Study II and Study III that were part of the Three Cities Study included a sample that was rather young at the outset of the study (12-13 years). In accordance with the declaration of Helsinki, parental consent was obtained. However, we chose to make use of a passive form of parental consent, that is, parents were asked to inform if they did *not* want their child to participate in the study. This procedure runs the risk of including participants whose parents for various reasons may not have read the information sent out to them about the study. However, this risk was weighed against the risk of the exclusion of participants presenting with some of the risk factors under study (e.g. externalizing behaviors) (see for example Shaw, Cross, Thomas, & Zubrick, 2015). A sample where students with certain risk factors are underrepresented introduces bias that ultimately can lead to ineffective and misinformed preventive interventions. Active consent was still obtained from students themselves, and the procedure was approved by the regional ethics board.

Summary and concluding remarks

This dissertation set out to further our understanding of adolescent stress and why it is that some adolescents develop stress-related mental health problems in the face of stressors whereas others do not. The findings presented in this dissertation propose that cognitive emotion regulation strategies play a key role in this development. More specifically, cognitive emotion regulation in the form of cognitive avoidance and repetitive negative thinking (RNT) was found to mediate the development of depressed mood as well as anxiety in the time period from mid- to late adolescence. RNT in the form of worry was also found to be important in the development of stress-related mental health problems in the face of stressors in the period from early- to mid-adolescence. This suggests that cognitive avoidance and RNT are important to address in prevention of stress-related mental health problems, preferably as early as the early adolescence period, when these types of strategies tend to increase. In this way, we may have a chance of interfering before these strategies are developed into more stable means of responding to stress and negative mood.

This dissertation also points to the preponderance of school-related stress over the course of adolescence. However, when investigating longitudinal relationships between different stressor domains and stress-related mental ill-health, it seems that interpersonal stressors may be more potent predictors of outcomes. Thus, although school is a common source of stress in adolescence, it remains unclear whether it is this stressor that drives development of mental health problems. This dissertation indicates that this may not be the case, at least not in the period from early- to mid-adolescence, however future studies are needed to fully address this issue.

Finally, the most consistent finding from the studies included in this dissertation is that stress and stress-related problems primarily seem to affect girls. Given that these problems are widespread and seem to be increasing, discerning factors contributing to girls' greater use of cognitive emotion regulation and susceptibility to stress-related mental health problems, should be a continued priority in stress research.

Conclusions

- Stress is primarily a problem for girls.
- School is the major contributor to stress over the adolescent period. However, interpersonal stressors may be the more potent risk factor when it comes to the development of stress-related mental health problems in adolescence.
- Cognitive avoidance and repetitive negative thought (RNT) such as worry mediates the development of stress-related mental health problems in adolescence. High levels of subjective stressor load in turn contribute to increased engagement in these strategies.
- Preventive interventions targeting cognitive avoidance and RNT may be an effective and parsimonious alternative in the prevention of prevalent stress-related mental-health problems such as anxiety and depression. However more research is still needed, preferably with long term follow-ups.
- RNT and cognitive avoidance have an advantage in that they can both be used to identify at-risk participants and as an intervention target in preventive interventions for stress-related mental health problems in adolescence.
- Preventive efforts towards stress-related mental health problems should consider timing. Preventive efforts targeting stress, cognitive avoidance and RNT may have a larger impact in early adolescence before these strategies have become habitual methods of dealing with stress.
- Future studies should discern what makes adolescent girls vulnerable to high use of RNT and cognitive avoidance. Interpersonal stressors as well as peer modelling and reinforcement of RNT may be important factors to investigate further.

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