The intraindividual relations between social and academic self-efficacy, loneliness, academic stress and psychological distress in adolescence

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Abstract

The overall aim of this thesis is to increase our understanding of the intraindividual relationships between academic and social self-efficacy and academic stress, loneliness and psychological distress during middle to late adolescence. Today, adolescents are increasingly expected, by others and themselves, to appear flawless and perfect. Young people should perform well in school and have many, preferably popular, friends. The academic and social pressures and unreasonable demands placed on the adolescent by those around them, and arguably themselves, might instigate a negative feedback loop of weak capability beliefs, academic stress, loneliness and psychological distress. However, there is a lack of research on how these factors are associated within adolescents over time. This thesis aims to fill that research gap. By separating within- and between-person effects, this thesis provides insight into intraindividual social and educational adjustment processes and accompanying capability beliefs and poor mental health. The dissertation is inspired by theoretical frameworks in the fields of education and psychology. The findings in this thesis are based on quantitative data, collected from a youth cohort during three years of their upper secondary school education.

Paper I drew on self-efficacy theory and helplessness-hopelessness theory, assuming a negative and exacerbating spiral between weak social self-efficacy and high psychological distress. The findings reveal that fluctuations in psychological distress consistently impacted fluxes in later social self-efficacy, but not the other way around. While this effect aligns with the theoretical assumption as to how self-efficacy is formed, it contradicts the presumption that low social self-efficacy is a pathway to the development of psychological distress. This highlights the importance of investigating cognitive and psychological processes on the intraindividual plane.

Paper II built on paper I and investigated social self-efficacy and gender as possible moderators in the intraindividual association between loneliness and psychological distress. Aligning with the interpersonal theory of depression, the ebbs and flows of psychological distress systematically affected the fluctuations in later

loneliness, but not vice versa. The intraindividual relationship between loneliness and psychological distress was more salient for girls than it was for boys. There was no apparent cushioning effect of having high social self-efficacy in the link between loneliness and psychological distress.

In paper III, academic self-efficacy was examined as a possible explanatory mechanism between academic stress and psychological distress at the intraindividual level. Gender was also tested as a moderator of the mentioned relationships. The findings revealed that academic self-efficacy, as presumed by self-efficacy theory and the transactional theory of stress and coping, partially mediated the relationship between academic stress and psychological distress. Regarding gender differences, the intraindividual effect of academic stress on psychological distress was more substantial for girls than it was for boys.

The findings in this thesis reveal that fluctuations in psychological distress impact several vital areas of adolescent life and development, such as social capability beliefs, loneliness and academic stress. Academic stress and psychological distress might comprise a negative and exacerbating loop over time. Additionally, fluxes in academic self-efficacy partially explain how fluctuations in academic stress impact changes in psychological distress. The intraindividual relationships between psychological distress and academic stress and loneliness are more salient for girls than for boys. This thesis reaffirms the need for effective intervention strategies to prevent and reduce psychological distress and academic stress and to strengthen young people’s capability beliefs. Separating inter- and intraindividual effects is encouraged to provide more reliable and accurate information on cognitive, behavioural and psychological processes.

Sammendrag

Det overordnede målet i denne avhandlingen er å øke vår forståelse av intraindividuelle sammenhenger mellom akademisk og sosial mestringstro og akademisk stress, ensomhet og symptomer på angst og depresjon. I dag er det et økende press på at ungdommer skal fremstå som perfekte. Det forventes at de skal gjøre det godt på skolen og ha mange, helst populære, venner. Dette presset og de urimelige forventningene fra mennesker rundt ungdommen, og de selv, kan starte en negativ spiral av svak mestringstro, skolerelatert stress, ensomhet og symptomer på angst og depresjon. Det mangler imidlertid forskning på hvordan disse faktorene henger sammen innad i ungdommer over tid. Denne avhandlingen hadde som mål å fylle dette forskningshullet. Ved å skille inter- og intraindividuelle effekter gir denne avhandlingen innsikt i intraindividuelle prosesser relatert til sosial og akademisk fungering og medfølgende mestringstro og dårlig mental helse. Avhandlingen er inspirert av teoretiske rammeverker i utdannings- og psykologifeltet. Funnene i denne avhandlingen er basert på kvantitative data, samlet inn fra en gruppe ungdommer igjennom tre år av deres videregående opplæring.

Artikkel 1 ble inspirert av teoriene om mestringstro og hjelpeløshet-håpløshet som antar en negativ og forsterkende loop av svak sosial mestringstro og symptomer på angst og depresjon. Funnene viser at fluktueringer i symptomer på angst og depresjon konsekvent innvirker på variasjoner i senere sosial mestringstro, men ikke motsatt. Denne effekten sammenfaller med den teoretiske antagelsen om hvordan mestringstro dannes, men motstrider påstanden om at lav sosial mestringstro bidrar til utviklingen av symptomer på angst og depresjon. Dette fremhever viktigheten av å undersøke kognitive og psykologiske prosesser på det intraindividuelle planet.

Artikkel 2 bygde på artikkel 1 og undersøkte sosial mestringstro og kjønn som mulige moderatorer i den intraindividuelle sammenhengen mellom ensomhet og symptomer på angst og depresjon. I samsvar med den interpersonlige teorien om depresjon, hadde fluktueringer i symptomer på angst og depresjon en systematisk effekt på svingninger i senere ensomhet, men ikke omvendt. Det intraindividuelle

forholdet mellom ensomhet og symptomer på angst og depresjon var mer fremtredende for jenter enn gutter. Det var ingen signifikant beskyttende effekt av å ha høy sosial mestringstro i forholdet mellom ensomhet og symptomer på angst og depresjon.

I artikkel 3 ble akademisk mestringstro undersøkt som en mulig forklarende mekanisme mellom akademisk stress og symptomer på angst og depresjon på det intraindividuelle nivået. Kjønn ble også testet som en moderator i de nevnte sammenhengene. Funnene viste at akademisk mestringstro, som forventet av teorien om mestringstro og den transaksjonelle teorien om stress og mestring, fungerte som en delvis mediator i sammenhengen mellom akademisk stress og symptomer på angst og depresjon. I henhold til kjønn var den intraindividuelle effekten av akademisk stress på symptomer på angst og depresjon sterkere for jenter sammenlignet med gutter.

Samlet sett viser funnene i denne avhandlingen at fluktueringer i symptomer på angst og depresjon har innvirkning på flere viktige områder i ungdommers liv og utvikling, som sosial mestringstro, ensomhet og skolerelatert stress. Akademisk stress og symptomer på angst og depresjon kan bestå av en negativ og forverrende loop over tid. I tillegg forklarte fluktueringer i akademisk mestringstro delvis hvordan variasjoner i akademisk stress har en innvirkning på endringer i symptomer på angst og depresjon. De intraindividuelle sammenhengene mellom symptomer på angst og depresjon og akademisk stress og ensomhet er sterkere for jenter enn gutter. Denne avhandlingen understreker behovet for effektive intervensjonsstrategier for å forhindre og redusere symptomer på angst og depresjon og skolerelatert stress og styrke ungdommers mestringstro. Å skille mellom inter- og intraindividuelle effekter er viktig i fortsettelsen for å finne mer pålitelig og korrekt informasjon om kognitive, atferdsmessige og psykologiske prosesser.

List of Publications

Paper I Kristensen, S. M., Danielsen, A. G., Jeno, L. M., Larsen, T. M. B., & Urke, H. B. (2021). The within-person effect of psychological distress on social self-efficacy: A random intercept cross-lagged panel model. *Journal of Research on Adolescence, 32*(4), 1267-1634. https://doi.org/10.1111/jora.12701

Paper II Kristensen, S. M., Urke, H. B., Larsen, T. M. B., & Danielsen, A. G. (2022). Hello darkness, my old friend: Moderating a random intercept cross-lagged panel model of loneliness and symptoms of anxiety and depression. *Research on Child and Adolescent Psychopathology, 51*(3), 383-397. https://doi.org/10.1007/s10802-022-00995-1

Paper III Kristensen, S. M., Larsen, T. M. B., Urke, H. B., & Danielsen, A. G. (2023). Academic stress, academic self-efficacy, and psychological distress: A moderated mediation of within-person effects. *Journal of Youth and Adolescence*. https://doi.org/10.1007/s10964-023-01770-1

Contents

1. Introduction

Psychological distress[1] tends to crest during adolescence (Hankin et al., 1998; Vannucci et al., 2018) and has been linked to physical and cognitive developmental changes, negative life events and the social challenges that characterise this period (e.g., Blakemore, 2019). Psychological distress increases the likelihood of suicide (Davidson et al., 2011; Windfuhr et al., 2008), smoking, alcohol and substance abuse (Wolitzky-Taylor et al., 2012), obesity (Hasler et al., 2005), academic underperformance (Fletcher, 2008; Van Ameringen et al., 2003), maladjustment (Benjamin et al., 2013) and poor health later in life (Keenan-Miller et al., 2007).

There have been several Norwegian (Helse- og omsorgsdepartementet, 2003; St. prp. nr. 63, 1997–1998) and international (WHO, 2013, 2015) efforts to reduce mental health problems in young people. A multi-sectorial approach is central to the Norwegian strategies, emphasising the importance of well-functioning communication and collaboration between several different social actors, such as schools, social and health care services, leisure time sectors, child protective services, out-patient clinics, families and young people's social environments. For example, research suggests that supportive family, friends and other adults are protective factors in the development of poor mental health (Wight et al., 2006). However, despite efforts, secular trends of increasing mental health issues, both internationally (Collishaw, 2015; Potrebny et al., 2017) and nationally (Krokstad et al., 2022; von Soest & Wichstrøm, 2014), have been observed. For instance, symptoms of anxiety and depression nearly doubled during the last two decades in Norway, from 15.3 per cent to 29.8 per cent (Krokstad et al., 2022).

This upward trend of increasing mental health problems in adolescence might be attributed, in part, to escalating pressure to perform well in school (Högberg et al.,

[1] *Psychological distress* is conceptualised as symptoms of anxiety and depression (Drapeau et al., 2012; Mirowsky & Ross, 2002). Paper II consistently uses the term 'symptoms of anxiety and depression' due to journal preferences, while papers I and III use the term 'psychological distress'. The two terms are used interchangeably throughout this thesis and refer to the same phenomenon.

2020). Sweeting et al. (2010) found that the increase in psychological distress between 1987 and 2006 was best accounted for by arguments with parents, school disengagement and school-related worries. In recent decades, academic stress has become more harmful to young people's mental health (Högberg et al., 2020). Research shows that academic stress substantially impacts quality of life (Berdida & Grande, 2022) and relates to psychosomatic symptoms such as sleeping and concentration difficulties, stomach aches, tension, headaches, poor appetite, sadness and giddiness (Nygren & Hagquist, 2019). A recent report indicated that 40 to 49 per cent of girls and 18 to 28 per cent of boys experienced academic stress “very often” throughout their upper secondary education in Norway (Eriksen et al., 2017). Moreover, 39 per cent of girls and 14 per cent of boys who experienced academic stress very often also reported being “very bothered” by symptoms of anxiety and depression (Eriksen et al., 2017).

West and Sweeting (2003) argued that academic stress is the main culprit in the trend of poorer psychosomatic health, particularly for girls. This association might be explained by the “educational stressors hypothesis” (West & Sweeting, 2003), which proposes a progressively greater societal emphasis and value on educational attainment, accompanied by an increase in the number of school-related stressors (West & Sweeting, 2003). Specifically, the pressure to perform well in school, an increase in normative testing, and the adverse experiences that come with being evaluated are on the rise, negatively impacting young people’s health (Karvonen et al., 2005). Girls are more susceptible to these external pressures and demands because they value schoolwork more and are more sensitive to stressors in the school environment than boys (Landstedt et al., 2009; Schraml et al., 2011). Consequently, self-esteem and self-worth might be more negatively impacted by poor educational attainment and academic stress for girls than for boys.

In addition to the rising pressure of educational attainment and its accompanying stresses, adolescents report increasing levels of loneliness (Buecker et al., 2021). On a global level, nearly twice as many adolescents in 2018 had elevated

levels of loneliness compared to 2012 (Twenge et al., 2021). Around 24 per cent of Norwegian adolescents reported feeling “somewhat” or “very” lonely before the COVID-19 pandemic (Bakken, 2020). The increase in adolescent loneliness has been attributed, in part, to the digital media revolution, which was accompanied by a shift in the way young people socialise. Face-to-face interactions were largely replaced by communication via smartphone during the 2010s (Twenge et al., 2019; Twenge & Spitzberg, 2020). One reason loneliness has increased in recent years could be because emotional closeness is lower on digital media compared to face-to-face interactions (Sherman et al., 2013).

Compared to boys, girls experienced a larger increase in loneliness during the 2010s (Bakken, 2018; Twenge et al., 2021). In Norwegian secondary schools, 22 per cent of girls and 11 per cent of boys reported being lonely in 2011, compared to 27 and 11 per cent, respectively, in 2017 (Bakken, 2018). Compared to boys, girls’ mental health might be more at risk when experiencing social disturbances such as loneliness (Rudolph et al., 2008). Specifically, girls might be more prone to define themselves based on interpersonal relationships, be more reliant on others, have goals that correspond with their social connections' interests and be more concerned about social evaluations than boys (for an overview, see Rose & Rudolph, 2006). Additionally, depressive symptoms might negatively impact girls’ interpersonal relationships more than boys (Rudolph et al., 2007). One reason for this might be that girls tend to rely more on intimate and supportive relationships than boys, which can be difficult to initiate and maintain when experiencing anhedonia, a core indicator of depression (Rudolph et al., 2008). However, research has found that emotionally supportive teachers and caring classroom environments might diminish the loneliness experienced by both boys and girls in their everyday school life (Morin, 2020).

Today, loneliness is considered a relevant public health issue, and a national strategy has been proposed to prevent and reduce loneliness in Norway (Helse- og omsorgsdepartementet, 2019). The Norwegian Ministry of Health and Care Services has put forth three overarching goals in the plan: 1) highlight loneliness as a public

health challenge and stimulate increased social participation, 2) gain more knowledge about loneliness and effective measures and 3) work systematically to prevent loneliness and increase social support (Helse- og omsorgsdepartementet, 2019). This strategy is similar to political movements in other Western countries, such as the UK (HM Government, 2018). Although there is an increased focus on loneliness prevention and reduction, loneliness interventions and research have largely ignored the distinction between persistent (trait-like) and transient (state-like) loneliness (e.g., Eccles & Qualter, 2021; Danneel et al., 2019; Lasgaard et al., 2011; Vanhalst et al., 2012). Thus, there is a lack of knowledge concerning the cognitive, behavioural and environmental processes related to fluctuations in loneliness within young people.

1.1. The Adolescent Period

Adolescence is a critical transitional phase of life that sees the emergence of many new challenges. During middle to late adolescence, youth must start addressing their role in the adult world and make decisions that will impact their future in almost every dimension of life (Bandura, 1997, p. 177). Choosing one's lifework looms in this period, and young people are forced to learn several new skills and assume greater responsibility for how they behave and move through society. The environment plays an important role in how adolescents adjust to these new challenges, wherein adverse psychological changes can arise due to the unmet needs of the developing adolescent (Eccles et al., 1993). Additionally, how adolescents exercise their perceived self-efficacy[2] during this developmental time opens different doors to pathways leading them into adulthood. A weak self-efficacy for school-related tasks in upper secondary school might foreclose several professional endeavours. And social inefficacy can render people helpless in their pursuit of meaningful and

[2] For the sake of brevity, *perceived self-efficacy* (Bandura, 1977; 1997) has been shortened to *self-efficacy* or *efficacy* throughout the thesis and the connecting papers.

supportive relationships that could assist them in the face of negative life events and everyday pressures and demands.

The stakes are higher in upper secondary school (grades 11–13) compared to lower secondary and primary school. During this educational period, performances such as grades determine admission to future occupational activities. External pressures and demands to do well in school are some of the main sources of negative stress[3] and health-related issues in adolescence (Frydenberg, 2008). During upper secondary school, adolescents face increasing pressure from teachers (Song et al., 2015) and parents (Deb et al., 2015) to perform academically. In addition, adolescents experience a looming expectation to begin working or to attend tertiary education after finishing upper secondary school. Expectedly, adolescents experience high academic pressure and stress during late secondary school (Dewald et al., 2014; Leonard et al., 2015; McGraw et al., 2008; Moeller et al., 2020; Pascoe et al., 2020).

During the transition to upper secondary school, youth are more at risk of feeling lonely due to the socioemotional disruptions that occur in this period (Benner et al., 2017). Loneliness (i.e., perceived social isolation: Cacioppo & Cacioppo, 2018) is a painful affective state often described as a discrepancy between desired and actual social interactions (Peplau & Perlman, 1982, p. 5). Loneliness is associated with several negative consequences, such as low quality of life and somatic and psychological suffering (e.g., Cacioppo et al., 2002; Heinrich & Gullone, 2006), and increased risk of suicide (McClelland et al., 2020) and mortality (Holt-Lunstad et al., 2015). Contrary to what might be expected, it is the quality, not the quantity, of peer connections that is the predominant factor in what people desire in their social interactions (Hawkley & Cacioppo, 2010). Although the number of peer connections is related to loneliness, there is an existential aspect to the perception of being lonely (Fromm-Reichmann, 1959). Individuals can feel lonely in the presence of other people, even when they seemingly get along with others and enjoy their company.

[3] *Negative stress* is defined as an adverse feeling that arises when a person who is exposed to a challenging situation perceives their personal resources as lacking (Bandura, 1997; Lazarus, 1966).

However, compared to non-lonely people, lonely individuals often perceive their social connections as less supportive and comforting (Cacioppo et al., 2003, p. 73). For example, thinking one's parents are caring and having close friends are related to decreased loneliness throughout adolescence (von Soest, 2020).

The prevalence of loneliness peaks during adolescence, presumably due to the many changes in identity, needs and social relationship expectations that adolescents go through (Heinrich & Gullone, 2006). Young people experience a transition period where parents are traded for peers as primary social agents (Crosnoe, 2000). As time progresses in adolescence, peer connections and networks (Prinstein & Dodge, 2008) and the quality of friendships (Qualter et al., 2015) become increasingly important. When youth are unable to connect with peers, their psychological and physiological functioning is at risk. Initiating and maintaining friendships, and experiencing and managing peer conflicts, are related to mental and physical health in young people (Hendry & Reid, 2000). Additionally, having unsuccessful social or romantic lives during adolescence contributes to long-lasting internalising symptoms such as anxiety, depression and social withdrawal (Kansky & Allen, 2018; Landstedt et al., 2015).

Navigating adolescence with feelings of being socially isolated and unable to meet scholastic pressures and demands—while going through disquieting physical, social and academic changes—carries a high risk of anxiety arousal and despondency (Bandura, 1997). Young people who experience academic stress or loneliness are increasingly likely to develop symptoms of anxiety and depression (e.g., Loades et al., 2020; Murberg & Bru, 2005). In addition to the obvious discomfort of feeling socially isolated or stressed about school, Bandura (1997, p. 153) argued that anxiety and depressive symptoms are related to an inability to exercise control in areas perceived as important.

1.2. Believing in the Capability to Control Adversity

Adolescents' perceived efficacy in social and academic situations influences their emotional well-being and development (Bandura, 1997, p. 179). Supportive and warm social relationships bring satisfaction to one's life and tend to buffer the effect of stressors on personal adjustment. Socially efficacious youth are better than those who doubt themselves at initiating and maintaining supportive social connections (Bandura, 1997; Connolly, 1989). A strong sense of academic self-efficacy instigates achievement-related behaviours, such as task choice, effort, persistence and effective learning strategies (Schunk & DiBenedetto, 2016; Schunk & Pajares, 2009). Students with strong academic self-efficacy work harder at schoolwork, participate in scholarly activities more readily, show greater interest in learning and feel tranquil and ready in the face of difficult academic challenges (Bandura, 1986, 1997; Schunk, 2012). In contrast, students with weak academic self-efficacy often think tasks are more difficult than they are and put less effort into schoolwork, give up more readily in the face of challenges and struggle to perform at a higher educational level (Dinther et al., 2011; Schunk & Pajares, 2002).

According to self-efficacy theory (Bandura, 1977, 1997), youth who believe they are inefficacious in social or academic endeavours may have a propensity for anxiety arousal and despondency. A major reason for this is that being successful in school and being capable of initiating and maintaining supportive peer connections becomes progressively important throughout adolescence. Adolescents who experience physiological arousal or despondency during a challenging and demanding activity are increasingly likely to attribute the arousal or gloomy mood as indications of their inability to handle the situation (Bandura, 1997). Symptoms of depression and anxiety often co-occur and accompany perceived inefficacy to alter dismal life conditions (Bandura, 1997, p. 153). Similarly, Seligman (1975) and Alloy et al. (1990) argued that people become resigned and helpless if they feel unable to influence outcomes through their actions.

Social cognitive theory (Bandura, 1986) suggests reciprocity between people's cognitions, their behaviour and the environment. Thus, individuals with symptoms of anxiety and depression might negatively impact their environment and their own cognitions through adverse behaviour and attributions (Bandura, 1997; Coyne, 1976). First, suppose a person is despondent and apprehensive. In such a case, they might act in ways that create a gloomy and stressful environment—for instance, through excessive reassurance-seeking and off-putting, dismal or hostile behaviour (Coyne, 1976, 1985; Bandura, 1997). This aversive behaviour can also result in social rejection, withdrawal and avoidance. Second, psychologically distressed people tend to attribute failures to their personality and characteristics, thus further nurturing a negative self-system and the adverse cognitions accompanying it (Bandura, 1997). Negative environmental feedback, such as social rejection or poor grades, and aversive cognitions following situations, impact people's self-efficacy (Bandura, 1997). According to the reasoning of Bandura (1986, 1997), there is a negative and exacerbating loop of poor self-efficacy, loneliness, stress and psychological distress through adverse behaviours, environmental feedback, and cognitions.

1.3. Separating Within- and Between-person Effects

Bandura (1997) argued that self-efficacy is not a static, omnibus trait, but an essential mechanism of personal agency that fluctuates within people over time and across different situations. However, even though fluctuations of a cognitive construct arguably concern processes occurring within people, the theoretical assumptions of self-efficacy theory are based on research on the between-person level. The between-person level refers to an individual's personal norm of a factor across a period of time (e.g., how efficacious an individual feels, on average, throughout a study). The within-person level indicates a person's deviations from their trait-like, normative level of a factor on each measurement occasion (e.g., fluctuating levels of efficacy that are unusually low or high compared to the individual's norm). Separating the between-person level (i.e., trait-like level) from the within-person level (i.e., state-like level) is crucial to increasing accuracy when determining the temporality

and true relationship between factors over time (Curran & Bauer, 2011; Hamaker et al., 2015).

Yeo and Neal (2013) argued that between-person analysis is useful when investigating trait-like associations (e.g., the relationship between overcoming phobias and the level of self-efficacy). However, using between-person analysis to examine, for example, how changes in self-efficacy relate to later changes in performance at a within-person level, is insufficient (Yeo & Neal, 2013). Like Yeo and Neal (2013), I argue that using between-person analyses when examining the roles of academic and social self-efficacy in academic stress, loneliness and psychological distress processes over time might not be sufficient. The development of loneliness, academic stress, social and academic self-efficacy, and psychological distress (and the association between these) concerns processes that occur within individuals over time. Importantly, people differ not only from each other but also from themselves at different time points (i.e., they fluctuate around their normative levels). Therefore, it might be more appropriate to examine how loneliness, academic stress, social and academic self-efficacy, and psychological distress relate to one another at an intraindividual level.

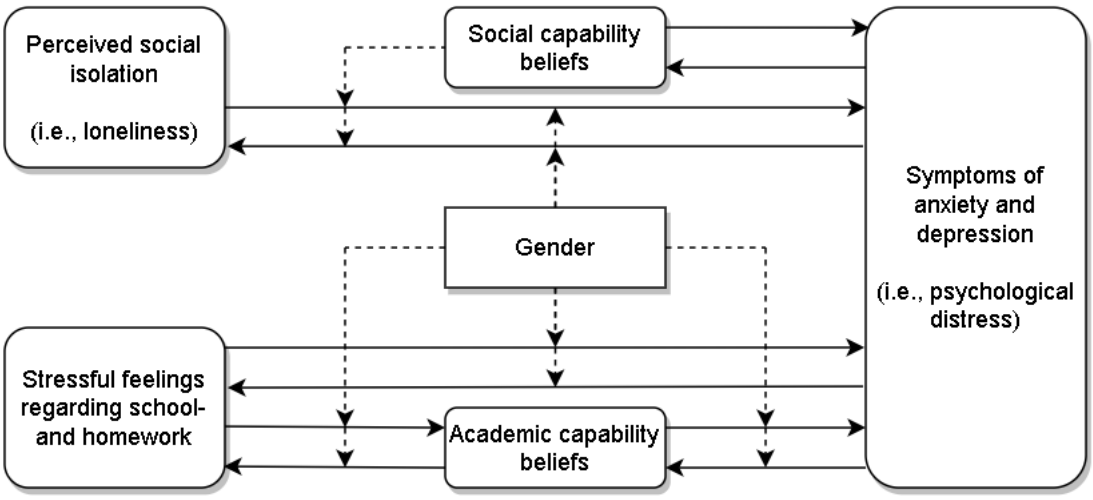
1.4. Problem Statements

This thesis aims to investigate how social and academic self-efficacy are related to academic stress, loneliness and psychological distress within individuals across three years in middle to late adolescence. Research suggests that self-efficacy beliefs in young people are intertwined with psychological distress, academic stress and loneliness (e.g., Burger & Samuel, 2017; Ehrenberg et al., 1991; Landon et al., 2007). In the face of challenges, individuals low in social self-efficacy might have an increased vulnerability to becoming psychologically distressed through unsatisfactory social interactions and support (Bandura, 1994; Bandura et al., 1999; Steca et al., 2014). Additionally, when experiencing stressful situations, individuals' self-efficacy for the same context might decrease because of the adverse feelings that characterise the stress, which could result in increased psychological distress

(Bandura, 1997; Lazarus & Folkman, 1984). In reverse, psychological distress is related to negative cognitions of how the person functions and is often expressed through aversive behaviour that leads to social rejection, withdrawal, social isolation and stressful environments, which might result in decreased self-efficacy (Bandura, 1997; Muris, 2002; Tak et al., 2017). Compared to boys, girls are more sensitive to educational and interpersonal stressors (Rose & Rudolph, 2006; West & Sweeting, 2003) and are increasingly prone to ruminate and experience the negative relational effects of psychological distress (Rose & Rudolph, 2006; Rudolph et al., 2007). Hence, the negative loop between psychological distress and academic stress and loneliness might be more salient for girls than boys. Figure 1 illustrates how academic stress, loneliness, academic and social self-efficacy, psychological distress, and gender might be related within adolescents over time.

Figure 1

Conceptual Model of Intraindividual Associations



Note. The dotted lines represent moderating effects.

This thesis will shed light on intraindividual processes related to academic and social self-efficacy during an important developmental period in adolescence. Research emphasising the importance of self-efficacy in personal adjustment and mental health has so far focused mainly on a between-person level. In longitudinal

research, disaggregating between- and within-person effects is essential because associations can have opposing effects across the two analytical levels (Curran & Bauer, 2011). Failing to separate within- from between-person variance can distort the true direction of effects, and the magnitude of these, at the within-person level (Curran & Bauer, 2011; Hamaker et al., 2015; Yeo & Neal, 2013).

Against this backdrop, the thesis will aim to address the following overarching research question: *What are the longitudinal intraindividual relationships between social and academic self-efficacy and loneliness, academic stress, and psychological distress?* This problem statement is investigated in three studies. The first study concerns the intraindividual relationship between social self-efficacy and psychological distress over time. The research question in the first study is: *What is the within-person temporal association between social self-efficacy and psychological distress?* Based on theory and research, a reciprocal and negative intraindividual relationship between the two constructs is expected to exist. Being unable to control or influence future social situations during adolescence can give rise to feelings of hopelessness, uselessness and anxiety. In reverse, despondent and anxious people are increasingly likely to ruminate about their helplessness and miserable life situation, both in general and during social settings, which can negatively impact their social efficacy.

The second study investigates the relational processes between loneliness and psychological distress occurring within adolescents over time and if this association is more salient for one gender or people with high or low social self-efficacy. The research question in the second study is: *What is the within-person temporal association between loneliness and psychological distress, and does social self-efficacy or gender function as a moderator in this relationship?* According to previous empirical findings and relevant theories, it is expected that 1) loneliness and psychological distress have a reciprocal relation within adolescents over time and 2) the intraindividual relationship between loneliness and psychological distress is stronger for girls and adolescents with low social self-efficacy. The bidirectional

association between loneliness and psychological distress might be stronger for girls than boys, mainly because girls are more reliant on others, define values and self-perceptions based on social connections, and desire more intimate and supportive relationships compared to boys. Compared to individuals with weak social self-efficacy, youth with strong social self-efficacy are more likely to initiate and maintain supportive relationships, which can buffer the effect of stressors on personal adjustment.

The third study investigates whether academic self-efficacy functions as an explanatory mechanism (i.e., a mediator) in the intraindividual relationships between academic stress and psychological distress and whether the relationships are more salient for one gender. The research question in this study is threefold: 1) *What is the within-person effect of academic stress on psychological distress, and what is its recursive effect?,* 2) *Is academic self-efficacy an explanatory mechanism in the relationship between academic stress and psychological distress?,* and 3) *Does gender moderate the associations?* Regarding the first problem statement, it is anticipated that deviations in academic stress are related to similar fluctuations in psychological distress. Additionally, academic self-efficacy is expected to function as a mechanism in the association between academic stress and psychological distress. In other words, fluctuations in academic self-efficacy partly explain the intraindividual relationship between academic stress and psychological distress. Lastly, because girls are more susceptible to school-related stressors, place greater value on academic attainment, and tend to ruminate more than boys, the intraindividual relationships between academic stress, academic self-efficacy and psychological distress might be more salient for girls.

1.5. Overview of the Thesis

This thesis consists of six chapters. Chapter two elaborates on the worldview, metatheory and theories that guided this thesis and the three accompanying articles based on the domain of inquiry. Chapter three examines previous research on the associations between social and academic self-efficacy, loneliness, academic stress

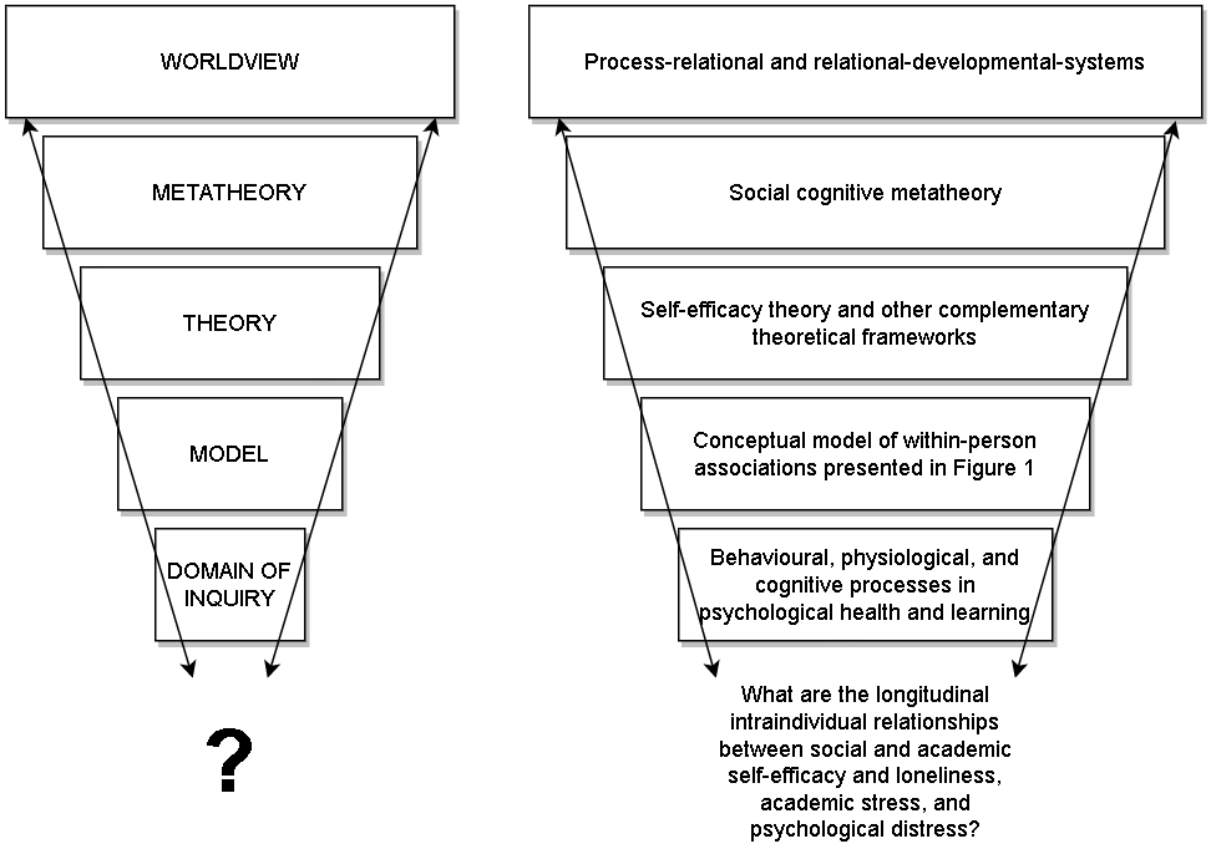
and psychological distress. Research gaps are identified at the end of chapter three, and hypotheses are thus formulated based on theoretical assumptions and previous findings. In chapter four, the methods of the studies are presented, including information on the studies' designs, materials used, and statistical analyses and considerations. Chapter five describes the results of each study. Finally, in chapter six, the findings are discussed in light of previous research, theory, implications for policy and practice, recommendations for future research, and methodological considerations, followed by a conclusion.

2. Worldview, Metatheory, and Theories

Based on the overarching problem statement in this thesis—*what are the longitudinal intraindividual relationships between social and academic self-efficacy and loneliness, academic stress and psychological distress?*—the domain of inquiry concerns behavioural, physiological and cognitive processes in psychological health and learning. Therefore, the thesis employs theories and descriptive models that complement one another within the disciplines of health and educational psychology. This thesis's metatheory is used as a conceptual system to understand developmental processes between individuals, their behaviour and their environment. See Figure 2 for a visualisation of how the research paradigm is connected to the problem statements through metatheory, theories, model and domain of inquiry. This chapter will first elaborate on the worldview used as an anchor for the methodological and theoretical decisions made in the thesis. Next, the metatheory is presented, followed by the theoretical frameworks.

Figure 2

Research Paradigm, Metatheory, Theory, Conceptual Model, Domain of Inquiry, and Research Question



Note. The figure on the left is adapted from Overton (2015, p. 6).

2.1. The Process-relational and Relational-developmental-systems Worldview

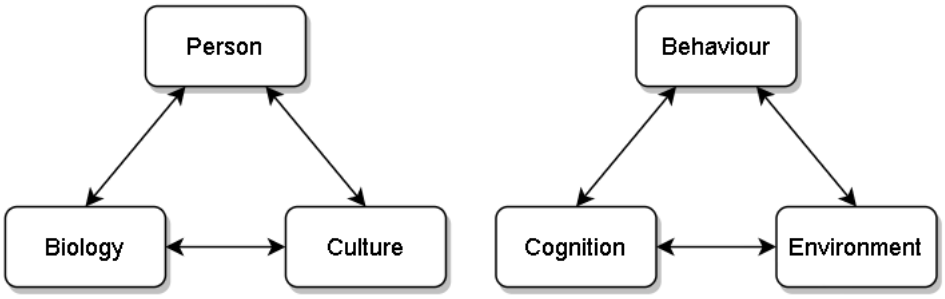
This thesis investigates complex human functioning and developmental change, such as the associations between agentic cognitions, perceiving oneself in social and academic systems and poor mental health processes across time. This thesis' focus is first and foremost on intraindividual processes but acknowledges the significance of the environment in these processes. As such, the thesis aligns with a paradigm, metatheory and theories that see humans as not developing in a vacuum but rather as interacting with their environment.

In the process-relational and relational-developmental-systems paradigm, humans are ontologically viewed as active, ever-changing, and coactive and

interactive with processes in their social milieu through personal agency (Overton, 2013; 2014; 2015; Overton & Molenaar, 2015). Similarly, social cognitive theory suggests that agency is *emergent* and *interactive* (Bandura, 1989, p. 1175). In other words, social cognitive theory considers agency as a constantly developing process, interacting with the environment around the self-regulating organism. Bandura (2006, p. 165), like the process-relational and relational-developmental-systems paradigm (i.e., a pluralistic and holistic worldview: Overton, 2015, pp. 39-40), rejected a duality between human agency and the social structure. According to the paradigm, the environment is active, dynamic and actively constructed by the organism, which is concurrently and reactively modified by it (Reese, 1976). That is, the association between people and the environment reciprocally interact (i.e., positive or negative feedback loops: Overton, 2015, p. 42), similar to the views of Bandura (1977; 1986; 1997). Figure 3 illustrates the relationship between individuals and their environment in the process-relational and relational-developmental-systems paradigm and social cognitive theory.

Figure 3

The Association Between Individuals and their Environment



Note. The models are adapted from Overton (2015, p. 44) (left) and Bandura (1997, p. 6) (right).

In the process-relational and relational-developmental-systems paradigm, reductionism (i.e., reducing many appearances to the one Real) becomes meaningless because understanding is achieved by investigating patterns—how things are related (Overton, 2014; 2015, p. 33). Similarly, social cognitive theory

adopted ontological, epistemological and methodological non-reductionistic views on human agency. Bandura (2006) pointed out that understanding agency went beyond the anatomical localisation and brain circuitry subserving human activities. He claimed that if we were to epistemologically reduce a higher level of complexity of humans to the function of subatomic particles, we could never fully account for human behaviour (Bandura, 2006). Therefore, concerning methodological reductionism, Bandura (1989) rejected the possibility of explaining complex human capacity, such as symbolic thinking and grasping social systems, by studying rudimentary processes.

The ontological view in this thesis, considering people as ever-changing and active, informs the methodological decisions to study developmental change. Moreover, the thesis does not reduce a phenomenon (e.g., social or academic self-efficacy) to one single process, but rather investigates a phenomenon in relation to other relevant processes over time to increase our understanding of it. Aligning with the process-relational and relational-developmental-systems worldview (Overton, 2015; Overton & Molenaar, 2015), believing there are differences across individuals within time and within individuals across time, this study employs a person-oriented approach, considering intraindividual change across time using change-sensitive models. This approach has gained increased traction in contemporary developmental science compared to variable-centred analyses on group means (Nesselroade & Molenaar, 2010).

2.2. Social Cognitive Metatheory

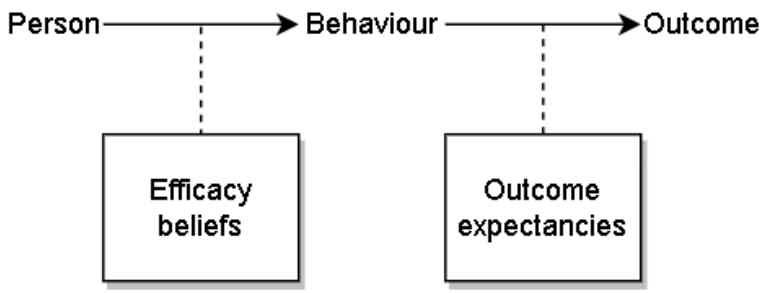
Social cognitive theory postulates that agency is manifested in three properties: forethought, self-reactiveness and self-reflectiveness (Bandura, 2018). People motivate and guide themselves during forethought, self-regulate as self-reactiveness and consider personal functioning during self-reflectiveness (Bandura, 2018). Bandura (1977, 1986, 1997) argued that the most central and pervasive mechanism of agency is personal efficacy. Social cognitive theory (Bandura, 1997, p. 3) argues that self-efficacy beliefs impact the course of action that individuals pursue, how

much effort they will put into endeavours, how well they will persevere while experiencing hardships, their resilience to adversity, and how much stress and depression they experience in managing heavy environmental demands. Bandura (1997, p. 19) pointed out that self-efficacy beliefs influence nearly everything we do: how we think, motivate ourselves, feel and behave.

In addition to self-efficacy, people's outcome expectancies influence behaviour and affective states (Bandura, 1991). Self-efficacy is an evaluation of how well one can perform an action in a certain situation, while outcome expectancy is a judgment of what result the action will produce (Bandura, 1997, p. 21). The conditional relationship between a person, their behaviour and outcomes is presented in Figure 4. Outcome expectancies come in three major forms, and positive or negative expectations serve as incentives or disincentives within each form (Bandura, 1986). The first type of outcome consists of the positive and negative physical effects, such as pleasurable or aversive physical experiences, that accompany a behaviour. The second type of outcome entails positive and negative social effects, such as attention, support, and recognition or indifference, condemnation and rejection. The third type of outcome consists of the positive and negative self-evaluations of one's own behaviour, such as self-satisfaction or self-criticism.

Figure 4

The Association Between Self-efficacy and Outcome Expectancies



Note. The model is adapted from Bandura (1997, p. 22).

People self-regulate through the motivation of effort to achieve highly desired outcomes (Bandura, 1997). The self-regulatory mechanisms are governed by personal capability appraisals, aspirations, positive and negative outcome expectancies, the outcome value, and available environmental resources (Bandura, 1997, p. 26). These self-regulatory systems are prominent social cognitive elements that determine people's life courses. Notably, a behaviour or *performance* (i.e., accomplishment) is not considered an *outcome*; rather, the outcome is a consequence of the performance (Bandura, 1997). During middle to late adolescence, highly valued performances likely constitute supportive and warm social connections and favourable school attainments because the potential positive outcomes of these performances are important during this period.

2.3. Self-efficacy and Personal Functioning

Self-efficacy was coined by Bandura (1977), who posited that it "is concerned not with the skills one has but with the judgments of what one can do with whatever skills one possesses" (Bandura, 1986, p. 391). As such, self-efficacy can be regarded as a motivational resource crucial for an individual's beliefs regarding learning, performance and behaviour (Bandura, 1977, 1997).

Personal efficacy is not a contextless, omnibus trait-like disposition, but varies on different dimensions (Bandura, 1997). There are three major dimensions of self-efficacy (Bandura, 1997, p. 42). The first self-efficacy dimension is *level*. It is generally assumed that there is a hierarchy of different levels of self-efficacy, ranging from the most universal and general level to task-specific, within a certain context, domain or subject. The second dimension of self-efficacy is *generality*. Individuals might evaluate themselves as being efficacious across a broad scope of activities or only in certain situations (Bandura, 1997). For instance, the judgment of one's self-efficacy for one activity may become increasingly similar to one's efficacy in other activities as those activities become more comparable. The last self-efficacy dimension is *strength*. Individuals with weak self-efficacy doubt their capabilities in certain situations and shy away from difficult tasks in those settings (Bandura, 1997, p. 39).

During challenging situations, they tend to ruminate on personal inadequacies, the difficulty of the task and the negative outcomes of failure. This cognitive pitfall undermines their effort and logical thinking, shifting attention even further away from how best to execute behaviours and into worries about personal inadequacy and catastrophic outcomes (Bandura, 1997). They approach threats in the environment with a lack of confidence in their ability to exercise some control over them. Such an inefficacious mindset enhances performance failures, increases stress and heightens vulnerability to depression. In contrast, individuals with strong self-efficacy will persevere in the face of difficulties and often attribute failures to situational factors (as opposed to personal ones) (Bandura, 1997).

2.3.1. The Formation and Operation of Self-efficacy

Four principal sources are crucial in forming self-efficacy beliefs: mastery experiences, vicarious experiences, verbal persuasion and affective/physical states (Bandura, 1997, p. 79). Because this thesis investigates academic stress, loneliness and psychological distress in relation to self-efficacy, affective and physiological states as a source of efficacy will be given more attention than the other sources.

Mastery experiences, as the name implies, are personal experiences of how well one has demonstrated command over a task or situation. It is generally assumed that this is the most influential of the different sources of self-efficacy due to the authentic validation it provides regarding one's ability to succeed in similar, future endeavours (Bandura, 1997). For instance, academic assessments, such as grades, play a large role in informing students' academic self-efficacy. The second informational source is *vicarious experiences*, which use information through personal comparisons with other people. Although students use academic accomplishments as a source for their academic self-efficacy, comparing one's performances to those of other students (particularly those who are similar to oneself) provides an even more accurate evaluation of personal performance. For example, a specific examination score might be relatively meaningless unless one compares it to the examination scores of other students (Bandura, 1997, p. 87). The

third self-efficacy source is *verbal persuasion*, which concerns the feedback one receives from the environment. Specifically, people can be persuaded that they possess the capabilities to perform a certain task or to perform a task in a specific situation, resulting in self-affirmation and increased self-efficacy (Bandura, 1997). To illustrate, a teacher might convince a student of their capabilities to perform well prior to an exam, thereby increasing the student's academic efficacy.

The last informational source of self-efficacy involves the *physiological and affective states* people use to evaluate their abilities. A person who experiences a physiological arousal or despondent mood during a demanding situation is more likely to interpret the bodily activation and negative affect as adverse reactions to the challenge (Bandura, 1997, p. 106). This negative evaluation might impair personal efficacy for the specific context. For example, an adolescent who feels despondent, apprehensive and worried during social interactions with unfamiliar peers is increasingly likely to believe that his affective and physiological state is due to social demands; consequently, he experiences a decrease in social self-efficacy. Furthermore, mood states trigger memories that are congruent with one's current mood (Bandura, 1997, p. 111). Hence, despondency during social interactions likely activates negative memories of past social failures, further exacerbating the aversive affective state and perceptions of inefficacy.

Importantly, while positive mastery and vicarious experiences, verbal persuasions and affective states do not necessarily raise efficacy beliefs, negative events do not automatically lower them (Bandura, 1997). Changes in self-efficacy occur because of the cognitive processing that follows receipt of the information. If people have negative self-systems and low self-worth, and if they attribute failures to personal characteristics and expend a large amount of effort to manage a situation, they are increasingly likely to interpret events and circumstances as damaging to their personal efficacy (Bandura, 1997). Moreover, people differ in proneness to ruminating and dwelling on previous physical and affective reactions, which govern the effect of environmental events and cognitions on personal efficacy.

2.3.2. Self-efficacy and Affective and Physiological Processes

Bandura (1997, p. 137) suggested that self-efficacy mechanisms are crucial elements in regulating affective states. Self-efficacy can influence emotion regulation by exercising control over *thought, action* and *affect*. Concerning thought, attentional biases influence how situations are evaluated, represented and retrieved from memory in either positive or negative ways. Additionally, controlling upsetting thinking patterns determines how well people can prevent negative thought processes. Actions influence emotion regulation through a transformation of the environment, wherein the potential of emotional impact is altered (i.e., reducing the emotional effect the environment can have on the person) (Bandura, 1997). Lastly, control over affect concerns how well people believe they can mitigate the impact of adverse emotions once those emotions have been awakened.

Perceived efficacy to control potentially threatening events and to manage situations related to highly valued outcomes plays a central role in anxiety arousal and despondent mood states (Bandura, 1986). Being unable to control or influence future events and social situations that are personally important can give rise to feelings of hopelessness, uselessness and anxiety (Bandura, 1997, p. 153). For example, Bandura (1997) suggested that people experience anxiety when they perceive themselves as being unable to handle potentially adverse events. Further, he argued that people experience sadness and depression when they believe that they are incapable of gaining highly valued outcomes (Bandura, 1997). Importantly, however, thinking that one is powerless to achieve highly valued outcomes is also often anxiety provoking. Hence, because feelings of deprivation and apprehension frequently co-occur, symptoms of both depression and anxiety often accompany perceived inefficacy to alter dismal life conditions (Bandura, 1997, p. 153).

2.3.2.1. Emotions and Social Adjustment and Efficacy. Seligman (1975) suggested that individuals feel defeated when they expect that they will be unable to affect outcomes through their actions. In a similar vein, the helplessness-hopelessness theory (Alloy et al., 1990) posits that people who experience feelings of

certain helplessness about a situation will develop a mixed anxiety and depression syndrome. Peer relationships and expanding social networks become increasingly important during adolescence. If young people perceive themselves as helpless in initiating and maintaining peer connections (i.e., weak social efficacy), feelings of despondency, worry and apprehension might arise. Alloy et al. (1990) argued that people who feel certain helplessness about future events might still be unsure about the situation's outcome. Thus, the socially inefficacious adolescent might become socially passive, “give up”, and ruminate about possible future social outcomes (i.e., experience depressed mood), while simultaneously enduring hypervigilance, worry and apprehension (i.e., anxiety arousal) (Alloy et al., 1990). Bandura (1997, p. 108) underscored that individuals often experience mixed emotions rather than a single one and that they often vacillate rapidly between anxiety and depression.

Despondent, anxious people are increasingly likely to ruminate about their helplessness and miserable life situation, which sustains and exacerbates their psychological distress (Bandura, 1997). Psychologically distressed individuals understand that the dejecting thought cycle is counterproductive and meaningless; however, they are unable to exercise the necessary thought control to stop it. Because they have negative self-systems and a morose and pessimistic outlook on life, psychologically distressed people tend to act hostile and gloomy (Bandura, 1997, p. 154; Coyne, 1985). The interpersonal theory of depression (Coyne, 1976) posits that the behaviour of depressed or depressed-prone individuals is off-putting for others, which can result in social rejection, withdrawal and avoidance. Furthermore, psychologically distressed people tend to reject the initial social support provided by others, thereby sustaining their despondent state (Coyne, 1976). The resulting relational issues serve as an exacerbator of the person’s negative affect.

Bandura (1997, p. 159) suggested that people become depressed when they do not experience sufficient social support to manage chronic stressors. Thus, being socially isolated while trying to cope with stressors is one of the pathways to the development of psychological distress. The evolutionary theory of loneliness

(Cacioppo & Cacioppo, 2018), on the other hand, argues that perceiving oneself as socially isolated (i.e., feeling lonely) is sufficient to instigate depressive symptomatology. In other words, it is the quality of one's connections that is important, not their number (Cacioppo et al., 2003; Hawkley & Cacioppo, 2010).

Cacioppo and Cacioppo (2018) suggested that loneliness is a biological alarm system, motivating the person to repair or replace the apparent deficiencies in their social connections. One of the bodily reactions to increased loneliness is depression, which is assumed to minimise the risks associated with social harm (i.e., the value of social contacts becomes less than its burden) (Allen & Badcock, 2003). The depressive state decreases the likelihood that effort will be made to force one's way into a social group from which one feels isolated. Additionally, it increases the likelihood of the person exhibiting bodily cues, such as facial expressions, posture and vocalisations, that will incite others to come to their aid (Cacioppo et al., 2014; Cacioppo & Patrick, 2008). However, the depressive symptomatology, and the beneficial social effects that might accompany it, are only beneficial in the short-term and will increase the likelihood of early mortality if they become a long-term affliction (Cacioppo & Cacioppo, 2018).

Self-efficacy theory (1977, 1997) and the developmentally based interpersonal model of depression (Rudolph et al., 2008) propose that social cognitive factors (e.g., self-efficacy) can function as a buffer in the relationship between interpersonal disturbances and depression. Bandura (1997, p. 157) argued that weak social efficacy hinders people when they are trying to form meaningful and supportive interpersonal relationships. Warm and supportive connections function as a cushion in the face of chronic stressors and increase life satisfaction. Individuals with a strong sense of social self-efficacy are more able to create a supportive environment than are socially inefficacious people (Bandura, 1997). Thus, people who experience perceived social isolation (i.e., loneliness) might struggle to ask for help from others to overcome setbacks in their lives if they have a weak, as opposed to a strong, sense of social efficacy (Bandura, 1997).

Psychologically distressed people, on the other hand, are increasingly likely to have a negative self-system consisting of aversive cognitions and attributions (Bandura, 1997; Rudolph et al., 2008). The adverse impact of despondency and anxiety arousal on perceived social isolation may become even greater if the person has a weak sense of social efficacy. As mentioned, psychologically distressed people often behave in ways that are off-putting to others (Coyne, 1976). People who have experienced depressive symptoms can feel nervousness and relentless fear of experiencing emerging symptoms, which may manifest in avoidance behaviour and stress regarding interpersonal issues, as well as impaired coping (Coyne et al., 1998). A weak sense of social efficacy might further exacerbate socially incompetent behaviour, resulting in an even more extensive sense of being socially isolated.

2.3.2.2. Stress, Arousal, Mood, and Efficacy Judgment. Whether a person experiences an anxious or depressive reaction to environmental threats is not determined by omnibus, stable traits or an aversive appraisal of the environmental happening as a danger to personal safety. Bandura (1997) and Lazarus and Folkman (1984) suggested that people "weigh" the potentially harmful aspects of the environment against their personal capabilities. The transactional theory of stress and coping (Lazarus, 1966; Lazarus & Folkman, 1984) posits that this process involves two appraisals. The first appraisal evaluates whether the stressor is irrelevant, benign-positive or stressful. A stressful evaluation is characterised by feelings of either harm/loss, threat or challenge. According to this reasoning, students in secondary school continuously appraise their schoolwork and homework as either challenging or threatening. If they evaluate their educational demands as threatening (e.g., that they are incapable of completing schoolwork and homework, assumed to result in despondency and worry related to poor academic achievement), the student needs to do something to cope with the situation.

When a situation has been appraised as threatening, causing a stressful reaction, a second appraisal becomes salient and happens roughly simultaneously with the first appraisal (Lazarus & Folkman, 1984). This second appraisal concerns the

strength of the personal efficacy related to the stressful situation, such as students' capability beliefs of performing academically. The aversive feelings characterising the first appraisal might lower the perceived self-efficacy for the situations relevant to handle the threatening situation. The academically stressed and inefficacious student experiences negative thought patterns that likely inhibit and impair their academic functioning, resulting in despondency and anxiety (Bandura, 1997; Lazarus & Folkman, 1984). Indeed, Bandura (1997) argued that people who lack the control to handle painful stimuli display higher anxiety arousal and despondent mood and more performance impairments than do those with a strong sense of control. If, on the other hand, people believe that they can exercise control over the threatening schoolwork and homework situation, they might cognitively transform the situation into a safe one, thereby reducing psychological distress (Bandura, 1997, p. 141).

2.3.2.3. The Loop Between Self-efficacy and Psychological Distress. Bandura (1997, p. 113) emphasised that mood and self-efficacy are associated both concurrently and predictively in a bidirectional, reinforcing process. Psychological distress weakens self-efficacy through negative attributions, cognitions and self-regulation. Feeling helpless (i.e., experiencing a weak sense of self-efficacy) to gain valuable life conditions or belongings spawns personal failures, breeding even greater psychological distress (Bandura, 1997). A weakened self-efficacy undermines motivation and increases inadequate performance, resulting in even more profound despondency and worry (Bandura, 1997, p. 160). Thus, psychological distress and inefficacy can become part of a downward cycle in a reciprocal affirmative process.

Fluctuations in mood inform self-efficacy judgments, and the more intense the mood, the larger its effect on efficacy (Bandura, 1997, p. 112). However, Bandura (1997) pointed out that mood cannot transform a normatively weak self-efficacy into "superstar" levels: a mouse cannot become a mighty lion through positive emotions, and a lion will not become a quivering mouse through negative affect. Hence, it makes little sense to examine the relationship between self-efficacy and emotions without ruling out people's own normative levels of the two factors and conducting

an investigation into how fluctuations in affect and efficacy relate over time. Despite this, the research literature uses as a foundation for the self-efficacy theoretical framework concerns between-person, trait-like levels to postulate intraindividual associations. This is known as the ecological fallacy (Robinson, 1950), wherein the relationship between two factors observed on an interpersonal level is assumed to also apply to the intraindividual level. Curran and Bauer (2011) visualised the harm of the ecological fallacy using as an example the association between physical activity and heart attacks: people who exercise often have a lower risk of heart attack (between-person effect), but there is an increased risk of having a heart attack while exercising (within-person effect).

3. A Review of the Literature

The literature is abundant on the association between different types of stress, self-efficacy and mental health constructs. Therefore, there were several criteria for including studies in the literature review. First, the participants' mean age in a study had to be above 10 (onset of early adolescence) and below 25 (end of young adulthood). Second, only stress measures that were school-related, such as study stress, exam stress, schoolwork stress, etc. (i.e., academic stress), were included. Third, because self-efficacy ranges from different levels of specificity, only studies on social and academic self-efficacy were included in the literature review. Fourth, because social self-efficacy is arguably more crucial in interpersonal processes than in other domains (i.e., academics), social self-efficacy was paired with loneliness and psychological distress during the search process. Similarly, academic stress was combined with academic self-efficacy and psychological distress in the literature review. Lastly, only anxiety or depressive symptoms were included as part of the construct of psychological distress and, therefore, in the literature review. Anxiety and depressive disorders are included in the literature review, as anxiety and depressive symptoms are also characteristic of these disorders.

The majority of the studies that were found in the literature review were cross-sectional. The findings from these studies imply that academic (Bacchini & Magliulo, 2003; Carranza Esteban et al., 2022; Chemers et al., 2001; Ehrenberg et al., 1991; Grøtan et al., 2019; Karademas & Kalantzi-Azizi, 2004; Muris, 2001, 2002; Suldo & Shaffer, 2007; Tahmassian & Jalali Moghadam, 2011; Thijs & Verkuyten, 2008) and social (Bacchini & Magliulo, 2003; Hermann & Betz, 2004, 2006; Jenkins et al., 2002; Kashdan & Roberts, 2004; McFarlane et al., 1995; Muris, 2002; Raskauskas et al., 2015; Riaz et al., 2014; Smith & Betz, 2002; Suldo & Shaffer, 2007; Tahmassian & Jalali Moghadam, 2011; Wei et al., 2005) self-efficacy are negatively related to concurrent psychological distress. Moreover, academic (Chee et al., 2019; McKay et al., 2014; Travis et al., 2020; Ye et al., 2018; Zajacova et al., 2005) and social (Andretta & McKay, 2018; Tsai et al., 2017; Wei et al., 2005) self-efficacy are negatively related to

academic stress and loneliness, respectively. Lastly, academic stress (Ang & Huan, 2006; Byrne et al., 2007; Deb et al., 2015; Hau Jett & Yusoff, 2013; Liu & Lu, 2012; Moksnes et al., 2010; Murberg & Bru, 2005; Torsheim & Wold, 2001) and loneliness (Chang, 2018; Danneel et al., 2019; Diehl et al., 2018; Gallagher et al., 2014; Lasgaard et al., 2011; for an overview, see Loades et al., 2020; for a meta-analysis, see Mahon et al., 2006; McIntyre et al., 2018) are positively associated with simultaneous psychological distress. Because the present study is longitudinal, the following literature review is limited mainly to longitudinal studies. However, cross-sectional studies investigating directional effects are included.

3.1. Social Self-efficacy and Psychological Distress

Although cross-sectional, some studies have investigated the impact that social self-efficacy and psychological distress have on one another. Regarding the effect that social self-efficacy has on psychological distress, Smith and Betz (2002) found that shyness was an explanatory mechanism in the association. Another study (Hermann & Betz, 2004) implies that social self-efficacy directly affects depression and that shyness does not mediate this effect. In contrast, some research implies that attachment anxiety (Wei et al., 2005) and anxiety (Muris, 2002) significantly and negatively impact social self-efficacy.

Research on the longitudinal relationships between social self-efficacy and psychological distress is scarce, and the results are mixed. Older research on the topic seems to have primarily investigated, and found support for, the direction of effect where social self-efficacy functions as a precursor to psychological distress. For instance, a classic study by Bandura et al. (1999) established that social self-efficacy in early adolescence was predictive of depressive symptoms one and two years later. Social self-efficacy also impacted depression indirectly through pro-socialness and problem behaviours (Bandura et al., 1999). Another study (McFarlane et al., 1995) showed that social self-efficacy at one time point was significantly related to depression six months later when controlling for earlier depression. Lastly, a study by Caprara et al. (2004) indicated that social self-efficacy significantly predicted

internalising symptoms two years later, but only when treated as a total variable with academic and self-regulatory efficacy, and not as separate predictors.

Some studies have found support for the opposite direction of effect, wherein psychological distress is an antecedent of social self-efficacy. A recent study by Tak et al. (2017) indicated that depressive symptoms predicted later social self-efficacy during early to middle adolescence but not the other way around. In other words, higher levels of depressive symptoms were related to lower subsequent social self-efficacy. Moreover, an experimental study showed that socially anxious individuals reported lower social self-efficacy in several experimental conditions, such as in socially threatening, neutral or encouraging situations (Kashdan & Roberts, 2004).

3.2. Loneliness and Psychological Distress

Several cross-sectional studies have studied the widely acknowledged impact of loneliness on psychological health, and the findings generally imply that loneliness worsens psychological distress. For example, one systematic review found that loneliness affects anxiety and depression (Loades et al., 2020), and one meta-analysis showed that loneliness predicts depression (Erzen & Çikrikci, 2018). Moreover, one meta-analysis implied that loneliness significantly impacts depression, anxiety, general mental health and well-being (Park et al., 2020). Of note—although I include the findings from the meta-analysis by Park et al. (2020)—relatively few of the included studies focused on adolescents (21 out of 114).

Longitudinal studies investigating the relationship between loneliness and psychological distress have generally assumed that loneliness functions as an antecedent of psychological distress, and findings support that assumption. For instance, Wei et al. (2005) and Barbieri and Mercado (2022) showed that loneliness predicts later depression and psychological distress, respectively. Moreover, one systematic review found that most studies indicated that loneliness precedes depression and anxiety (Loades et al., 2020). Lastly, one longitudinal study established that loneliness and depressive symptoms at one time point were

moderately to strongly associated with one another both at six months later and one year later (Rotenberg et al., 2004).

Studies that have examined the bidirectionality between loneliness and psychological distress have found mixed results. Cavanaugh and Buehler (2016) established that loneliness was predictive of later social anxiety, but not the other way around. One study by Danneel et al. (2019) found that, across three adolescent samples, loneliness and symptoms of social anxiety were reciprocally related over time, and that depressive symptoms predicted subsequent levels of loneliness, but not vice versa. Similarly, Lasgaard et al. (2011) indicated that symptoms of depression were antecedents of loneliness one year later and not the other way around. Vanhalst, Klimstra, et al. (2012) found evidence for a reciprocal relationship between loneliness and depressive symptoms in adolescents. Another study by Vanhalst, Luyckx, et al. (2012) established that loneliness was a consistent predictor of later depressive symptoms and that depressive symptoms impacted loneliness on one later occasion. Lastly, Zhou et al. (2020) discovered that depression at one time point predicted loneliness one year later, which again impacted depression after another year.

Although the following studies do not investigate the direction of effect between loneliness and psychological distress, they address the developmental associations between the two constructs. Vanhalst et al. (2013) examined how different latent classes of loneliness across five years (age ~15 – 20) were associated with depression and generalised anxiety at age 20. They found that adolescents with chronically high loneliness experienced significantly higher depression and anxiety compared to other latent classes, such as “high and decreasing”, “moderate and decreasing”, “low and increasing” and “stable and low” (Vanhalst et al., 2013). Another longitudinal study on the association between initial status and growth of loneliness and depression found that 1) initial statuses of loneliness and depression were strongly and significantly related, and 2) the developmental change in loneliness and depression was strongly and significantly associated (Ladd & Ettekal, 2013).

Moreover, adolescents with chronic loneliness experienced high and increasing depression over time (Ladd & Ettekal, 2013).

3.3. Academic Stress and Psychological Distress

Most research concerning the relationship between academic stress and psychological distress has been interested in how academic stress might impact psychological health. The literature review in this thesis found no studies as to how psychological distress might influence academic stress. One study established that perceived stress, including pressure and demands from school, was related to symptoms of anxiety and depression (Wiklund et al., 2012). Similarly, Sweeting et al. (2010) showed that worry about school is significantly related to psychological distress. Perceived academic stress significantly predicts health complaints (Torsheim & Wold, 2001), and adolescents with high academic stress are increasingly likely to be depressed and, as a result, experience suicidal ideation (Ang & Huan, 2006). One mixed methods study found that time pressure, schoolwork and reconciling schoolwork and leisure time activities were the major categories of stress during adolescence (Östberg et al., 2015). Moreover, when individuals suffered high levels of such stress, they often experienced psychological distress and somatic symptoms as a result (Östberg et al., 2015).

Little is known about the longitudinal or possibly bi-directional relationship between academic stress and psychological distress. Like the cross-sectional studies, the research seems to be overwhelmingly one-sided. Academic stress is mainly assumed to be an antecedent, not an outcome, of psychological health problems. For instance, one longitudinal study found that academic stress significantly predicted depressive symptoms over and beyond previous symptoms of depression (Murberg & Bru, 2005). Another study showed that perceived school stress impacted negative mental health six months later (Tian et al., 2019).

3.4. Academic Self-efficacy and Psychological Distress

Cross-sectional studies regarding the relationship between academic self-efficacy and psychological distress imply that these factors impact each other. Most studies have investigated the predictive value of poor psychological health on academic self-efficacy. For instance, Muris (2002) and Thijs and Verkuyten (2008) found that depression or depressed affect negatively predicted academic self-efficacy. Moreover, one study indicated that psychological distress negatively impacted academic self-efficacy, particularly for individuals with severe symptoms (Grøtan et al., 2019). Investigating the opposite direction of effect, Karademas and Kalantzi-Azizi (2004) showed that examination self-efficacy significantly predicted concurrent poor psychological health.

There is a paucity of longitudinal research on the association between academic self-efficacy and psychological distress—only three studies were found in the literature review. Bandura et al. (1999) observed that academic self-efficacy influenced later depression directly and indirectly through academic achievement, problem behaviour and prior depression. Tak et al. (2017) found that symptoms of depression consistently predicted later academic self-efficacy, but not vice versa, in adolescence. Similarly, another longitudinal study implied that poor psychological health at an earlier time predicted later study self-efficacy (Karademas & Kalantzi-Azizi, 2004).

3.5. Academic Stress and Academic Self-efficacy

There is a scarcity of studies on the association between academic stress and academic self-efficacy in adolescence. Some cross-sectional studies support the assumption that academic self-efficacy impacts academic stress. For instance, Chee et al. (2019) found that academic self-efficacy significantly and negatively affected academic stress. Moreover, Karademas and Kalantzi-Azizi (2004) showed that study self-efficacy functioned as a significant predictor of threat appraisals such as worry, fear and anxiety. On the other hand, McKay et al. (2014) found that stress related to school performance negatively predicted academic self-efficacy. Furthermore, one

longitudinal study across three years in adolescence indicated that academic stress negatively predicted students' academic self-efficacy over time (Ye et al., 2018).

3.6. Gender Differences

This section will focus on gender moderation effects in the following cross-sectional or longitudinal associations: 1) loneliness and psychological distress, 2) academic stress and self-efficacy, 3) academic stress and psychological distress and 4) academic self-efficacy and psychological distress.

The findings are mixed regarding the moderating effect of gender on the relationship between loneliness and psychological distress. Several longitudinal studies imply no gender differences in the associations between loneliness, anxiety and depression across time (Danneel et al., 2019; Lasgaard et al., 2011; Vanhalst, Klimstra, et al., 2012). Those studies that have found gender differences generally imply that the relationship between loneliness and psychological distress is more salient for girls. For example, a longitudinal study by Liu et al. (2020) implied that loneliness significantly predicted an increase in depressive symptoms for women, while social isolation was more predictive of depressive symptoms for men. Moreover, Chang (2018) found that the predictive value of loneliness on concurrent anxiety and depressive symptoms was stronger for girls than boys.

Only one study examining whether gender moderates the relationship between academic stress and academic self-efficacy was found during the literature review. Ye et al. (2018) discovered that the association is more salient for girls than it is for boys. Specifically, the predictive effect of academic stress on academic self-efficacy was larger for girls than for boys.

Concerning the gender moderation of the relationship between academic stress and psychological distress, one study implied that academic stress might harm the psychological health of girls more than boys. For example, a Swedish longitudinal study discovered that girls experienced significantly higher mental health problems than boys toward the end of compulsory school (Giota & Gustafsson, 2017). These

gender differences were completely accounted for by school stress and demands (Giota & Gustafsson, 2017).

Most studies show null findings regarding gender moderation in the longitudinal relationship between academic self-efficacy and psychological distress. For instance, Bandura et al. (1999) found no gender differences in the effect of academic self-efficacy on concurrent and subsequent depression. Similarly, Tak et al. (2017) found no evidence of gender differences in the bi-directional, longitudinal relationship between depressive symptoms and academic self-efficacy. Additionally, the cross-sectional study by Suldo and Shaffer (2007) implies no gender moderation. However, Muris (2001) established that academic self-efficacy and depression were more strongly correlated for girls than boys.

3.7. Aims and Hypotheses

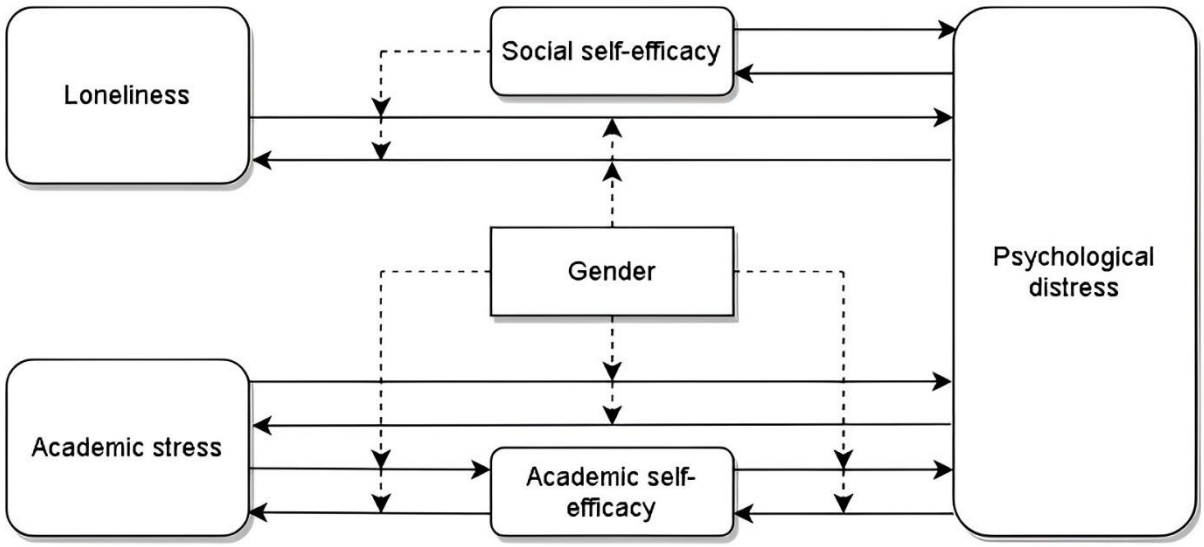
The literature review indicates the following. First, social self-efficacy and psychological distress might be bidirectionally related across time in adolescence, supporting the theoretical assumptions of self-efficacy theory (Bandura, 1997) and the helplessness-hopelessness theory (Alloy et al., 1990). Second, loneliness and psychological distress are likely reciprocally associated, in line with the evolutionary theory of loneliness (Cacioppo & Cacioppo, 2018) and the interpersonal theory of depression (Coyne, 1976). Third, it is likely that academic stress and academic self-efficacy influence psychological distress, aligning with the transactional theory of stress and coping (Lazarus, 1966; Lazarus & Folkman, 1984) and self-efficacy theory (Bandura, 1997). In reverse, psychological distress might also impact academic self-efficacy. Fourth, academic stress and academic self-efficacy probably impact each other over time, which is in agreement with self-efficacy theory (Bandura, 1997). Lastly, while gender might moderate the relationships between loneliness and psychological distress and academic self-efficacy, academic stress and psychological distress, the evidence for this in the literature is not convincing.

There are some shortcomings in the literature regarding the associations between social and academic self-efficacy and loneliness, academic stress and psychological distress. First, although research on general stress, stressors and psychopathology implies that psychological distress impacts stress (Grant et al., 2003; Grant et al., 2004; Grant et al., 2006; Grant et al., 2014; Hammen, 2005, 2020), the literature concerning how psychological distress influences academic stress is scarce. Second, little is known about how gender might moderate the relationships between loneliness and psychological distress and academic stress, academic self-efficacy and psychological distress. Third, studies are mostly cross-sectional, and when longitudinal designs have been employed, most have not considered bidirectionality between factors. Lastly, most previous research on the relationships between social and academic self-efficacy and loneliness, academic stress and psychological distress focuses on the between-person level (i.e., how people differ from each other). Importantly, however, individuals also vary from themselves (i.e., within-person level). By analysing at the intraindividual level, we can, with increasing accuracy, determine the associations between factors using state-like variables.

Based on the theoretical frameworks used in this thesis and previous research, an overall model of loneliness, academic stress, social and academic self-efficacy, psychological distress and gender was hypothesised (see Figure 5). The three accompanying articles examine different sections of the model, which are explained in detail below.

Figure 5

The Hypothesised Longitudinal Intraindividual Relationships Between Social and Academic Self-efficacy and Loneliness, Academic Stress and Psychological Distress



Note. The dotted lines represent moderating effects.

3.7.1. Paper I

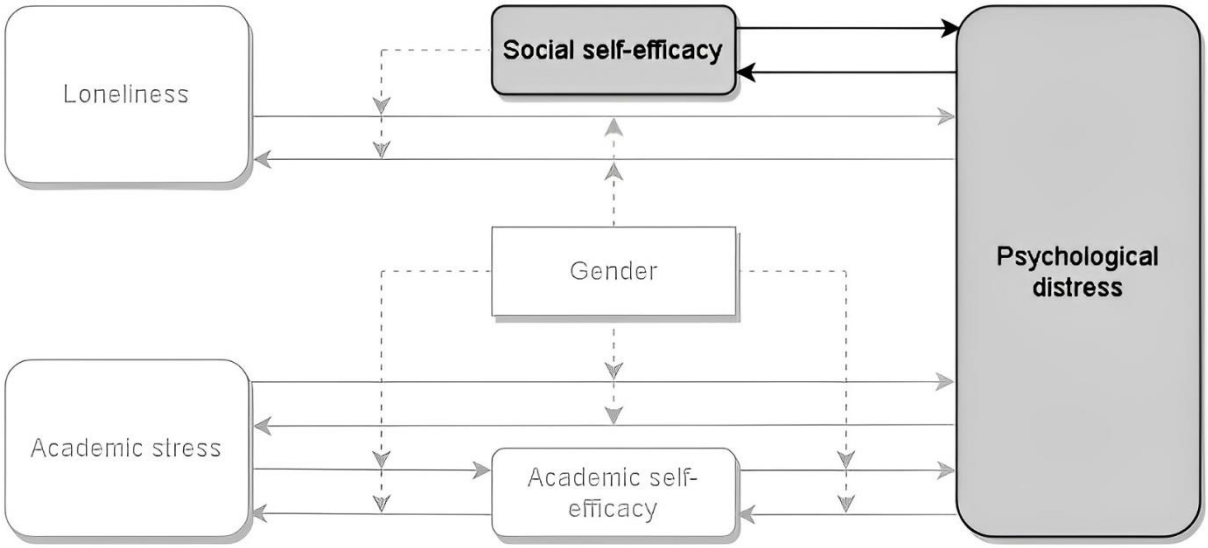
Paper I investigates how social self-efficacy and psychological distress are temporally related during middle to late adolescence (see Figure 6). Based on self-efficacy theory, helplessness-hopelessness theory, and empirical findings, the following hypotheses were formulated:

1. There is a negative association between social self-efficacy and psychological distress at the within- and between-person level;
2. There are positive carry-over stability effects in social self-efficacy (i.e., a deviation in social self-efficacy is likely followed by a similar deviation on the next occasion);
3. There are positive carry-over stability effects in psychological distress (i.e., a deviation in psychological distress is likely followed by a similar deviation on the next occasion);

4. There are negative cross-lagged effects from social self-efficacy to subsequent psychological distress (i.e., deviations in social self-efficacy are likely followed by opposite deviations in later psychological distress); and
5. There are negative cross-lagged effects from psychological distress to subsequent social self-efficacy (i.e., deviations in psychological distress are likely followed by opposite deviations in later social self-efficacy).

Figure 6

Conceptual Model of Social Self-efficacy and Psychological Distress



Note. The highlighted section is examined in paper I.

3.7.2. Paper II

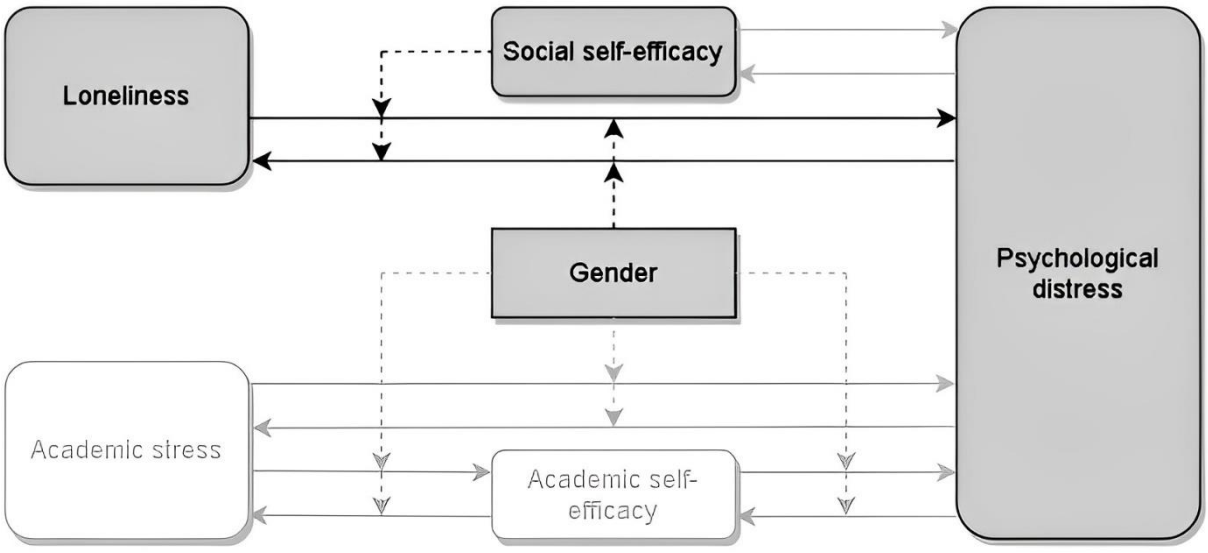
Paper II builds on the findings in paper I. Social self-efficacy and gender are examined as possible moderators in the longitudinal relationship between loneliness and psychological distress (see Figure 7). Based on self-efficacy theory, the evolutionary theory of loneliness, the interpersonal theory of depression, and the literature review, the following hypotheses were posited:

1. Loneliness and psychological distress are positively related on the within- and between-person levels;

2. There are positive cross-lagged effects from loneliness to subsequent psychological distress (i.e., deviations in loneliness are likely followed by similar deviations in later psychological distress);
3. There are positive cross-lagged effects from psychological distress to subsequent loneliness (i.e., deviations in psychological distress are likely followed by similar deviations in later loneliness);
4. Gender moderates the relationship between loneliness and psychological distress (i.e., the associations are stronger for girls than for boys); and
5. Social self-efficacy moderates the relationship between loneliness and psychological distress (i.e., the associations are stronger for individuals with low social self-efficacy than for people with high social self-efficacy).

Figure 7

Conceptual Model of Loneliness and Psychological Distress



Note. The highlighted section is investigated in paper II. The dotted lines represent moderating effects.

3.7.3. Paper III

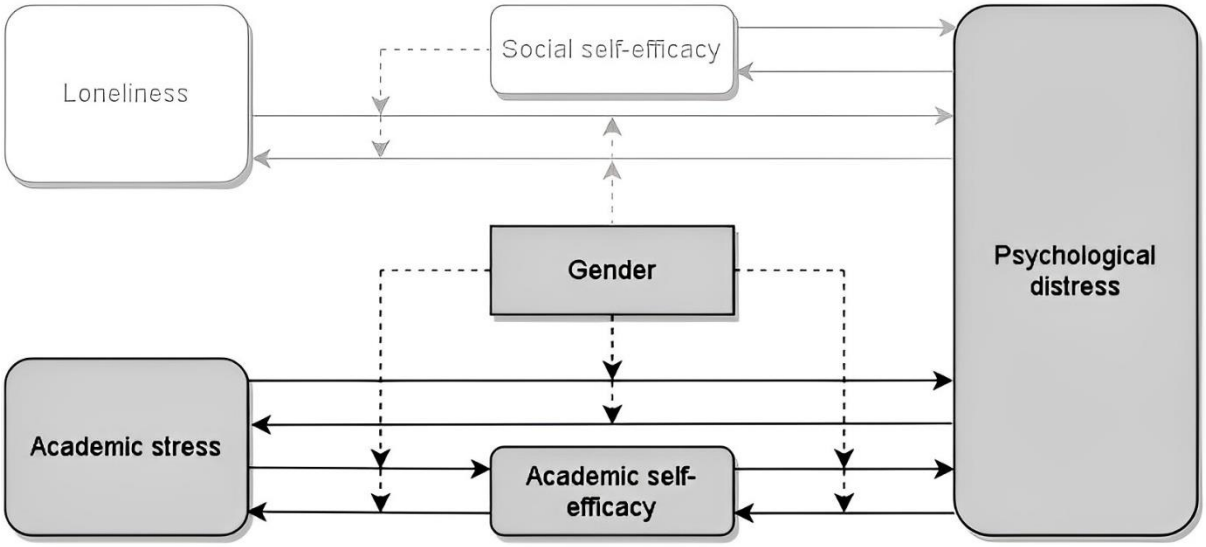
Paper III investigates the associations between academic stress, academic self-efficacy and psychological distress (see Figure 8). The study is based on theoretical

assumptions from self-efficacy theory, the transactional theory of stress and coping and empirical findings. The following hypotheses were formed:

1. Academic self-efficacy is negatively associated with academic stress and psychological distress, and academic stress and psychological distress are positively associated on a between-person level;
2. Academic stress has a positive effect on concurrent psychological distress at the within-person level (i.e., deviations in academic stress are related to similar deviations in concurrent psychological distress);
3. Academic self-efficacy partially mediates the effect of academic stress on concurrent psychological distress (i.e., deviations in academic self-efficacy partially explain the association between deviations in academic stress and psychological distress);
4. Gender moderates the associations between academic stress, academic self-efficacy and psychological distress (i.e., the associations are stronger for girls than for boys);
5. Psychological distress is negatively associated with later academic self-efficacy (i.e., deviations in psychological distress are likely followed by opposite deviations in later academic self-efficacy); and
6. Academic self-efficacy is associated with later academic stress (i.e., deviations in academic self-efficacy are likely followed by opposite deviations in academic stress).

Figure 8

Conceptual Model of Academic Stress, Academic Self-efficacy, and Psychological Distress



Note. The highlighted section is investigated in paper III. The dotted lines represent moderating effects.

4. Methods

This thesis aligns with the process-relational and relational-developmental-systems worldview (Overton, 2013, 2015), and the methodological decisions made in the project reflect the norms, guidelines and principles in this paradigm. Understanding is promoted by uncovering relationships between parts and transitions among patterns (Overton, 2015). Hence, the methodological focus is on the relationships between things. This chapter will present the methodological design, procedures and considerations that align with the underlying beliefs of developments and how they should be analysed in the process-relational and relational-developmental-systems paradigm (Overton, 2015).

4.1. Participants and Procedure

The sample used in all three accompanying articles was from the COMPLETE project (Larsen et al., 2018). COMPLETE was a randomised controlled trial with the overarching goal of improving the psychosocial environment in upper secondary schools, assumed to result in reduced absence and dropout rates. All upper secondary schools in four Norwegian counties were invited to participate in the study. Sixteen schools accepted and were randomly assigned intervention conditions: six schools implemented the Dream School programme, six schools implemented the Dream School programme with a mental health support team and four schools served as the control group (Larsen et al., 2018). In total, 3,058 students participated in the COMPLETE project. However, around half of the students were enrolled in vocational education, which has major attrition in the third year of upper secondary school. This attrition is due to the design of vocational education in Norway, which usually includes two years of upper secondary education followed by two years of training off campus in a specific trade. To avoid the large attrition rate during the third year of upper secondary school, only students who were enrolled in a general education programme were included in this study. The total sample consisted of 1,508 upper secondary school students.

In Norway, students are mostly 15–16 years old when they begin their upper secondary school education. At this point, the students have finished ten years (grades 1 through 10) of primary and lower secondary school education, which begins when they turn six. The first measurement occasion (T1) occurred at the beginning of the student's first semester (August) of upper secondary school in 2016. The following data collections took place in late March 2017 (T2), 2018 (T3) and 2019 (T4). Thus, a large cohort of students was followed throughout their upper secondary school education. Researchers and research assistants physically gathered data on the school grounds using tablets. Students who were absent during the data collection were invited to participate through e-mail. Table 1 provides an overview of the number of students participating throughout the study period.

Concerning the participants' ages at T1, they were 15 (n = 425, 28.2%), 16 (n = 955, 63.3%), 17 (n = 63, 4.2%), 18 (n = 23, 1.5%), 19 (n = 15, 1%), 20 (n = 8, 0.5%), 21 (n = 11, 0.7%), 22 (n = 4, 0.3%), 23 (n = 1, 0.1%) and 24 (n = 3, 0.2%) years old. Gender information was retrieved from registry data, and the sample comprised 60.7 per cent girls and 39.3 per cent boys. Most participants were born in Norway (70.6%), while 5.5 per cent were born outside of Norway. Regarding socioeconomic position, a median split indicated that 52.9 per cent perceived their family as being "well off" or "very well off" economically. In comparison, 22.5 per cent perceived their family as being "not well off" or "not at all well off" economically.

Table 1

Respondents Across Measurement Occasions

Time point	*N*	%	Cumulative %
T1	55	3.6	3.6
T2	34	2.3	5.9
T3	23	1.5	7.4
T4	138	9.2	16.6
T1 + T2	144	9.5	26.1
T1 + T3	11	0.7	26.9
T1 + T4	16	1.1	27.9
T2 + T3	35	2.3	30.2
T2 + T4	17	1.1	31.4
T3 + T4	43	2.9	34.2
T1 + T2 + T3	190	12.6	46.8
T1 + T2 + T4	155	10.3	57.1
T1 + T3 + T4	38	2.5	59.6
T2 + T3 + T4	67	4.4	64.1
T1 + T2 + T3 + T4	542	35.9	100
Total	1508	100	

4.2. Ethical Concerns

The COMPLETE project was funded by the Norwegian Ministry of Education (grant number: 20161789) and approved by the Norwegian Centre for Research Data (NSD) (reference number: 48551 LB/LR). Students under the age of 16 needed written consent from a parent/guardian to participate; individuals without consent were excluded from the data. Before participating in the study, the students were given written and oral information about the study and were ensured that participation was voluntary. The data were anonymised, and the key was stored separately from

the data at the county level. Data were stored and analysed in the University of Bergen's secure deposit for data storage (SAFE).

4.3. Sample Considerations and Robustness

Several analytical considerations regarding the sample were performed. First, because the sample consisted of two intervention groups and one control group, the possible impact of the interventions on the study's variables and assumed associations were consistently investigated. First, group differences in terms of mean levels were examined. Second, the study's variables' intraclass correlation coefficients (ICC) were investigated based on intervention groups. Third, when analysing the theorised structural equation models (SEM), possible intervention effects were investigated using intervention conditions as cluster variables in TYPE = COMPLEX analyses on the theorised models in Mplus. The chi-square, coefficients and standard errors in the cluster model were compared to the comparison model. Fourth, even though the abovementioned analyses indicated that intervention groups had virtually no effect on the studies' variables and associations, two dummy variables based on intervention conditions were included in all SEM models to avoid the possibility of estimation bias.

Because the implementations were performed on a school level, the above-explained procedure was also performed based on the school-level cluster variable. Like intervention conditions, no evidence of systematic effects of school belonging in the variables or the association between them were found. However, school level was not included as a control variable in the models, mainly because that would entail creating and modelling many dummy variables in the theorised models, which could increase the computational burden. Because the interventions were on a school level, the intervention conditions were deemed adequate as control variables regarding possible estimation effects at the school level.

4.4. Missingness

Incorrect procedures for missing data considerations can bring about several adverse outcomes, such as parameter estimation bias (Jones, 1996), standard error and test statistics bias (Glasser, 1964), as well as inadequate data usage (Afifi & Elashoff, 1966). Missingness on the level of items is related to missing completely at random (MCAR) processes. MCAR data indicate that missingness causes are entirely unrelated to the data (Little, 1988). Missing at random (MAR) occurs when missing in one variable (Y) might depend on the value of another variable (X), but not on the value of Y if X is held constant (Rubin, 1976). Lastly, missing not at random (MNAR) refers to instances where data are likely missing due to missing data themselves—that is, missing in Y is related to Y itself when X is controlled (Little & Rubin, 1987; Rubin, 1976).

The abovementioned missing data mechanisms are reflected through individuals' response rates and are considered on three levels: item-, construct-, and person-level (Newman, 2014), referring to MCAR, MAR, and MNAR, respectively. Item-level missingness refers to when participants do not respond to a small number of items on a scale. Construct-level missingness occurs when a person avoids answering to entire scales. Finally, person-level missingness refers to the process wherein an individual fails to respond to any part of the survey. In the three adjoining empirical articles, the missing mechanism has been demonstrated by examining the constructs' response rates and partial correlations. Newman (2014) showed that the following equation can define the response rate:

$$\text{Response rate} = (n \text{ partial respondents} + n \text{ full respondents})/n \text{ contacted}$$

We can then consider full response as being on an item-missing level, partial response as construct-level missingness, and non-response as person-level missingness.

Newman (2014) suggested using full information maximum likelihood (FIML) estimation or multiple imputation (MI) if more than 10% of the sample has construct-

level missingness; in other words, if they are partial respondents. All three accompanying articles had missingness mechanisms that were MCAR or were approximate to MAR functions with lower than 10% partial response rates. Even though the partial response rates were lower than 10% in all three studies, FIML was used to handle construct-level missingness during all SEM analyses in Mplus (Muthén & Muthén, 1998–2017). FIML was used because it is more robust than other relevant missing data estimation techniques (e.g., pairwise deletion: Enders, 2010).

Even though the person-level missingness was lower than 30% (which would indicate high person-level missingness) in all studies, several sensitivity analyses regarding the response rates across measurement occasions were performed. Variables based on personal non-response across time points were created. The respondents were divided into groups based on their non-response: partial or full response across all measurement occasions (i.e., respondents who participated at all time points), partial or full response intermittently (i.e., one or more non-responses followed by one or more occasions of partial or full response; at minimum, the last time point—in other words, non-dropouts) and all respondents. This missingness variable was used as a cluster variable in several TYPE = COMPLEX analyses in Mplus, and the results of the theorised models were compared across groups. The estimates and standard errors were approximately the same across missingness groups, indicating that the level of missingness did not have a major impact on the hypothesised models.

4.5. Instruments

4.5.1. Social Self-efficacy

Participants' social self-efficacy was measured using the seven-item social sub-scale from the Self-efficacy Questionnaire for Children (SEQ-C) by Muris (2001). The participants responded on a 5-point scale ranging from 1 (not at all) to 5 (very well). The indicators were altered to better suit the adolescent age group. For instance, the word "children" was changed to "peers". The scale assesses how individuals perceive

their capabilities for social activities, peer relationships and self-assertiveness. An example indicator is, “how well can you become friends with peers?” Previous research has found Cronbach’s alpha > .81 (Minter & Pritzker, 2015; Muris, 2001, 2002).

4.5.2. Academic Self-efficacy

Academic self-efficacy was assessed with the five-item academic efficacy scale from Patterns of Adaptive Learning Scales (PALS: Midgley et al., 2000). Because the Norwegian translation of “classwork” can be regarded as schoolwork in general, the items were altered to measure efficacy for schoolwork in general (i.e., work during school hours and work assigned to be done at home) instead of class-specific work. An example item is, “Even if the work is hard, I can learn it”. The respondents answered the questions on a five-point Likert scale ranging from 1 (not at all confident) to 5 (very confident). Earlier studies imply adequate reliability of the scale ($\alpha > .78$) (Midgley et al., 2000).

4.5.3. Psychological Distress

Symptoms of anxiety and depression were measured using a Norwegian short version of the Symptoms Check List-90-R (SCL-90) by Tambs and Moum (1993). The five-item scale (SCL-5) consists of indicators from the anxiety and depression sub-scales from the SCL-90. The instrument is not considered a diagnostic tool or a clinical assessment but rather an indication of the degree to which individuals experience general symptoms of anxiety and depression. Example indicators measuring symptoms of anxiety and depression are, respectively, “nervousness or shakiness inside” and “feeling hopeless about the future”. The participants responded on a four-point scale ranging from 1 (not at all) to 4 (very much). Earlier research has found acceptable Cronbach’s values of the scale ($\alpha > .83$) (Gjerde et al., 2011; Skrove et al., 2013; Strand et al., 2003; Tambs & Moum, 1993).

4.5.4. Academic Stress

The extent to which students experienced stress related to school was assessed using one indicator from the Health Behaviour in School-Aged Children (HBSC) study (WHO, 2012). Students were asked how stressed they felt due to the schoolwork they must do (both work during school hours and homework). The response scale ranged from 1 (not at all) to 4 (a lot).

4.5.5. Loneliness

A short, slightly modified version of the UCLA Loneliness Scale (Kraft & Loeb, 1997; Mittelmark et al., 2004) was used to measure students' loneliness. The Norwegian six-item scale was developed for population-based studies in Western Norway. An example item is, "I feel lonely even when I am around other people". The participants responded on a five-point scale ranging from 1 (not at all true) to 5 (very true). The instrument has previously shown adequate Cronbach's alpha values ($\alpha > .77$) (Mittelmark et al., 2004).

4.5.6. Gender

The students' gender was retrieved from registry data and coded as 0 (boys) and 1 (girls). Of note, participants were allowed to report their own gender in the questionnaire (i.e., male, female or other). However, because the number of non-cisgendered and other-gendered individuals was very small, the possible impact of inferences regarding creating and using such variables was deemed limited.

4.5.7. Control Variables

As mentioned above, every hypothesised model used intervention conditions as control variables. Two dummy variables were created based on the number of interventions. Either the students belonged to one intervention group (coded as 1) or not (coded as 0). A dummy variable of socioeconomic position was created based on a median split of a variable measuring perceived family wealth (Iversen & Holsen, 2008). Participants either considered their family as being in a low (coded as 0) or high (coded as 1) socioeconomic position. Lastly, we controlled for country of origin

by using a dummy variable categorised as Norwegian-born (coded as 0) and born outside of Norway (coded as 1).

4.6. Analytical Plan

Preliminary analyses in all studies consisted of descriptive statistics, bi-variate correlations, omega reliability and measurement invariance. These analyses were performed in SPSS version 25 or 28 (IBM, 2017, 2021) and Mplus version 8 (Muthén & Muthén, 1998–2017). Due to space constraints, results from the preliminary analyses are not presented in this thesis. Please see the attached manuscripts for more details on these results.

When investigating the hypothesised models using SEM, the comparative fit index (CFI), the root mean square error of approximation (RMSEA) and the standardised root mean square residual (SRMR) were considered. Specifically, models with CFI > .90, RMSEA < .08, 95% RMSEA confidence interval width of ≤ .03, and SRMR < .08 had an acceptable fit (Hooper et al., 2007; Hu & Bentler, 1999; Kelley & Lai, 2011). Chi-square was considered and reported but was not decisive in model consideration due to sample size sensitivity (Hooper et al., 2007). Regarding correlation coefficients, the effect sizes were considered as small > .10, moderate > .30 or large > .50 (Cohen, 1988). The cross-lagged effects in the hypothesised models were considered as small > .03, moderate > .07 or large > .12 (Orth et al., 2022).

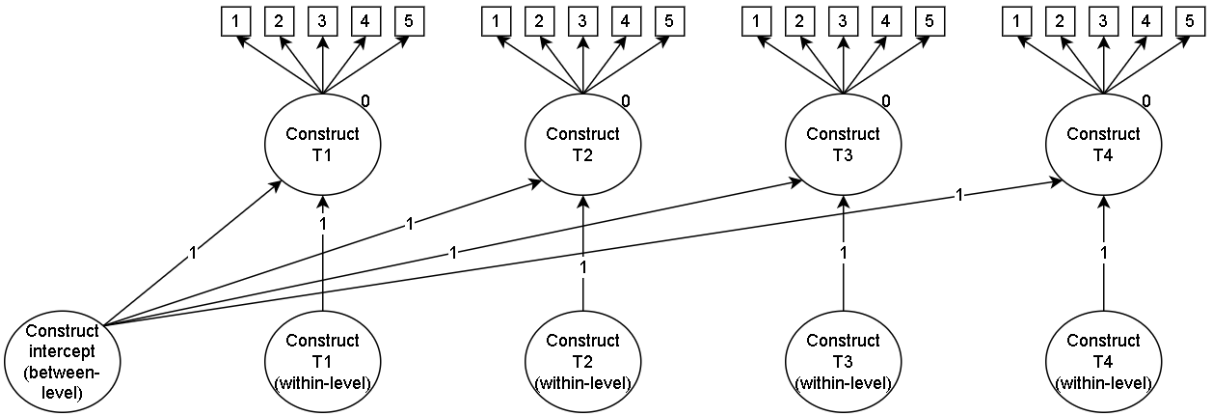
4.6.1. Common Analysis: Random Intercept Cross-lagged Panel Model

In all three studies, the between-person variance was separated from the within-person variance (Curran & Bauer, 2011). This was done using the random intercept cross-lagged panel model (RI-CLPM: Hamaker et al., 2015). Measurement invariance constraints from the preliminary analyses were contained during the RI-CLPM specification. In other words, all RI-CLPM models in this thesis are multiple indicator RI-CLPMs (Hamaker, 2018a; Mulder & Hamaker, 2021) with second-order latent factors. A random intercept was created by regressing a latent variable on the construct's latent variables from each time point, with the regression coefficients

constrained to unity. Thus, an intercept refers to each person's normative level of a construct throughout the study period and is at the between-person level. One latent variable per time point was specified, regressed on the corresponding latent variable with a regression coefficient constrained to unity to create within-person variables. Hence, the within-person variables refer to individuals' deviating levels (i.e., fluctuations or state-like levels) from their own intercept (i.e., personal norm or trait-like level) at each measurement occasion. Lastly, the variance of the first-order latent variables was constrained to zero to ensure that all variance was captured by the intercept and within-person variables (Hamaker, 2018a, 2018b; Hamaker et al., 2015). See Figure 9 for a visualisation of the specification of one construct in a RI-CLPM.

Figure 9

Multiple Indicator RI-CLPM Specification



4.6.2. Paper I

In paper I, the multiple indicator RI-CLPM specifications explained above were replicated for social self-efficacy and psychological distress. Autoregressive regression coefficients between all the time points in both constructs were added to estimate carry-over stability effects (i.e., how fluctuations in the same construct are related over time). The within-person variable at T4 was regressed on the within-person variable at T3, and so on in both constructs. To specify cross-lagged effects (i.e., how a fluctuation in one construct is related to a subsequent fluctuation in the other

construct), the within-person variable at T4 in social self-efficacy was regressed on the within-person variable at T3 in psychological distress and so forth. The process was replicated in the opposite direction. Lastly, to estimate the trait-like and state-like associations between social self-efficacy and psychological distress, correlation coefficients were added 1) between the intercepts and 2) between the two constructs' within-person variables at each time point.

4.6.3. Paper II

In paper II, the same above-explained procedure was followed to create an RI-CLPM of loneliness and psychological distress. In addition, social self-efficacy and gender were specified as moderating variables in two separate analyses. A mean level variable based on all the items of the social self-efficacy scale across time points was created. A median split was performed on this variable to create two groups: low and high social self-efficacy across the study's duration. Gender and social self-efficacy were then used as grouping variables in multi-group analyses, and autoregressive, cross-lagged and correlation parameters were compared across groups: boys vs girls and low vs high social self-efficacy. Comparisons were made using the constraint function in Mplus. Gender was added as a control variable in the social self-efficacy moderation model, and social self-efficacy was controlled in the gender moderation model. A thousand bootstrap draws were performed in both moderation models.

4.6.4. Paper III

Paper III examined the relationships between academic stress, academic self-efficacy and psychological distress. Because the hypothesised associations were based on the theoretical assumptions of the transactional theory of stress and coping (Lazarus, 1966; Lazarus & Folkman, 1984), the time lags between the within-person variables should arguably be smaller than one year, which is approximately the interval between each time point in the study. When a person experiences a stressful reaction, they do not wait one year to appraise the resources that are available to handle the stressful situation; the second appraisal happens roughly simultaneously with the first appraisal (Lazarus & Folkman, 1984). In creating the mediation model of

academic stress, academic self-efficacy and psychological distress, the specification of between- and within-person variables was the same as papers I and II, but the regression coefficients were modelled as concurrent effects instead of having lags of one year. In addition, gender was specified as a potential moderator in the model. Parameters in the model were compared across gender in a multiple-group analysis, using the model constraint function in Mplus.

5. Results

5.1. Paper I

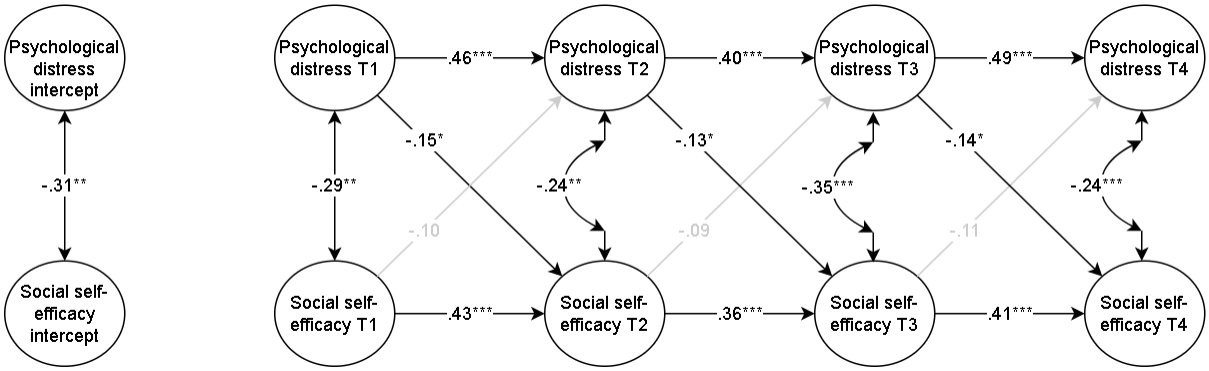
Figure 10 shows the results of the RI-CLPM of social self-efficacy and psychological distress. In support of hypothesis 1, social self-efficacy and psychological distress were moderately and negatively associated at the trait-like level (r = -.31, p < .01). This association implies that young people who generally experienced a high level of psychological distress during adolescence were increasingly likely to experience a low level of social self-efficacy simultaneously. Moreover, the state-like associations between social self-efficacy and psychological distress were negative at T1 (r = -.29, p < .01), T2 (r = -.24, p < .01), T3 (r = -.35, p < .001) and T4 (r = -.24, p < .001). This indicates that deviations in one construct increased the likelihood of experiencing an opposite deviation in the other construct concurrently throughout middle to late adolescence.

There were significant and positive carry-over stability effects from T1 to T2 (β = .43, p < .001), T2 to T3 (β = .36, p < .001) and T3 to T4 (β = .41, p < .001) in social self-efficacy, aligning with hypothesis 2. Similarly, there were significant and positive carry-over stability effects in psychological distress from T1 to T2 (β = .46, p < .001), T2 to T3 (β = .40, p < .001) and T3 to T4 (β = .49, p < .001), supporting hypothesis 3. Thus, a deviation in one construct at one time point was likely followed by the same deviation in the corresponding construct throughout the study period.

Contrary to hypothesis 4, social self-efficacy did not impact later psychological distress. In support of hypothesis 5, there were large and negative cross-lagged effects from psychological distress to later social self-efficacy from T1 to T2 (β = -.15, p < .05), T2 to T3 (β = -.13, p < .05) and T3 to T4 (β = -.14, p < .05). In other words, a fluctuation in psychological distress on one occasion was likely followed by an oppositional fluctuation in social self-efficacy at the following time point throughout the study, but not vice versa.

Figure 10

Results from the RI-CLPM of Social Self-efficacy and Psychological Distress



Note. Standardised estimates are presented in the figure. The grey lines are non-significant. *** $p < .001$, ** $p < .01$, * $p < .05$.

5.2. Paper II

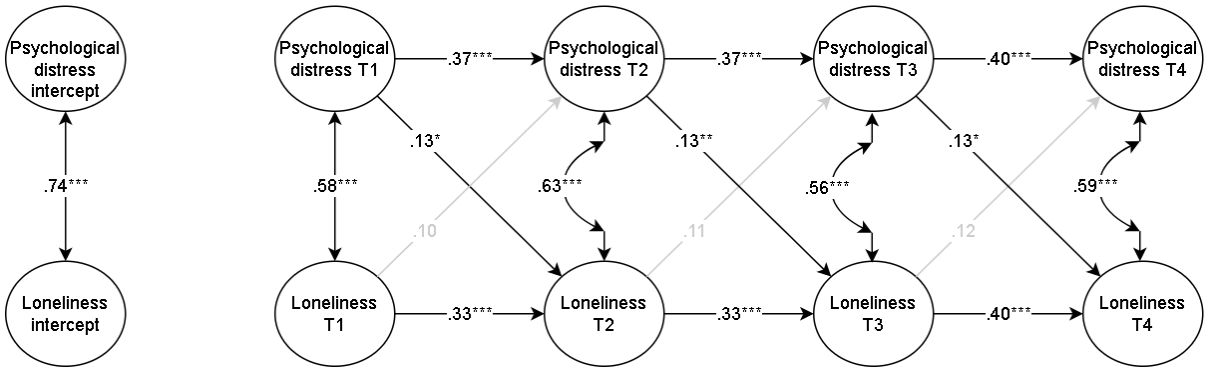
Figure 11 shows the results from the RI-CLPM of psychological distress and loneliness. In support of hypothesis 1, psychological distress and loneliness were strongly and positively related at a trait-like level ($r = .74$, $p < .001$). This association indicates that adolescents with a high level of psychological distress likely experienced a high level of loneliness during middle to late adolescence. This relationship was also apparent at the within-person level. A fluctuation in psychological distress was associated with a similar flux in loneliness at T1 ($r = .58$, $p < .001$), T2 ($r = .63$, $p < .001$), T3 ($r = .56$, $p < .001$) and T4 ($r = .59$, $p < .001$).

There were significant and positive carry-over stability effects in loneliness from T1 to T2 ($\beta = .33$, $p < .001$), T2 to T3 ($\beta = .33$, $p < .001$) and T3 to T4 ($\beta = .40$, $p < .001$). Similarly, there were significant and positive carry-over stability effects in psychological distress from T1 to T2 ($\beta = .37$, $p < .001$), T2 to T3 ($\beta = .37$, $p < .001$) and T3 to T4 ($\beta = .40$, $p < .001$). In other words, a deviation in one construct were likely followed by the same deviation in the corresponding construct throughout the study.

There were no significant within-person effects from loneliness to later psychological distress throughout the study, contradicting hypothesis 2. In support of hypothesis 3, there were large and positive cross-lagged effects from psychological distress to loneliness from T1 to T2 (β = .13, p < .05), T2 to T3 (β = .13, p < .01) and T3 to T4 (β = .13, p < .05). Thus, a fluctuation in psychological distress predicted a similar fluctuation in loneliness approximately one year later throughout the study, but not the other way around.

Figure 11

Results from the RI-CLPM of Loneliness and Psychological Distress



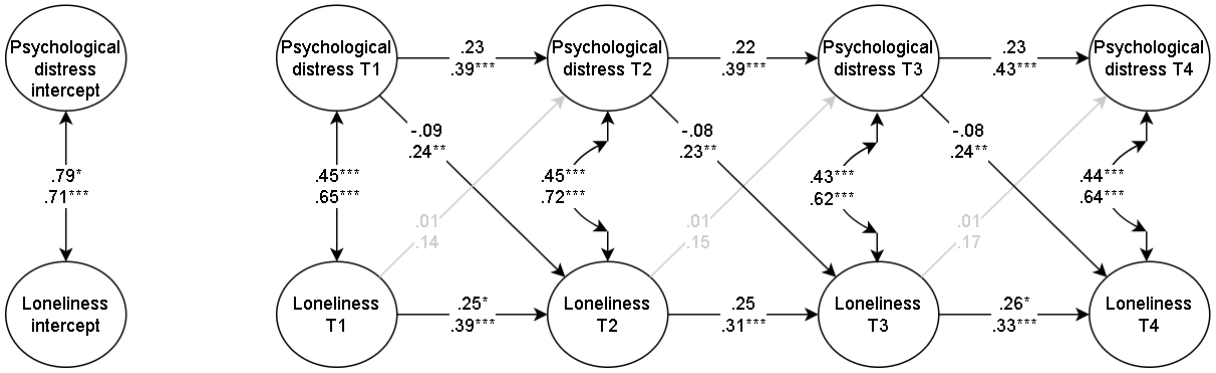
Note. Standardised estimates are presented in the figure. The grey lines are non-significant. *** $p < .001$, ** $p < .01$, * $p < .05$.

The moderating effects of gender and social self-efficacy are presented in Figure 12 and Figure 13, respectively. Partially supporting hypothesis 4, two parameters differed across gender. First, girls experienced consistently stronger state-like associations between loneliness and psychological distress than boys (unstandardised $r_{difference}$ = .071, $p < .05$). In other words, girls were more likely to experience the same deviations in loneliness and psychological distress at each time point compared to boys. Second, the within-person effects of psychological distress on subsequent loneliness across time were higher for girls than for boys (unstandardised $B_{difference}$ = .298, $p < .001$). Hence, girls had a higher likelihood of experiencing similar deviations in loneliness following deviations in psychological

distress compared to boys. In contradiction to hypothesis 5, there were no significant differences in the association between psychological distress and loneliness across the low and high social self-efficacy groups.

Figure 12

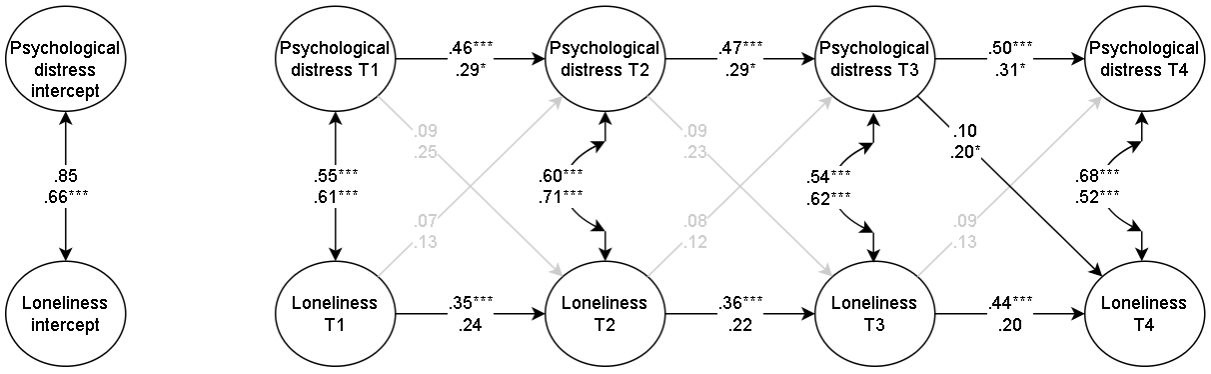
Gender Moderation of the RI-CLPM of Loneliness and Psychological Distress



Note. Boys are on the upper line, and girls are on the lower line. Standardised estimates are presented. The grey lines are non-significant. *** $p < .001$, ** $p < .01$, * $p < .05$.

Figure 13

Social Self-efficacy Moderation of the RI-CLPM of Loneliness and Psychological Distress



Note. High social self-efficacy is on the upper line, and low social self-efficacy is on the lower line. Standardised estimates are presented in the figure. The grey lines are non-significant. *** $p < .001$, * $p < .05$.

5.3. Paper III

Figure 14 shows the results of the RI-CLPM of academic stress, academic self-efficacy and psychological distress. There was a small and negative association between academic self-efficacy and academic stress at the trait-like level (r = -.28, p < .001), supporting hypothesis 1. Additionally, the academic self-efficacy intercept was moderately and negatively related to the psychological distress intercept (r = -.38, p < .001). Lastly, the between-person association between academic stress and psychological distress was moderate in effect size and positive (r = .49, p < .001). In other words, students with high academic self-efficacy likely experienced low academic stress and psychological distress during upper secondary school. Further, students who experienced high academic stress were increasingly likely to experience high psychological distress simultaneously.

There were positive carry-over stability effects in academic stress from T1 to T2 (β = .14, p < .01), T2 to T3 (β = .29, p < .001) and T3 to T4 (β = .22, p < .001). Similarly, positive carry-over effects were observed in academic self-efficacy from T1 to T2 (β = .36, p < .001), T2 to T3 (β = .44, p < .001) and T3 to T4 (β = .22, p < .001). Lastly, there were positive carry-over stability effects in psychological distress from T1 to T2 (β = .33, p < .001), T2 to T3 (β = .30, p < .001) and T3 to T4 (β = .42, p < .001). In other words, throughout the study, a deviation in one construct at one time point was likely followed by the same deviation in the corresponding construct.

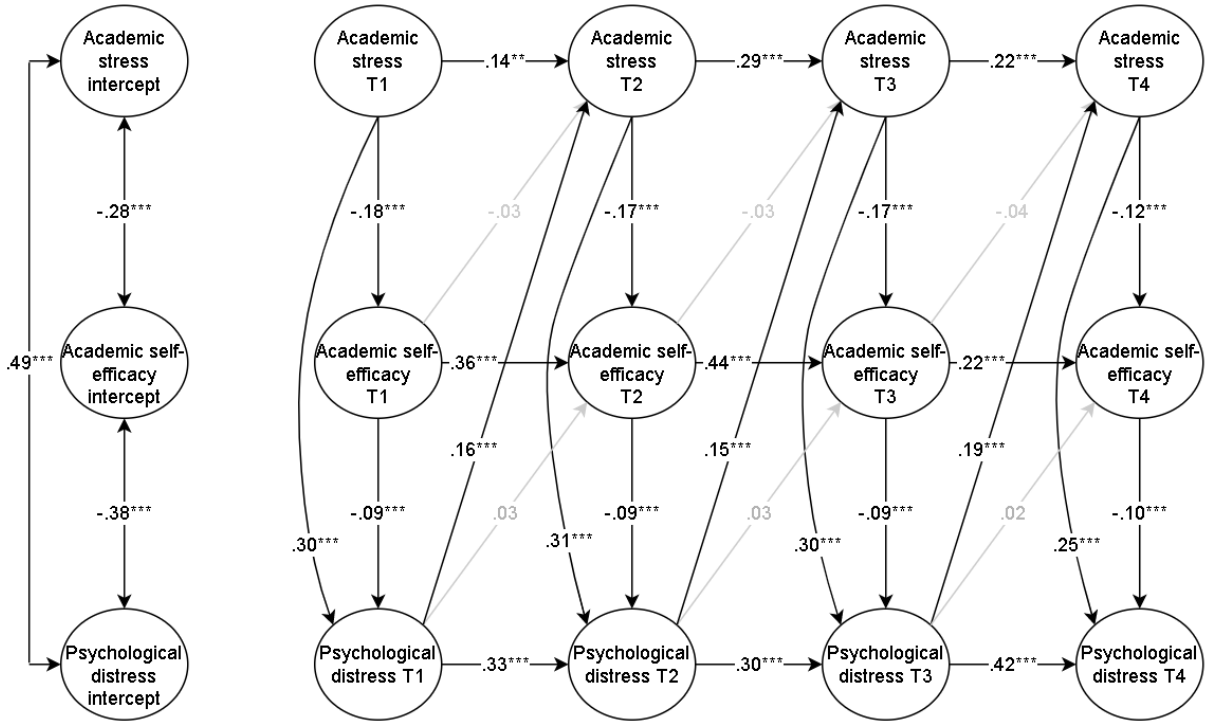
In support of hypothesis 2, there were large and positive concurrent effects from academic stress to psychological distress at T1 (β = .30, p < .001), T2 (β = .31, p < .001), T3 (β = .30, p < .001) and T4 (β = .25, p < .001). Thus, a deviation in academic stress at one time point predicted a similar deviation in concurrent psychological distress throughout upper secondary school. Supporting hypothesis 3, academic self-efficacy partially mediated the relationship between academic stress and psychological distress at T1 (β = .02, p < .01), T2 (β = 02, p < .01), T3 (β = .02, p < .01) and T4 (β = .01, p < .01). This indicates that a deviation in academic self-efficacy

partially explained the relationship between fluctuations in concurrent academic stress and psychological distress throughout upper secondary school.

Psychological distress was not associated with later academic self-efficacy, contradicting hypothesis 5. Similarly, academic self-efficacy did not impact later academic stress, contrary to hypothesis 6. On the other hand, there were large and positive cross-lagged effects from psychological distress to academic stress from T1 to T2 (β = .16, p < .001), T2 to T3 (β = .15, p < .001) and T3 to T4 (β = .19, p < .001). Thus, a deviating level of psychological distress predicted a similar deviation in academic stress at the following time point throughout upper secondary school.

Figure 14

Results from the RI-CLPM of Academic Stress, Academic Self-efficacy and Psychological Distress

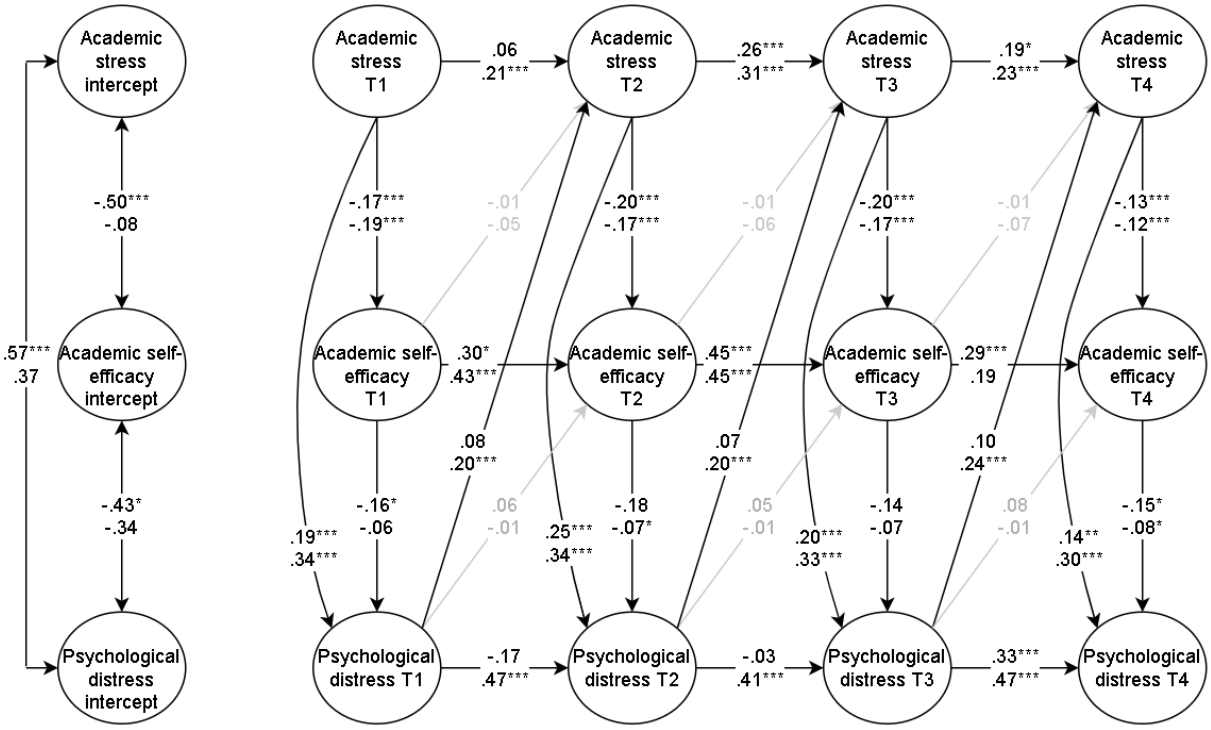


Note. Standardised estimates are presented in the figure. The grey lines are non-significant. *** p < .001, **p < .01.

Partially supporting hypothesis 4, four parameters were significantly different across genders (see Figure 15). First, the trait-like association between academic stress and academic self-efficacy was stronger for boys than girls (unstandardised $r_{difference}$ = .086, p = .025). Second, boys also experienced a stronger association between psychological distress and academic stress at the trait-like level than did girls (unstandardised $r_{difference}$ = –.082, p = .044). Third, the time-invariant, within-person effect of academic stress on concurrent psychological distress was higher for girls than for boys throughout the study (unstandardised $B_{difference}$ = .164, p < .001). Lastly, the carry-over stability effect from psychological distress at T1 to psychological distress at T2 was significantly larger for girls than for boys (unstandardised $B_{difference}$ = .624, p = .010). Of note, unstandardised parameters were compared in the multi-group analysis, but standardised estimates are presented in the figure. When examining mediation effects across gender, the significance level of the mediations disappeared, and there were no apparent gender differences in these effects.

Figure 15

Gender Moderation of the RI-CLPM of Academic Stress, Academic Self-efficacy and Psychological Distress



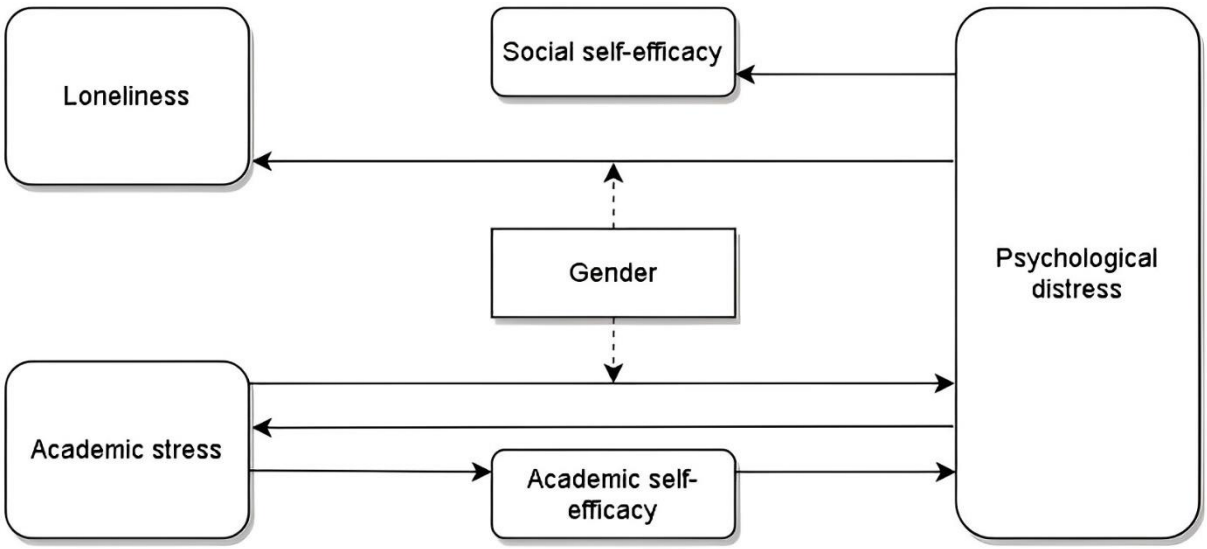
Note. Boys are on the upper line, and girls are on the lower line. Standardised estimates are presented in the figure. The grey lines are non-significant. *** $p < .001$, ** $p < .01$, * $p < .05$.

6. Discussion

The overarching goal of this thesis was to investigate the intraindividual relationships between social and academic self-efficacy and loneliness, academic stress and psychological distress during middle to late adolescence. The main findings follow. First, psychological distress impacted subsequent social self-efficacy, loneliness, academic stress and psychological distress. Second, academic stress affected concurrent psychological distress directly and indirectly through academic self-efficacy. Third, the 1) within-person association between loneliness and psychological distress and 2) within-person relationship between academic stress and psychological distress were stronger for girls than for boys. See Figure 16 for the hypothesised model of the thesis with only significant pathways presented.

Figure 16

Results of the Longitudinal Intraindividual Model of Social and Academic Self-efficacy and Loneliness, Academic Stress and Psychological Distress



Note. Only significant pathways are presented in the model. The dotted lines represent moderating effects.

6.1. The Impact of Psychological Distress

The results in paper I indicate that fluctuations in symptoms of anxiety and depression substantially influenced fluctuations in later social self-efficacy during

middle to late adolescence. Others have found similar directions of effects between depression and social self-efficacy (e.g., Tak et al., 2017) and between depression and social self-competence (Ohannessian & Vannucci, 2020; Ohannessian et al., 2019). This might indicate a more consistent impact of mental health problems on later social self-beliefs and competence than the reverse during adolescence, which enhances the importance of promoting mental well-being and preventing and reducing psychological distress. For instance, several systematic reviews and meta-analyses indicate that school-based interventions are effective in reducing psychological distress (e.g., Arora et al., 2019; Corrieri et al., 2014; Dray et al., 2017; Erbe & Lohrmann, 2015; O'Connor et al., 2018; Werner-Seidler et al., 2017).

The negative impact of psychological distress on later social self-efficacy aligns with assumptions in self-efficacy theory. Bandura (1997) posited that affective and physiological states (e.g., despondency, worry and apprehension) during social situations aversively inform self-efficacy for the same setting in the future, resulting in decreased social efficacy. Because psychologically distressed people tend to have a negative self-system consisting of aversive cognitions and attributions (Bandura, 1997; Rudolph et al., 2008), they are increasingly likely to interpret social failures as a result of personal characteristics and incapabilities. Earlier research on the relationship between social self-efficacy and psychological distress might have been somewhat one-dimensional (e.g., Bandura et al., 1999; McFarlane et al., 1995), assuming that social self-efficacy is a precursor and determinant of mental health and only partially (or not at all) the other way around. Although affective and physiological states have previously been reduced to limited influencing factors of future efficacy (Bandura, 1997), they might be exceedingly important in forming social self-efficacy during adolescence.

Paper II found that fluctuations in psychological distress consistently predicted similar fluxes in later loneliness during three adolescent years. This finding aligns with some longitudinal research in the field (Danneel et al., 2019; Lasgaard et al., 2011), self-efficacy theory, and the interpersonal theory of depression. Despondent and

anxious individuals often behave in off-putting, gloomy or hostile ways (Bandura, 1997; Coyne, 1976, 1985), resulting in social rejection, withdrawal and avoidance. When people around the psychologically distressed person offer social support, they are likely to refuse the relational help offered (Coyne, 1976). Eventually, the socially supportive people around the psychologically distressed person will stop offering support, furthering the psychologically distressed person's feelings of being socially isolated. Additionally, psychologically distressed people are likely to ruminate, be pessimistic, have a negative self-system and attribute negative events to personal shortcomings (Bandura, 1997), which can exacerbate the existential aspect of feeling lonely. For example, a minor social failure or even a challenging social situation that is not considered a failure by others, might get blown out of proportion by a young person who is experiencing high despondency, worry and apprehension, causing the psychologically distressed adolescent to experience an unexpected rise in perceived social isolation.

According to self-efficacy theory and the interpersonal theory of depression, psychologically distressed people are increasingly likely to create environments they perceive as stressful (Bandura, 1997; Coyne, 1976). Findings from paper III suggest that this effect might be transferrable to a school setting, wherein students who are unusually psychologically distressed, compared to their own norm, act in ways that create more stress regarding their schoolwork and homework. One possibility is that the highly psychologically distressed student avoids schoolwork and homework, is hostile toward teachers or class peers or stops attending school altogether. Such aversive actions can result in a rise in academic stress due to a perception of *threat*. The adverse impact of psychological distress on academic stress might, as time progresses in upper secondary school, create a downward spiral of negative affect, anxiousness and feelings of insurmountability concerning schoolwork and homework. Anxiety symptoms in particular are connected to increases in threat perceptions, threatening interpretations, aversive feelings and cognitions, and early detection of threats (Muris et al., 2000).

All three papers found that fluctuations in psychological distress were associated across time, implying that adolescents experienced an exacerbating and aversive loop of psychological distress over time during middle to late adolescence. Youth who at one time point experienced deviating psychological distress likely experienced the same fluctuation in psychological distress on proximal occasions. People with despondency and anxiety are increasingly likely to ruminate about their helplessness and miserable life situation, which sustains and exacerbates their psychological distress (Bandura, 1997). Although they understand that the dejecting thought cycle is counterproductive and meaningless, they are unable to exercise the necessary thought control to stop it. The intraindividual associations between deviations in psychological distress at different time points align with these assumptions.

Bandura (1997) argued that the self-reinforcing effects of psychological distress take place because the negative affect and physiological states influence 1) people's behaviours and environmental conditions and 2) the aversive cognitions and attributions of their own behaviour and environmental feedback. Psychologically distressed people are prone to act in off-putting ways and negatively impact their social milieu. Moreover, their behaviour and the environmental response to the off-putting actions are increasingly likely to be interpreted, evaluated and stored as negative memories and experiences within the individual due to negative cognitions and attributions (Bandura, 1997). The aversive recollections are ruminated on and brought to mind in future similar settings, further exacerbating the despondency and anxiety arousal process within individuals as time progresses. In a similar vein, Alloy et al. (1990) highlighted that feelings of certain helplessness can further escalate psychological distress, leading to a malevolent cycle of poor mental health.

6.2. School-related Functioning and Psychological Distress

Lazarus and Folkman (1984) and Bandura (1997) suggested that a stressful reaction to, or negative affect for, a situation (e.g., doing schoolwork and homework) aversively impacts efficacy for the same setting (e.g., academic self-efficacy).

Additionally, because educational attainments are becoming increasingly important for upper secondary school students, low academic efficacy likely increases despondency and anxiety arousal because the outcome is important to the youth. Bandura (1997) argued that people with little or no control over the achievement of important accomplishments, such as good academic performances, are likely to experience anxiety. Moreover, sadness and depression can arise when attaining a highly valued outcome, such as the consequences of good grades, is mitigated by their own perceived inefficacy (Bandura, 1997). Aligning with these assumptions, paper III found that adolescents who experienced a fluctuation in academic stress at one time point were increasingly likely to experience the same deviation in concurrent psychological distress, partly due to an opposite and simultaneous fluctuation in academic self-efficacy.

As shown in paper III, academic stress impacted simultaneous psychological distress, and psychological distress recursively affected later academic stress. Thus, the two processes might be part of a negative loop within adolescents during upper secondary school. The physical and affective states (e.g., heart racing, apprehension, and a sense of “doom and gloom”) of people who experience a stressful reaction to their schoolwork and homework might instigate a spiral of exacerbating psychological distress and later stress that is specific to their school functioning. The aversive cognitions, attributions, pessimistic outlook and negative self-system that are characteristic of psychological distress increase the likelihood of interpreting the mood and physical activations that accompany an activity as harmful to the person (Bandura, 1997). Such interpretations are further integrated into the self, recollected, and evaluated as a threatening factor which can spur the adverse cycle of academic stress and psychological distress until the threatening stressor is managed or removed. In other words, schoolwork and homework can transform into challenging or benign-positive tasks, as opposed to threatening ones, through coping and self-regulation, dropping out of school or graduating.

6.3. Girls and the Salience of Academic Stress and Interpersonal Problems

As shown in paper II, a fluctuation in loneliness was more related to a similar fluctuation in psychological distress for girls concurrently than for boys. Further, the effects of psychological distress fluctuations on later loneliness fluxes were consistently stronger for girls compared to boys. The transition from lower to upper secondary school increases the risk of loneliness due to socioemotional disruptions, such as losing close friendships (Benner et al., 2017). Because girls rely more heavily on social relationships and support than do boys (Derdikman-Eiron et al., 2011; Rose & Rudolph, 2006), the association between loneliness and psychological distress might be stronger in girls during upper secondary school. Moreover, girls use social connections to define themselves to a higher degree and place more value on social evaluations than boys (Rose & Rudolph, 2006). Thus, a high level of psychological distress on one occasion could make it more difficult to seek help from others (Gadalla, 2008; Gagné et al., 2014), which might result in a rise in loneliness one year later. Girls might find it more difficult to attain and maintain intimate and supportive relationships when they experience the despondency, worry and apprehension that accompany psychological distress.

Aligning with the educational stressor hypothesis (West & Sweeting, 2003) and a recent study by Giota and Gustafsson (2017), paper III showed that the intraindividual association between academic stress and psychological distress was stronger for girls than boys. Högberg et al. (2020) established that girls had experienced a larger increase in school stress compared to boys, which explains about half of the increase in gender gaps in psychological distress. Indeed, girls seem more likely to feel stressed by schoolwork and simultaneously experience higher psychological distress than boys (Eriksen et al., 2017). West and Sweeting (2003) argued that this is because girls integrate school attainment as valuable personal goals, consequently leading to a deterioration of self-worth and self-esteem when experiencing academic stress or poor educational outcomes. Because girls value schoolwork more than boys, they are increasingly susceptible to external pressures

and demands (Schraml et al., 2011), which is especially salient during upper secondary school.

6.4. The Null Findings of Social and Academic Self-efficacy and Loneliness

In contradiction to self-efficacy theory, this thesis found that social self-efficacy did not impact later psychological distress (paper I) and that academic self-efficacy did not affect later academic stress (paper III). Bandura (1997) argued that people cannot instantly transform their self-efficacy to "superstar" levels if it is initially weak. This thesis considers adolescents' fluctuations of self-efficacy; however, these fluctuations are likely not massive fluxes but more akin to a gust on an insufferably hot day—in other words, delicate flutters. You still suffer in the heat, but the wind temporarily alleviates the misery. Suppose an adolescent has a very weak trait-like social or academic self-efficacy level. In that case, the state-like fluctuations may not ascend to the desired glorious level even though they temporarily experience a little stronger social or academic self-efficacy. Such fluxes might not be enough to instigate the behaviours necessary to achieve the desired accomplishments and subsequent positive outcomes. Although a person experiences an unusually high level of social or academic self-efficacy (compared to their own norm) on one occasion, it does not necessarily mean that they have intentions to initiate and maintain supportive social relationships or to perform schoolwork, respectively. Indeed, believing that one *can* do a behaviour (i.e., high self-efficacy) does not necessarily mean they *will* (i.e., intention of behaviour) (Cahill et al., 2006; Williams, 2010), particularly if the fluctuation of self-efficacy is a minor surge from an originally weak status quo. To further the knowledge of the associations between 1) social self-efficacy and psychological distress and 2) academic self-efficacy and stress, it might be beneficial to include initiative or intention as explanatory mechanisms. It is possible that such factors completely mediate these associations at the within-person level.

Hopelessness about the future and anticipatory apprehension over possible future aversive happenings are core symptoms of depression and anxiety, respectively (Bandura, 1997). Thus, when adolescents experience a surge in

depressive and anxiety symptoms, academic self-efficacy should arguably be impacted due to the negative state of mind and affect that precedes the self-efficacy judgment (Bandura, 1997). However, paper III found that psychological distress did not influence later academic self-efficacy. One reason psychological distress impacted subsequent social, but not academic, self-efficacy could be related to the measure of psychological distress. Specifically, the measure of psychological distress, the SCL-5 (Tambs & Moum, 1993), consists of three indicators of anxiety symptoms and two indicators of depressive symptoms. Muris (2001, 2002) found that social self-efficacy is related more to anxiety, while academic self-efficacy is related to depression. It is also possible that fluctuations in psychological distress do not impact subsequent deviations in academic self-efficacy above and beyond the effects of concurrent academic stress and previous academic self-efficacy.

Paper I showed that social self-efficacy did not impact later psychological distress. There is a possibility that this association is entirely mediated through another factor. For example, Bandura (1994, 1997) argued that the pathway from social self-efficacy to later depression might be through social isolation. But because loneliness did not directly affect later psychological distress, the results from paper II partially do not support Bandura's assumed mediation of social isolation in the association between social self-efficacy and psychological distress. Furthermore, paper II showed that social self-efficacy did not moderate the association between loneliness and psychological distress. This lack of effects might be related to the conceptualisation of loneliness. Loneliness is an existential feeling and not an objective account of how socially isolated one is (Cacioppo & Cacioppo, 2018; Cacioppo & Hawkley, 2009; Cacioppo et al., 2006). That is, loneliness concerns people's *perception* of personal social isolation—and people can certainly feel lonely around others. Thus, social self-efficacy might not tap into the existential aspect of loneliness, which is likely predictive of psychological distress (Fromm-Reichmann, 1959). Because social self-efficacy concerns how socially capable individuals evaluate themselves to be, it might more appropriately moderate the association between

objective social isolation and psychological distress. For instance, Bandura (1994, 1997) argued that individuals high in social self-efficacy initiate and maintain social relationships, which help the person remain in control of challenging situations and mitigate the impact of stressors. In comparison, individuals with low social self-efficacy might experience a heightened vulnerability to psychological distress through social isolation.

6.5. Implications for Policy and Practice

Papers I, II and III found that psychological distress impacts social self-efficacy, loneliness and academic stress throughout upper secondary school. Relevant ministries, stakeholders and municipalities, health and social services and the educational system should focus on decreasing adolescents' psychological distress. Aligning with this recommendation, the new Norwegian plans and strategies put forth take an interdisciplinary, multi-sectorial approach to increasing young people's sense of efficacy and mastery experiences, facilitating socially supportive environments, better including young people's psychological health in systematic public health work, and ensuring a positive psychosocial school environment (Helse- og omsorgsdepartementet, 2017–2022, 2022; Prop. 121 S., 2018–2019). In 2018, a new plan was put forth to promote and improve psychological health in young people (Prop. 121 S., 2018–2019). The strategy "master the whole life" (Helse- og omsorgsdepartementet, 2017–2022) is in line with international action plans on mental health (WHO, 2013, 2015). Moreover, a public health campaign called "ABC for mental health" will be launched between 2022–2024 to increase people's competence in psychological health, promote good psychological health and prevent psychological disorders (Helse- og omsorgsdepartementet, 2022).

On a local level, several actors, organisations and institutions might reduce adolescents' psychological distress through an improved offering of recreational activities, public health services and school-based interventions. Stakeholders and municipalities could increase adolescents' opportunities for leisure time and recreational activities, such as organised sports (Panza et al., 2020), nature-based

recreational activities (Lackey et al., 2021), social community-based recreational programmes (Petryshen et al., 2001) and clubhouses (McKay et al., 2018). Public health and care services, such as hospitals and public health centres or clinics, could provide brief psychological interventions through a mental health drop-in service (Catanzano et al., 2021) and free, flexible mental health services for youth and their families (Reardon et al., 2017). Furthermore, Reardon et al. (2017) found that families might benefit from interventions designed to improve parents' ability to identify mental health problems, reduce stigma for parents, and increase awareness of how to access services. Lastly, because school-based interventions are effective in reducing psychological distress (e.g., Corrieri et al., 2014), systematic work in schools is encouraged.

Paper III found that academic self-efficacy partly functions as an explanatory mechanism between academic stress and psychological distress. The school system and teachers might facilitate a positive and supportive psychosocial learning environment to increase academic self-efficacy and reduce academic stress and psychological distress. A supportive, safe and positive psychosocial learning environment reduces academic stress (Torsheim & Wold, 2001) and psychological distress (Rucinski et al., 2018), and increases academic self-efficacy (Zysberg & Schwabsky, 2021). Further, several meta-analyses and systematic reviews imply that various school-based interventions effectively reduce students' stress (Feiss et al., 2019; Kraag et al., 2006; Rew et al., 2014; van Loon et al., 2020; van Loon et al., 2022). The education of teachers in upper secondary school might include an increased focus on improving the teachers' competencies regarding positive teacher-student and student-student relations, leading classes, working in harmony with the student's homes and securing a well-organised culture for learning in the school (Kunnskapsdepartementet, 2021). Such competencies can help to ensure that students experience a safe, socially supportive and positive psychosocial environment at their school, which they are entitled to according to the Education Act (Opplæringslova, 2017). However, such efforts may exacerbate the notion that

teachers should be responsible for their student's mental health, a controversial debate in Norway (e.g., Aftenposten, 2022; TV2, 2022).

In Norway, instructions and classroom activities should, according to the new national curriculum, contribute to an inclusive community, equity, respect and a positive self-image (Kunnskapsdepartementet, 2017). The new national curriculum has an increased focus on teaching young people about public health and life mastery skills. The abovementioned mental health debate is carried over into the effectiveness of this subject. For instance, Mørch (2021) asked if teachers are equipped to teach young people life skills to improve their physical and mental health without tangible and concrete guidelines and methods. Furthermore, Nordgreen (2020) argued that society is placing too much accountability on individual children, saying, “toughen up and find a way” if they display any social or academic maladjustment in lectures deemed appropriate for life mastery teachings. Teachers are not licensed psychologists, and children are not living in the 1950s, in need of tougher skin. Tharaldsen (2020) suggested that learning social and emotional skills “takes a village”, and that school practices should be grounded in research with specific and tangible strategies.

Papers II and III showed that the within-person relationships between 1) loneliness and psychological distress and 2) academic stress and psychological distress were stronger for girls than for boys. Upper secondary school staff, health- and social service workers, local leisure time and recreational actors, and other relevant people in sectors involving adolescents might consider gender differences in school and social settings. Girls experience more pressures and demands regarding school performance (Gådin & Hammarström, 2000) and are more concerned than boys about the opinions and judgments of others (Rudolph, 2002). Moreover, girls tend to react more negatively than boys when they receive feedback that they interpret as a message of personal inadequacy (Dedovic et al., 2009). Adults surrounding youth should be mindful of how they organise activities in school (e.g., examinations and tests, homework, and group work) and during leisure time (e.g.,

organised sports, choir or band practice, and scout or gaming clubs). Furthermore, they should reflect on what kind of feedback they provide during and after the activities. Adolescents, and girls in particular, might benefit from alternative grading (Brookhart et al., 2016; Högberg et al., 2021), need supportive feedback in school (Monteiro et al., 2021) and leisure time activities (Carpentier & Mageau, 2013; Mouratidis et al., 2008) and challenges adjusted to be optimal for individual abilities (Bassi et al., 2014).

6.6. Future Research

Previous studies on stress, loneliness, self-efficacy and psychological distress might have over- or underestimated associations because between-person effects have been analysed together with within-person effects (Hamaker et al., 2015). By separating within- from between-person effects in the present thesis, the results are increasingly likely to be more accurate than some earlier research on similar inquiries regarding the direction of effects. For example, research and theory imply that loneliness and social self-efficacy are antecedents of depression and anxiety. However, papers I and II indicate that the opposite effects are consistently stronger during middle to late adolescence. Thus, future research should focus on separating within- from between-person effects to more accurately parse associations between factors over time. Importantly, research on within-person processes might help in the development of tools and practices that can identify when adolescents experience deviations in mental health problems and loneliness, as well as plunges in self-efficacy. Such research might benefit future intervention strategies to improve adolescents' social and academic adjustment, perceived capability beliefs and mental health.

Even though self-efficacy theory, and all of the theoretical frameworks cited in this thesis, describe processes occurring within individuals (e.g., cognitions, attributions, evaluations, etc.), the research used as a foundation is on a between-person level (see e.g., Bandura, 1997). Some researchers have found negative effects between self-efficacy and performance or effort (Vancouver, 2012; Vancouver &

Kendall, 2006), highlighting that self-efficacy functions differently (and sometimes oppositely) on the between- and within-person level (Lord et al., 2010; Yeo & Neal, 2006, 2013). The negative and oppositional between- and within-person findings enhance the ecological fallacy of assuming that between-person effects could be aggregated to explain within-person processes over time. Analysing self-efficacy on the between-person level might not provide the complete picture as to how the construct functions specifically within people over time. Therefore, the results of this thesis show the need for an increased focus on the functional properties of self-efficacy on the intraindividual level across time, which could inform further development of the theory or specific assumptions within the theory.

This thesis found that academic stress and academic self-efficacy were antecedents of psychological distress (paper III), while social self-efficacy and loneliness were psychological distress outcomes (papers I and II). Notably, the significant direct and indirect effects of stress and academic self-efficacy on psychological distress may result from the proximity of the variables in time. For instance, academic self-efficacy and academic stress were modelled as predictors of simultaneous psychological distress. On the other hand, social self-efficacy and loneliness were modelled as predictors and outcomes of psychological distress with roughly one-year intervals. Then, because fluctuations in psychological distress consistently predicted deviations in academic stress, social self-efficacy and loneliness, this thesis indicates that within-person “scar effects” are consistently more long-lasting than within-person “vulnerability effects”. Scar effects may constitute negative cognitions related to self-worth and self-concepts following a surge of psychological distress (Zeigler-Hill, 2011) or adverse behaviour that provokes negative reactions from others (Orth et al., 2008), resulting in poor self-beliefs, stressful environments or relationship disturbances. Vulnerability effects, on the other hand, refer to the role that personal vulnerability and external stressors play in the development of psychological distress (Hankin & Abela, 2005). The findings in this

thesis highlight the need for more research on the within-person processes following rises in anxiety and depressive symptoms.

The findings in papers II and III also suggest that it might be beneficial to consider the impact of gender on loneliness, different types of stress, self-efficacy, mental health and the associations between them in future research. For instance, in paper II we found that the within-person association between loneliness and psychological distress was more salient for girls than for boys. Similarly, in paper III it was apparent that the intraindividual effect of academic stress on concurrent psychological distress was stronger for girls compared to boys. In contrast, the relationship between the trait-like components of academic stress and academic self-efficacy and psychological distress was stronger for boys than for girls. These findings imply that different effects could be more or less impactful depending on gender. In other words, between-person effects could be more salient for boys and within-person effects for girls. If this is further examined in similar domains of inquiry and other samples than the present one, the results might be relevant for theory development and intervention research.

6.7. Methodological Considerations

Some limitations in this thesis are worth mentioning. First, participants assessed their academic self-efficacy on a Likert scale. Specifically, the middlemost response category is neutral, worded as “neither agree nor disagree”, making the scale bipolar. According to Bandura (2012), perceived self-efficacy should be measured on a gradient, unipolar scale ranging from zero to a maximum strength of belief without a neutral midpoint. However, Likert and traditional scales of self-efficacy are found to correlate highly and have similar reliability (Maurer & Andrews, 2000). Thus, using the bipolar academic self-efficacy scale was deemed acceptable.

Second, in paper II, social self-efficacy was dichotomised to be used as a moderator in the RI-CLPM of loneliness and psychological distress. Using social self-efficacy as a dummy variable may be problematic regarding possible non-linearity in

the association with other factors, decreased power, and categorisation of responses in a “high” or “low” group (Cohen, 1983; MacCallum et al., 2002). However, to avoid convergence issues, the usefulness of dichotomising the variable for moderation analyses outweighed the possible downsides.

Third, the measure of psychological distress uses a short instrument (SCL-5: Tambs & Moum, 1993) with anxiety and depressive indicators from the symptom checklist (SCL-90). Although the SCL-5 is highly correlated with other SCL versions, such as SCL-10, SCL-25 and SCL-90 (Strand et al., 2003), investigating symptoms of anxiety and depression as two separate constructs might provide even more information on developmental processes. Specifically, even though anxiety and depression have a similar aetiology and high co-morbidity, the disorders tend to develop at different time points (i.e., symptoms of anxiety usually precede symptoms of depression) (Cole et al., 1998).

Lastly, the sample in this thesis is not nationally representative. Thus, I advise caution in generalising the findings in this thesis to the entirety of the Norwegian adolescent population. However, the respondents in this thesis are demographically similar to other Norwegian and Western societies, and the findings are transferable to comparable samples.

One strength of this thesis is the richness of its data—with a large sample and several measurement occasions over the course of three years—which increases the likelihood of untangling the direction of effects between constructs. The project followed a cohort of students from the beginning to the end of upper secondary school, which is an important time developmentally. It is a period in which adolescents are bombarded with external pressures while undergoing several major social, academic, sexual and cognitive transitions. Understanding developmental processes in middle to late adolescence is particularly interesting because loneliness and mental health problems tend to crest simultaneously during this period, while academic pressures increase.

Another strength is the up-to-date separation analysis of between- and within-person effects in all papers, increasing the accuracy of the results regarding intraindividual associations across time. Investigating how social and academic self-efficacy relate to academic stress, loneliness, and psychological distress processes during adolescence might provide important knowledge for future theory development, intervention strategies and research.

6.8. Conclusion

This thesis contributes new and novel knowledge on the intraindividual associations between academic and social self-efficacy, loneliness, academic stress and psychological distress across gender and time during adolescence. Social self-efficacy and loneliness fluctuations did not predict subsequent changes in psychological distress. Variations in academic stress impacted fluctuations in psychological distress directly and indirectly through fluxes in academic self-efficacy throughout upper secondary school. Fluctuations in psychological distress consistently affected deviations in later social self-efficacy, loneliness and academic stress. Lastly, the intraindividual associations between 1) psychological distress and loneliness and 2) psychological distress and academic stress were stronger for girls than for boys. Future research might benefit from separating within- from between-person effects to increase knowledge of cognitive, emotional and behavioural intraindividual processes during adolescence. Further, studies on stress, loneliness, self-efficacy and mental health should consider the impact of gender while separating within- and between-person effects.

This thesis's implications align with the Norwegian government's current strategies and mental health plans (Helse- og omsorgsdepartementet, 2017–2022, 2022; Prop. 121 S., 2018–2019), particularly the interdisciplinary, multi-sectorial approach to increasing young people’s sense of efficacy and mastery experiences, facilitation of socially supportive environments, better inclusion of young people’s psychological health in systematic public health work and ensuring a positive psychosocial school environment. Important adults surrounding adolescents might

consider how activities are organised, as well as the type of feedback they provide during and after activities. Lastly, because students spend a lot of time in school, the educational system, particularly teachers, might be essential to improve adolescents' psychosocial environment. Schools could implement measures to reduce academic stress and, as a result, increase academic self-efficacy and decrease psychological distress. Lastly, teacher education could benefit from increasing teachers' competencies to facilitate a supportive, safe and positive psychosocial learning environment.

7. References

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The Within-Person Effect of Psychological Distress on Social Self-Efficacy: A Random Intercept Cross-Lagged Panel Model

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This study investigated the temporal relationship between social self-efficacy and psychological distress during 3 years in middle to late adolescence. The sample comprised 1508 participants (60.7% female; baseline mean age = 16.33, *SD* = .62; 52.9% high perceived family wealth; 70.6% born in Norway). We used a random intercept cross-lagged panel model to investigate the concurrent and subsequent associations between the two constructs. The results indicated (1) small to moderate and negative associations between the trait-like components and within-person fluctuations of social self-efficacy and psychological distress, (2) positive and significant carry-over stability effects on both constructs across time, and (3) that psychological distress predicted subsequent social self-efficacy more consistently across four time points, than social self-efficacy predicted later psychological distress.

Key words: social self-efficacy – psychological distress – random intercept cross-lagged panel model

Because psychological distress increases dramatically during middle to late adolescence (Hankin et al., 1998; Kleppang, Thurston, Hartz, & Haguist, 2019; Rohde, Lewinsohn, & Seeley, 1991; Vannucci, Flannery, & Ohannessian, 2018; Zahn–Waxler, Klimes–Dougan, & Slattery, 2000), this period can be regarded as a critical time of vulnerability for individuals. Psychological distress, that is, experiencing a state of mental suffering characterized by symptoms of anxiety (e.g., worrying, restlessness, feeling tense) and depression (e.g., hopelessness, negative affect) (Drapeau, Marchand, & Beaulieu-Prévost, 2012; Mirowsky & Ross, 2002), constitutes a major risk factor for suicide (Davidson, Wingate, Grant, Judah, & Mills, 2011; Windfuhr et al., 2008), educational impairments (Fletcher, 2008; Van Ameringen, Mancini, & Farvolden, 2003), increased rate of smoking, substance/alcohol misuse, and obesity (Hasler et al., 2005; Keenan-Miller, Hammen, & Brennan, 2007; Wolitzky-Taylor, Bobova, Zinbarg, Mineka, & Craske, 2012), as well as maladjustment (Benjamin, Harrison, Settipani, Brodman, & Kendall, 2013; Essau, Lewinsohn, Olaya, & Seeley, 2014). During recent decades, the prevalence of adolescents who experience psychological distress has been relatively stable in countries like the United States, France, and Latvia (Ottová-Jordan et al., 2015). However, in Northern Europe (Potrebny, Wiium, & Lundegård, 2017), and particularly in the Nordic countries (Kosidou et al., 2010; von Soest & Wichstrøm, 2014), there are increasing levels of psychological distress reported by adolescents. According to a national Norwegian survey, the number of upper secondary school students who experience high levels of psychological distress has increased from 40.4% in 2014 to 52.5% in 2018 (Myhr, Anthun, Lillefjell, & Sund, 2020). Because high psychological distress, and its short- and long-term consequences, is a major issue for an increasing number of adolescents, research that investigates precursors and consequences of psychological distress in this age group is of great importance.

Social self-efficacy, that is, an individual's beliefs regarding their social capabilities and performances, seems to be related to the development of psychological distress through processes of vulnerability (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996; Bandura, Pastorelli, Barbaranelli, & Caprara, 1999). Such processes refer to the role personal vulnerability and environmental stressors plays in the development of psychological disorders and symptoms of these (see Hankin & Abela, 2005). Although numerous studies have established negative concurrent associations between psychological distress and social self-efficacy in all stages of adolescence (e.g., Hermann & Betz, 2004, 2006;

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Muris, 2002; Riaz, Yasien, & Ahmad, 2014; Smith & Betz, 2002; Suldo & Shaffer, 2007; Tahmassian & Jalali Moghadam, 2011; Uhrlass, Schofield, Coles, & Gibb, 2009), the temporal relationship between the two constructs has not been sufficiently explored. There is a scarcity of longitudinal research that has focused on social self-efficacy as a precursor of psychological distress, and even more limited is research on psychological distress as an antecedent of social self-efficacy. Therefore, it is not evident whether social self-efficacy precedes psychological distress, psychological distress influences subsequent social self-efficacy, or both. Hence, the main goal of this study is to investigate the temporal and concurrent associations between social self-efficacy and psychological distress within individuals during 3 years in middle to late adolescence. This research will benefit our understanding of the developmental processes of psychological distress and self-beliefs in adolescence and might have implications for theoretical frameworks that aim to explain such processes, such as the helplessness–hopelessness theory (Alloy, Kelly, Mineka, & Clements, 1990) and self-efficacy theory (Bandura, 1977).

The Helplessness–Hopelessness Theory and Social Self-Efficacy

Central tenets of social self-efficacy (Bandura, 1977, 1997) have been shown to be critical in several areas of adolescent functioning and development, such as self-assertiveness and perceived capabilities for peer relationships (Ludwig & Pittman, 1999; Zullig, Teoli, & Valois, 2011). Social self-efficacy might provide an important element in the certainty of expectations individuals hold about their social interactions and feelings of helplessness. An adolescent with low social self-efficacy might know how to become friends with peers, work well with others, and express their opinions when people disagree with them, however, they do not believe they are socially capable enough to do it. As Abramson, Metalsky, and Alloy (1989) note, if a person is certain that nothing he or she does matters, why try? We suggest that feelings of certain helplessness in middle to late adolescence can occur when individuals believe they do not possess the necessary social assertiveness and capabilities for peer relationships and social activities (low social self-efficacy), resulting in symptoms of anxiety and depression (i.e., psychological distress).

The helplessness–hopelessness theory (Alloy et al., 1990) is an expansion of the hopelessness theory of depression (Abramson et al., 1989). The framework was developed to provide an increasingly heuristic perspective on the co-occurrence of anxiety and depression symptoms (Alloy et al., 1990). The helplessness–hopelessness theory suggests that the association between anxiety and depression is contingent on varying degrees of the three components of *hopelessness*: negative outcome expectancy, helplessness expectancy, and certainty of these expectations. According to this framework, combinations of the three components form different conditions of psychological distress (Alloy et al., 1990). A person who expects to be helpless in controlling future outcomes, but is unsure about their helplessness, will exhibit *pure anxiety*. With an uncertain helplessness, the individual believes that future control is possible, and as a result experiences increased arousal and anxiety. If the person becomes certain about their helplessness, but is still unsure about the likelihood of future negative life events, a *mixed anxiety–depression syndrome* will develop (Alloy et al., 1990). In this situation, arousal will decline, and the individual will "give up" and become passive. However, they will still ruminate and worry about future outcomes. *Hopelessness depression* unfolds when the negative outcome expectancy becomes certain, and feelings of helplessness turn into hopelessness.

The helplessness–hopelessness theory suggests that individuals are likely to ruminate about their helplessness because the outcome involved is highly valuable to them (Alloy et al., 1990). Peer relationships and networks become increasingly important as time progresses in adolescence (Prinstein & Dodge, 2008), and adolescents with high psychological distress might be prone to ruminate about how incapable and inefficient they believe themselves to be in peer interactions. As such, because individuals with high levels of psychological distress might become increasingly sad and uneasy due to rumination, their cognitions about their self-efficacy beliefs will become even more negative. Furthermore, the level of self-efficacy individuals feel in a social interaction is determined by several past and current sources of information, such as previous performances in comparable situations, observations of others in similar circumstances, social feedback from others, and recollections of one's physical and affective state from previous social interactions (Bandura, 1994; Maddux, 1995). Psychologically distressed individuals often misjudge their own behavior (Widiger, 2011), negatively compare themselves to others (McCarthy & Morina, 2020), are rated as less socially skilled compared to others (Rapee &

Spence, 2004), and suffer from negative affect and uneasiness on a general basis, including while interacting with others. Hence, there is reason to assume that psychological distress influences subsequent levels of social self-efficacy.

The Temporal Association Between Social Self-Efficacy and Psychological Distress

Social self-efficacy as a precursor of psychological distress. Several studies have demonstrated the predictive power of social self-efficacy on psychological distress in several age groups. For example, research has established that social self-efficacy predicts depressive symptoms in young adults (Hermann & Betz, 2004, 2006) and adolescents (Bandura et al., 1996; McFarlane, Bellissimo, & Norman, 1995). Another study found in an adolescent sample that social self-efficacy was associated with symptoms of anxiety disorder but not depressive symptoms (Muris, 2002). One earlier longitudinal study on how social self-efficacy predicts subsequent psychological distress found that social self-efficacy is a precursor of depressive symptoms (Bandura et al., 1999). Bandura et al. (1999) established that high social self-efficacy reduces vulnerability to depression, both directly and through prosocial behavior and curtailment of problem behavior. In a more recent longitudinal study, Steca et al. (2014) demonstrated that the association between hassles and depressive symptoms was stronger for children with low social self-efficacy and weaker for children with positive beliefs regarding their perceived social self-assertiveness and capabilities. Similarly, Wei, Russell, and Zakalik (2005) established that social self-efficacy mediated the association between loneliness and depression, when previous levels of depression were controlled.

Psychological distress as an antecedent of social self-efficacy. Although there is less research on how psychological distress impacts social self-efficacy, there is some empirical evidence supporting this direction of effect. For instance, some research has found that individuals high in social anxiety and attachment anxiety experience lower social self-efficacy compared to others (Kashdan & Roberts, 2004; Mallinckrodt & Wei, 2005). It has been established that psychologically distressed individuals often withdraw from social interactions, have unsatisfactory functioning in their social environment, and perceive family and peers as less supportive compared to others (Jaycox et al., 2009; Schaefer, Kornienko, & Fox, 2011). Moreover, psychologically distressed individuals usually believe they are less able to interact with others effectively, which might result in avoidance behavior during periods of negative affect (Maddux & Meier, 1995). Withdrawal and avoidance behavior, unsatisfactory social functioning, and less supportive interactions might negatively impact individual's feelings of social self-efficacy due to severely limited and negative social feedback. In addition, individuals with high levels of psychological distress frequently experience difficulties in concentrating and have feelings of worthlessness (Epkins & Heckler, 2011), which implies that psychologically distressed people might erroneously think they perform inadequately in social settings and simultaneously believe they are unworthy of meaningful and supportive relationships. It has been demonstrated that psychological distress is associated with fears regarding failure and criticism, low self-worth, and negative self-perceptions that extend even beyond the social domain (Epkins, 1996). These fears might disrupt the desire to reach out to others and distort individuals' interpretation of how capable they are when they interact with their social environment. Lastly, it has been found that depressed individuals produce more stressors compared to nondepressed individuals (e.g., Hammen, 2005, 2006), which might have adverse effects on how efficacious individuals perceive themselves to be in social interactions (Matsushima & Shiomi, 2003; McKay, Dempster, & Byrne, 2014).

Bidirectional association between social self-efficacy and psychological distress. Individuals with low social self-efficacy might experience increased psychological distress due to feelings of helplessness in social interactions. This in turn can disrupt performance and increase social avoidance, self-criticism, repetitive rumination, and worry, thus lowering social self-efficacy further. This might create a negative cycle of influence between social self-efficacy and psychological distress over time, wherein both constructs influence each other at subsequent time points. Although research has largely investigated the unidirectional relationships between social self-efficacy and psychological distress, studies examining the bidirectional relationship between the two constructs are scarce. In order to disentangle the temporal precedence, it is important to consider the stability of both constructs and their concurrent association in the same model as directionality. One study on the bidirectional association between psychological distress

and social self-efficacy found that depressive symptoms predicted later social self-efficacy and not the other way around (Tak, Brunwasser, Lichtwarck-Aschoff, & Engels, 2017). Two studies investigating the temporal relationship between depressive symptoms and social self-competence, which generally refer to perceptions of one's social abilities, skills, or knowledge (Harter, 2012), found a temporal effect similar to that in Tak et al. (2017), wherein depressive symptoms predicted later social self-competence much more consistently than the reverse (Ohannessian & Vannucci, 2020; Ohannessian, Vannucci, Lincoln, Flannery, & Trinh, 2019). However, these studies have some limitations that are worth noting. First, the studies of Ohannessian et al. (2019) and Ohannessian and Vannucci (2020) only have two measurement waves, which might not be sufficient to determine the longitudinal association between two constructs. Second, Tak et al. (2017) used an urban Dutch sample from a depression prevention program, which might limit the study's generalizability. Lastly, all three studies describe processes that occur within individuals, that is, how a person's own self-efficacy or self-competence is associated to the same individual's risk of becoming depressed and vice versa. However, these studies have employed cross-lagged panel models without random intercepts, which can be regarded as insufficient in answering hypotheses regarding within-person associations.

Study Aims

Given the limitations in the literature on the within-person relationship between social self-efficacy and psychological distress, we aim at testing a longitudinal model across four time points, in which we investigate the concurrent and subsequent associations between social self-efficacy and psychological distress. Due to recent advancements in the analysis of longitudinal associations (Hamaker, Kuiper, & Grasman, 2015), we include two random intercepts (one for social self-efficacy and one for psychological distress) in a cross-lagged panel model. This heightens the accuracy of determining how much of the variation in the latent constructs and their associations is explained by between-people variations or fluctuations within individuals. Our model has several methodological advantages. First, random intercept cross-lagged panel models (RI-CLPMs) provide information about the association between constructs, both in the stable, trait-like component (i.e., how stable individual differences in social self-efficacy are related to stable individual differences in psychological distress) and the within-person components at all time points (i.e., how deviations from individual's personal norm of social self-efficacy are related to deviations in their level of psychological distress concurrently). Second, it contributes to understanding the developmental processes within individuals (i.e., carry-over stability effects of social self-efficacy and psychological distress from one occasion to the next). Carry-over stability effects refer to whether deviating levels in one construct are associated with deviating levels in the same construct on subsequent time points. Most importantly, such models produce knowledge on how within-person fluctuations in one construct impact within-person fluctuations in another construct subsequently.

Hypotheses. Based on the theoretical assumptions of social self-efficacy (Bandura, 1994, 1997) and the helplessness–hopelessness theory (Alloy et al., 1990), and previous bidirectional models of psychological distress and social self-efficacy or social self-competence (Ohannessian & Vannucci, 2020; Ohannessian et al., 2019; Tak et al., 2017), we propose a reciprocal model of social self-efficacy and psychological distress. We have formed the following hypotheses:

- Hypothesis 1 (H_1): We hypothesize a negative relationship between social self-efficacy and psychological distress, both at the between-person level (i.e., the intercepts) and concurrently at each measurement occasion at the within-person level.
- Hypothesis 2 (H_2): High social self-efficacy improves individuals' social interactions, which in turn increase their social self-efficacy through positive social models, mastery experience, affect, and feedback. We hypothesize positive carry-over stability effects of social self-efficacy across time points (i.e., individuals with higher levels than expected of social self-efficacy at one time point are more likely to experience higher levels than expected of later social self-efficacy).
- Hypothesis 3 (H_3): Psychological distress intensifies a person's helplessness, which increases the likelihood of experiencing the same symptoms of anxiety and depression in the future. We hypothesize positive carry-over stability effects of psychological distress across time points (i.e., individuals with higher levels than expected of psychological distress at one time point are more

likely to experience higher levels than expected of later psychological distress).

- Hypothesis 4 (H_4): Low social self-efficacy (believing one does not possess the necessary social assertiveness and capabilities for peer relationships and social activities) leads to feelings of helplessness, resulting in psychological distress. We hypothesize a negative cross-lagged effect from social self-efficacy to later psychological distress (i.e., people with lower levels than expected of social self-efficacy have an increased likelihood of experiencing higher levels than expected of later psychological distress).
- Hypothesis 5 (H_5): Psychological distress negatively impacts social self-efficacy through several affective, cognitive, and behavioral symptoms (e.g., negative affect, poor social skills, social avoidance, self-criticism, negative self-evaluation, rumination, worry, etc.). We hypothesize a negative cross-lagged effect from psychological distress to later social self-efficacy (i.e., individuals with higher levels than expected of psychological distress have an increased likelihood of experiencing lower levels than expected of later social self-efficacy).

METHOD

Procedure and Participants

All upper secondary schools in four counties in Norway were invited to participate in the COMPLETE study (Larsen et al., 2018). COMPLETE is a randomized controlled trial developed to improve the psychosocial learning environment and as a result increase the completion rate in upper secondary school. In the study, there were two intervention groups (six schools each) and one control group (four schools). All students enrolled in the 1st grade of upper secondary school in August 2016 in the mentioned schools were invited to participate in the project. The sample comprised 1508 upper secondary school students who attended a general education program. The baseline mean age of the participants was 16.33 (SD = .62). At baseline, the majority of the participants reported that they were ethnic Norwegian (70.6%), while 5.5% were born in another country and 23.9% did not answer the question. In our sample, 39.3% (N = 592) were boys and 60.7% (N = 916) were girls. A median split of socioeconomic position on baseline indicated that 22.5% (N = 340) perceived their family as being in a low socioeconomic position (not well off or not at all well off), while 52.9% (N = 797) perceived their family as being in a high socioeconomic position (well off or very well off) and 24.6% (N = 371) did not answer the question.

The study was approved by the Norwegian Centre for Research Data (NSD), and the participants received written and oral information concerning the study's aims prior to participation. The data consist of four measurement occasions, stretching from the beginning of upper secondary school in 2016 to the adolescents' final year in 2019. In Norway, the grade levels of primary and secondary school consist of 13 grades, from age 6 to age 19. Upper secondary school (grade 11 to grade 13) is voluntary and free. Approximately 98% (SSB, 2021) of adolescents choose to begin an upper secondary school education.

Data collections were performed with intervals of 1 year, except for the two first measurement waves which took place at the beginning and nearing the end of the 11th grade, in August 2016 (T1) and in March 2017 (T2). This was done to acquire data from the cohort immediately when they started upper secondary school in August. The third and fourth time points were in March 2018 (T3) in the 12th grade and March 2019 (T4) in the 13th grade. Researchers and research assistants physically collected data at the school grounds using tablets. Students who were not present at the school during data collection were sent an invitation to participate online in the study via e-mail.

Instruments

Social self-efficacy. To measure social self-efficacy, the social subscale from the Self-Efficacy Questionnaire for Children (SEQ-C: Muris, 2001) was employed. Initially, the scale consisted of eight indicators. However, Muris (2001) found that one item ("How well do you succeed in preventing quarrels with other children?") had unsatisfactory loading on the social self-efficacy scale, hence this item was omitted. Furthermore, the wording of some indicators was slightly adapted to better fit the age group of the study sample, wherein "children" was replaced with "peers." As such, the social self-efficacy scale in the present study consists of seven indicators, measuring individuals' perceived capabilities for peer relationships (e.g., "How well can you become friends with peers?"), social activities (e.g., "How well can you work in harmony with your classmates?"), and social self-assertiveness (e.g., "How well can you express your opinions when other classmates disagree with you?"). The students responded on a Likert scale

ranging from 1 = "not at all" to 5 = "very well." Cronbach's alpha from previous studies has been found to be >.81 in middle to late adolescent samples (Minter & Pritzker, 2015; Muris, 2001, 2002).

Psychological distress. Psychological distress was measured using a short form of the Norwegian version of the Symptom Check List-90-R (SCL-90-R; Tambs & Moum, 1993), with indicators from the anxiety and depression subscales. The Norwegian Institute of Public Health has established that the SCL-90-R is well designed for assessing overall psychological distress and changes in the construct for use in a Norwegian context (Siqveland, Moum, & Leiknes, 2016). The short form consists of five indicators and has been estimated to be a valid, global measure of psychological distress (Tambs & Moum, 1993). It is important to note that the instrument is not a clinical measurement or a diagnostic tool for anxiety or depression, but instead an indicator of general symptoms of anxiety and depression. The students were asked to what degree they have felt bothered or distressed by the following issues in the last 14 days: "feeling fearful," "nervousness or shakiness inside," "feeling hopeless about the future," "feeling blue," and "worrying too much about things." Students responded on a Likert -scale ranging from 1 = "not at all" to 4 = "very much." Previous studies have found Cronbach's alpha of the Symptom Check List-5 (SCL-5) ranging from .83 to .87 (Gjerde et al., 2011; Skrove, Romundstad, & Indredavik, 2013; Strand, Dalgard, Tambs, & Rognerud, 2003; Tambs & Moum, 1993).

Control variables. *Gender.* Boys were coded as 0 and girls as 1.

Socioeconomic position. Socioeconomic position (SEP: Iversen & Holsen, 2008) was measured by the question "How well off is your family?". The participants responded on a 5-point Likert scale ranging from 1 "not at all well off" to 5 "very well off." We created dummy variables based on a median split, wherein participants either rated their family as being in a low (coded as 0) or high (coded as 1) SEP. This variable was measured on each measurement occasion and was added as a time-varying covariate. Because earlier levels of SEP might have an impact on future levels of the study's constructs, we also specified previous levels of SEP as covariates for later levels of psychological distress and social self-efficacy. Thus, T3 SEP functioned as a covariate for the constructs at T3 and T4, while T2 SEP was specified as a covariate at T2, T3, and T4, and T1 SEP was included as a covariate for the constructs at all time points.

Ethnicity. Regarding ethnicity, the participants were asked which country they were born in at T1. We coded this variable as dichotomous, wherein ethnic Norwegian was coded as 1 and nonethnic Norwegian was coded as 0.

Intervention condition. To prevent possible over- or underestimation of effects in our model, we included the intervention condition (three intervention groups) as a control variable in our model, similar to other studies (e.g., Ringlever, Hiemstra, Engels, van Schayck, & Otten, 2013; Tak et al., 2017). We used the control group as a reference group and created two dummy variables, wherein participants were in that specific intervention group (coded as 1) or not (coded as 0).

STATISTICAL ANALYSES

Missing data

While investigating construct-level missingness on each measurement occasion, we considered response rate, full response rate, and partial response rate (Newman, 2014). Response rate refers to how many of the invited individuals responded to the survey. Full response rate indicates the number of respondents who replied to both scales in our study. Partial response rate refers to the number of respondents who replied to one of the scales, but not both. There were 16 schools with a total of 1508 students that were invited to participate in the study (see Appendix A for the number of respondents across measurement waves). Of the 1508 invited participants, surveys were returned by 1151 students at T1 (response rate = 76.3%; full response = 72.8%; partial response = 3.5%). At T2, 1184 students participated (response rate = 78.5%; full response = 75.1%; 3.4%). After T2, one school with 30 participants dropped out of the study. Of the 1478 students who were invited at T3, 949 students participated (response rate = 64.2%; full response = 61.9%; partial response = 2.3%). At T4, surveys were completed by 1016 of the 1478 invited students (response rate = 68.7%; full response = 65.6%; partial response = 3.1%). Because one school dropped out of the study, we investigated our hypothesized model with school level as a CLUSTER variable in conjuncture with the TYPE = COMPLEX analysis in M*plus* as a robustness test. The model produced similar results to our original model, the standard errors of the coefficients in the

models did not substantially differ from each other, and a chi-square difference test was not significant ($p > .05$).

The missing data pattern across the four time points was not completely at random according to Little's missing completely at random (MCAR) test ($\chi^2 = 3285.053$, $df = 3144$, $p = .039$). It was found that the missing data were approximately equivalent to "pure missing at random" (MAR). Under MAR, it is assumed that missing in one variable ($_{\text{missing}}Y$) is related to another variable (X), but $_{\text{missing}}Y$ is not related to Y after X is controlled (Newman, 2014). Social self-efficacy was not related to missingness in social self-efficacy on subsequent measurement waves when psychological distress was controlled and vice versa. Therefore, we retained our constructs across each time point for following analyses and used full information maximum likelihood (FIML) to handle potential construct-level missingness. Of note, although we did not have response rates lower than 30% on any measurement times, which would indicate high person-level missingness, we conducted several follow-up sensitivity analyses on our hypothesized model to investigate the potential impact of the person-level missingness in our study. The sensitivity analyses produced similar patterns of results when estimating models with participants with complete data, participants with intermittent missing data patterns, and all participants.

Preliminary analysis

We used SPSS version 25 and M*plus* version 8 software (Muthén & Muthén, 1998–2017) to perform the following preliminary analyses. First, we investigated the omega reliability for the social self-efficacy and psychological distress factors. Second, a Pearson product-moment correlation analysis of psychological distress and social self-efficacy at all measurement waves was performed to establish significant associations within- and between the two constructs across time. Third, the intraclass correlation coefficient (ICC) of psychological distress and social self-efficacy was investigated on several levels—intervention condition, school membership, and personal level. Lastly, we investigated configural, metric, scalar, and strict longitudinal measurement invariance of social self-efficacy and psychological distress (Chen, 2007; Millsap, 2011; Wickrama, Lee, O'Neal, & Lorenz, 2016). This was performed by first specifying a configural model with no constraints on the indicators. Next, a metric model with constraints on like factor loadings in both constructs across time was tested. After that, we added equality constraints to the corresponding indicator intercepts across time both constructs across time. Lastly, a strict model was specified by including constraints on the residual variance of corresponding indicators across time. If the model fit did not deteriorate significantly between models (ΔCFI < 0.01, ΔRMSEA < 0.015, and ΔSRMR < 0.03: Chen, 2007), the model with the highest level of invariance was accepted and the constraints were kept in place for further modeling.

Primary analysis

M*plus* version 8 software (Muthén & Muthén, 1998–2017) was used to perform structural equation modeling (SEM) in our primary analysis with maximum likelihood estimation. To examine the model fit of our SEM model, we relied on the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). Although we included chi-square statistics in the evaluation of model fit, this indicator was not decisive, as it can often be sensitive to sample size (Hooper, Coughlan, & Mullen, 2007). We used the recommended cut-offs of CFI > 0.95, RMSEA < 0.05, and SRMR < 0.08 indicating a good model fit, and CFI > 0.90 and RMSEA < 0.08 indicating an acceptable model fit (Byrne, 2012; Hooper et al., 2007; Hu & Bentler, 1999).

To investigate the temporal and concurrent associations between social self-efficacy and psychological distress within individuals, we specified a random intercept cross-lagged panel model (RI-CLPM: Hamaker et al., 2015) of the two constructs with four time points. Each latent variable of social self-efficacy and psychological distress was decomposed into a stable trait-like part (individual's personal norm) and state-like part at each measurement wave (deviations within individuals). As such, individuals have their own stable and trait-like level of social self-efficacy and psychological distress over time; in other words, their random intercept score, and they fluctuate around this level at all measurement occasions. This specification was performed by first including two random intercepts, one for each construct. The four first-order latent factors of social self-efficacy and psychological distress were specified as the indicators of each intercept, wherein every factor loading was constrained to 1. The intercepts were allowed to freely covary in the model. Second, we specified

the within-individual component by regressing another latent factor on the corresponding first-order latent factor, with factor loadings constrained to 1 (Mulder & Hamaker, 2020). The resulting eight latent second-order factors (i.e., one for social self-efficacy and one for psychological distress at each of the four time points) were used to specify state-like concurrent correlation coefficients, carry-over stability coefficients, and cross-lagged coefficients. The error variance of the first-order latent factors was constrained to 0, which ensures that all variation in the latent factors was entirely captured by the within- and between factor structures (Hamaker, March 21, 2018). Next, we added gender, ethnicity, socioeconomic position, and intervention conditions as time-invariant and time-varying control variables in the model. We performed a chi-square difference test to investigate whether the effect of the control variables changed over time (first-order latent variables regressed on the control variables) or if the effects were invariant over time (intercepts regressed on the control variables). Because the chi-square difference test indicated no significant difference between the two models, we retained the model with the best model fit wherein the first-order latent variables were regressed on the control variables. Lastly, to test whether the within-person carry-over stability paths and cross-lagged paths were invariant across measurement occasions, we compared a freely estimated RI-CLPM against a model wherein carry-over stability paths and cross-lagged paths were constrained to be equal over time. If the chi-square difference between the two models was not significant ($p > 0.05$), the constrained model was retained. However, if the model fit deteriorated significantly, the effects between waves were not equal and the fully constrained model was rejected.

RESULTS

Descriptive Statistics, Correlation, and Intraclass Correlation

Table 1 contains the descriptive statistics and reliability of social self-efficacy and psychological distress and the correlation between the two variables at all measurement occasions. The constructs of social self-efficacy and psychological distress produced acceptable omega reliability at all time points ($\omega > 0.82$). The level of social self-efficacy in our sample is similar to those of other adolescent and young adult samples across cultures (Anderson & Betz, 2001; Habibi, Tahmasian, & Ferrer-Wreder, 2014; Minter & Pritzker, 2015; Muris, 2001; Smith & Betz, 2000; Suldo & Shaffer, 2007). Findings from studies with adolescent samples that have used the same psychological distress measure as the current study reported lower levels of psychological distress compared to our sample (Pape, Bjørngaard, Holmen, & Krokstad, 2012; Skrove et al., 2013; Strand et al., 2003). However, it is worth noting that these studies are based on data that were collected in the late 1990s and early 2000s, which are expected to have somewhat lower levels of psychological distress than today, given the current development explained in the Introduction.

The effect sizes of the correlation coefficients were based on the values from Cohen (1988), wherein $r > .10$ is small, $r > .30$ is moderate, and $r > .50$ is large. The associations between psychological distress and social self-efficacy were negative and small to moderate, with coefficients ranging from –.14 to –.35. The correlation within the same construct between different time points was positive and moderate to large, ranging from .45 to .70. The correlation coefficients were larger with adjacent measurement times and smaller the more distal the measurement times.

The school-level ICC of social self-efficacy and psychological distress at each measurement wave was $r < .013$, indicating that the schools are not necessarily more similar than dissimilar concerning the study's constructs. Likewise, the ICC within the intervention conditions in social self-efficacy and psychological distress was negligible ($r < .003$). On the personal level, the results of the ICC for social self-efficacy indicated that 30.7% of the variance could be explained by between-person differences and 69.3% by fluctuations within individuals. The ICC for psychological distress demonstrated that 44.5% of the variance could be explained by between-person differences and 54.5% by fluctuations within individuals.

Measurement Invariance

The configural models of social self-efficacy and psychological distress produced acceptable model fit (see Table 2 for details). The metric models did not differ significantly from the configural models. The scalar model of social self-efficacy significantly deteriorated model fit compared to the metric model. We released one indicator intercept constraint and accepted partial scalar longitudinal invariance. The construct of psychological distress

TABLE 1
Descriptive statistics, omega reliability, and correlation matrix of social self-efficacy and psychological distress over four time points

	N	ω	M	SD	*Range*	*Min*	*Max*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1. T1 SSE	1128	.82	3.68	.66	4	1	5	–							
2. T2 SSE	1165	.85	3.71	.67	4	1	5	.70	–						
3. T3 SSE	930	.86	3.75	.70	4	1	5	.55	.64	–					
4. T4 SSE	976	.85	3.76	.75	4	1	5	.49	.58	.64	–				
5. T1 PD	1114	.90	1.82	.77	3	1	4	–.33	–.28	–.24	–.15	–			
5. T2 PD	1147	.90	1.95	.80	3	1	4	–.27	–.28	–.22	–.23	.64	–		
5. T3 PD	926	.90	1.99	.80	3	1	4	–.15	–.19	–.29	–.22	.51	.63	–	
5. T4 PD	994	.89	2.13	.81	3	1	4	–.22	–.20	–.29	–.35	.45	.56	.67	–

Note. All correlations are significant at the $p < .01$ level. SSE = social self-efficacy, PD = psychological distress. N = 658–973 within PD correlations; N = 654–999 within SSE correlations; N = 650–1133 between PD and SSE correlations.

TABLE 2
Longitudinal measurement invariance of social self-efficacy and psychological distress

	χ^2	df	*RMSEA [90% CI]*	*CFI*	*SRMR*	*ΔRMSEA*	*ΔCFI*	*ΔSRMR*
Social self-efficacy								
Configural	1096.148	302	0.042 [0.039, 0.045]	.941	.058			
Metric	1123.659	320	0.041 [0.038, 0.044]	.941	.061	.001	.000	.003
Scalar	1344.431	338	0.045 [0.042, 0.047]	.926	.061	.004	.015	.000
Partial scalar	1270.653	337	0.043 [0.040, 0.046]	.931	.061	.002	.005	.000
Psychological distress								
Configural	428.732	134	0.038 [0.034, 0.042]	.978	.027			
Metric	463.294	146	0.038 [0.034, 0.042]	.976	.031	.000	.002	.004
Scalar	560.233	158	0.041 [0.038, 0.045]	.970	.033	.003	.006	.002
Strict	622.648	173	0.042 [0.038, 0.045]	.966	.037	.001	.004	.004

Note. χ^2 = chi square; *df* = degree of freedom; RMSEA = the root mean square error of approximation; CI = confidence interval; CFI = comparative fit index; SRMR = standardized root mean square residual.

achieved strict longitudinal measurement invariance.

Random Intercept Cross-Lagged Panel Model of Social Self-Efficacy and Psychological Distress

The RI-CLPM of social self-efficacy and psychological distress with gender, ethnicity, socioeconomic position, and intervention condition as control variables and measurement invariance constraints produced an acceptable model fit: $\chi^2 = 2521.553$, $df = 1402$, $p < .001$, RMSEA = 0.039, 90% CI [0.036, 0.041], CFI = 0.923, SRMR = 0.062. To test equality assumptions of the regression coefficients across measurement waves, a model with autoregressive and cross-lagged constraints was compared to the original model. The fully constrained model did not differ significantly from the unconstrained model: $\chi^2 = 2527.772$, $df = 1410$, $p < .001$, RMSEA = 0.039, 90% CI [0.036, 0.041], CFI = 0.923, SRMR = 0.063 ($\Delta\chi^2 = 6.219$, $\Delta df = 8$, $p = .623$). Therefore, we decided that the equality assumption of the stability and cross-lagged coefficients across measurement occasions was tenable, and the fully constrained model was retained. Figure 1 is a simplified representation of the model presented with standardized estimates and confidence intervals (CIs) (standardized and unstandardized estimates and standard errors from the model are presented in Appendix B).

At the between-person level, the correlation between the intercepts of social self-efficacy and psychological distress was significant, negative, and moderate in effect size. This implies that on a trait level, individuals with low psychological distress generally experienced high levels of social self-efficacy and vice versa during 3 years in middle to late adolescence.

On the within-person level, small, negative, and significant concurrent associations were found between psychological distress and social self-efficacy. Hence, adolescents who scored higher than expected (i.e., higher than their personal norm) on psychological distress also scored lower

Simplified Representation of the RI-CLPM of Social Self-Efficacy and Psychological Distress Across Four Measurement Occasions

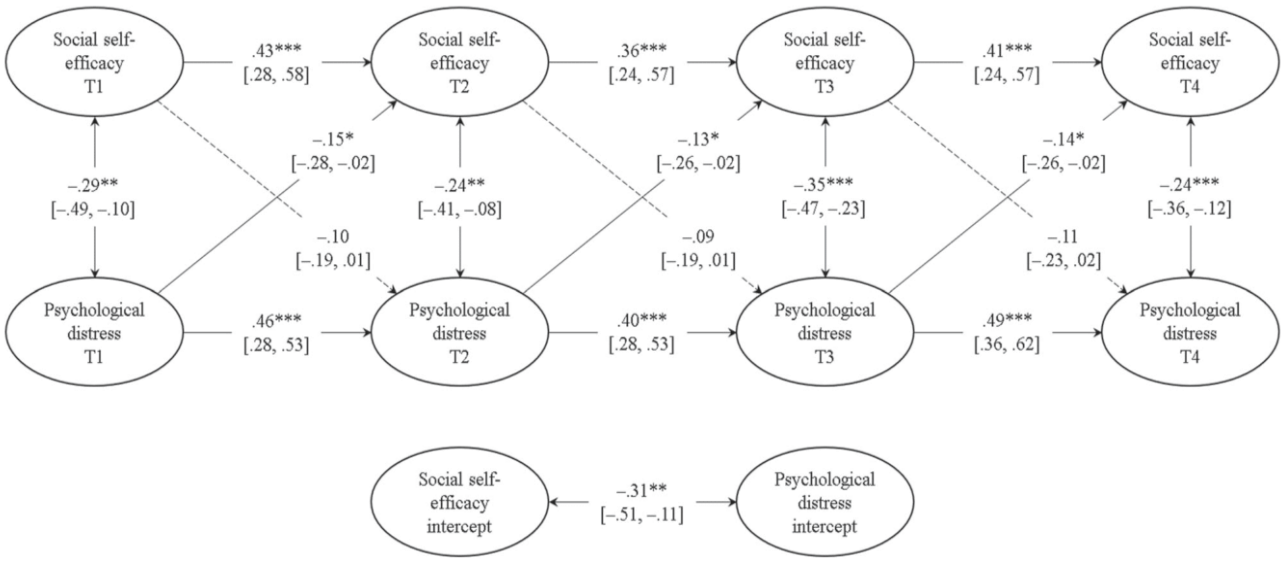

FIGURE 1 Simplified representation of the random intercept cross-lagged panel model (RI-CLPM) of social self-efficacy and psychological distress across four measurement occasions. *Note*. Standardized coefficients are presented with 95% confidence interval in brackets. ***$p < .001$, **$p < .01$, *$p < .05$.

than expected on social self-efficacy concurrently at each measurement occasion. In contrast, adolescents who scored lower than expected on psychological distress scored higher than expected on social self-efficacy at the same time point. These results imply that adolescents with positive deviations from their normal trait level in one construct had increased probability of experiencing negative deviations from their expected scores in the other construct at the same time point.

On the within-person level, there were significant and positive carry-over stability (autoregressive) effects for both constructs. This implies that occasions on which an adolescent scored below their expected level were likely to be followed by an occasion on which they again scored below their expected level, and vice versa with higher than expected scores (Hamaker et al., 2015). For example, adolescents who reported social self-efficacy or psychological distress above their expected scores at the age of 16 were more likely to report above their expected scores in the same construct at the age of 17.

At the within-person level, significant and negative cross-lagged effects from psychological distress to subsequent social self-efficacy (but not from social self-efficacy to later psychological distress) were observed at all time points. This indicates that within-person deviations in psychological distress at all ages were negatively predictive of within-person deviations in social self-efficacy at subsequent time points. As such, adolescents who reported higher than expected levels of psychological distress at one time point likely experienced lower than expected scores of social self-efficacy 1 year later. Similarly, individuals who experienced lower than expected levels of psychological distress on one occasion likely reported higher than expected scores of social self-efficacy on the following time point.

DISCUSSION

Our main goal was to investigate how social self-efficacy and psychological distress fluctuate within individuals and how these fluctuations relate to each other during 3 years in middle to late adolescence. We applied the concept of social self-efficacy (Bandura, 1994, 1997) to the theoretical assumptions of the helplessness–hopelessness theory (Alloy et al., 1990) and expanded on previous bidirectional models that have addressed the temporal associations between depression and social self-efficacy or depression and social self-competence (Ohannessian & Vannucci, 2020; Ohannessian et al., 2019; Tak et al., 2017). We proposed a reciprocal model of social self-efficacy and psychological distress, where we hypothesized negative concurrent correlations between the constructs, positive carry-over stability effects within each construct across

time, and negative cross-lagged effects between the constructs. To investigate the temporal associations, we used the recently developed RI-CLPM (Hamaker et al., 2015; Usami, Murayama, & Hamaker, 2019), which separates the within-person process from the stable between-person differences in a cross-lagged panel model.

The Concurrent Association Between Social Self-Efficacy and Psychological Distress

Our results support hypothesis 1 which stated a negative relationship between social self-efficacy and psychological distress, both at the between-person level (i.e., the intercepts) and at each measurement occasion at the within-person level. Preliminarily, we found that social self-efficacy and psychological distress were negatively related at all measurement occasions, which corroborate previous findings regarding the association between the two constructs among adolescents in samples from the general (nonclinical) population (e.g., Hermann & Betz, 2004, 2006; Muris, 2002; Riaz et al., 2014; Smith & Betz, 2002; Suldo & Shaffer, 2007; Tahmassian & Jalali Moghadam, 2011; Uhrlass et al., 2009). Furthermore, at the between-level, we observed a moderate and negative relationship between the stable trait-like components of social self-efficacy and psychological distress. This indicates that individuals with higher social self-efficacy, during the course of 3 years in middle to late adolescence, also tend to have lower psychological distress during the same time period, and vice versa. Concerning the results from the within-person associations, we found significant, negative, and small to moderate concurrent relationships between social self-efficacy and psychological distress at all four time points. The results imply that when adolescents experience unexpectedly high (or low) levels of psychological distress, they also experience unusually low (or high) levels of social self-efficacy at the same time point. Because we separated the between-person variations from the within-person fluctuations, these within-person concurrent associations have implications for our understanding of the relationship between the social self-efficacy and psychological distress within individuals. The significant and negative within-person associations support the theoretical benefit of combining the self-efficacy theory and helplessness–hopelessness theory to investigate how fluctuating levels of adolescents' beliefs regarding their social capabilities and performances relate to concurrent fluctuations of experiences of negative affect and uneasiness.

Carry-Over Stability Effects in Middle to Late Adolescence

As mentioned, it seems that psychological distress increases during middle to late adolescence (e.g., Hankin et al., 1998; Rohde et al., 1991; Vannucci et al., 2018; Zahn–Waxler et al., 2000). Our study sheds some light on how fluctuations of psychological distress and social self-efficacy within individuals predict later variations in the same construct. In support of hypotheses 2 and 3, we found significant and positive carry-over stability effects between time points at the within-person level. This implies that when a person scored above or below their expected scores in one construct, they were likely to score above or below their expected score in the same construct approximately 1 year later. If an adolescent experienced an unexpected deviation in levels of social self-efficacy or psychological distress, it was quite likely that they experienced the same deviation a year later (i.e., unusually high or low levels from year to year). These carry-over effects might not be surprising, considering that adolescence is characterized by many social, educational, and physical challenges, which might result in fluctuations around individuals' usual level of social self-efficacy beliefs and psychological distress. These results are in line with theoretical assumptions. Helplessness–hopelessness theory argues that increasing levels of psychological distress will further escalate the feelings of helplessness, which lead to a vicious cycle of increasing symptoms (Alloy et al., 1990). Although the self-efficacy theory does not make any explicit postulations regarding the continuity of high or low levels of social self-efficacy across time, the theory argues that self-efficacy influences behavior, and that behavior and performance influence both cognition and affect in a triangulation of reciprocal effect (Bandura, 1997). However, whether the within-person fluctuations of social self-efficacy and psychological distress are only typical and distinctive for middle to late adolescents, or these particular constructs need to be investigated in future studies in other age groups and compared to our results.

The Temporal Relationship Between Social Self-Efficacy and Psychological Distress

Concerning our hypotheses of a reciprocal longitudinal relationship between social self-efficacy and psychological distress, the results support hypothesis 5 but not hypothesis 4. We identified significant

and negative cross-lagged effects from psychological distress to later social self-efficacy, but not the other way around. Tak et al. (2017), Ohannessian et al. (2019), and Ohannessian and Vannucci (2020) found unidirectional effects from depression to subsequent social self-efficacy or social self-competence in bidirectional models. Importantly, our study found similar results when separating between- and within-person variations. Our findings, together with the previous studies, imply that across different cultural settings (Norway, the Netherlands, and the United States) and during different stages of adolescence, psychological distress predicts social self-efficacy or social self-competence more consistently than the reverse. In accordance with the helplessness–hopelessness theory, the temporal effect from psychological distress to social self-efficacy might be related to rumination, negative self-evaluations, poor social skills, worry, and self-criticism (Alloy et al., 1990). This effect might become more salient during middle to late adolescence due to the rapid cognitive development individuals experience in this time period. As adolescents mature, they become more conscious about how their anxious and depressive behavior negatively impacts their social functioning in the environment (Steinberg, 2005), which might impede their social self-efficacy belief. Because rumination is common in depressed and anxious individuals, negative thought patterns relating to how socially inept one is might become all-consuming during a time when peers progressively gain influence in one's life and peer networks begin to expand. As such, the psychologically distressed youth might have recurring thoughts based on negative and incorrect interpretations of how successfully they interact with others, and as a result, they might withdraw from and avoid social situations (Schaefer et al., 2011), which severely limit social feedback and mastery experiences within the social domain.

The lack of significant longitudinal effects of social self-efficacy on later psychological distress in our study challenges one aspect of the helplessness–hopelessness theory (and other cognitive vulnerability models), which generally assume that cognitive vulnerabilities, such as low levels of social self-efficacy, are a cause of psychological distress. One explanation for the nonsignificant effect can be related to the helplessness expectancy and the uncertainty/certainty of one's helplessness in future situations. As elaborated in the helplessness–hopelessness theory (Alloy et al., 1990), pure anxiety is likely to precede the mixed anxiety–depression syndrome as well as hopelessness depression. Therefore, it is possible that low social self-efficacy is more related to the development of anxiety, wherein an individual is not yet certain of their helplessness, as opposed to mixed anxiety–depression. In line with this assumption, Muris (2001, 2002) found that social self-efficacy might be more related to anxiety in adolescent samples, compared to depression.

Limitations

There are some limitations worth mentioning when interpreting our results. First, the cross-lagged effects from psychological distress to social self-efficacy were small, which implies that this risk might not be major over the course of 3 years in middle–late adolescence. Thus, we recommend interpreting this result with caution. However, if these small effects spill over across time, the impact psychological distress has on social self-efficacy might be more considerable as time progresses. More studies based on the within-person association of social self-efficacy and psychological distress are needed to make any definitive statements about the relationship between the two constructs within individuals over time. Replication studies with more frequent data collections and a longer time span might further unravel the nature of psychological distress and its relationship to self-efficacy in the social domain.

Second, although we remove some of the bias regarding confounding variables by specifying random intercepts and including socioeconomic position as a time-varying covariate (Usami, 2021; Usami et al., 2019), we cannot infer causality (Cook, Campbell, & Shadish, 2002). Usami (2021) points out that within-person causal reciprocal effects can only be represented in the RI-CLPM if there are no model errors and no unobserved confounders in the model estimation (see Usami, July 3, 2020; Usami et al., 2019 for details). Because this is challenging computationally and for research, we recommend caution when interpreting our cross-lagged results.

Third, we also acknowledge the potential element of other mediating or moderating factors that might explain or increase/decrease the relationship between social self-efficacy and psychological distress (e.g., personality, cognitive factors, rumination, social withdrawal, etc.).

Fourth, it is worth noting that our sample is part of an intervention project. As a robustness test, we have performed several analyses to investigate the

impact intervention conditions has on the study's constructs and our hypothesized model. Initially, we investigated social self-efficacy and psychological distress ICC and mean level differences within- and between intervention groups. There were no significant mean differences between the intervention conditions or major intraclass correlations within the intervention conditions in social self-efficacy and psychological distress. Furthermore, we used intervention conditions as a cluster variable in a TYPE = COMPLEX analysis in M*plus* on our hypothesized model. The results were similar to our original model and there were no significant differences in chi squares or standard errors of the model's coefficients. Although the intervention conditions showed virtually no effect on our variables or model, we included them as control variables in the model to safeguard against possible effects of the interventions, even as a by-product, similar to other studies (e.g., Ringlever et al., 2013; Tak et al., 2017).

Lastly, the study's sample is not nationally representative. Therefore, generalizing the results to the entire Norwegian adolescent population should be done with caution. Nevertheless, the study's participants are from a mix of rural, semiurban, and urban areas in small, medium, and large schools. Moreover, there is an approximate equal representation of both genders. Overall, the demographics in our study reflect the Norwegian middle to late adolescent population to a large degree.

Strengths and Future Directions

This is the first study, to our knowledge, that investigates the temporal relationship between social self-efficacy and psychological distress at the within- and between-person level in middle to late adolescence. This is a substantial asset, given that developmental processes are mainly a function of within-person fluctuations, not variations between individuals. By including random intercepts and several control variables, it allows us to exclude confounders such as gender, socioeconomic position, and ethnicity. While excluding such confounders and controlling for previous fluctuating levels of both constructs, it was found that young people who experience higher levels of psychological distress than they usually do also tend to experience lower than expected levels of subsequent social self-efficacy. The results contribute important knowledge concerning how social self-efficacy and psychological distress develop and influence each other in adolescence. It is possible that the observed temporal relationship is particular to social self-efficacy as a construct, and as such, there is a need for more research on the directionality between psychological distress and social self-efficacy to further establish the path of effect. However, because similar results have been demonstrated in related constructs, such as social self-competence (Ohannessian & Vannucci, 2020; Ohannessian et al., 2019), our results might have an impact on how we understand and theorize developmental processes in adolescence in regard to the temporal precedence between social self-efficacy and psychological distress.

Future research should investigate the potential underlying mechanisms that might be involved in the association between psychological distress and social self-efficacy (e.g., rumination, dysfunctional coping or behavior, social withdrawal and avoidance, etc.). It would be beneficial to identify developmental pathways, precursors, and possible protective factors of psychological distress in adolescence. Such models would be helpful in future treatments or interventions in relevant arenas where adolescents spend much of their time, such as school. For instance, one meta-analysis on depression prevention in adolescent samples implies that the potential effectiveness of educational interventions has not been fully investigated (Merry, McDowell, Hetrick, Bir, & Muller, 2004), which indicates that there is a need for research in this area.

Evidence suggests that stressors (negative life events) might constitute as a key contributor to the development of psychological distress (see Compas, Grant, & Ey, 1994; Goodyer, 2001; Grant et al., 2003). Thus, it could be beneficial to include such measures in future studies that are interested in temporal models with psychological distress. Because the belief in social assertiveness and capabilities for social interactions and activities did not have a significant effect on the later psychological distress in our model, social self-efficacy might be more suited to be tested as a moderator in the association between stressors and psychological distress in middle to late adolescence. For example, Steca et al. (2014) found that social self-efficacy had a buffering effect on the relationship between stressors and depression in children. Therefore, we recommend including stressors in a longitudinal model with social self-efficacy and psychological distress to further unravel the relationship between the two constructs.

Further investigations with more measurement waves of the association between social self-efficacy, anxiety, and depression within individuals might identify critical periods of vulnerability in

adolescence. Although research indicates high comorbidity and association between anxiety and depression (e.g., Cummings, Caporino, & Kendall, 2014), it might be beneficial to replicate our RI-CLPM design and analyze the association between social self-efficacy and depression and anxiety separately, and not as indicators of psychological distress. Because research (e.g., Cole, Peeke, Martin, Truglio, & Seroczynski, 1998) and theory (Alloy et al., 1990) indicates that anxiety precedes depression, this would provide important information first, pertaining to the within-person development of both anxiety and depression over time and their temporal relationship. Second, a model with social self-efficacy and anxiety and depression addressed separately will further untangle the nature of their within-person associations. As such, random intercept cross-lagged panel models with social self-efficacy and anxiety and depression as separate constructs might provide important information that has major implications for the prevention of depression and anxiety and resulting impairments, risk behavior, and future psychological and physical problems.

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APPENDIX

RESPONDENTS ACROSS MEASUREMENT WAVES

Time point	N	*Percent*	*Cumulative percent*
T1	55	3.6	3.6
T2	34	2.3	5.9
T3	23	1.5	7.4
T4	138	9.2	16.6
T1 + T2	144	9.5	26.1
T1 + T3	11	0.7	26.9
T1 + T4	16	1.1	27.9
T2 + T3	35	2.3	30.2
T2 + T4	17	1.1	31.4
T3 + T4	43	2.9	34.2
T1 + T2 + T3	190	12.6	46.8
T1 + T2 + T4	155	10.3	57.1
T1 + T3 + T4	38	2.5	59.6
T2 + T3 + T4	67	4.4	64.1
T1 + T2 + T3 + T4	542	35.9	100
Total	1508	100	

APPENDIX

UNSTANDARDIZED AND STANDARDIZED COEFFICIENTS FROM THE RANDOM INTERCEPT CROSS-LAGGED PANEL MODEL (RI-CLPM) OF SOCIAL SELF-EFFICACY AND PSYCHOLOGICAL DISTRESS.

	Unstandardized	SE	*Standardized*	SE
Autoregressive coefficients				
T1 SSE →T2 SSE	.434***	.087	.431***	.076
T2 SSE → T3 SSE	.434***	.087	.360***	.085
T3 SSE → T4 SSE	.434***	.087	.405***	.084
T1 PD → T2 PD	.475***	.066	.462***	.063
T2 PD → T3 PD	.475***	.066	.402***	.065
T3 PD → T4 PD	.475***	.066	.487***	.067
Cross-lagged coefficients				
T1 SSE → T2 PD	–.164	.096	–.100	.059
T2 SSE → T3 PD	–.164	.096	–.086	.051
T3 SSE → T4 PD	–.164	.096	–.106	.063
T1 PD → T2 SSE	–.094*	.039	–.149*	.067
T2 PD → T3 SSE	–.094*	.039	–.127*	.055
T3 PD → T4 SSE	–.094*	.039	–.140*	.059
Correlation coefficients				
T1 SSE ↔ T1 PD	–.032*	.013	–.291**	.100
T2 SSE ↔ T2 PD	–.021**	.007	–.244**	.086
T3 SSE ↔ T3 PD	–.046***	.009	–.351***	.061
T4 SSE ↔ T4 PD	–.029***	.008	–.238***	.062
SSE INTERCEPT ↔ PD INTERCEPT	–.034**	.013	–.311**	.101

Note. SSE = social self-efficacy; PD = psychological distress; SE = standard errors.
***$p < .001$, **$p < .01$, *$p < .05$.

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Hello Darkness, My Old Friend: Moderating a Random Intercept Cross-lagged Panel Model of Loneliness and Symptoms of Anxiety and Depression

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Abstract

The present study investigated the trait- and state-like associations between loneliness and symptoms of anxiety and depression during three years in middle to late adolescence. The moderating effect of gender and social self-efficacy was examined on the hypothesised model. The sample consisted of 1508 Norwegian upper secondary school students (61% female; mean age at T1 = 16.33; 52.9% high socioeconomic position; 70.6% Norwegian-born). We found 1) strong and positive trait- and state-like associations between loneliness and symptoms of anxiety and depression, 2) that anxiety and depressive symptoms consistently predicted later loneliness but not the other way around, 3) that gender moderated parts of the state-like associations between loneliness and symptoms of anxiety and depression, and 4) that social self-efficacy had no moderating effect on the longitudinal relationship between loneliness and anxiety and depressive symptoms. The present study might inform future research, theory development, and intervention strategies in middle to late adolescent samples.

Keywords Symptoms of anxiety and depression · Loneliness · Random intercept cross-lagged panel model · Gender · Social self-efficacy

Introduction

Loneliness (i.e., a perception of being socially isolated: Cacioppo & Hawkley, 2009; Hawkley & Cacioppo, 2010) is a relatively common and temporary experience throughout our lives, which tends to be prevalent in adolescence (Goossens, 2018; Laursen & Hartl, 2013; Qualter et al., 2015). The presence of loneliness during the adolescent period is mainly due to the social reorientation process that adolescents undergo, which is characterised by several social challenges (Goossens, 2018). Overcoming these challenges and connecting with peers become increasingly salient throughout adolescence. For instance, a lack of intimate friendships is more associated with depression in adolescence than in children (Buhrmester, 1990) – it seems that friendship quality becomes more important than quantity during the adolescent years (Qualter et al., 2015). Because symptoms of anxiety and depression also increase considerably during this period (Hankin et al., 1998; Zahn–Waxler et al., 2000), mid-late adolescence could represent a crucial developmental life stage to investigate how perceived social isolation and symptoms of anxiety and depression are associated within individuals (Goossens, 2006; Hankin et al., 1998).

The assumed reciprocal relationship between loneliness and symptoms of anxiety and depression in adolescence has gained increased focus recently (e.g., Danneel et al., 2019; Lasgaard et al., 2011; Vanhalst et al., 2012). Danneel et al. (2019) found that loneliness and social anxiety symptoms were reciprocal in nature, while depressive symptoms predicted later loneliness and not the other way around. Similarly, Lasgaard et al. (2011) established that depressive symptoms were associated with subsequent loneliness but not vice versa. Vanhalst et al. (2012) showed that loneliness and depressive symptoms were reciprocally related across five years in adolescence. Although this research has increased our understanding of the prospective associations between loneliness, anxiety, and depression, there is a noteworthy shortcoming in the mentioned studies. Namely, they

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have not disaggregated within-person effects from between-person effects, making the temporal associations somewhat inaccurate (Hamaker et al., 2015) and the theoretical impacts questionable (Curran & Bauer, 2011).

When separating within-person effects from between-person effects, people's personal norm of a factor (i.e., their trait-like level across the study's duration) is separated from the deviations individuals experience at each measurement occasion (i.e., their state-like level at each time point that diverges from their personal norm) (Hamaker et al., 2015). By using the deviating state-like factors to investigate the association between loneliness and symptoms of anxiety and depression over time, we can increase our understanding of the true nature of the temporal relations; it can allow us to evaluate central theoretical assumptions and thereby be relevant for future intervention strategies on to improve mental health and decrease perceived social isolation.

We use empirical findings from adolescent samples and combine several theoretical assumptions to investigate the within-person association between loneliness and symptoms of anxiety and depression in mid-late adolescence. Specifically, we 1) incorporate both anxiety and depressive symptoms in one construct based on the rationales of the cumulative interpersonal risk model by Epkins and Heckler (2011), 2) use the evolutionary theory of loneliness (Cacioppo & Cacioppo, 2018) to explain how loneliness may function as an antecedent of symptoms of anxiety and depression, 3) use the interpersonal theory of depression (Coyne, 1976) to illustrate how symptoms of anxiety and depression might lead to loneliness, and 4) use the developmentally based interpersonal model of depression by Rudolph et al. (2008) to hypothesise moderating effects on the longitudinal association between loneliness and symptoms of anxiety and depression.

Developmental Processes of Loneliness and Symptoms of Anxiety and Depression

The Evolutionary Theory of Loneliness

According to the evolutionary theory of loneliness by Cacioppo and Cacioppo (2018), perceived social isolation (i.e., loneliness) functions as a warning signal that brings attention to the possible deterioration of the body. Humans are regarded as inherently social beings (Cacioppo & Patrick, 2008), and when the innate, strong desire to connect with others is thwarted, people become motivated to fix the perceived deficiencies in their social relationships and thus avoid the negative emotions (Cacioppo & Hawkley, 2009). Paradoxically, people can also be motivated to be alert and avoid possible social dangers to ensure their self-preservation (Cacioppo & Cacioppo, 2018), or in other words, socially withdraw. The evolutionary theory proposes that the signal to self-preserve (i.e., feeling lonely) triggers several behavioural and physical adjustments to manage and deal with faulty social relations, thus avoiding premature mortality. One adjustment is increased depressive symptomatology (Cacioppo & Cacioppo, 2018). Several studies have found support for this theorised effect (for an overview, see e.g., Loades et al., 2020).

The Interpersonal Theory of Depression

The interpersonal theory of depression (Coyne, 1976) argues that depressed and depressed-prone individuals have certain characteristics and behave in manners that impede social relationships by eliciting negative reactions from others (Giesler et al., 1996; Gotlib & Hammen, 1992; Joiner et al., 1992; Swann et al., 1992) and produce interpersonal stress and conflict (Hammen, 2020; Rudolph et al., 2000). For example, depressed people may attempt to decrease feelings of personal guilt and low self-worth through excessive reassurance from people they are close to (Coyne, 1976). Initially, people might offer support. However, because the depressed person is uncertain about the genuineness, they continue to demand reassurances which causes others to become agitated and reject them (Starr & Davila, 2008). Indeed, studies indicate that, compared to non-depressed people, depressed individuals are increasingly likely to experience social dysfunctions (Gotlib & Lee, 1989), less enjoyment and intimacy from social interactions (Nezlek et al., 2000), and withdraw from social interactions (Schaefer et al., 2011).

Two Models of Relevance

The cumulative interpersonal risk model (Epkins & Heckler, 2011) argues that although symptoms of anxiety (particularly social anxiety) and depression have similar etiological influences, most researchers overlook the considerable overlap in or comorbidity of anxiety and depressive symptoms. For instance, recent findings imply that certain genomes are related to the co-occurrence of anxiety and depressive symptoms (Jami et al., 2022). Thus, in this study, we combine symptoms of anxiety and depression in one construct, examining the shared and overlapping risk factors and/or consequences that symptoms of anxiety and depression pose in relation to loneliness during mid-late adolescence. This might advance research that is theoretically and empirically relevant to prevention and treatment (Epkins & Heckler, 2011).

The developmentally based interpersonal model of depression (Rudolph et al., 2008, p. 80; see Appendix A for details) suggests that gender and social cognitive factors (e.g., social self-efficacy) might moderate the extent to which relationship disturbances heighten the risk for

depression (Hankin & Abela, 2005), as well as the extent to which depression influences interpersonal functioning (Coyne et al., 1998). Empirical findings indicate that the association between loneliness and symptoms of anxiety and depression could be stronger for girls than for boys (Chang, 2018; Rudolph et al., 2008). Girls, compared to boys, are increasingly likely to define themselves based on their interrelationships, be more dependent on social connections, prioritise goals in line with their relationships, and worry about others' evaluations of them (Rose & Rudolph, 2006). Furthermore, girls tend to increase in depressive symptoms due to their reactions to interpersonal stress, such as rumination (Rose & Rudolph, 2006).

People with a cognitive vulnerability are increasingly likely to experience a pattern of information processing that is inherently negatively biased, facilitating a descent into depression (Abela & Hankin, 2008). Social self-efficacy (i.e., social capability beliefs; Bandura, 1977, 1997) may function as a vulnerability/protective factor in the association between loneliness and symptoms of anxiety and depression. It is assumed that socially efficacious people pursue and maintain social connections that help the individual be in control of difficult situations and dampen the effect of negative life events. In contrast, people with low social self-efficacy have increased vulnerability to depression through social isolation (Bandura, 1994). Indeed, social self-efficacy is negatively associated with loneliness (Hermann & Betz, 2006; Tsai et al., 2017; Wei et al., 2005) and symptoms of anxiety and depression (Hermann & Betz, 2004; Kristensen et al., 2021; McFarlane et al., 1995) in adolescence and young adulthood.

Study Aims

Although the relationship between loneliness and symptoms of anxiety and depression in adolescence is gaining increased focus (Goossens, 2018), there is a gap in the research literature. The association between loneliness and anxiety and depressive symptoms has largely, perhaps only, been investigated on a between-person level, despite the fact that the relationship between the two should arguably be examined on a within-person level. That is, the temporal association between loneliness and symptoms of anxiety and depression might only make sense if the experienced levels in both constructs are relative to individuals' own normative level (i.e., how deviations in one construct are related to deviations in the other construct within individuals over time).

Our study aims to fill the abovementioned research gap. We use the evolutionary theory of loneliness (Cacioppo & Cacioppo, 2018), the interpersonal theory of depression (Coyne, 1976), the cumulative interpersonal risk model (Epkins & Heckler, 2011), and the developmentally based interpersonal model of depression (Rudolph et al., 2008) to create a hypothetical model of loneliness and symptoms of anxiety and depression, possibly moderated by gender or social self-efficacy. The model is presented in Fig. 1. Although little or no research has been done on the within-person associations of the study's variables, we use the abovementioned theoretical frameworks and models to inform the following hypotheses:

1. Loneliness and symptoms of anxiety and depression are positively related on a trait- and state level.

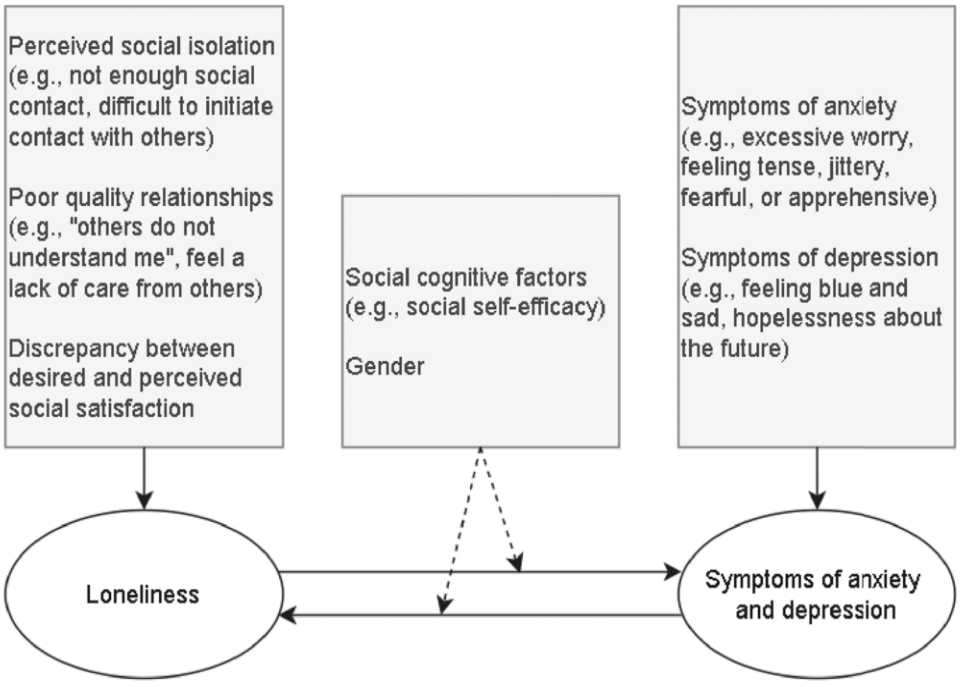

Fig. 1 Hypothesised Relationship Between Loneliness and Symptoms of Anxiety and Depression. *Note*. The model is based on theoretical assumptions in ETL and rationales from the interpersonal model of youth depression (Rudolph et al., 2008, p. 80) and the cumulative interpersonal risk model (Epkins & Heckler, 2011). Dashed lines represent moderating effects

2. Loneliness is positively associated with subsequent symptoms of anxiety and depression at the within-person level.
3. Symptoms of anxiety and depression are positively associated with subsequent loneliness at the within-person level.
4. Gender moderates the association between loneliness and symptoms of anxiety and depression (i.e., the association is stronger for girls compared to boys).
5. Social self-efficacy moderates the association between loneliness and symptoms of anxiety and depression (i.e., the association is stronger for people with low social self-efficacy compared to people with high social self-efficacy).

Methods

Procedure

The COMPLETE project (Larsen et al., 2018) followed a sample of Norwegian adolescents from approximate age 15 to 19. The project is a randomised controlled trial with two intervention groups and one control group. There were six schools each in the intervention group and four schools in the control group. All general education programme students who enrolled in the first year of upper secondary school (a three-year education) in August 2016 in the selected schools were asked to participate in the study. The students who agreed answered a questionnaire shortly after and were invited to respond to the same questionnaire again in March, nearing the end of the school year, in 2017, 2018, and 2019. Students under the age of 16 at baseline needed parental/guardian consent to participate in the study. Individuals who did not provide this consent were invited to participate again at the following measurement occasion – all students were above the age of 16 at this time point. The study was approved by the Norwegian Centre for Research Data (NSD), and the participants received written and oral information about the study ahead of participation. Data was gathered on school grounds physically by research members in the project.

Participants

The sample consisted of 1508 adolescents (see Missing Data section for more information on response rates), wherein 60.7% (N = 916) were girls, and 39.3% (N = 592) were boys. The mean age at the first measurement occasion was 16.33 (*SD* = 0.62). Concerning the ethnicity of the participants, 70.6% (N = 1065) were Norwegian-born, 5.5% (N = 83) were non-ethnic Norwegian, and 23.9% (N = 360) did not answer the question. A median split of perceived family wealth showed that 52.9% (N = 797) perceived their family as being in a high socioeconomic position, while 22.5% (N = 340) perceived their family as being in a low socioeconomic position and 24.6% (N = 371) did not answer the question.

Measurements

Loneliness

Loneliness was measured using a slightly modified six-item short form of the UCLA loneliness scale, developed for population-based studies in Western Norway (Kraft & Loeb, 1997; Mittelmark et al., 2004). An example indicator is 'I feel lonely even when I am around other people'. The participants rated their answers on a scale ranging from 1 'Not at all true' to 5 'Very true'. The adapted short form has shown adequate reliability, with Cronbach's alpha values above 0.77 (Mittelmark et al., 2004).

Symptoms of Anxiety and Depression

To measure anxiety and depressive symptoms, a short Norwegian version of the Symptom Check List-90-R (SCL-5; Tambs & Moum, 1993) was used, with items from the anxiety and depression subscales. The participants were asked to rate how bothered or distressed they had felt during the last 14 days on a scale ranging from 1 'not at all' to 4 'very much'. Indicator examples of anxiety and depression are 'nervousness or shakiness inside' and 'feeling hopeless about the future', respectively. Studies have found the Cronbach's reliability of the SCL-5 to be higher than 0.83 (Gjerde et al., 2011; Skrove et al., 2013; Strand et al., 2003; Tambs & Moum, 1993). Of note, this scale is not a clinical assessment of or diagnostic tool for anxiety and depression but instead a measure of *symptoms* of mixed anxiety and depression (Siqveland et al., 2016). The cut-off value to best predict the presence of mental disorders and/or belonging to a high-risk group is 2.0 for the SCL-5 (Strand et al., 2003).

Social Self-efficacy

We used the social subscale from the Self-efficacy Questionnaire for Children (SEQ-C: Muris, 2001) to measure social self-efficacy. The scale was adapted to fit the adolescent age group, that is, wordings like 'children' were replaced with 'peers' and so on. The social SEC-Q consists of seven indicators that participants rated on a scale ranging from 1 'not at all' to 5 'very well'. A sample item is 'How well can you become friends with peers?'. Previous research has found Cronbach's alpha values above 0.81 in adolescent samples (Minter & Pritzker, 2015; Muris, 2001, 2002). Because social self-efficacy was tested as a moderator, we created a dummy variable by doing a median split on the personal mean level of social self-efficacy across all

measurement waves. Thus, adolescents were, on average, either in the low (coded as 0) or high (coded as 1) social self-efficacy group.

Gender

Gender was coded as 0 (boys) and 1 (girls).

Control Variables

We included several time-invariant covariates in the model. The participant's socioeconomic position was assessed by a question on how well off economically they perceived their family to be (Iversen & Holsen, 2008). Individuals rated their perceived family wealth on a scale ranging from 1 (not at all well off) to 5 (very well off). Baseline socioeconomic position was dummy coded as 0 (low) and 1 (high) by a median split. Ethnicity was coded as 0 (Norwegian-born) and 1 (non-ethnic Norwegian). The two dummy variables for intervention conditions were coded as 0 (control group) and 1 (intervention condition).

Data Analyses

Preliminary Analyses

Initially, we investigated the omega reliability and longitudinal measurement invariance of the study's constructs. Next, we followed the procedure by Snedecor and Cochran (1980) to investigate the difference in correlation coefficients between subgroups across time. We used SPSS version 25 for data cleaning and correlation analysis and M*plus* version 8 (Muthén & Muthén, 1998–2017) for structural equation modelling. We used the following criteria to evaluate if the structural equation models achieved acceptable fit: CFI (> 0.90), RMSEA (< 0.08), and SRMR (< 0.08) (Hu & Bentler, 1999). When performing longitudinal measurement invariance testing, we used the effects-coding approach by (Little et al., 2006). Thus, the latent factors' means and variances were constrained to 0.0 and 1.0, respectively. We specified configural models for the loneliness and symptoms of anxiety and depression constructs and applied factor loading constraints to establish weak (metric) measurement invariance across time and the moderation subgroups. Acceptable differences between the nested models and the comparison models were evaluated using the following criteria: ΔCFI < 0.010, ΔRMSEA < 0.015, and ΔSRMR < 0.030 (Chen, 2007). The invariance constraints were retained for further modelling. For space considerations, measurement invariance results are presented in the appendices (see Appendix B for details).

Primary Analyses

For the main analysis, we specified a random intercept cross-lagged panel model (RI-CLPM) between loneliness and symptoms of anxiety and depression using maximum likelihood estimation. This was achieved by creating corresponding latent factors for each first-order latent factor at all time points (four variables in each construct), with factor loading constrained to 1 and a random intercept for each construct, regressed by all first-order latent factors, with factor loadings constrained to 1 (Hamaker, 2018; Hamaker et al., 2015; Mulder & Hamaker, 2021). The variance of the first-order latent variables was constrained to 0.0 to ensure all variance is captured by the between-person variables (intercepts) and within-person variables. Next, we included gender, social self-efficacy, socioeconomic position, ethnicity, and intervention conditions as time-invariant covariates regressed by the random intercepts. Lastly, we investigated whether the correlation and regression coefficients in the RI-CLPM were time-invariant by constraining the within-person correlation coefficients and autoregressive- and cross-lagged regression coefficients to be equal over time and comparing the model fit of the nested model to the comparison model. A significant deterioration of model fit would indicate that the effects were not invariant over time and the constraints would be removed for further modelling.

Next, we tested if gender or social self-efficacy moderated the between- and within-person associations between loneliness and symptoms of anxiety and depression in the RI-CLPM. Preliminarily, we investigated RI-CLPMs of all groups without constraints and with time-invariant correlation and regression coefficients. If chi-square did not significantly deteriorate, we would keep the constraints in the moderation analyses. Lastly, we performed two multi-group analyses (one for gender and one for social self-efficacy) on the RI-CLPM with 1000 bootstrap replications and compared the parameters across groups using model constraints. We included gender as a time-invariant covariate in the social self-efficacy moderation model and social self-efficacy in the gender moderation model.

Results

Missing Data

When examining possible construct-level missingness in our data, we considered response rates across measurement occasions (Newman, 2014). See Table 1 for details. We also investigated the partial correlations of loneliness and missingness in loneliness at the following time point while controlling for the effect of symptoms of anxiety and depression (and vice versa) across measurement waves. There were no

Table 1 Response Rates

	T1	T2	T3	T4
Invited participants	1508	1508	1478	1478
Respondents	1151	1184	949	1016
Response rate	76.3%	78.5%	64.2%	68.7%
Full response rate	71.9%	74.7%	61.6%	66%
Partial response rate	4.4%	4.1%	2.6%	2.7%

Full response rate individuals who responded to both scales, *partial response rat*e individuals who responded to only one scale

significant associations between a construct and following missingness in the same construct in either loneliness or anxiety and depression, indicating that the construct-level missingness in our data is approximate to or approaching missing at random (MAR) (Newman, 2014). We used full information maximum likelihood (FIML) estimation to handle potential construct-level missingness in our data.

Descriptive Statistics and Correlations

The descriptive statistics of the study's variables are presented in Table 2. The omega reliability results imply that symptoms of anxiety and depression and loneliness had satisfactory reliability across measurement occasions ($\omega >$ 0.80). The results imply that girls were considered a high-risk group concerning mental health at all time points ($\geq$ 2.0), while the boys were not on any measurement occasion. Similarly, the group with low social self-efficacy reported values above the cut-off in symptoms of anxiety and depression throughout the study, while adolescents with high social self-efficacy did not. In general, boys and youths with high social self-efficacy experienced lower anxiety and depressive symptoms and loneliness compared to girls and youths with low social self-efficacy, respectively. According to Cohen (1988), the differences between genders and social self-efficacy groups were moderate (> 0.50) and small (> 0.20), respectively. Concerning loneliness, the differences between boys and girls were small, while the differences between the low and high social self-efficacy groups were large (> 0.80).

Tables 3 and 4 show the results of the correlations between the study's variables across gender and social self-efficacy groups, respectively. The within-construct associations of loneliness and symptoms of anxiety and depression were positive and moderate (> 0.30) to large (> 0.50) (Cohen, 1988) across all time points in all subgroups. The between-construct correlations of loneliness and symptoms of anxiety and depression were positive and ranged from small (> 0.10) to large, wherein the effect sizes were smaller the greater the distances were in time. There were several correlations within and between loneliness and symptoms of anxiety and depression that were significantly larger for girls compared to boys (see Table 3 for details). Concerning social self-efficacy, only correlations within loneliness over time were significantly stronger within the low social self-efficacy group compared to the group with high social self-efficacy.

The Longitudinal Association Between Loneliness and Symptoms of Anxiety and Depression

The RI-CLPM of loneliness and symptoms of anxiety and depression with time-invariant covariates and metric longitudinal invariance constraints achieved acceptable model fit (CFI > 0.90, RMSEA < 0.08, SRMR < 0.08). The model fit did not significantly deteriorate when we applied time-invariant constraints on the correlation and regression coefficients ($\Delta\chi^2 = 8.28$, $\Delta df = 11$, $p = 0.688$): $\chi^2 = 2677.38$ $df = 1101$, $p < 0.001$, RMSEA = 0.04, 95% CI [0.03, 0.04], CFI = 0.94, SRMR = 0.05. Therefore, the time-invariance

Table 2 Descriptive Statistics of the Study Variables

				Gender			Social self-efficacy		
				Boys	Girls		Low	High	
Variable	N	ω	Min – Max	*M (SD)*	*M (SD)*	*d*	*M (SD)*	*M (SD)*	*d*
AD symptoms T1	1114	0.90	1 – 4	1.55 (0.67)	2.00 (0.78)	–0.63	2.02 (0.82)	1.67 (0.69)	0.46
AD symptoms T2	1147	0.90	1 – 4	1.60 (0.63)	2.17 (0.82)	–0.76	2.15 (0.82)	1.78 (0.74)	0.47
AD symptoms T3	926	0.90	1 – 4	1.70 (0.71)	2.20 (0.80)	–0.65	2.19 (0.83)	1.84 (0.74)	0.46
AD symptoms T4	994	0.89	1 – 4	1.88 (0.28)	2.28 (0.81)	–0.51	2.35 (0.83)	1.94 (0.74)	0.53
Loneliness T1	1088	0.81	1 – 5	2.07 (0.72)	2.22 (0.78)	–0.20	2.52 (0.74)	1.88 (0.65)	0.94
Loneliness T2	1146	0.80	1 – 5	2.11 (0.70)	2.33 (0.78)	–0.31	2.62 (0.70)	1.94 (0.65)	1.03
Loneliness T3	915	0.81	1 – 5	2.20 (0.78)	2.38 (0.77)	–0.23	2.70 (0.71)	1.99 (0.68)	1.03
Loneliness T4	984	0.84	1 – 5	2.25 (0.84)	2.38 (0.80)	–0.17	2.71 (0.76)	2.00 (0.71)	0.96

AD anxiety and depressive, *d* cohen's *d*

Table 3 Correlation Coefficients of the Study Variables Separated by Gender

	1.	2.	3.	4.	5.	6.	7.	8.
1. AD symptoms T1	–	0.64[a]	0.45	0.40	0.60	0.49[a]	0.41	0.27
2. AD symptoms T2	0.52	–	0.60	0.53	0.51[a]	0.62[a]	0.50	0.40
3. AD symptoms T3	0.49	0.57	–	0.66	0.28	0.45	0.61	0.43
4. AD symptoms T4	0.41	0.48	0.61	–	0.30	0.39	0.50	0.61
5. Loneliness T1	0.55	0.39	0.33	0.41	–	0.70[a]	0.52	0.44
6. Loneliness T2	0.33	0.52	0.41	0.42	0.59	–	0.68[a]	0.52
7. Loneliness T3	0.40	0.41	0.57	0.49	0.54	0.60	–	0.67
8. Loneliness T4	0.35	0.41	0.40	0.63	0.52	0.59	0.66	–

Boys are below the diagonal, and girls are above. All correlations are significant at the 0.001 level

AD anxiety and depressive

[a]significantly stronger correlation compared to the other subgroup

constraints were considered tenable. The standardised model results are presented in Fig. 2, and more details are provided in Appendix C.

At the between-person level, the random intercepts of loneliness and symptoms of anxiety and depression were positively and strongly related. This indicates that individuals who, in general, experienced high levels of loneliness during mid-late adolescence also reported high levels of anxiety and depression during the same time. At the within-person level, there were positive and strong associations between loneliness and symptoms of anxiety and depression at each time point. This implies that positive or negative fluctuations at one time point in loneliness are related to similar fluctuations in symptoms of anxiety and depression simultaneously. We found positive carry-over stability effects in both loneliness and symptoms of anxiety and depression over time. This implies that adolescents who experienced higher or lower levels than expected of either loneliness or symptoms of anxiety and depression on one occasion had an increased likelihood of experiencing the same deviation in the corresponding construct at the next time point. Lastly, there were positive and significant cross-lagged effects from symptoms of anxiety and depression to later loneliness, but not the other way around. This indicates that adolescents who experienced a deviation in anxiety and depressive symptoms at one time point likely experienced the same deviation in loneliness at the next time point but not vice versa.

Moderation of the Association Between Loneliness and Symptoms of Anxiety and Depression

Gender

When comparing unconstrained to constrained models within each gender, the model fit did not significantly deteriorate for either girls or boys ($p > 0.05$). Thus, we tested the difference between six parameters between boys and girls in the RI-CLPM of loneliness and symptoms of anxiety and depression: the time-invariant correlations, autoregressive and cross-lagged regression coefficients at the within-person level and the correlation between the random intercepts. The gender multi-group RI-CLPM of loneliness and symptoms of anxiety and depression achieved satisfactory fit: $\chi^2 = 4065.90$, $df = 2163$, $p < 0.001$, RMSEA = 0.04, 95% CI [0.04, 0.04], CFI = 0.92, SRMR = 0.06. The model results

Table 4 Correlation Coefficients of the Study Variables Separated by Low and High Social Self-efficacy Groups

	1.	2.	3.	4.	5.	6.	7.	8.
1. AD symptoms T1	–	0.61	0.48	0.42	0.55	0.37	0.37	0.27
2. AD symptoms T2	0.63	–	0.61	0.53	0.46	0.54	0.42	0.35
3. AD symptoms T3	0.51	0.62	–	0.66	0.26	0.39	0.55	0.40
4. AD symptoms T4	0.43	0.52	0.64	–	0.31	0.37	0.42	0.58
5. Loneliness T1	0.56	0.42	0.29	0.27	–	0.54	0.38	0.41
6. Loneliness T2	0.45	0.59	0.41	0.35	0.64[a]	–	0.52	0.48
7. Loneliness T3	0.36	0.44	0.58	0.49	0.49[a]	0.62[a]	–	0.59
8. Loneliness T4	0.23	0.30	0.37	0.32	0.32	0.42	0.60	–

The low social self-efficacy group is below the diagonal, and the high social self-efficacy group is above. All correlations are significant at the 0.001 level

AD anxiety and depressive

[a]significantly stronger correlation compared to the other subgroup

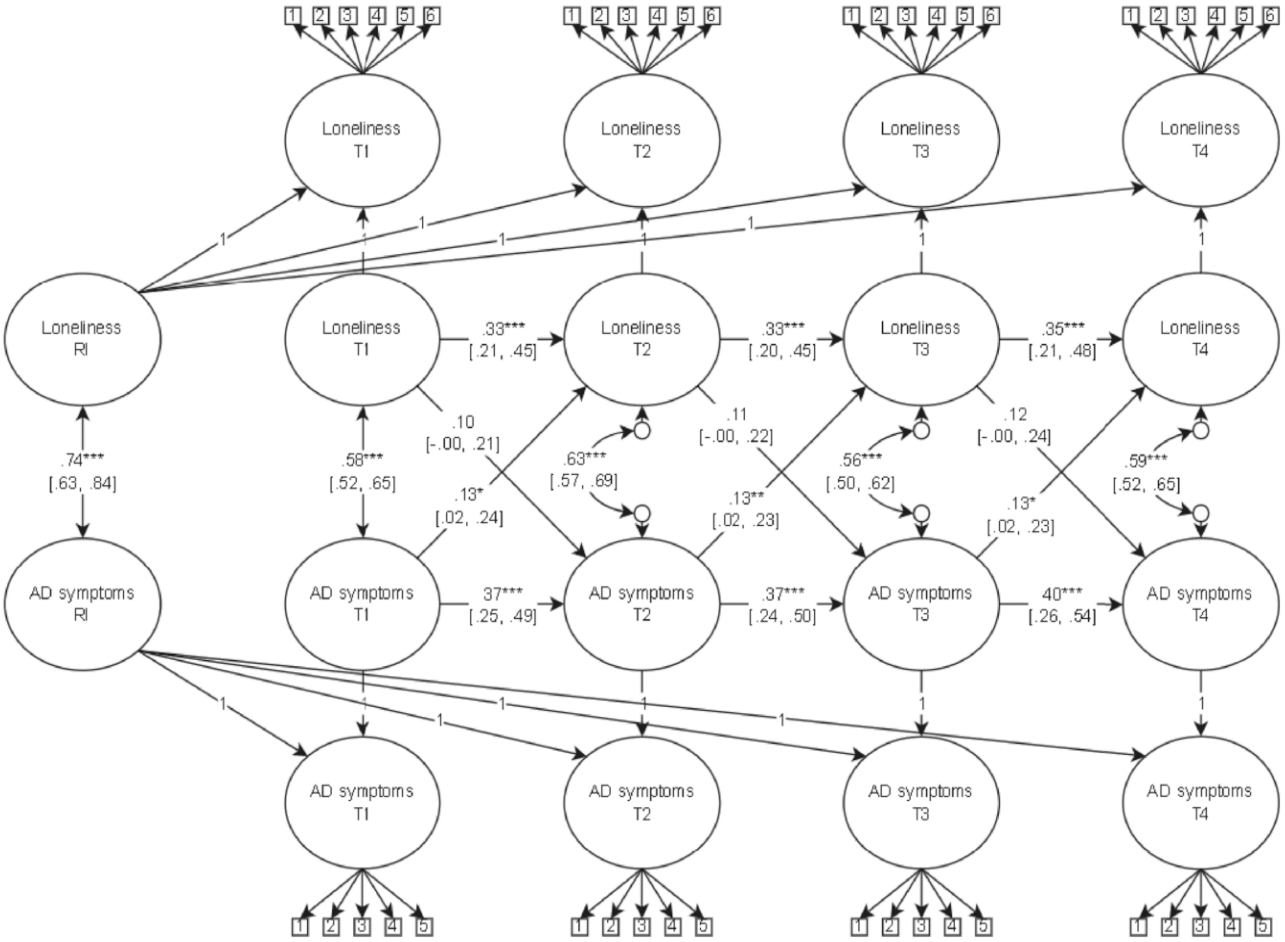

Fig. 2 Random Intercept Cross-lagged Panel Model of Loneliness and Symptoms of Anxiety and Depression. *Note*. RI = random intercept, AD = anxiety and depressive. Standardised estimates presented with 95% confidence interval in brackets. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

are presented in Fig. 3, and further details are provided in Appendix D. We found that gender differed on two parameters. One, the concurrent state-like associations between loneliness and symptoms of anxiety and depression were significantly stronger for girls across all measurement waves compared to boys ($r_{diff} = 0.07$, $p < 0.05$). Two, the within-person effects from symptoms of anxiety and depression to later loneliness throughout the study were significantly higher for girls compared to boys ($B_{diff} = 0.30$, $p < 0.001$).

Social Self-efficacy

The model fit did not significantly change when comparing nested, fully time-invariant models to completely unconstrained models within the low and high social self-efficacy groups ($p > 0.05$). As such, we tested the difference between the same six parameters as in the gender moderation model: the time-invariant correlations, autoregressive and cross-lagged regression coefficients at the within-person level and the correlation between the random intercepts. The results from the social self-efficacy moderation analysis on the loneliness and symptoms of anxiety and depression RI-CLPM produced acceptable model fit: $\chi^2 = 4002.76$, $df = 2163$, $p < 0.001$, RMSEA = 0.04, 95% CI [0.04, 0.04], CFI = 0.91, SRMR = 0.07. The standardised results from the model are presented in Fig. 4, and unstandardised and standardised estimates, standard errors, and bootstrapped 95% confidence intervals are presented in Appendix E. Even though the low and high social self-efficacy groups have somewhat different coefficients, these differences were not significant ($p > 0.05$). This indicates that high social self-efficacy does not act as a protective factor in the within- and between-person association between loneliness and symptoms of anxiety and depression.

Discussion

The present study had two main goals. First, we wanted to investigate how loneliness and symptoms of anxiety and depression were associated at the within- and between-person level during mid-late adolescence. Second, gender and social self-efficacy were tested as possible moderators in this relationship. We found that symptoms of anxiety

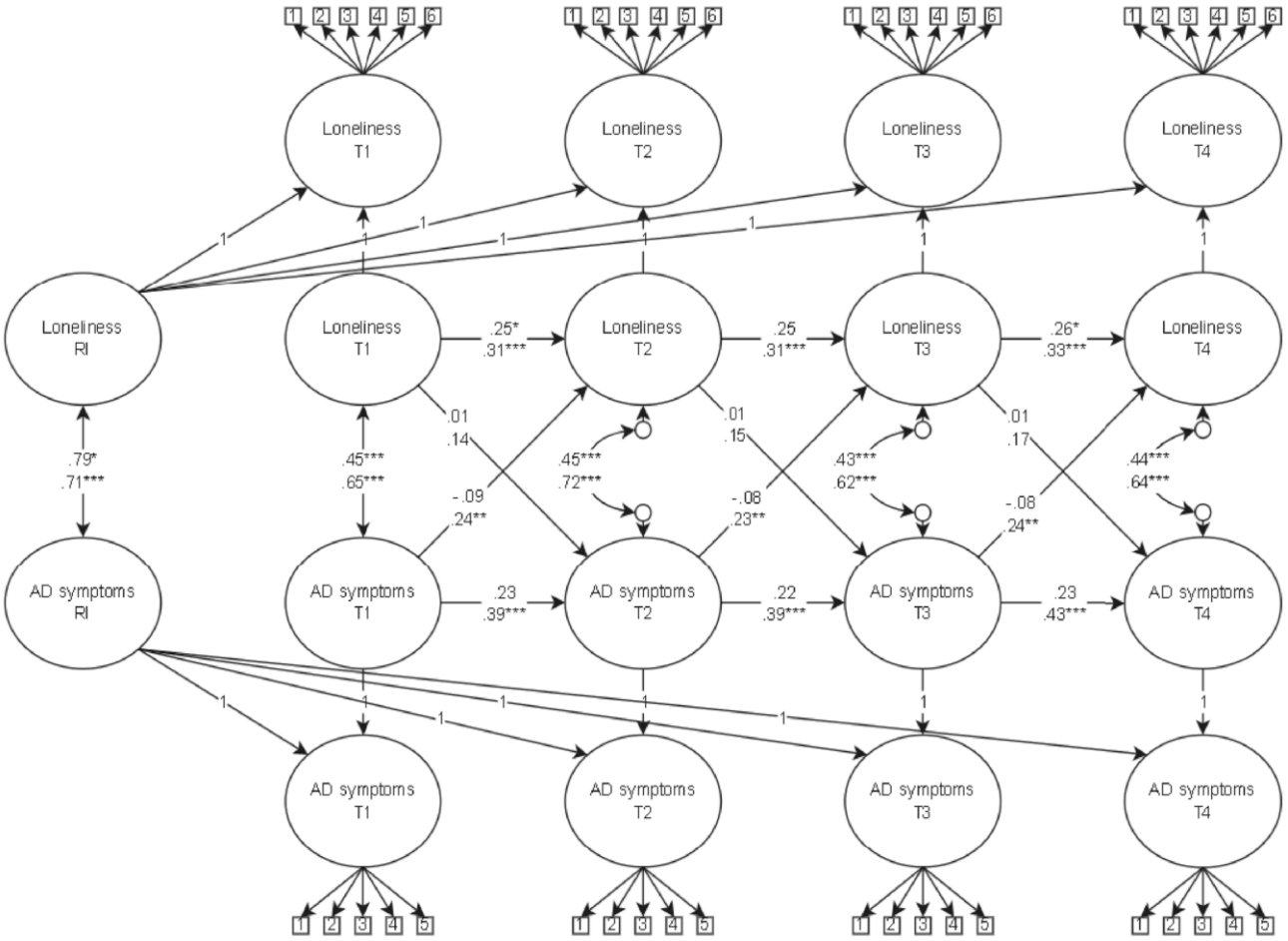

Fig. 3 Random Intercept Cross-lagged Panel Model of Loneliness and Symptoms of Anxiety and Depression Moderated by Gender, *Note*. RI = random intercept, AD = anxiety and depressive. Boys on upper line and girls on lower line. Standardised estimates presented in figure. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

and depression had an effect on later loneliness but not vice versa. Next, girls seemed to be more sensitive and at risk regarding the state-like associations between loneliness and symptoms of anxiety and depression compared to boys. Lastly, social self-efficacy might not be considered an important protective factor in the relationship between loneliness and symptoms of anxiety and depression.

Loneliness and Symptoms of Anxiety and Depression in a Developmental Perspective

The Trait-like Association

In support of hypothesis 1, our results indicate that adolescents who, in general, experience symptoms of anxiety and depression are highly likely to also feel lonely during three years in the mid-late adolescent period. In other words, the trait-like components of anxiety and depression symptoms and loneliness were strongly related. This is largely in line with previous research, which has found positive associations between loneliness, anxiety, and depression (Beutel et al., 2017; Erzen & Çikrikci, 2018; Park et al., 2020). The trait-like association between loneliness and symptoms of anxiety and depression might, in part, be related to the conceptualisation of the constructs. For example, Peplau and Perlman (1982) illustrate that loneliness taps into feelings that are central to anxiety and depression, such as distress, sadness, lacking care, psychological discomfort, and boredom. Individuals who feel lonely on a trait level are more likely to be less socially competent, believe their loneliness is due to ever-lasting personal qualities, and struggle to overcome social shortages (Perlman & Peplau, 1998). Adolescents with these perceptions and beliefs are arguably expected also to experience feelings of sadness, apprehension, worry, nervousness, and hopelessness simultaneously. This is further supported by the strong state-like associations between loneliness and symptoms of anxiety and depression across time. Consistently in mid-late adolescence, individuals that were lonelier than usual on one occasion, were increasingly likely to experience higher than average symptoms of anxiety and depression at the same time point.

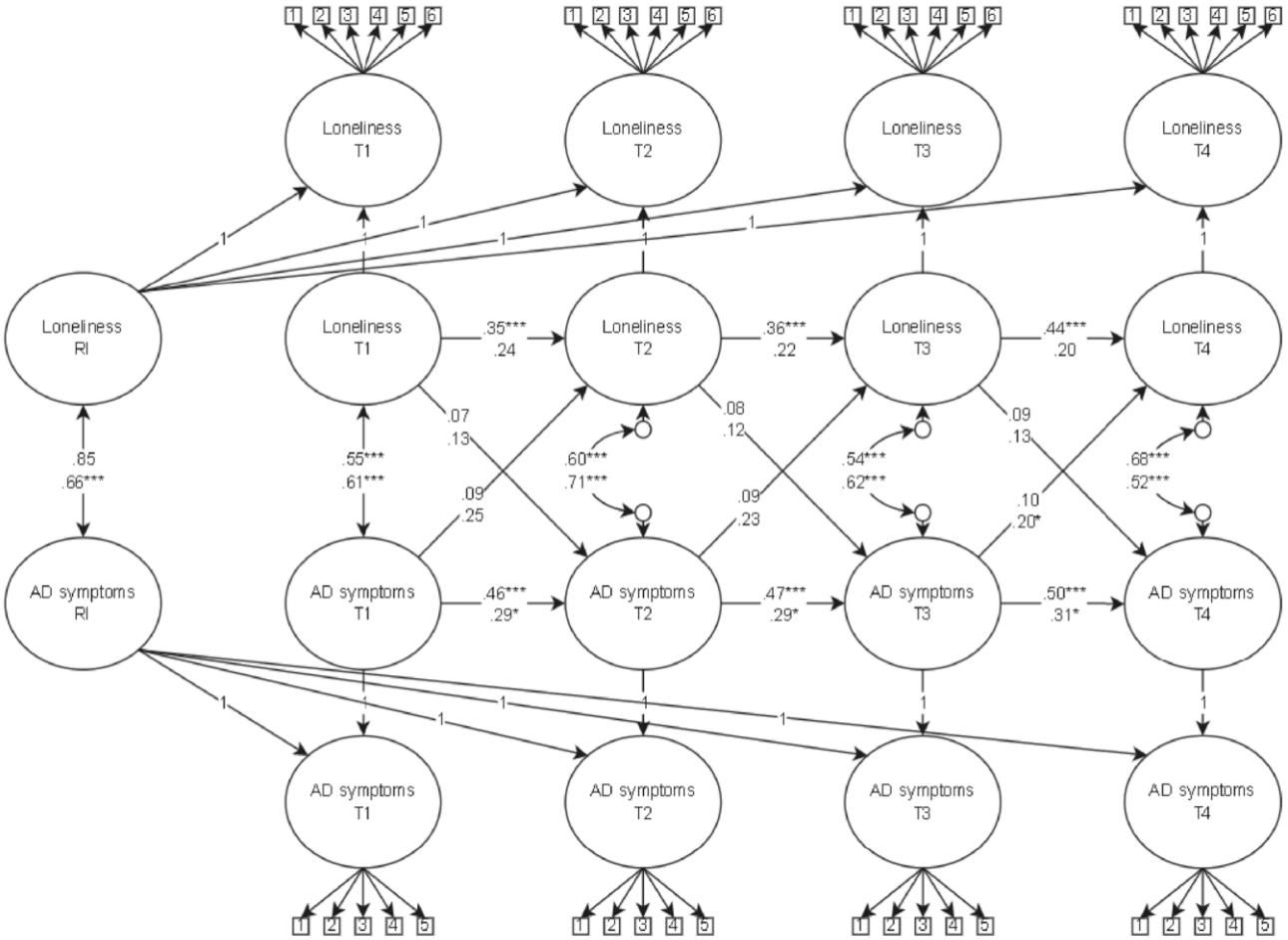

Fig. 4 Random Intercept Cross-lagged Panel Model of Loneliness and Symptoms of Anxiety and Depression Moderated by Social Self-efficacy. *Note*. RI = random intercept, AD = anxiety and depressive. High social self-efficacy on upper line and low social self-efficacy on lower line. Standardised estimates presented in figure. *** $p < 0.001$, *$p < 0.05$

Carry-over Stability Effects

The positive carry-over stability effects in loneliness might be related to the major social transitions that take place during mid-late adolescence. First, during adolescence, peer relationships become increasingly important, while parental influence diminishes (Larson & Richards, 1991; Prinstein & Dodge, 2008), causing several social expectancies and alterations that can be challenging (or exceedingly easy) for some individuals. Second, most people begin an upper secondary school education at age 15–16, which is a major shift in adolescents' social lives (Eccles & Roeser, 2009, 2011; Wigfield et al., 1991). Third, during adolescence, individuals experience sexual maturation and an increased interest in pursuing romantic relationships with others (Collins et al., 2009), which could both alter individuals' perception of what being alone means and bring about several time periods of unusual relationship satisfaction or dissatisfaction.

We found positive carry-over stability effects within symptoms of anxiety and depression, implying that adolescents who experienced an unusual level of anxiety and depression at one time point likely experienced the same unusual level one year later. This finding has been discussed in light of helplessness-hopelessness theory (Kristensen et al., 2021), which states that periods of increased symptoms of anxiety and depression are likely to be followed by the same deviations of anxiety and depressive symptoms due to a vicious cycle of exacerbating symptoms over time (Alloy et al., 1990).

The Temporal Relationship between Loneliness and Symptoms of Anxiety and Depression

In contradiction to hypothesis 2 and previous research (see Cacioppo & Cacioppo, 2018 for an overview; Lim et al., 2016; Wei et al., 2005), our results indicate that feelings of unusually high or low loneliness did not predict unexpectedly high or low symptoms of later anxiety and depression. Because previous research has largely failed to separate the within-person effects from between-person effects, the assumption that loneliness increases subsequent mental health issues might be overestimated (Hamaker et al.,

2015). Thus, although reducing feelings of being socially isolated is an important goal in itself, our findings question whether modifying unusual perceptions of social isolation would improve unexpected levels of adolescent anxiety and depressive symptoms. Interventions aimed at reducing loneliness have not separated implementation strategies between persistent (trait) and transient (state) loneliness (Eccles & Qualter, 2021), which could be important in future endeavours aimed at decreasing unusual loneliness.

We found that higher-than-normal symptoms of anxiety and depression were predictive of unusually high feelings of subsequent loneliness throughout the study. This result could imply that initiatives aimed at reducing anxiety and depressive symptoms in adolescence (see e.g., Das et al., 2016 for an overview) may decrease loneliness as a result. However, it is also important to identify adolescents who experience symptoms of anxiety and depression that are out of the ordinary (i.e., deviating from their personal norm). Significant adults that are close to adolescents, such as parents (Logan & King, 2001), teachers (Rothì et al., 2008), school healthcare professionals (Levinson et al., 2019), and guidance counsellors (Collins, 2014) or school administrators (Green et al., 2013) need resources and competence to identify and deal with negative fluctuations in young people's mental health to avoid unusual escalations of loneliness.

Is the Association between Loneliness and Symptoms of Anxiety and Depression More Salient for Some?

In support of hypothesis 4, we found that 1) the state-like association between loneliness and symptoms of anxiety and depression and 2) the within-person effect of anxiety and depressive symptoms on later loneliness were more salient for girls than boys. Girls rely on social relationships and the support these bring about to a greater extent (Derdikman-Eiron et al., 2012). Because unexpected loneliness and symptoms of anxiety and depression arise simultaneously for girls, they could have increased difficulties in seeking help due to a perception of not having caring and supportive relationships (Gadalla, 2008; Gagné et al., 2014) or an unease about opening up regarding their loneliness (Verity et al., 2022). Girls' mental health benefits more from social bonds and support compared to boys (Rose & Rudolph, 2006). Thus, if lonely girls believe they do not have a socially supportive environment, they could have more trouble seeking help for their symptoms of anxiety and depression, resulting in a reinforcing effect of anxiety and depressive symptoms on later loneliness experiences.

In contradiction to hypothesis 5, we found that social self-efficacy did not moderate any effects in the association between loneliness and symptoms of anxiety and depression. The lack of moderation is somewhat surprising, considering theories and models within a vulnerability framework (e.g., Hankin & Abela, 2005) argue that low social self-efficacy functions as a vulnerability factor in the development of anxiety and depressive symptoms (Bandura, 1997). The results indicate that adolescents likely experience loneliness following an unexpected rise in anxiety and depression symptoms, despite how socially capable they perceive themselves to be. As such, even though people who are socially efficacious behave in ways that are socially desirable, they could still lack fundamental care and understanding from the people around them. It is possible that a central element to this (non)effect is that the experience of loneliness is a qualitative issue, not quantitative – we need connections that satisfy our need to belong (e.g., Baumeister & Leary, 1995; Bowlby, 1979; Cacioppo & Patrick, 2008; Ryan & Deci, 2017), not necessarily several connections that do not (Qualter et al., 2015).

Limitations

One limitation of the current study is the dichotomisation of the social self-efficacy variable. This could lead to several problems regarding power and inferences. First, by creating a dummy variable, when said variable is continuous in nature, we assume that the logical cut-off point is the median level without really knowing this to be true. Second, we lose statistical power by the dichotomisation (Cohen, 1983; MacCallum et al., 2002). Third, there is a chance that we miss non-linearity in the relationship between the dichotomised variable and other factors. However, despite the drawbacks of creating a dummy variable of social self-efficacy, the statistical benefits of using the factor as a multi-group moderator variable in the within-person association between loneliness and symptoms of anxiety and depression were deemed to outweigh the downsides.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s10802-022-00995-1.

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Compliance with Ethical Standards

Conflict of Interests We have no known conflict of interest to disclose.

Ethical Approval This study was approved by the Norwegian Centre for Research Data (NSD).

Informed Consent Informed consent was obtained from all participants.

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EMPIRICAL RESEARCH

Academic Stress, Academic Self-efficacy, and Psychological Distress: A Moderated Mediation of Within-person Effects

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Abstract

Previous research has largely failed to separate the between- and within-person effects in the longitudinal associations between academic stress, academic self-efficacy, and psychological distress (symptoms of anxiety and depression). Filling this research gap, this study investigated if academic self-efficacy mediated the relationship between academic stress and psychological distress at the intraindividual level during 3 years of upper secondary school. Gender moderation was also examined in the hypothesised model. The present sample consisted of 1508 Norwegian adolescents (baseline M age = 16.42; 52.9% high perceived family wealth; 70.6% Norwegian-born). The random intercept cross-lagged panel model results indicated (1) positive and time-invariant direct effects from academic stress to psychological distress, (2) academic self-efficacy partially mediated these effects, and (3) psychological distress impacted later academic stress. Academic stress was more strongly related to academic self-efficacy and psychological distress at the interpersonal level for boys, while the intraindividual impact of academic stress on psychological distress was stronger for girls. The study findings might have implications for school-based implementation strategies and theoretical development.

Keywords Academic stress · Academic self-efficacy · Psychological distress · Gender differences · Random intercept cross-lagged panel model

Introduction

School-related stress affects young people's quality of life (Berdida & Grande, 2022). Studies show that academic stress (Högberg et al., 2020), including demands and pressure from school (Wiklund et al., 2012) and school-related worry (Sweeting et al., 2010), impacts psychological distress (i.e. symptoms of anxiety and depression: Drapeau et al., 2012; Mirowsky & Ross, 2002) (Torsheim & Wold, 2001) over and beyond previous depressive symptoms (Murberg & Bru, 2005) on an interpersonal, between-person level. However, the intraindividual (i.e. within-person) relationship between academic stress and psychological distress, including relevant explanatory mechanisms and moderators, has largely been ignored. This study employs a moderated random intercept cross-lagged panel model (RI-CLPM) to examine the intraindividual, longitudinal associations between academic stress, academic self-efficacy, and psychological distress in a cohort of upper secondary school students.

During late secondary school, people experience increasing academic pressure from significant adults such as parents (Deb et al., 2015) and teachers (Song et al., 2015). In addition, comparing oneself to and competing with peers intensifies during this period (Eccles et al., 2003), and a series of final examinations that decide future work and educational prospects are on the horizon. In other words, students experience many day-to-day hassles related to their education, such as different pressures and demands to perform well academically during late secondary school (Dewald et al., 2014; Pascoe et al., 2020), and stressful feelings (Leonard et al., 2015; McGraw et al., 2008; Moeller et al., 2020). How adolescents experience stress is highly individual and varies in terms of duration and intensity (Moksnes, Byrne, et al., 2010). Motivation, performance, and well-being can increase if stressors feel challenging due to goal relevance and manageability, resulting in positive stress (eustress: Selye, 1974) (Travis et al., 2020). However, if people lack resources to cope with the various pressures and demands, the stressors are perceived as threatening and can be

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detrimental to psychological health and well-being (Murberg & Bru, 2005). When adolescents cannot handle a situation, negative stress and accompanying adverse feelings arise (Lazarus, 1966; Sarafino & Smith, 2022).

An increasing secular trend of adolescent psychological distress has been observed during the past decades, internationally (Collishaw, 2015) and particularly in northern Europe (Potrebny et al., 2017) and Norway (von Soest & Wichstrøm, 2014). In Norway, adolescent psychological distress has approximately doubled from 2006 to 2019, increasing from 15 to 30% (Krokstad et al., 2022). A recent study found that academic stress partly explains the rising trend of psychological distress during adolescence (Högberg et al., 2020). The 'educational stressors hypothesis' has been put forth as a possible explanation for this association (West & Sweeting, 2003). The educational stressors hypothesis argues that there is a societal development of increasing emphasis on and value of educational attainment, which comes with an increase in school-related stressors (West & Sweeting, 2003). The rising pressure to perform academically and a more prominent focus on normative testing are accompanied by adverse experiences associated with being evaluated, negatively affecting young people's health (Karvonen et al., 2005). Girls are more likely to experience stress due to these pressures and demands because they place more value on schoolwork and are more susceptible to stressors in their educational environment than boys (Landstedt et al., 2009; Schraml et al., 2011).

Academic self-efficacy (i.e. a person's belief regarding their capabilities to perform academically: Bandura, 1997) might constitute an explanatory mechanism in the relationship between academic stress and psychological distress (Lazarus, 2006). When people perceive their school-and homework as stressful, their academic self-efficacy might decrease due to the adverse affective state that characterises the negative evaluation (Bandura, 1997). In support of this assumption, studies indicate that school-related stress negatively impacts academic self-efficacy (McKay et al., 2014; Ye et al., 2018). Further, low academic self-efficacy has been established as a predictor of psychological distress cross-sectionally (Karademas & Kalantzi-Azizi, 2004) and longitudinally (Bandura et al., 1999). A reduction in academic self-efficacy might impede individuals' ability and drive to handle the academic pressures, demands, and difficulties that instigated stressful feelings in the first place, which could result in negative emotions. If individuals do not believe in their academic capabilities enough to cope with their perceived academic stress, feelings of hopelessness and anxiety are promoted (Flett et al., 2011).

Self-efficacy and the Transactional Theory of Stress and Coping

Lazarus and Folkman (1984) argue that people continuously go through primary and secondary cognitive appraisals, evaluating their situations and the resources available to handle them. A primary appraisal concerns the personal implications of a situation. In late secondary school, students continuously appraise their workload, namely if their school- and homework have implications for their personal well-being. There are three types of situational implications: irrelevant, benign-positive, and stressful (Lazarus & Folkman, 1984, p. 32). A stressful appraisal concerns feelings of harm/loss, threat, or challenge. Feelings of threat and challenge are most relevant to evaluating school- and homework as an implication for personal well-being. *Threat* concerns anticipation of loss or harm, such as being unable to do school- and homework and consequently receiving poor grades. A *challenge* is a positive situation that could lead to personal growth, such as favourable consequences for school success. Students who evaluate their school-and homework as challenging likely experience eagerness, excitement, and exhilaration. On the other hand, students who consider their school workload threatening focus on the potential harms of the situation and characteristically experience negative emotions (Lazarus & Folkman, 1984).

When students perceive their school- and homework as stressful, they must do something to cope (Lazarus & Folkman, 1984). In this case, the second appraisal becomes salient and intricately interacts with the primary appraisal to shape individuals' emotional reactions (Lazarus & Folkman, 1984). The second appraisal is an evaluation of whether the individual can manage the stressful situation. In other words, what biological, social, and cognitive resources are available to meet and cope with the contextual demands? An example of this evaluation is context-specific self-efficacy (Lazarus, 2006). Perceiving a situation as a threat might negatively inform self-efficacy through the affective/physiological state experienced in the specific setting (Bandura, 1997). The stressful reaction to school- and homework might decrease self-efficacy in the same context (i.e. academic self-efficacy), resulting in increased psychological distress (Bandura, 1997). In contrast, if the academic workload is perceived as challenging, academic self-efficacy might increase due to the positive feelings associated with school-and homework, thus reducing psychological distress.

The transactional relationship between stress, coping, and emotions is a complex system, assumed to be recursive (Lazarus & Folkman, 1987). In other words, a precursor might become an outcome and vice versa as time progresses. Therefore, in addition to the assumed associations described above, it could be beneficial to investigate the possible recursive effects over time. Specifically, psychological distress might simultaneously be an outcome and an antecedent of academic stress and academic self-efficacy. Similarly, academic self-efficacy may be an outcome and precursor of academic stress. For example, psychological distress increases stress in general (Bandura, 1997; Hammen, 2005, 2020) and reduces academic self-efficacy (Bandura, 1997; Grøtan et al.,

2019; Usher & Pajares, 2008), which can result in heightened academic stress (Chee et al., 2019; Chemers et al., 2001).

Moderating effects

According to Lazarus and Folkman (1984, p. 22), people in different groups have varying degrees of vulnerability and sensitivity to stressors and their understanding and response to them. In support of this assumption in an academic setting, Ye et al. (2018) found that gender moderated the association between academic stress and later academic self-efficacy. Specifically, they found that the association between academic stress and later academic self-efficacy was more salient for girls than boys. Moreover, studies imply that the relationship between academic stress and psychological distress is stronger for girls than boys in secondary school students (Liu & Lu, 2012; Moksnes, Moljord, et al., 2010). There is a lack of studies on the possible gender moderation of the relationship between academic self-efficacy and psychological distress. However, many studies have found gender differences in academic self-efficacy, wherein boys generally report higher levels than girls (for an overview, see Huang, 2013). These findings might imply the existence of gender differences in the association between academic self-efficacy and other factors.

Current Study

There is a lack of research on the longitudinal relationship between academic stress and psychological distress within adolescents. This study investigates the association between academic stress, academic self-efficacy, and psychological distress on an inter- and intrapersonal level throughout upper secondary school. Additionally, gender differences in these relationships are investigated. The following hypotheses are based on previous research and the assumptions of the transactional theory of stress and coping. First, academic self-efficacy will be negatively related to academic stress and psychological distress, and academic stress and psychological distress will be positively related on an interpersonal level (hypothesis 1). Second, fluctuations in academic stress will predict similar fluctuations in concurrent psychological distress (hypothesis 2). Third, fluctuations in academic self-efficacy will partially explain the association between the fluctuations in academic stress and psychological distress (hypothesis 3). Fourth, the associations between academic stress, academic self-efficacy, and psychological distress will be more salient for girls than boys (hypothesis 4). Fifth, fluctuations in psychological distress will predict opposite fluctuations in subsequent academic self-efficacy (hypothesis 5). Lastly, fluctuations in academic self-efficacy will predict an opposite fluctuation in subsequent academic stress (hypothesis 6). Due to a lack of previous research on the effect of psychological distress on later academic stress, there is no specific hypothesis regarding this relationship. However, the association is investigated in the model.

Methods

Procedure and Participants

The participants were part of the COMPLETE project (Larsen et al., 2018), a randomised controlled trial aiming to improve the psychosocial learning environment and reduce dropout rates in upper secondary school in Norway. Sixteen schools in four municipalities agreed to participate in the study. The project randomly assigned schools to one of two intervention conditions or the control group. All students who started in August 2016 in the mentioned schools were invited to participate. The participants in this study attended a general education programme, which spans 3 years of upper secondary school from grade 11 through grade 13. The study followed a cohort of students from the beginning to the end of this education. Participants ($N = 1508$) were adolescents who had recently started in grade 11. The respondents completed surveys in August 2016 (start of grade 11), March 2017 (end of grade 11), March 2018 (end of grade 12), and March 2019 (end of grade 13). Students who were part of the same cohort, but were absent at a previous data collection, were allowed to participate in the following data collections throughout the study. Please see Table 3 for more details on the number of participants across time points.

The Norwegian Centre for Research Data (NSD) approved that the COMPLETE project is in line with GDPR. Students under age 16 needed parental/guardian consent before participating, and respondents actively consented to participate. Ahead of participation, the students were informed about the study's aims. Researchers and research assistants in the project collected survey data using tablets on the school grounds. Students not physically present during data collection were invited to participate via e-mail.

Concerning the participant's age at baseline, they were 15 ($n = 425$, 28.2%), 16 ($n = 955$, 63.3%), 17 ($n = 63$, 4.2%), 18 ($n = 23$, 1.5%), 19 ($n = 15$, 1%), 20 ($n = 8$, 0.5%), 21 ($n = 11$, 0.7%), 22 ($n = 4$, 0.3%), 23 ($n = 1$, 0.1%), and 24 ($n = 3$, 0.2%) years old. Regarding gender, 60.7% were girls, and 39.3% were boys. The reason for the somewhat unequal distribution of gender is that girls comprise the majority of general education students in Norway. In contrast, approximately nine out of ten students in vocational education are boys (SSB, 2022). Most students were born in Norway (70.6%), and 5.5% had an immigrant background. Concerning perceived family wealth, a median split indicated that 52.9% thought their family were in a high socioeconomic position, and 22.5% believed their family were in a low socioeconomic position.

Instruments

Academic stress

The student's academic stress was measured using a single indicator from the study 'Health Behaviour in School-Aged Children (HBSC)' (Klinger et al., 2015; WHO, 2012). Participants answered how stressed they felt due to the schoolwork they must do (both work during school hours and homework). The response scale ranged from 1 (not at all) to 4 (a lot).

Academic self-efficacy

The participants' academic self-efficacy was assessed using the five-item academic efficacy scale from Patterns of Adaptive Learning Scales (PALS: Midgley et al., 2000). The scale is a context-specific measure of how capable individuals perceive themselves to be in performing and mastering schoolwork (i.e. classwork and homework). An item example is 'even if the work is hard, I can learn it'. The participants responded to the items on a Likert scale ranging from 1 (not at all confident) to 5 (very confident). Earlier studies have found acceptable Cronbach's alpha values (>0.78) (Midgley et al., 2000).

Psychological distress

Participants' psychological distress was measured by the Norwegian five-item short version of the Symptom Check List-90-R, based on the anxiety and depression subscales (Tambs & Moum, 1993). This measure is not a diagnostic tool for anxiety or depression disorders but a global indicator of mixed anxiety and depressive symptoms (Siqveland et al., 2016). Adolescents assessed how bothered or distressed they had been in the last 14 days on a scale ranging from 1 (not at all) to 4 (very much). Example indicators of depression and anxiety are 'feeling blue and sad' and 'feeling tense and worried', respectively. Previous research indicates acceptable Cronbach's values (>0.83) (Gjerde et al., 2011; Skrove et al., 2013; Strand et al., 2003; Tambs & Moum, 1993).

Gender

Gender was retrieved from registry data, coded as 0 (boys) and 1 (girls). Of note, participants also answered a question on gender identification (female, male, or other) in the questionnaires. However, very few respondents identified as non-cis or other-gendered (14 respondents on baseline). Thus, multigroup comparisons were not viable using all groups (cis females, cis males, non-cis females, non-cis males, and other-gendered).

Control variables

The following variables were included as time-invariant covariates in the model. Two dummy variables were created based on intervention conditions —participants were either in an intervention group (coded as 1) or not (coded as 0). The study measured socioeconomic position using a single indicator question on perceived family wealth (Iversen & Holsen, 2008), which was dummy coded as 0 (low) and 1 (high) by a median split. Regarding country of origin, Norwegian-born participants were coded as 0, and participants born outside of Norway were coded as 1.

Analytical Plan

Preliminary analyses

Initial analyses investigated omega reliability, descriptive statistics, and correlations using SPSS version 28 (IBM corp, 2021). M*plus* version 8 (Muthén & Muthén, 1998–2017) and maximum likelihood (ML) estimation were used for structural equation modelling (SEM). Several criteria were used to assess the model fit of the SEM models. Model fit was considered acceptable if CFI > 0.90, RMSEA < 0.08, and SRMR < 0.08 (Byrne, 2012; Hu & Bentler, 1999). When investigating measurement invariance, the following fit criteria were used between comparison and nested models: ΔCFI < 0.010, ΔRMSEA < 0.015, and ΔSRMR < 0.030 (Chen, 2007).

This study investigated measurement invariance across time and gender using the effects-coding approach by Little et al. (2006), which is preferable to other methods (Breitsohl, 2019). In effects-coding, the average factor loadings across all indicators are constrained to 1.0, and the sum of the indicator intercepts is constrained to 0.0. The configural models were otherwise freely estimated. Equal factor loading constraints were applied across time and gender to establish metric (weak) invariance for the multiple indicator RI-CLPM (Hamaker, 2018). The invariance constraints were retained in further modelling. The academic self-efficacy and psychological distress scales achieved partial weak invariance, wherein at least two indicators of each scale were invariant over time and gender (Byrne et al., 1989). For space constraints, the measurement invariance results are presented in Table 2.

Primary analyses

The random intercept cross-lagged panel model (RI-CLPM) with academic stress, academic self-efficacy, and psychological distress was modelled following the approaches by Hamaker (2018) and Mulder and Hamaker (2021). First, each construct's random intercept (interindividual, trait-like components) was specified by adding regression coefficients from the intercepts to corresponding latent factors at each time

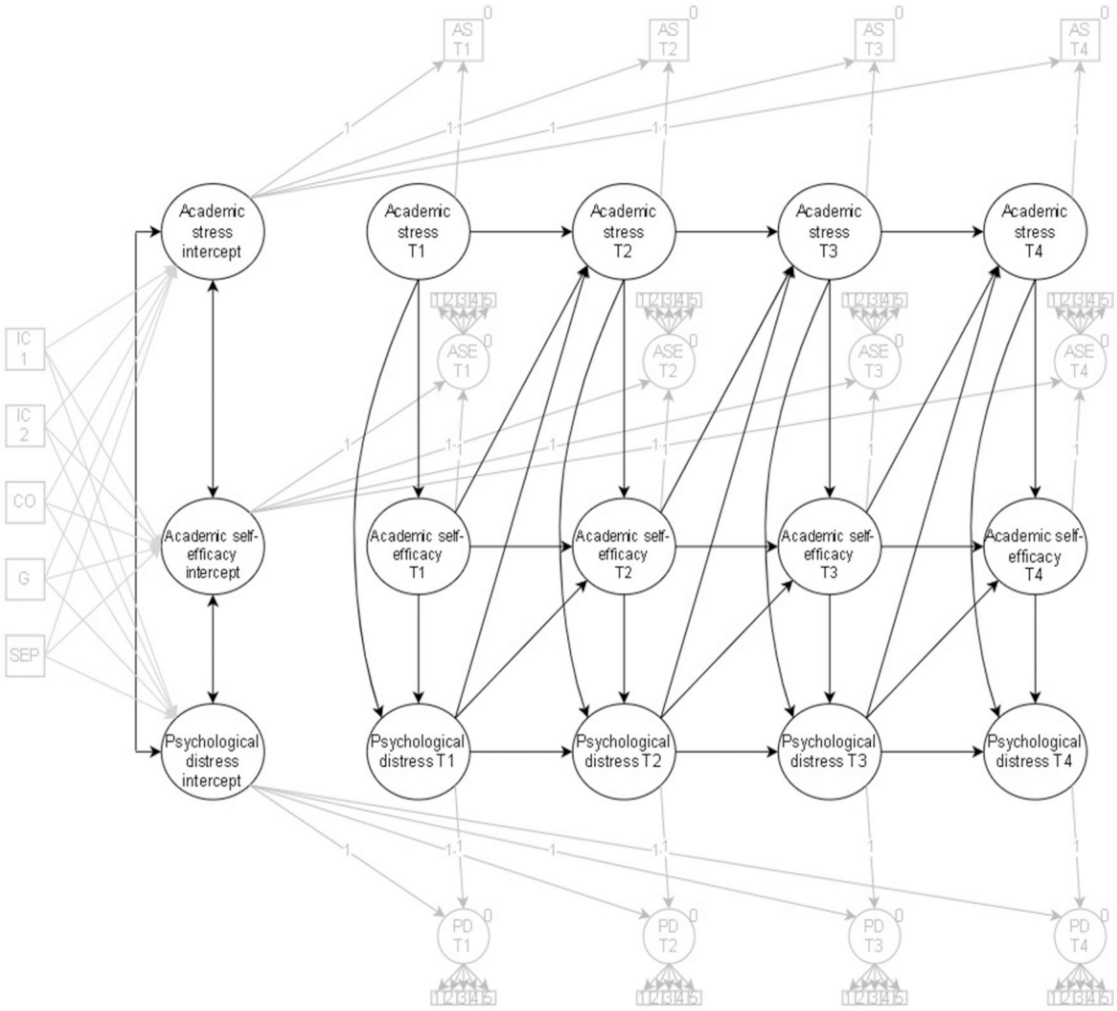

Fig. 1 Model Specification of the Random Intercept Cross-lagged Panel Model of Academic Stress, Academic Self-efficacy, and Psychological Distress. IC = intervention condition, CO = country of origin, G = gender, SEP = socioeconomic position, PD = psychological distress, ASE = academic self-efficacy, AS = academic stress

point, constrained to 1.0. Second, 12 second-order latent factors (state-like components) were specified (one latent factor for each of the four time points in three constructs), with regression coefficients to corresponding first-order latent factors constrained to 1.0. Third, to ensure the random intercepts and within-person variables capture all variance, the variances of the first-order latent factors were constrained to 0.0. Lastly, socioeconomic position, gender, country of origin, and intervention conditions were added as control variables in the model, regressed on the random intercepts.

Academic stress was specified as a predictor of concurrent academic self-efficacy and psychological distress on an intraindividual level throughout the study period (see Fig. 1 for model specification), mainly because the first and second stress appraisals happen roughly simultaneously within individuals (Lazarus & Folkman, 1984). Further, the effect of academic self-efficacy on later academic stress and the impact of psychological distress on subsequent academic self-efficacy and academic stress was examined. A freely estimated model was compared to a time-invariant model (i.e. coefficients are equal over time). The time-invariant constraints were retained if the model fit did not significantly deteriorate the chi-square. If the constraints significantly deteriorated model fit, the constraints were not tenable and removed. Next, this study examined the academic self-efficacy mediation between academic stress and psychological distress using the "model indirect" syntax in M*plus*.

To investigate if gender moderated the effects in the RI-CLPM, time-invariant constraints were initially investigated for both genders separately. Then, a multigroup analysis on the RI-CLPM with 1000 bootstraps using gender as a grouping variable was conducted, and the model constraint function in M*plus* was used to compare estimates across groups.

Missingness

According to Little's missing completely at random (MCAR) test, the patterns of missingness in the study's variables were completely random ($\chi 2 = 3092.302$, df = 3031, $p = 0.215$). Full information maximum likelihood (FIML) was used to

handle potential missing data at the construct level (Newman, 2014). Detailed information regarding the number of respondents across time is in Table 3.

Results

Descriptive Statistics

The descriptive statistics of the study variables are presented in Table 1. There were significant gender differences in all variables. Girls experienced significantly higher academic stress, psychological distress, and lower academic self-efficacy at all times than boys. The gender differences in terms of effect sizes were, according to Cohen (1988), moderate to large concerning academic stress, moderate regarding psychological distress, and negligible to small concerning academic self-efficacy.

Random Intercept Cross-lagged Panel Model of Academic Stress, Academic Self-efficacy, and Psychological Distress

The RI-CLPM of academic stress, academic self-efficacy, and psychological distress produced good model fit: $\chi^2 = 2241.786$, df = 1031, $p < 0.001$, RMSEA [95% CI] = 0.032 [0.030, 0.034], CFI = 0.954, SRMR = 0.039. The model included metric invariance constraints and socioeconomic position, country of origin, gender, and intervention conditions as time-invariant covariates. Next, a fully time-invariant model with identical constraints on the regression coefficients over time was investigated. A chi-square difference test showed that the model fit significantly deteriorated ($\Delta\chi^2 = 40.658$, Δdf = 21, $p = 0.006$). The autoregressive constraints were removed, and the time-invariant, cross-lagged constraint model was compared to the freely estimated model. The model fit did not significantly deteriorate: $\Delta\chi^2 = 24.326$ Δdf = 15, $p = 0.060$. Therefore, the constraints were deemed tenable, and the partially time-invariant model produced good fit ($\chi^2 = 2266.112$, df = 1046, $p < 0.001$, RMSEA [95% CI] = 0.032 [0.030, 0.034], CFI = 0.954, SRMR = 0.040). The results are presented in Fig. 2, and more details are in table 4.

In support of hypothesis one, the correlation between academic stress and psychological distress was positive and moderate in effect size at the interindividual level (i.e. the random intercepts) ($r = 0.49$, $p < 0.001$). Moreover, the interindividual association between psychological distress and academic self-efficacy was negative and moderate ($r = -0.38$, $p < 0.001$). Lastly, the correlation between academic self-efficacy and academic stress intercepts was negative and small ($r = -0.28$, $p < 0.001$). Thus, adolescents who experienced high academic stress throughout their upper secondary school education were also likely to experience high psychological distress and low academic self-efficacy during the same time. Additionally, individuals likely experienced opposite levels of psychological distress and academic self-efficacy during this period.

The autoregressive regression coefficients were positive and significant in academic stress from T1 to T2 ($\beta = 0.14$, $p < 0.01$), T2 to T3 ($\beta = 0.29$, $p < 0.001$), and T3 to T4 ($\beta = 0.22$, $p < 0.001$). Similarly, there were positive and significant carry-over stability effects in academic self-efficacy from T1 to T2 ($\beta = 0.36$, $p < 0.001$), T2 to T3 ($\beta = 0.44$, $p < 0.001$), and T3 to T4 ($\beta = 0.22$, $p < 0.001$). Lastly, fluctuations in psychological distress were positively and significantly associated with later fluxes in psychological distress from T1 to T2 ($\beta = 0.33$, $p < 0.001$), T2 to T3 ($\beta = 0.30$, $p < 0.001$), and T3 to T4 ($\beta = 0.42$, $p < 0.001$). Thus, adolescents were increasingly likely to experience similar fluctuations at approximate time points in all three constructs.

In support of hypothesis two, individuals with a deviating level of academic stress were increasingly likely to experience the opposite deviation in concurrent academic self-efficacy on T1 ($\beta = -0.18$, $p < 0.001$), T2 ($\beta = -0.17$, $p < 0.001$),

Table 1 Descriptive statistics of the study variables

				Gender			
	N	ω	Min–Max	Girls *M* (*SD*)	Boys *M* (*SD*)	*p* value	*d*
Academic stress T1	1110	–	1–4	2.72 (0.84)	2.18 (0.82)	<0.001	−0.65
Academic stress T2	1153	–	1–4	2.95 (0.85)	2.35 (0.91)	<0.001	−0.69
Academic stress T3	930	–	1–4	3.07 (0.87)	2.45 (0.93)	<0.001	−0.70
Academic stress T4	953	–	1–4	3.37 (0.76)	2.69 (0.85)	<0.001	−0.85
Psychological distress T1	1114	0.90	1–4	2.00 (0.78)	1.55 (0.67)	<0.001	−0.63
Psychological distress T2	1147	0.90	1–4	2.17 (0.82)	1.60 (0.63)	<0.001	−0.76
Psychological distress T3	926	0.90	1–4	2.20 (0.80)	1.70 (0.71)	<0.001	−0.65
Psychological distress T4	994	0.89	1–4	2.28 (0.81)	1.88 (0.28)	<0.001	−0.51
Academic self-efficacy T1	1085	0.91	1–5	4.04 (0.72)	4.14 (0.78)	0.030	0.14
Academic self-efficacy T2	1151	0.91	1–5	3.92 (0.80)	4.12 (0.75)	<0.001	0.26
Academic self-efficacy T3	923	0.92	1–5	3.88 (0.85)	4.09 (0.79)	<0.001	0.26
Academic self-efficacy T4	947	0.89	1–5	3.65 (0.98)	3.79 (1.04)	0.037	0.14

d = Cohen's d, ω = omega reliability

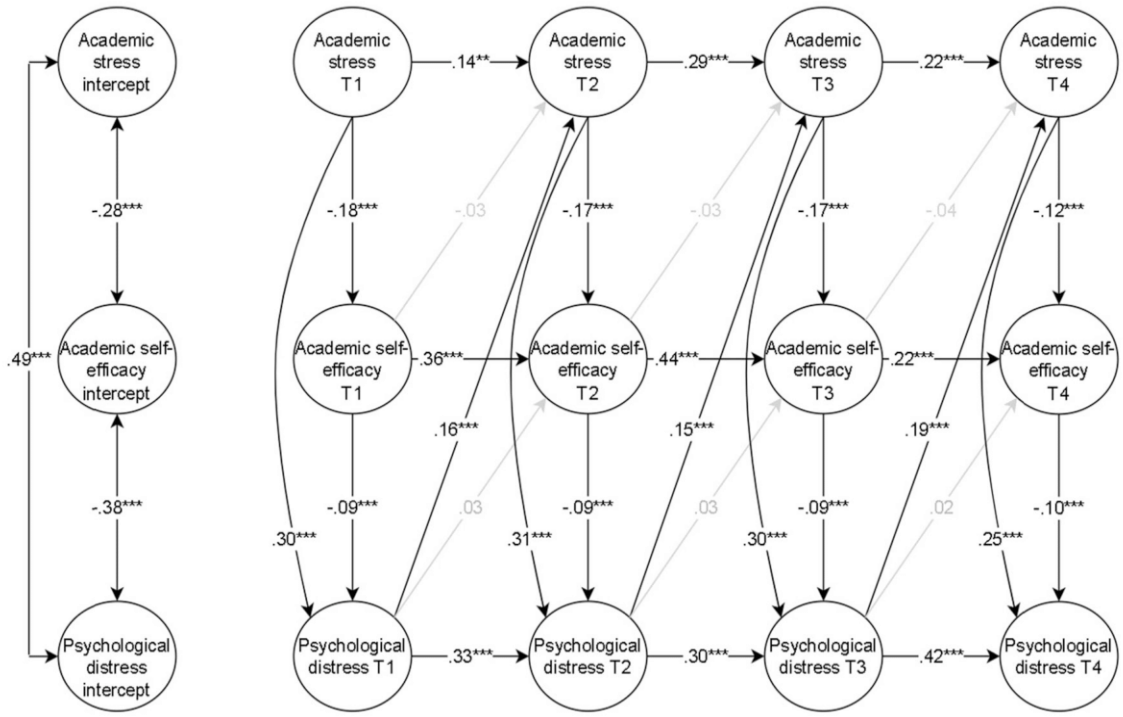

Fig. 2 Random Intercept Cross-lagged Panel Model of Academic Stress, Academic Self-efficacy, and Psychological Distress. Standardised estimates are presented. The grey lines are non-significant. *** $p < 0.001$, ** $p < 0.01$

T3 ($\beta = -0.17$, $p < 0.001$), and T4 ($\beta = -0.12$, $p < 0.001$). In addition, fluctuations in academic stress were positively and significantly related to changes in concurrent psychological distress on T1 ($\beta = 0.30$, $p < 0.001$), T2 ($\beta = 0.31$, $p < 0.001$), T3 ($\beta = 0.30$, $p < 0.001$), and T4 ($\beta = 0.25$, $p < 0.001$).

Fluctuations in academic self-efficacy were predictive of oppositional fluctuations in concurrent psychological distress on T1 ($\beta = -0.09$, $p < 0.001$), T2 ($\beta = -0.09$, $p < 0.001$), T3 ($\beta = -0.09$, $p < 0.001$), and T4 ($\beta = -0.10$, $p < 0.001$). Supporting hypothesis three, the results showed that academic self-efficacy partially mediated the time-invariant association between concurrent academic stress and psychological distress on T1 ($\beta = 0.02$, $p < 0.01$), T2 ($\beta = 0.02$, $p < 0.01$), T3 ($\beta = 0.02$, $p < 0.01$), and T4 ($\beta = 0.01$, $p < 0.01$).

There was no support for hypotheses five or six. The results indicated a null effect between psychological distress and later academic self-efficacy. Similarly, academic self-efficacy did not impact later academic stress. However, the impact of psychological distress on subsequent academic stress was positive from T1 to T2 ($\beta = 0.16$, $p < 0.001$), T2 to T3 ($\beta = 0.15$, $p < 0.001$), and T3 to T4 ($\beta = 0.19$, $p < 0.001$). Thus, fluctuations in psychological distress were consistently associated with similar fluxes in academic stress approximately 1 year later throughout the study.

Gender moderation model

Before the moderation analysis of the RI-CLPM of academic stress, academic self-efficacy, and psychological distress, the appropriateness of the time-invariant constraints enforced in the mediation model was separately examined for boys and girls. The chi-square in the freely estimated RI-CLPMs was compared to the chi-square in the time-invariant constraint models in both genders. The chi-square difference tests were non-significant for both genders ($p > 0.05$), indicating that the time-invariant constraints were tenable. Thus, the following nine parameters between boys and girls were compared: three intercept correlation coefficients and six time-invariant regression coefficients (academic stress on concurrent academic self-efficacy and psychological distress; academic self-efficacy on concurrent psychological distress; psychological distress on subsequent academic self-efficacy and academic stress; academic self-efficacy on subsequent academic stress).

The gender moderation RI-CLPM of academic stress, academic self-efficacy, and psychological distress achieved acceptable model fit: $\chi^2 = 3727.383$, df = 2059, $p < 0.001$, RMSEA [95% CI] = 0.038 [0.036, 0.040], CFI = 0.933, SRMR = 0.057. The results are presented in Fig. 3 and table 5. In partial support of the fourth hypothesis, three parameters significantly differed across gender: the intercept correlation between academic stress and academic self-efficacy ($r_{difference} = 0.086$, $p = 0.025$), the intercept correlation between psychological distress and academic stress ($r_{difference} = -0.082$, $p = 0.044$), and the time-invariant regression coefficient from academic stress to concurrent psychological distress ($B_{difference} = 0.164$, $p = 0.000$). Of note, the difference tests consider unstandardised estimates,

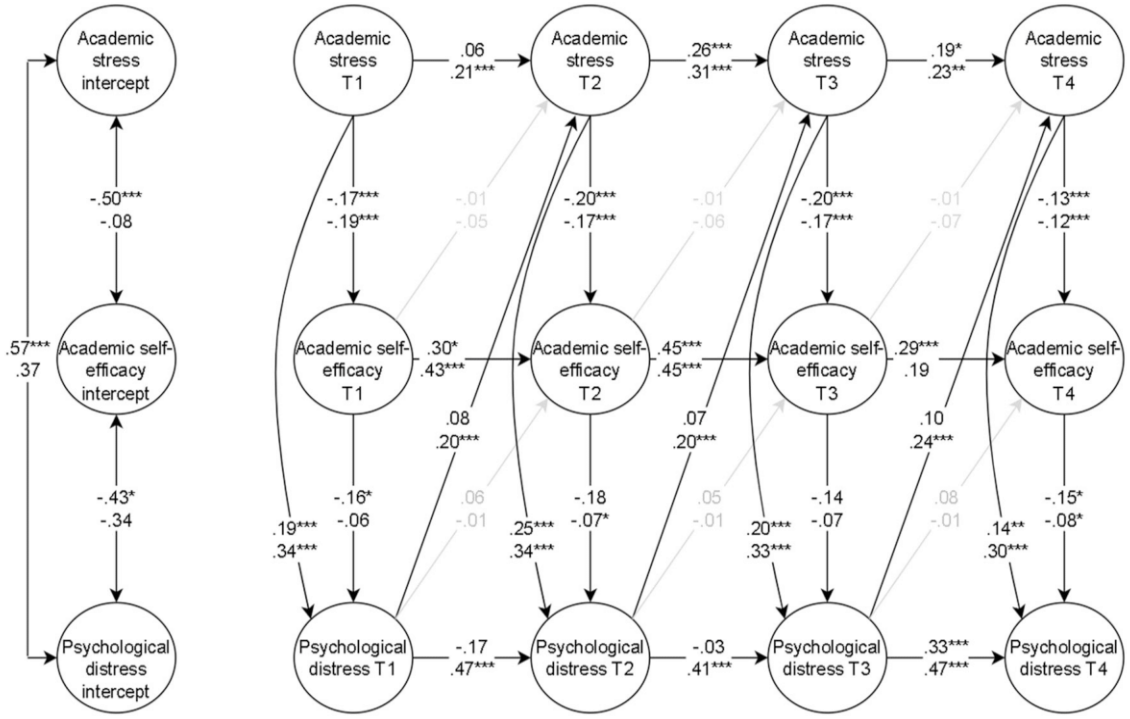

Fig. 3 Random Intercept Cross-lagged Panel Model of Academic Stress, Academic Self-efficacy, and Psychological Distress Moderated by Gender. Boys on the upper line and girls on the lower line. Standardised estimates are presented. The grey lines are non-significant. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

while Fig. 3 shows the standardised results. Please see table 5 for further details on model estimates.

The significance of the indirect effects of academic stress on concurrent psychological distress through academic self-efficacy disappeared in the moderation analysis. There were no apparent gender differences in these effects (see table 6 for details). However, the 95% confidence interval of the indirect effect did not include zero for both genders. Thus, the mediation effect, albeit small, might still be relevant for both genders despite the lack of a significant p value.

There was a significantly stronger intercept correlations between academic stress and psychological distress for boys ($r = 0.57$, $p < 0.001$) than girls ($r = 0.37$, $p > 0.05$). Additionally, the interindividual association between academic stress and academic self-efficacy was significantly stronger for boys ($r = -0.50$, $p < 0.001$) than girls ($r = -0.08$, $p > 0.05$). Hence, boys who experienced a high (or low) level of academic stress in late secondary school were more likely to experience a similar level of psychological distress and oppositional level academic self-efficacy during the same time compared to girls. Girls had significantly larger direct effects from academic stress to concurrent psychological distress (T1: $\beta = 0.34$, $p < 0.001$; T2: $\beta = 0.34$, $p < 0.001$; T3: $\beta = 0.33$, $p < 0.001$; and T4: $\beta = 0.30$, $p < 0.001$) than boys (T1: $\beta = 0.19$, $p < 0.001$; T2: $\beta = 0.25$, $p < 0.001$; T3: $\beta = 0.20$, $p < 0.001$; and T4: $\beta = 0.14$, $p < 0.001$). Thus, girls with unusually high (or low) academic stress at each time point were more likely to experience unusually high (or low) psychological distress concurrently than boys.

Sensitivity Analyses

This study investigated several competing models, such as different time lags between the constructs, and examined the impact of missingness on the selected model. The final model was chosen because (1) the theoretical assumptions of the transactional theory of stress and coping argue that the first and second appraisals occur simultaneously, and (2) the AIC and BIC values in the final model were lower than competing models. Regarding missingness, the final model was compared across three groups in our sample: participants with complete data (no missingness), participants with intermittent missing data patterns (non-dropouts), and all participants. The models produced similar patterns of results in terms of coefficients and standard errors.

Discussion

Few or none have investigated the associations between academic stress and psychological distress while separating inter- and intrapersonal effects. Consequently, there is little knowledge of possible explanatory mechanisms or moderators in the mentioned association on an intraindividual level. This study sought to fill that knowledge gap. The results implied that, during upper secondary school, the normative levels of academic stress, academic self-efficacy, and psychological distress were associated. Further, that academic stress consistently predicted psychological distress

throughout the study and that academic self-efficacy partially mediated this relationship. Recursively, psychological distress impacted later academic stress. Lastly, the intraindividual association between academic stress and psychological distress was stronger for girls, while the interpersonal associations between academic stress, academic self-efficacy, and psychological distress were stronger for boys.

The Longitudinal Associations Between Academic Stress, Academic self-efficacy, and Psychological Distress

Aligning with the assumptions in the transactional theory of stress and coping (Lazarus & Folkman, 1984) and previous research, the association between academic stress and psychological distress was positive within adolescents during upper secondary school. Adolescents with, for them, unusually high (or low) academic stress at one time were increasingly likely to experience unusually high (or low) psychological distress simultaneously. Moreover, fluctuations in psychological distress were related to similar fluxes in academic stress on the following occasions. These findings indicate that interventions successful in decreasing levels of academic stress and psychological distress (e.g. Feiss et al., 2019) might lower levels in the other factor concurrently and over time, respectively. However, it might be beneficial for implementation research to investigate the effect of school-based measures on the intraindividual association between academic stress and psychological distress. For instance, are interventions designed on an interpersonal level effective in reducing unusually high academic stress or psychological distress at the intraindividual level? Such research might further important knowledge in the field.

Academic self-efficacy functioned as a mechanism, partially explaining the concurrent relationship between academic stress and psychological distress within adolescents over time. Indeed, fluctuations in academic stress were related to oppositional fluctuations in academic self-efficacy and similar fluxes in psychological distress simultaneously. This effect aligns with central assumptions on how self-efficacy changes within individuals, wherein adverse feelings in certain situations decrease self-efficacy in the same settings (Bandura, 1997). Because stress, as measured in this study, is an inherently negative affective state, the reduction in self-efficacy for the same context that induced the negative feeling has been explored in many instances (for an overview, see Usher & Pajares, 2008). However, the finding that fluctuations in academic self-efficacy partly explain changes in psychological distress during fluxes in academic stress is novel. Theoretical or conceptual models of stress and mental health problems might include this mechanism in adolescent samples. Even though the transactional theory of stress and coping (Lazarus & Folkman, 1984) and self-efficacy theory (Bandura, 1997) describe processes occurring within individuals, such as cognitive evaluations and change, and emotional responses, the frameworks have used research on the interpersonal level to postulate intraindividual psychological developments.

The impact of psychological distress on later academic stress was positive. Hence, fluctuations in psychological distress were associated with similar changes in academic stress ~1 year later throughout the study period. Little research has focused on the impact psychological distress has on academic stress, mainly because academic stress is assumed to be an antecedent in the relationship between the two (e.g. Murberg & Bru, 2005; Tian et al., 2019). However, psychologically distressed individuals often behave in manners that create situations they perceive as stressful (Hammen, 2020). The findings in this study suggest that this effect might also apply to the educational setting, particularly the perception of school- and homework as stressful. In other words, due to an unexpected rise in psychological distress, students might behave in ways that increase the likelihood of experiencing the school- and homework as stressful later. It is possible that unusually psychologically distressed students postpone or avoid the academic workload or even physically withdraw from school. Such behaviour might result in perceiving school- and homework as a *threat* instead of challenging, positive, or irrelevant to personal well-being. Thus, an adverse loop of school-related stress and hopelessness, sadness, and worry might arise.

Gender Differences

Regarding gender differences, fluctuations in academic stress were more strongly associated with concurrent fluxes in psychological distress for girls than boys. The stronger intraindividual association for girls might be related to the academic pressure and demands girls perceive by others and themselves. For example, girls experience more pressures and expectations concerning their school performances (Gådin & Hammarström, 2000) and are more worried and affected by the beliefs and judgments of other people (Rudolph, 2002) than boys. Indeed, one report indicated that 39% of Norwegian girls, compared to 14% of boys, who experienced school-related stress "very often" also felt "very bothered" by symptoms of anxiety and depression (Eriksen et al., 2017). On the other hand, academic stress was significantly more strongly related to academic self-efficacy and psychological distress on an interindividual level throughout upper secondary school for boys than girls.

Limitations

One limitation is that the sample is not nationally representative. However, the participants have typical

characteristics of Norwegian and Western cultures, and the results are likely transferable to other late secondary school samples similar in age and demographics.

Another possible limitation is the single-item measurement of academic stress. Single-item measures have uncertain reliability and might not adequately capture a complex psychological construct (Allen et al., 2022). A latent factor with several indicators might have provided more information concerning academic stress as a construct. However, the single indicator has been validated previously and functions well as a measure of academic stress (Klinger et al., 2015). Additionally, based on comparisons with negative stress items in stress scales, such as the perceived stress scale (Cohen et al., 1983) and the educational stress scale for adolescents (Sun et al., 2011), the included indicator is expected to have strong face validity. The bivariate correlations between the indicator across time points were moderate to strong in effect size, according to Cohen (1988), ranging from $r = 0.36$ ($p < 0.001$) to $r = 0.55$ ($p < 0.001$).

Any bias associated with self-report measures, such as common method bias (Doty & Glick, 1998) or under- and overreporting (Hunt et al., 2003; Sigmon et al., 2005), might be considered another limitation, as all data was self-reported in this study. Regarding underreporting, one study found that the difference between self-reported and administrative health service data on mood and anxiety disorders has decreased over time, particularly in adolescence (O'Donnell et al., 2016). This finding might indicate improved mental health literacy or a positive societal change in the perceptions of mental health, such as reduced stigma (O'Donnell et al., 2016). Concerning common method bias, a post hoc Harman's single factor test was performed on each time point to investigate if a latent factor was accountable for the variance in the study's data (Chang et al., 2010). The results showed that a single factor did not account for the majority of the variance, and several factor solutions were more appropriate for each measurement occasion.

Lastly, the mediating effect of academic self-efficacy between academic stress and psychological distress was small. Therefore, caution in interpreting this finding is advised. However, within-person effects tend to be smaller than effects that include both between- and within-person variances. Furthermore, the model controls for prior levels of the predictive variables. Thus, the mediation effect is relevant even though it is small.

Future Directions

Academic self-efficacy was only a partial mediator in the concurrent association between academic stress and psychological distress, implying it only explains parts of the relationship. Future research should include other relevant mediators between stress and psychological distress (e.g. coping mechanisms) in a school setting to further unravel these associations over time. Notably, researchers are encouraged to separate between- and within-person effects to truly parse the associations between academic stress and adolescent psychological distress. Moreover, when investigating the associations between academic stress, academic self-efficacy (or other mediators), and psychological distress, researchers should consider the effect of gender.

Conclusion

There is a research gap on explanatory mechanisms and moderators in the intraindividual relationship between academic stress and psychological distress during adolescence. This study aimed to fill this gap. Specifically, the inter- and intraindividual associations between academic stress, academic self-efficacy, and psychological distress, and possible gender differences in these relationships, were investigated in an upper secondary school cohort. The results showed that academic stress, directly and indirectly through academic self-efficacy, impacted concurrent psychological distress consistently during 3 years in mid-late adolescence. Psychological distress systematically affected later academic stress. Intraindividual effects were more salient for girls, and interindividual effects were stronger for boys. The study findings imply the existence of an exacerbating feedback loop between academic stress and psychological distress in upper secondary school, which functions differently for boys and girls and is partly explained by fluctuations in academic self-efficacy.

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Authors' contributions S.M.K. conceived of the study, participated in its design and coordination, drafted the paper, performed the statistical analyses, and interpreted the data; T.B.L. conceived of the study, participated in its design and coordination, and helped draft the paper; H.B.U. conceived of the study, participated in its design and coordination, and helped draft the paper; A.G.D. conceived of the study, participated in its design and coordination, and helped draft the paper. All authors read and approved the final paper.

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Data sharing and declaration This paper's data will not be deposited.

Compliance with ethical standards

Conflict of interest The authors declare no competing interests.

Ethical approval The Norwegian Centre for Research Data (NSD) approved that this study is in line with GDPR.

Informed consent Informed consent was obtained from all participants.

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Appendix

Tables 2–6

Table 2 Measurement Invariance

	χ^2	df	RMSEA [90% CI]	CFI	SRMR	ΔRMSEA	ΔCFI	ΔSRMR
Across time								
Psychological distress								
Configural	428.732	134	0.038 [0.034, 0.042]	0.978	0.027			
Metric	466.374	149	0.038 [0.034, 0.042]	0.976	0.034	0.000	0.002	0.007
Academic self-efficacy								
Configural	962.980	134	0.065 [0.061, 0.069]	0.945	0.035			
Metric[a]	998.133	146	0.063 [0.059, 0.067]	0.943	0.065	0.002	0.002	0.030
Across gender								
Psychological distress								
Configural	615.975	268	0.042 [0.037, 0.046]	0.971	0.039			
Metric[b]	663.697	287	0.042 [0.038, 0.046]	0.969	0.066	0.000	0.002	0.027
Academic self-efficacy								
Configural	1196.946	268	0.068 [0.065, 0.072]	0.938	0.045			
Metric[a]	1234.547	285	0.067 [0.063, 0.071]	0.937	0.063	0.001	0.001	0.018

[a]Three indicator factor loading constraints were removed for model fit

[b]Two indicator factor loading constraints were removed for model fit

Table 3 Respondents across measurement waves

Time point	*N*	Percent	Cumulative percent
T1	55	3.6	3.6
T2	34	2.3	5.9
T3	23	1.5	7.4
T4	138	9.2	16.6
T1 + T2	144	9.5	26.1
T1 + T3	11	0.7	26.9
T1 + T4	16	1.1	27.9
T2 + T3	35	2.3	30.2
T2 + T4	17	1.1	31.4
T3 + T4	43	2.9	34.2
T1 + T2 + T3	190	12.6	46.8
T1 + T2 + T4	155	10.3	57.1
T1 + T3 + T4	38	2.5	59.6
T2 + T3 + T4	67	4.4	64.1
T1 + T2 + T3 + T4	542	35.9	100
Total	1508	100	

Table 4 Estimates from the random intercept cross-lagged panel model of academic stress, academic self-efficacy, and psychological distress

			Unstandardised			Standardised		
			Est.	SE	95% CI	Est.	SE	95% CI
Autoregressive regression coefficients								
T1 ASE	→	T2 ASE	0.382***	0.072	0.241, 0.523	0.362***	0.066	0.233, 0.491
T2 ASE	→	T3 ASE	0.464***	0.067	0.332, 0.596	0.438***	0.060	0.319, 0.556
T3 ASE	→	T4 ASE	0.264***	0.078	0.111, 0.417	0.221***	0.066	0.092, 0.350
T1 AS	→	T2 AS	0.142**	0.051	0.041, 0.243	0.136**	0.048	0.041, 0.231
T2 AS	→	T3 AS	0.306***	0.050	0.208, 0.403	0.292***	0.046	0.202, 0.381
T3 AS	→	T4 AS	0.185***	0.048	0.091, 0.280	0.218***	0.055	0.110, 0.326
T1 PD	→	T2 PD	0.325***	0.080	0.168, 0.482	0.326***	0.074	0.181, 0.471
T2 PD	→	T3 PD	0.322***	0.080	0.166, 0.479	0.300***	0.074	0.155, 0.445
T3 PD	→	T4 PD	0.439***	0.066	0.310, 0.569	0.424***	0.053	0.321, 0.527
Time-invariant regression coefficients								
T1 AS	→	T1 ASE	−0.136***	0.022	−0.178, −0.093	−0.176***	0.028	−0.231, −0.121
T2 AS	→	T2 ASE	−0.136***	0.022	−0.178, −0.093	−0.174***	0.028	−0.228, −0.119
T3 AS	→	T3 ASE	−0.136***	0.022	−0.178, −0.093	−0.172***	0.027	−0.225, −0.118
T4 AS	→	T4 ASE	−0.136***	0.022	−0.178, −0.093	−0.122***	0.020	−0.162, −0.082
T1 AS	→	T1 PD	0.212***	0.020	0.174, 0.251	0.296***	0.028	0.241, 0.352
T2 AS	→	T2 PD	0.212***	0.020	0.174, 0.251	0.310***	0.029	0.253, 0.368
T3 AS	→	T3 PD	0.212***	0.020	0.174, 0.251	0.302***	0.028	0.248, 0.356
T4 AS	→	T4 PD	0.212***	0.020	0.174, 0.251	0.248***	0.027	0.196, 0.300
T1 ASE	→	T1 PD	−0.079***	0.024	−0.126, −0.032	−0.085***	0.026	−0.137, −0.033
T2 ASE	→	T2 PD	−0.079***	0.024	−0.126, −0.032	−0.090***	0.028	−0.145, −0.035
T3 ASE	→	T3 PD	−0.079***	0.024	−0.126, −0.032	−0.089***	0.028	−0.143, −0.035
T4 ASE	→	T4 PD	−0.079***	0.024	−0.126, −0.032	−0.103***	0.030	−0.162, −0.043
T1 PD	→	T2 ASE	0.031	0.042	−0.052, 0.114	0.027	0.037	−0.045, 0.100
T2 PD	→	T3 ASE	0.031	0.042	−0.052, 0.114	0.026	0.035	−0.042, 0.094
T3 PD	→	T4 ASE	0.031	0.042	−0.052, 0.114	0.023	0.031	−0.038, 0.084
T1 PD	→	T2 AS	0.227***	0.054	0.121, 0.332	0.155***	0.038	0.082, 0.229
T2 PD	→	T3 AS	0.227***	0.054	0.121, 0.332	0.148***	0.038	0.073, 0.223
T3 PD	→	T4 AS	0.227***	0.054	0.121, 0.332	0.187***	0.048	0.094, 0.281
T1 ASE	→	T2 AS	−0.040	0.044	−0.127, 0.047	−0.030	0.033	−0.094, 0.035
T2 ASE	→	T3 AS	−0.040	0.044	−0.127, 0.047	−0.030	0.033	−0.095, 0.036
T3 ASE	→	T4 AS	−0.040	0.044	−0.127, 0.047	−0.037	0.042	−0.119, 0.045
Correlation coefficients								
PD RI	↔	ASE RI	−0.073***	0.016	−0.104, −0.043	−0.378***	0.071	−0.518, −0.238
PD RI	↔	AS RI	0.094***	0.021	0.053, 0.135	0.493***	0.066	0.363, 0.623
ASE RI	↔	AS RI	−0.052**	0.017	−0.085, −0.018	−0.280***	0.082	−0.441, −0.119
Covariates								
IC 1	→	PD RI	0.004	0.051	−0.095, 0.103	0.004	0.048	−0.091, 0.098
IC 1	→	ASE RI	0.049	0.051	−0.052, 0.149	0.053	0.056	−0.057, 0.162
IC 1	→	AS RI	−0.026	0.053	−0.130, 0.078	−0.025	0.050	−0.123, 0.074
IC 2	→	PD RI	0.038	0.051	−0.062, 0.139	0.036	0.048	−0.059, 0.130
IC 2	→	ASE RI	0.013	0.052	−0.089, 0.115	0.014	0.056	−0.095, 0.123
IC 2	→	AS RI	−0.020	0.054	−0.125, 0.086	−0.018	0.050	−0.117, 0.080
CO	→	PD RI	0.032	0.073	−0.111, 0.174	0.015	0.036	−0.054, 0.085
CO	→	ASE RI	−0.047	0.075	−0.195, 0.100	−0.026	0.042	−0.108, 0.056
CO	→	AS RI	−0.123	0.077	−0.275, 0.029	−0.060	0.038	−0.133, 0.014
SEP	→	PD RI	−0.215***	0.040	−0.294, −0.136	−0.190***	0.037	−0.261, −0.118
SEP	→	ASE RI	0.260***	0.041	0.179, 0.341	0.260***	0.043	0.177, 0.344
SEP	→	AS RI	−0.091*	0.042	−0.175, −0.008	−0.080*	0.039	−0.153, −0.007
G	→	PD RI	0.480***	0.038	0.405, 0.554	0.449***	0.039	0.372, 0.526
G	→	ASE RI	−0.141***	0.039	−0.240, −0.065	−0.150***	0.041	−0.231, −0.069
G	→	AS RI	0.606***	0.040	0.528, 0.684	0.565***	0.039	0.489, 0.642

Est. estimate, *SE* standard error, *CI* confidence interval, *RI* random intercept, *PD* psychological distress, *AS* academic stress, *ASE* academic self-efficacy, *IC* intervention condition, *CO* country of origin, *SEP* socioeconomic position, *G* gender

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

Table 5 Estimates from the random intercept cross-lagged panel model of academic stress, academic self-efficacy, and psychological distress moderated by gender

			Unstandardised			Standardised		
			Est.	SE	95% CI	Est.	SE	95% CI
BOYS								
Autoregressive regression coefficients								
T1 ASE	→	T2 ASE	0.273*	0.139	0.000, 0.547	0.298*	0.145	0.000, 0.570
T2 ASE	→	T3 ASE	0.480***	0.150	0.165, 0.750	0.452***	0.134	0.170, 0.686
T3 ASE	→	T4 ASE	0.371*	0.152	0.031, 0.646	0.290*	0.123	0.022, 0.523
T1 AS	→	T2 AS	0.068	0.094	−0.124, 0.256	0.063	0.085	−0.116, 0.228
T2 AS	→	T3 AS	0.272***	0.084	0.098, 0.423	0.262***	0.079	0.097, 0.400
T3 AS	→	T4 AS	0.164	0.084	−0.010, 0.316	0.193*	0.097	−0.012, 0.364
T1 PD	→	T2 PD	−0.137	0.228	−0.618, 0.321	−0.167	0.277	−0.757, 0.320
T2 PD	→	T3 PD	−0.046	0.302	−0.800, 0.416	−0.034	0.211	−0.507, 0.341
T3 PD	→	T4 PD	0.391**	0.131	0.143, 0.645	0.332***	0.102	0.122, 0.508
Time-invariant regression coefficients								
T1 AS	→	T1 ASE	−0.150***	0.042	−0.233, −0.069	−0.167***	0.047	−0.256, −0.078
T2 AS	→	T2 ASE	−0.150***	0.042	−0.233, −0.069	−0.200***	0.057	−0.317, −0.093
T3 AS	→	T3 ASE	−0.150***	0.042	−0.233, −0.069	−0.196***	0.053	−0.296, −0.089
T4 AS	→	T4 ASE	−0.150***	0.042	−0.233, −0.069	−0.130***	0.037	−0.204, −0.056
T1 AS	→	T1 PD	0.111***	0.034	0.046, 0.178	0.191***	0.057	0.075, 0.299
T2 AS	→	T2 PD	0.111***	0.034	0.046, 0.178	0.254***	0.070	0.118, 0.394
T3 AS	→	T3 PD	0.111***	0.034	0.046, 0.178	0.196***	0.058	0.081, 0.308
T4 AS	→	T4 PD	0.111***	0.034	0.046, 0.178	0.142**	0.048	0.052, 0.243
T1 ASE	→	T1 PD	−0.104*	0.050	−0.213, −0.013	−0.160*	0.081	−0.333, −0.018
T2 ASE	→	T2 PD	−0.104*	0.050	−0.213, −0.013	−0.179	0.106	−0.442, −0.020
T3 ASE	→	T3 PD	−0.104*	0.050	−0.213, −0.013	−0.141	0.073	−0.293, −0.017
T4 ASE	→	T4 PD	−0.104*	0.050	−0.213, −0.013	−0.153*	0.071	−0.296, −0.021
T1 PD	→	T2 ASE	0.086	0.111	−0.138, 0.314	0.061	0.077	−0.096, 0.206
T2 PD	→	T3 ASE	0.086	0.111	−0.138, 0.314	0.047	0.066	−0.069, 0.186
T3 PD	→	T4 ASE	0.086	0.111	−0.138, 0.314	0.050	0.064	−0.074, 0.179
T1 PD	→	T2 AS	0.156	0.118	−0.075, 0.394	0.083	0.063	−0.046, 0.211
T2 PD	→	T3 AS	0.156	0.118	−0.075, 0.394	0.066	0.054	−0.024, 0.186
T3 PD	→	T4 AS	0.156	0.118	−0.075, 0.394	0.104	0.080	−0.051, 0.266
T1 ASE	→	T2 AS	−0.011	0.080	−0.169, 0.144	−0.009	0.066	−0.143, 0.108
T2 ASE	→	T3 AS	−0.011	0.080	−0.169, 0.144	−0.008	0.059	−0.126, 0.098
T3 ASE	→	T4 AS	−0.011	0.080	−0.169, 0.144	−0.010	0.073	−0.168, 0.119
Correlation coefficients								
PD RI	↔	ASE RI	−0.080**	0.025	−0.122, −0.032	−0.428*	0.175	−0.923, −0.222
PD RI	↔	AS RI	0.132***	0.025	0.078, 0.180	0.572***	0.085	0.420, 0.764
ASE RI	↔	AS RI	−0.100**	0.031	−0.155, −0.029	−0.498**	0.193	−0.959, −0.244
Covariates								
IC 1	→	PD RI	−0.085	0.070	−0.222, 0.051	−0.085	0.069	−0.221, 0.051
IC 1	→	ASE RI	0.091	0.080	−0.065, 0.247	0.104	0.092	−0.075, 0.284
IC 1	→	AS RI	−0.270***	0.077	−0.421, −0.119	−0.250***	0.072	−0.392, −0.108
IC 2	→	PD RI	0.134*	0.069	−0.312, 0.002	−0.134	0.069	−0.269, 0.001
IC 2	→	ASE RI	0.121	0.079	−0.035, 0.276	0.138	0.091	−0.040, 0.316
IC 2	→	AS RI	−0.291***	0.076	−0.441, −0.142	−0.271***	0.072	−0.411, −0.131
CO	→	PD RI	0.100	0.107	−0.110, 0.309	0.050	0.054	−0.055, 0.155

Table 5 (continued)

			Unstandardised			Standardised		
			Est.	SE	95% CI	Est.	SE	95% CI
CO	→	ASE RI	−0.106	0.121	−0.343, 0.131	−0.061	0.070	−0.198, 0.076
CO	→	AS RI	−0.245	0.133	−0.506, 0.015	−0.114	0.062	−0.236, 0.007
SEP	→	PD RI	−0.334***	0.060	−0.451, −0.216	−0.291***	0.050	−0.390, −0.193
SEP	→	ASE RI	0.312***	0.069	0.177, 0.448	0.312**	0.076	0.164, 0.461
SEP	→	AS RI	−0.275***	0.066	−0.405, −0.145	−0.223***	0.055	−0.332, −0.115
GIRLS								
Autoregressive regression coefficients								
T1 ASE	→	T2 ASE	0.510***	0.118	0.231, 0.689	0.431***	0.108	0.182, 0.603
T2 ASE	→	T3 ASE	0.466***	0.135	0.183, 0.699	0.445***	0.115	0.184, 0.636
T3 ASE	→	T4 ASE	0.215	0.114	−0.027, 0.415	0.190	0.102	−0.025, 0.379
T1 AS	→	T2 AS	0.210***	0.066	0.069, 0.331	0.205***	0.063	0.068, 0.322
T2 AS	→	T3 AS	0.324***	0.071	0.182, 0.456	0.311***	0.066	0.179, 0.435
T3 AS	→	T4 AS	0.195**	0.074	0.035, 0.333	0.230**	0.084	0.043, 0.382
T1 PD	→	T2 PD	0.487***	0.082	0.297, 0.629	0.472***	0.076	0.304, 0.602
T2 PD	→	T3 PD	0.431***	0.093	0.236, 0.610	0.410***	0.086	0.225, 0.562
T3 PD	→	T4 PD	0.447***	0.088	0.264, 0.615	0.473***	0.068	0.324, 0.589
Time-invariant regression coefficients								
T1 AS	→	T1 ASE	−0.133***	0.028	−0.185, −0.076	−0.192***	0.040	−0.274, −0.116
T2 AS	→	T2 ASE	−0.133***	0.028	−0.185, −0.076	−0.166***	0.034	−0.233, −0.097
T3 AS	→	T3 ASE	−0.133***	0.028	−0.185, −0.076	−0.165***	0.035	−0.234, −0.098
T4 AS	→	T4 ASE	−0.133***	0.028	−0.185, −0.076	−0.124***	0.027	−0.176, −0.071
T1 AS	→	T1 PD	0.275***	0.026	0.225, 0.323	0.341***	0.037	0.268, 0.409
T2 AS	→	T2 PD	0.275***	0.026	0.225, 0.323	0.337***	0.038	0.254, 0.413
T3 AS	→	T3 PD	0.275***	0.026	0.225, 0.323	0.334***	0.037	0.261, 0.408
T4 AS	→	T4 PD	0.275***	0.026	0.225, 0.323	0.299***	0.040	0.230, 0.391
T1 ASE	→	T1 PD	−0.072*	0.035	−0.140, −0.007	−0.062	0.032	−0.135, −0.006
T2 ASE	→	T2 PD	−0.072*	0.035	−0.140, −0.007	−0.071*	0.035	−0.141, −0.006
T3 ASE	→	T3 PD	−0.072*	0.035	−0.140, −0.007	−0.070	0.036	−0.143, −0.006
T4 ASE	→	T4 PD	−0.072*	0.035	−0.140, −0.007	−0.084*	0.039	−0.161, −0.009
T1 PD	→	T2 ASE	−0.014	0.047	−0.107, 0.078	−0.013	0.047	−0.111, 0.076
T2 PD	→	T3 ASE	−0.014	0.047	−0.107, 0.078	−0.013	0.046	−0.110, 0.076
T3 PD	→	T4 ASE	−0.014	0.047	−0.107, 0.078	−0.012	0.042	−0.101, 0.068
T1 PD	→	T2 AS	0.250***	0.062	0.121, 0.361	0.198***	0.048	0.097, 0.286
T2 PD	→	T3 AS	0.250***	0.062	0.121, 0.361	0.196***	0.050	0.095, 0.288
T3 PD	→	T4 AS	0.250***	0.062	0.121, 0.361	0.243***	0.063	0.119, 0.362
T1 ASE	→	T2 AS	−0.074	0.057	−0.179, 0.045	−0.050	0.040	−0.127, 0.032
T2 ASE	→	T3 AS	−0.074	0.057	−0.179, 0.045	−0.057	0.044	−0.144, 0.035
T3 ASE	→	T4 AS	−0.074	0.057	−0.179, 0.045	−0.070	0.056	−0.181, 0.042
Correlation coefficients								
PD RI	↔	ASE RI	−0.054*	0.026	−0.105, −0.002	−0.335	0.267	−0.829, −0.024
PD RI	↔	AS RI	0.050	0.033	−0.015, 0.112	0.369	0.258	−0.198, 0.765
ASE RI	↔	AS RI	−0.013	0.025	−0.060, 0.033	−0.082	0.184	−0.376, 0.296
Covariates								
IC 1	→	PD RI	0.082	0.067	−0.050, 0.213	0.108	0.091	−0.070, 0.286
IC 1	→	ASE RI	0.029	0.067	−0.102, 0.159	0.032	0.073	−0.111, 0.175
IC 1	→	AS RI	0.127*	0.062	0.005, 0.248	0.168	0.083	0.005, 0.330

Table 5 (continued)

			Unstandardised			Standardised		
			Est.	SE	95% CI	Est.	SE	95% CI
IC 2	→	PD RI	0.154*	0.069	0.020, 0.289	0.199	0.095	0.012, 0.385
IC 2	→	ASE RI	−0.041	0.068	−0.176, 0.093	−0.044	0.073	−0.188, 0.100
IC 2	→	AS RI	0.141*	0.064	0.016, 0.266	0.182	0.083	0.019, 0.345
CO	→	PD RI	0.005	0.095	−0.182, 0.191	0.003	0.065	−0.125, 0.131
CO	→	ASE RI	0.002	0.096	−0.186, 0.190	0.001	0.055	−0.106, 0.108
CO	→	AS RI	−0.060	0.096	−0.248, 0.129	−0.041	0.066	−0.171, 0.089
SEP	→	PD RI	−0.147**	0.051	−0.182, 0.191	−0.184	0.072	−0.325, −0.042
SEP	→	ASE RI	0.237***	0.051	0.137, 0.337	0.246*	0.054	0.140, 0.353
SEP	→	AS RI	−0.024	0.050	−0.122, 0.073	−0.030	0.063	−0.153, 0.092

Est. estimate, *SE* standard error, *CI* confidence interval, *RI* random intercept, *PD* psychological distress, *AS* academic stress, *ASE* academic self-efficacy, *IC* intervention condition, *CO* country of origin, *SEP* socioeconomic position, *G* gender

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

Table 6 Moderated mediation model of academic stress, academic self-efficacy, and psychological distress at the within-person level

	Academic stress → Academic self-efficacy → Psychological distress					
	β	SE	95% CI	B	SE	95% CI
Total sample						
T1	0.015**	0.005	0.005, 0.025	0.011**	0.004	0.003, 0.018
T2	0.016**	0.006	0.005, 0.027	0.011**	0.004	0.003, 0.018
T3	0.015**	0.005	0.005, 0.026	0.011**	0.004	0.003, 0.018
T4	0.013**	0.004	0.004, 0.021	0.011**	0.004	0.003, 0.018
Boys						
T1	0.027	0.014	0.002, 0.060	0.016	0.009	0.001, 0.036
T2	0.036	0.023	0.002, 0.092	0.016	0.009	0.001, 0.036
T3	0.028	0.016	0.002, 0.066	0.016	0.009	0.001, 0.036
T4	0.020	0.011	0.002, 0.047	0.016	0.009	0.001, 0.036
Girls						
T1	0.012	0.006	0.001, 0.027	0.010	0.005	0.001, 0.020
T2	0.012	0.006	0.002, 0.026	0.010	0.005	0.001, 0.020
T3	0.012	0.006	0.001, 0.025	0.010	0.005	0.001, 0.020
T4	0.010	0.005	0.001, 0.022	0.010	0.005	0.001, 0.020

β standardised estimate, *B* unstandardised estimate, *SE* standard error, *CI* confidence interval

**$p < 0.01$

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