Applying mindset theory to emotion regulation in mid-adolescent secondary school students:

A moderated mediation model.

School of Psychology

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# Abstract

Adolescence is developmentally and psychosocially a formative time, marked by significant change and personal struggle for many young people. Past research has found robust associations between fixed mindset and negative affective states, and growth mindset and positive affective states. Indeed, a growth mindset offers young people coping resources to deal with the adversity and struggles they face. Since the school is well-placed as a health-promoting context and an intervention space, this study examines the mediating role of school belonging on the association between growth mindset and emotional regulation in mid-adolescent students and the moderation of the indirect effect of school belonging by gender. To date, no previous study has tested these aims. The present study examined a sample of 6786 South Australian school students (aged 14 – 16 years). School belonging was found to mediate the association between growth mindset and emotion regulation in the present sample while controlling for child-level covariates and socioeconomic status. The current study found no evidence of moderation of this indirect effect by gender. The potential for school belonging to buffer the negative effects of a fixed mindset on school belonging and emotional regulation holds promise for the formulation of school policy and the design and delivery of whole-school and targeted interventions.

*Keywords:* Growth mindset, school belonging, emotion regulation, moderated mediation, school interventions, adolescence, subjective well-being

# Declaration

This thesis contains no material which has been accepted for the award of any other degree or diploma in any University, and, to the best of my knowledge, this thesis contains no material previously published except where due reference is made. I give permission for the digital version of this thesis to be made available on the web, via the University of Adelaide's digital thesis repository, the Library Search and through web search engines, unless permission has been granted by the School to restrict access for a period of time.

25th September 2023

# Contributor Role Table

| ROLE | ROLE DESCRIPTION | STUDENT | PRIMARY SUPERVISOR | CO SUPERVISOR |
|---|---|---|---|---|
| **Conceptualization** | Ideas; formulation or evolution of overarching research goals and aims. | X | X | |
| **Methodology** | Development or design of methodology; creation of models. | X | X | X |
| **Project administration** | Management and coordination responsibility for the research activity planning and execution. | X | | |
| **Supervision** | Oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team. | | X | X |
| **Data curation** | Management activities to annotate (produce metadata), scrub data and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later re-use. | X | | |
| **Formal analysis** | Application of statistical, mathematical, computational, or other formal techniques to analyze or synthesize study data. | X | | |
| **Visualization** | Visualization/data presentation of the results. | X | | |
| **Writing – original draft** | Specifically writing the initial draft. | X | | |
| **Writing – review & editing** | Critical review, commentary or revision of original draft | X | X | X |

# Chapter 1: Introduction

## 1.1 Adolescence

Adolescence is psychosocially and developmentally a formative period, and it is a time of forging a stable sense of identity and consolidating a system of values and beliefs that sets young people up for adulthood (Blakemore & Mills, 2014; Güemes-Hidalgo et al., 2017; World Health Organisation, 2014). Importantly, adolescence is a sensitive period for the development of social-emotional skills that equip young people with the capacity (and agency) to navigate, understand and manage their emotional experiences, engage in strength-based goal setting, demonstrate prosociality and empathy, build friendships and relationships and fundamentally make healthy choices (Paolini, 2020). This is in the background of neuroscience-informed understandings of the functional and structural changes occurring in the brain during adolescence, to do with young peoples' understandings of their own and others' emotional experiences (Blakemore & Mills, 2014).

There is evidence to suggest that social-emotional skill development is associated with better engagement and achievement in school, tertiary education, as well as occupational domains during adulthood (Deming, 2017; Kessler et al., 2005; Knollmann et al., 2019; National Research Council, 2012; Suldo et al., 2011). Subjective well-being (SWB) is defined as an individual's cognitive and affective evaluations of and satisfaction with life, along with a balance of both positive and negative affect (Diener et al., 2002). Past research tells of the long-lasting and qualitatively unique impact of stress on adolescent development (Blakemore & Mills, 2014; McCormick et al., 2010) and it would appear that SWB acts as an efficient defence for adolescents when facing adverse life circumstances (Afzal et al., 2016, p. 73).

## 1.2 Subjective Well-Being

It is well-documented that higher levels of SWB is associated with improved health, longevity of life, occupational success, enriched social relationships, better cognitive functioning and fewer externalising problems in response to stressors later in life (Park, 2004; Weninger & Holder, 2014). SWB prioritises individuals' subjective experience of the specific domains and activities making up their lives, moving away from the traditional deficit model of health which primarily focused on detecting and treating dysfunction (Bailham & Harper, 2004). Such an approach is consonant with Seligman's (2000) positive psychology paradigm, which centralises the positive aspects of mental health so that individuals can thrive outside the context of adversity and pathology (Furlong et al., 2014; Seligman & Csikszentmihalyi, 2000). An interest in well-being (over ill-being) and understanding the factors that facilitate the flourishing of positive traits is considered central to the healthy development of adolescents (Keyes & Martin, 2017). The literature suggests that the development of these skills is sensitive to context (Goldberg et al., 2019).

## 1.3 The School Context

As well as providing the foundations for academic achievement, the school is well-placed as a health-promoting context (Greenberg et al., 2001; Kalubi et al., 2023). Calls have been made for the school and its many key players (from administrative staff to classroom teachers), to assist in the de-medicalisation and de-pathologisation of mental health, as well as in the promotion of well-being and the social-emotional skill development of their students (Cefai & Cavioni, 2015). Since the maladaptive development of these skills can have consequences that lead to psychopathology in adolescence and adulthood (Hofmann et al., 2012), promoting positive well-being during this developmentally formative period is imperative.  Adolescence, a period marked by heightened psychosocial stressors, poses a challenge to young people as they face an increased risk of mental illness and poor well-

being while their coping skills and social-emotional abilities are still only in their infancy

(Allen & McKenzie, 2015; Eccles et al., 1993; Eccles & Roeser, 2011). This only bolsters

recommendations for schools to consider students' cognitive and affective development

(Cefai & Cavioni, 2015). Given that mindset can act as a buffer against emotional stress for

adolescents, schools provide a valuable space to encourage the development of a growth

mindset and ameliorate the negative effects of a fixed mindset (Jiang et al., 2023).

## 1.3. Growth Mindset and Emotion Regulation

Growth mindset, as defined by Dweck (2006), refers to the belief that one's traits or

attributes can be developed and improved through effort, the acquisition of new knowledge or

engagement with one's environment. Growth-minded individuals are inclined towards

flexible thinking and consequently, are better equipped with the coping resources to respond

to challenging situations adaptively, which in turn, promotes improved psychological

adjustment and behaviours (Yeager et al., 2016). Furthermore, they are more likely to thrive

in the face of difficulty, compared to those of a fixed mindset who tend to shy away from

challenges and fail to meet their potential (Dweck & Yeager, 2019). Many systematic reviews

of intervention studies have replicated these findings (Burnette et al., 2022; Jiang et al.,

2023). The belief of intelligence as growing incrementally over time with experience, effort

and opportunity is characteristic of growth-minded individuals, as opposed to the fixed

mindset belief that intelligence is permanent, innate and immutable (Matthews & Folsom,

2008).

In line with the calls of many (namely, Kern, in press; Peterson, 2006), schools are

progressively acknowledging the value of mindset theory beyond its conventional focus on

academic outcomes, and expanding it to social-emotional skill development and emotional

outcomes, such as emotion regulation. Mindset theory lends itself well to emotion regulation,

finding robust associations between fixed mindset and negative states, and growth mindset

and positive states (Jiang et al., 2023). Emotion regulation plays an important role in many areas of the developing adolescents' life (Gajda et al., 2022). Since emotion regulation is considered a transdiagnostic factor in the development of internalising and externalising psychopathology, and positive well-being is supported by emotion regulation skills in adolescence (Aldao et al., 2016; Pandey et al., 2018), further inquiry into its predictors (i.e., growth mindset) is a worthwhile avenue for research.

Emotion regulation is understood under the five main families of regulatory processes by which individuals influence the emotions they experience, the nature of this experience and the way they express these emotions, 1) situation selection, 2) situation modification, 3) attentional deployment, 4) cognitive change, and 5) response modification (Gross, 1998b). According to Gross (1998a), emotion regulation processes involve conscious or automatic attempts of an affective or behavioural nature to manage emotion (e.g., to modulate internal states, make changes to one's involvement in the environment or to modify expression of these emotions). Some emotion regulation strategies serve adaptive functions, while others, despite the intention to effectively manage emotions, can actually be maladaptive, such as denial, which is an avoidant coping response (Compas et al., 2001). Cognitive reappraisal (change) is considered a more advanced form of antecedent-focused emotion regulation, a process occurring *before* the emotion response is elicited, which involves interpretation of an arousing/distressing situation in such a way that the emotion's impact or intensity is lessened, otherwise known as reframing (Gurera & Isaacowitz, 2019). Cognitive reappraisal, which is related to positive social-emotional well-being (Gross & John, 2003), is an emotion regulation process pertinent to the present study.

Indeed there is empirical evidence to support the social-emotional utility of mindset theory on emotion regulation. Brooks (2014) found that fostering a growth mindset involved reframing difficulties or failures as learning opportunities. One specific example of this is

reappraising anxiety as excitement, which was studied in the context of exam performance anxiety. Schroder (2021) explored the association between mindset and emotional tolerance and suggested that a growth mindset encourages individuals to confront and tolerate anxiety, while a fixed mindset is associated with avoidance of affect, which would indicate emotion dysregulation (Milojevich et al., 2019). Earlier Schroder et al. (2017) found growth mindset buffers the effect of stressful life events on students' mental health, which in turn leads to reduced symptoms of anxiety and depression and substance abuse behaviours. Other research has found growth mindset to be positively associated with cognitive reappraisal, while fixed mindset seems to be related to maladaptive emotion regulation strategie, like avoidance (Schroder et al., 2015), and reduced cognitive reappraisal (De Castella et al., 2013). Further, there are neural correlates for the relationship between mindset and emotional regulation (Moser et al., 2011).

These robust findings suggest that mindset theory provides an effective framework for understanding the way adolescents handle emotional responses triggered by challenges and setbacks. In their evaluation of large-scale growth mindset interventions, Walton and Yeager (2020) hypothesised that particular social contexts can encourage particular ways of experiencing, interpreting and responding to events. To align with this theory, the association between growth mindset and emotion regulation is not a psychological process considered in isolation. Rather, this study investigates whether particular social contexts can facilitate this process. The present focus is on the school context, with an emphasis on students' sense of belonging.

## 1.4 School Belonging as a Mediator

The literature points to the need to explore direct and indirect pathways from cognitive factors through social factors to multiple indicators of well-being, in order to map out the complex interplay of variables in an adolescent's environment (Šeboková et al.,

2018). Social factors as mediators of the influence of cognitive factors (i.e., growth mindset) on positive emotional functioning (i.e., emotion regulation) have often been overlooked in the literature. One of these social factors is school belonging.

School belonging is defined as the extent to which students "feel personally accepted, respected, included and supported" by those in the school environment (Goodenow, 1993, p. 61). School belonging has been found to support social and emotional functioning in adolescents and the evidence base for this is rich. Using structural equation modelling, Arslan et al. (2020) found school belonging to be a significant predictor of internalising and externalising problems and life satisfaction using both cross-sectional and longitudinal data. Indeed this lends support to Uchino's (2006) argument that social connectedness is essential to emotional health. Further, school belonging has been found to be associated with reduced anxiety and depression (Benner et al., 2017; Shochet et al., 2007), enhanced resilience (Scarf et al., 2016), improved sleep (Huynh & Gillen-O'Neel, 2013), enhanced subjective well-being (Fong Lam et al., 2015) and better self-esteem (Begen & Turner-Cobb, 2015; Zhang et al., 2018).

Theory, such as Bronfenbrenner's Ecological Systems Model (1977), offers an effective framework for considering the potential mediating role of school belonging in the association between growth mindset and emotion regulation. Bronfenbrenner's theory contends that the developing adolescent is largely influenced by the surrounding environment and context (Hayes et al 2017). According to Bronfenbrenner's Model, the school resides in the 'microsystem', the closest system to the adolescent, with factors having a direct influence on the psychosocial development and well-being of adolescents (Bronfenbrenner, 1977; Longaretti, 2020). For example, positive relationships in the school arena, especially warm and caring ones that elicit feelings of acceptance, respect, inclusion and support play a pivotal role in offsetting the potential detrimental effects of an ineffective home or neighbourhood

environment (El Zaatari & Maalouf, 2022). School belonging is at the centre of the present study, as a school-level factor that promotes positive psychosocial development in students, and influences their experience of the social world and ultimately their responses to challenges and setbacks (Krishnan, 2010).

Furthermore, school belonging has been found to mediate the relationship between academic competence and a range of well-being indicators (Šeboková et al., 2018). Likewise, Allen, Waters, et al. (2022) found school belonging to mediate the association between strength-based parenting and positive reappraisal, emotion processing and stress-related growth in a sample of Australian adolescents. Past research would suggest that emotion regulation outcomes in adolescents could be mediated through social factors like school belonging. While school belonging is a well-documented predictor of positive social, cognitive and emotional outcomes in adolescence and later life, no study to date has investigated its mediating role on the association between growth mindset and emotional regulation in adolescents.

## 1.5 Gender Differences

The literature suggests that there are gender differences in socialisation behaviours in adolescents, and there is a rich body of evidence indicating that young girls tend to report a stronger sense of belonging and more positive experiences in school, relative to boys (Aliyev & Tunc, 2015; Goodenow & Grady, 1993; Neel & Fuligni, 2013). The significance of this difference however seems to taper off in later years of schooling (Neel & Fuligni, 2013). For growth mindset, however, multiple studies have consistently found no significant gender differences (Macnamara & Rupani, 2017; Storek & Furnham, 2013; Tucker-Drob et al., 2016). In a large-scale survey of American students ($n = 282,867$), young girls demonstrated a slightly stronger growth mindset that diminished to a statistically insignificant level from age 11 to 14, only to become statistically significant again at ages over 14, during high school

(West et al., 2020). In light of these nuanced differences, and since there are distinct developmental processes around personality, coping and cognition occurring in boys and girls (El Zaatari & Maalouf, 2022), it is important to consider gender in the discussion of growth mindset, emotional regulation and school belonging. This area of research remains unexplored.

## 1.6 The Present Study

In the view of adolescence as a sensitive period and the position of the school as a space for well-being promotion, understanding the role of school belonging in mitigating the negative effects of fixed mindset on emotional regulation among adolescents is an important yet understudied area of research. Insights gained may inform policies and practices aimed at fostering positive adolescent development and supporting psychosocial well-being, as well as guiding the development of growth mindset interventions in schools.

At the heart of growth mindset is the belief that change and growth are possible under the right conditions (Yeager & Dweck, 2023). Furthermore, Walton and Yeager (2020) in the context of growth mindset interventions, stressed the need for researchers to understand the conditions under which individuals may *accept* a certain way of thinking. The present study addresses this, by exploring belonging in the context of school, as affording adolescent students a way of thinking (growth-mindedness). Thus, the present study primarily aims to examine the mediating role of school belonging in the association between growth mindset and emotional regulation in mid-adolescent students. Secondly, this study will examine whether gender moderates the mediating role of school belonging in the association between growth mindset and emotional regulation. The following conceptual model was proposed (Figure 1).

**Figure 1:**

*Proposed conceptual model of moderated mediation.*
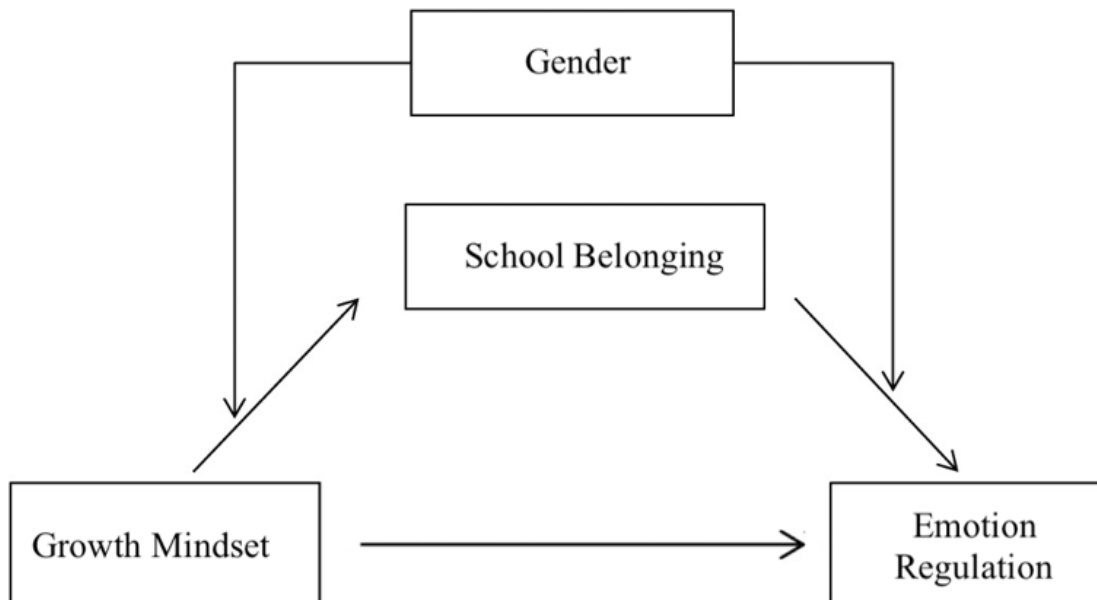


*Note.* The association between growth mindset and emotional regulation is proposed to be mediated by school belonging, with the indirect effect of school belonging moderated by gender both the a-path (growth mindset associated with school belonging) and b-path (school belonging associated with emotion regulation).

## 1.7 Hypotheses

The following hypotheses were proposed:

**Hypothesis 1:** The association between growth mindset and emotion regulation will be mediated through school belonging, while accounting for known covariates (age, gender, socio-economic status and English-speaking background).

**Hypothesis 2:** Gender will moderate the indirect effect of school belonging on the association between growth mindset and emotion regulation, specifically the path between growth mindset and school belonging, and the path between school belonging and emotional regulation. Likewise, known covariates will be accounted for (age, socio-economic status and English-speaking background). It is hypothesised that the indirect effect of school belonging will be stronger in adolescent girls.

# Chapter 2: Method

## 2.1 Data Source – The Well-Being and Engagement Collection (WEC)

The WEC is a survey that requires students in South Australian schools to respond to a range of validated scales that capture both positive and negative aspects of well-being (Gregory & Brinkman, 2020). The WEC is one of the largest population-based monitoring systems for child and adolescent well-being internationally and has been administered by the South Australian Department for Education since 2013 (Gregory et al., 2021; Halliday et al., 2022). The WEC aims to capture four broad areas of a student's life: 1) emotional well-being, 2) engagement with school, 3) learning readiness, and 4) health and well-being outside of school, with the ultimate goal of helping schools, community and government to identify opportunities and resources that may support students to reach their full potential (South Australia Department for Education, 2021). Since many of the WEC measures were adapted from the Canadian Middle Years Development Instrument (MDI), a similar census tool that measures children's (aged 9-12) social-emotional development and well-being (Schonert-Reichl et al., 2013), it is worth noting that the measures used in the present study have been adapted and validated for use in an Australian context (Gregory et al., 2019).

In the present study, only student responses from South Australian government schools were used, so that socio-demographic information sourced from deidentified administrative enrolment data could be linked to students' self-report WEC responses. These characteristics included gender, Aboriginal and Torres Strait Islander status, English-speaking background (ESB) and postcode of residence. Unless data was unavailable, in which case school enrolment data was used, gender was based on students' self-report, where they were asked to specify their gender as boy or girl. ESB was classified as English-speaking or non-English speaking (NESB). Finally, based on their postcodes of residence, each student was

assigned a Socio-Economic Indexes for Areas (SEIFA) score, which reflects their relative socioeconomic advantage and disadvantage. The SEIFA is derived from demographic data on income, education, employment, occupation and housing within student geographical area, obtained from the previous five-year censuses (Australian Bureau of Statistics, 2022). This information provided insights into the students' access to material and social resources and participation in society and is, therefore, a satisfactory way of capturing students' socio-economic status (SES) and the wider community in which they reside.

## 2.2 Participants

The participants of the present study consisted of South Australian government school students who participated in the WEC in Grade 9 in 2019. A total of 10,031 year 9 students completed the WEC in 2019. Only public school students were included in present study, as these students' demographic information could be linked to the WEC from enrolment records (n=7192). The final analysis sample consisted of 6786 students (see Table 1).

**Table 1**

*Sociodemographic characteristics of the analysis sample participants.*

| Descriptive Variables: | N | % |
|---|---|---|
| **Age** | | |
| 13 | 7 | 0.1% |
| 14 | 2001 | 29.5% |
| 15 | 4671 | 68.8% |
| 16 | 100 | 1.5% |
| 17 | 7 | 0.1% |
| **Gender** | | |
| Male | 3409 | 50.2% |
| Female | 3377 | 49.8% |
| **Aboriginal and Torres Strait Islander Status** | | |
| No | 6520 | 96.1% |
| Yes | 266 | 3.9% |
| **English Speaking Background** | | |
| English Background | 6684 | 98.5% |
| Non-English-speaking background | 102 | 1.5% |
| **SEIFA Score** | | |
| 1- Most disadvantaged | 1546 | 22.8% |
| 2 | 1198 | 17.7% |
| 3 | 1073 | 15.8% |
| 4 | 1431 | 21.1% |
| 5 - Most advantaged | 1538 | 22.7% |

*Note.* N = Number of participants, % = Percentage of participants, SEIFA = Socio-Economic

Indexes for Areas

## 2.3 Measures

### 2.3.1 Predictor – Growth Mindset.

The Cognitive Engagement scale from the WEC was used as a measure of growth mindset. This scale consisted of five items, including: "No matter who you are, you can change your intelligence" and "When I found something hard, I tried another way". Participants were asked to respond on a Likert scale, from 1 = *none of the time* to 5 = *all of the time*. This scale was selected as a measure of growth mindset in this study, since it was defined by the WEC authors as measuring attitudes related to holding a growth mindset (Gregory et al., 2021). Drawing upon the seminal theoretical work of Dweck (2006) and as outlined in more recent mindset theory research, the items mapped onto the six dimensions of growth mindset: motivation, attitudes and beliefs around the modifiable nature of intelligence, thinking and mind when faced with challenges or new situations, responding to adversity, grit and perseverance and a harnessing a sense of self-confidence (Yilmaz, 2022).

This scale shows excellent internal reliability in the current sample, with an alpha coefficient of .88 (Gregory & Brinkman, 2020). The scale demonstrates strong convergent validity, as evidenced by its correlations with theoretically similar WEC scales including optimism and perseverance ($r$ = .53 and .43 respectively; Gregory & Brinkman, 2020). The scale demonstrates good discriminant validity, evidenced by its low correlations with distinct WEC scales, sadness and worry ($r$ = -.39 and -.26 respectively; Gregory & Brinkman, 2020).

### 2.3.2 Mediator – School Belonging.

To assess school belonging, a two-item scale was used. Participants responded to items: "I feel like I belong in this school" and "I feel like I am important to this school" on a Likert scale from 1 = *strongly disagree* to 5 = *strongly agree*.

This scale demonstrates high internal reliability within the current sample, with an alpha of .84 (Gregory & Brinkman, 2020). The school belonging scale demonstrates good convergent validity, correlating highly with other theoretically similar scales of the WEC, like the School Climate scale that measures the tone of the school environment including teacher-student interactions ($r$ = .64; Gregory & Brinkman, 2020). With good discriminant validity too, school belonging showed a low correlation with distinct measures, like perseverance scale ($r$ = .43; Gregory & Brinkman, 2020).

### 2.3.3 Outcome – Emotion Regulation.

To measure emotion regulation in the WEC, an adaptation of the cognitive reappraisal scale from the 'Emotion Regulation Questionnaire for Children and Adolescents' was used (Gullone & Taffe, 2011). The scale includes items such as: "When I'm worried about something, I make myself think about it in a different way and that helps me feel better", "When I want to feel happier about something, I change the way I'm thinking about it" and "When I want to feel less bad (e.g. sad, angry, or worried), I change the way I'm thinking about it" (Gregory & Brinkman, 2020). Participants responded on a Likert scale from 1 = *strongly disagree* to 5 = *strongly agree*.

This scale demonstrated high internal reliability, with an alpha of .89 (Gregory & Brinkman, 2020). Convergent validity is well evidenced by Gregory and Brinkman (2020), with higher scores on the Emotion regulation scale associated with higher levels of happiness ($r$ =.55), and lower levels of sadness and worries ($r$ = -.47 and -.39 respectively). Discriminant validity is exhibited as well, with emotion regulation having a small correlation with theretically distinct constructs, like friendship intimacy, as would be expected ($r$ = .26; Gregory & Brinkman, 2020).

## 2.4 Covariates

Age, gender, language spoken at home and SES (as per the SEIFA indexes) were selected as covariates in the mediation model. Age has been found to be related to differences in growth mindset (Claro & Loeb, 2019), school belonging (Parr, 2022) and emotion regulation (Granziera et al., 2021). SES has been linked to growth mindset (Destin et al., 2019), school belonging (Ahmadi et al., 2020) and emotion regulation (De France & Evans, 2021; Kennewell et al., 2022). English speaking background is a well-documented student-level factor related to differences in growth mindset (Claro & Loeb, 2019), school belonging (Yough, 2009) and emotion regulation (Granziera et al., 2021). Finally, gender differences have been observed in growth mindset (Claro & Loeb, 2019), school belonging (Aliyev & Tunc, 2015; Goodenow & Grady, 1993; Neel & Fuligni, 2013) and emotion regulation (Granziera et al., 2021). In the moderated mediation model, age, language spoken at home and SES were selected as covariates.

## 2.5 Ethics and Preregistration

This study was granted approval by the *University of Adelaide Human Research Ethics Subcommittee* (#23/43). The Department for Education approved the use of the 2019 WEC dataset (#2020-0007). In line with the Open Science Framework (OSF) movement, this study was pre-registered (https://osf.io/35t7s; see Appendix A for de-identified). Reflecting on recommendations by Jamieson et al. (2023) and D'Silva et al. (2016), an audit trail was kept and a quantitative reflexivity statement (QRS; see Appendix B) was used to centralise biases.

**2.6 Statistical Analysis**

Data cleaning involved the removal of participants with missing data. A small number of students ($n$ = 406, 5.6% of the total sample) were not included in the analysis sample due to missing data and this is in line with calls from Lang and Little (2018) who caution against improper handling of missing data as a compromise of validity. The total number of participants before data cleaning was 7192, with the final analysis sample being 6786 (94.3% of the total). Given 1) the large sample and resulting statistical power, 2) the nature of Likert-scale response data, and 3) reflecting the recommendations from the literature (Cousineau & Chartier, 2010; Zijlstra et al., 2011), outlier detection and removal was deemed unnecessary in the present study.

Data analysis was conducted using IBM SPSS Statistics version 27, with the PROCESS macro 4.3.1 used to conduct the moderated mediation analysis (Hayes, 2017; IBM, 2020). For the beta coefficients of the indirect effects (hypothesis 1) and the index of moderation (hypothesis 2) to be considered significant, the 95% confidence interval must not contain zero (Hayes, 2017). Satisfaction of the moderated mediation and linear regression assumptions (see Appendix C) ensured a robust and properly specified model (Baron & Kenny, 1986; Judd & Kenny, 1981).

# Chapter 3: Results

## 3.1 Descriptive Statistics

Table 1 summarises the descriptive statistics for the participants of the analysis sample, Table 2 provides the pair-wise correlation matrix, and Table 3 describes the descriptive statistics for each measure by gender.

**Table 2**

*Pair-wise correlation matrix.*

|  | 1 | 2 | 3 |
|---|---|---|---|
| 1. Growth Mindset | 1 |  |  |
| 2. Emotion Regulation | .481* | 1 |  |
| 3. School Belonging | .469* | .477* | 1 |

*Note.* * Correlation is significant at the 0.01 level (2-tailed).

**Table 3**

*Descriptive statistics for the variables of interest by gender.*

|  | Male<br>*M (SD)* | Female<br>*M (SD)* |
|---|---|---|
| Growth Mindset | 3.53 (.85) | 3.60 (.86) |
| Emotional Regulation | 3.23 (.91) | 3.12 (.90) |
| School Belonging | 3.49 (.97) | 3.27 (1.0) |

*Note.* *M* = Mean. *SD* = Standard Deviation

A series of one-way ANOVAs were conducted to assess mean differences in growth mindset, emotion regulation and school belonging, by gender. Males scored significantly lower than females on growth mindset, $M = 3.53$, $SD = .85$ and $M = 3.60$, $SD = .86$, respectively, $F(1, 6784) = 10.58$, $p < .001$. By contrast, males scored significantly higher than females on both emotion regulation ($M = 3.36$, $SD = .91$ and $M = 3.12$, $SD = .90$), $F(1, 6784) = 118.20$, $p < .001$ respectively, and school belonging ($M = 3.49$, $SD = .97$ and $M = 3.27$, $SD = 1.01$), $F(1, 6784) = 79.30$, $p < .001$ respectively.

## 3.2 Mediation Model

A mediation analysis was performed using Hayes' (2017) model 4 of the PROCESS macro, to examine whether school belonging mediated the association between growth mindset and emotion regulation. The covariates age, gender, SES and ESB were controlled for in the analysis. As per Figure 2, the model gave beta coefficients ($b$) as indirect effect estimates, and confidence intervals ($CI_{95}$) for each of the 10,000 bias-corrected bootstrap iterations.

Growth mindset was positively associated with both school belonging, $b = .547$, $p < .001$, $CI_{95} = [0.52, 0.57]$ and emotion regulation, $b = .364$, $p < .001$, $CI_{95} = [0.34, 0.38]$, while school belonging also showed a positive association with emotion regulation, $b = .278$, $p < .001$, $CI_{95} = [0.25, 0.29]$. The indirect effect of growth mindset on emotion regulation through school belonging was significant, $b = .517$, $p < .001$, $CI_{95} = [0.13, 0.15]$. School belonging was thus found to significantly mediate the association between growth mindset and emotion regulation. The model accounted for a significant amount of variance in emotion regulation, $R_2 = .254$, $F(5, 6780)$, $p < .001$ (see Appendix D).

**Figure 2**

*Mediation Model.*
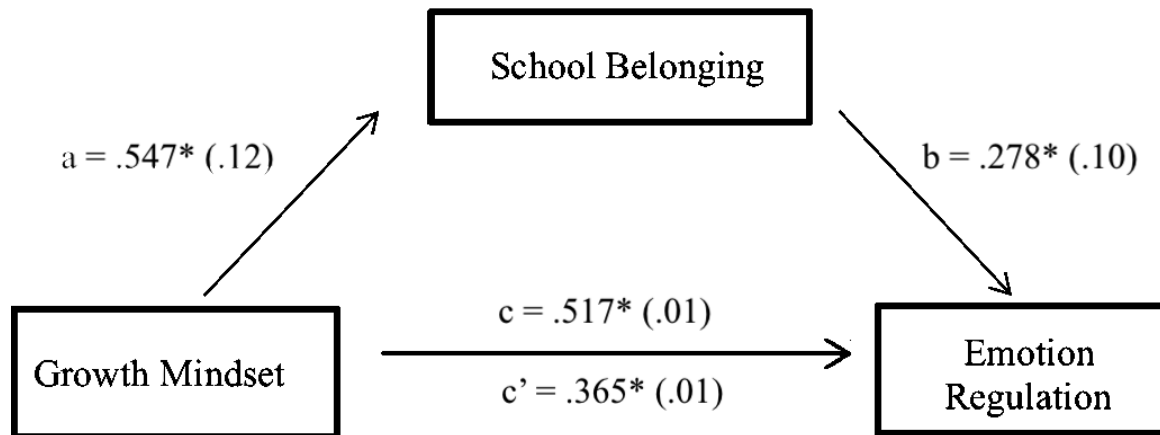


*Note.* a, b, c and c' are path coefficients representing unstandardised regression weights and standard errors (in parentheses). The c-path coefficient represents the total effect of growth mindset on emotion regulation through school belonging. The c-prime (c') refers to the direct effect of growth mindset on emotion regulation. All analysed paths were significant, * $p < .01$

## 3.3 Moderated Mediation Model

A moderated mediation regression analysis was performed using Hayes' (2017) model 58 of the PROCESS macro, to examine whether the indirect effect of school belonging on the association between growth mindset and emotion regulation was moderated by gender. The covariates age, SES and ESB were controlled for in the analysis. As per Table 4, the model shows beta coefficients (*b*) as indirect effect estimates, and confidence intervals ($CI_{95}$) for each of the 10,000 bias-corrected bootstrap iterations.

In this model, growth mindset was mean-centred, in line with recommendations in the literature to mean centre predictors in moderated mediation models (Gurnsey, 2018). The analysis was conducted both with and without mean centering and found no significant difference in statistical significance or effect sizes between the two approaches.

While gender was found to have a statistically significant effect on school belonging, $p < .001$, $CI_{95} = [-0.29, -0.20]$, and on emotion regulation, $p < .001$, $CI_{95} = [-0.29, -0.20]$, the index of moderated mediation was not significant, $b = -.017$, $p > .05$, $CI_{95} = [-0.04, 0.009]$. Despite this, the overall model accounted for a significant amount of variance in emotion regulation, see Table 4.

**Table 4**

*Testing the moderating effect of gender on the mediating effect of school belonging.*

| Paths and Interactions | Model a-path | | | Model b-path | | |
|---|---|---|---|---|---|---|
| | b (SE) | t | p | b (SE) | t | p |
| Growth Mindset on School Belonging | .546* (.0391) | 13.97 | < . 001 | | | |
| Gender on School Belonging | - .248* (.021) | -11.7 | < . 001 | | | |
| Growth Mindset × Gender on Emotion Regulation | .0007 (.024) | .029 | .976 | | | |
| School Belonging on Emotion Regulation | | | | .326* (.030) | 10.88 | < . 001 |
| Gender on Emotion Regulation | | | | - .202* (.018) | -10.98 | < . 001 |
| School Belonging × Gender on Emotion Regulation | | | | .031 (.018) | 1.71 | .087 |
| **Model Statistics** | | | | | | |
| $R^2$ | .237 | | | .325 | | |
| F | 351.57* | | | 466.52* | | |

*Note.* $b$ = beta coefficient, $SE$ = standard error, $t$ = t-statistic, $p$ = p-value, $R^2$= proportion of variance in the dependent variable that can be explained by the model, $F$ = f-statistic.

* $p < 0.01$

# Chapter 4: Discussion

## 4.1 General Discussion

This study used a large population-based cohort of South Australian secondary school students to examine the mediating role of school belonging on the association between growth mindset and emotion regulation. The moderating role of gender on the indirect effect of school belonging was also investigated. First, it was hypothesised that school belonging would mediate the association between growth mindset and emotion regulation, and second, that gender would moderate the indirect effect of school belonging.

While controlling for child-level covariates and socioeconomic status, school belonging was found to mediate the association between growth mindset and emotion regulation in the present sample. These findings indicate that school belonging may be an important intervening variable between adolescents' mindset and their emotion regulation capacity, the latter of which is central to their psychological health and well-being, is associated with positive developmental outcomes and is a protective factor in the face of adversity (Daniel et al., 2020). Since emotion regulation is considered a transdiagnostic factor in the development of psychopathology (Aldao et al., 2016), reducing adolescents' risk of developing issues with emotion regulation is important, as this may, in turn, reduce their risk of developing mental health concerns presently, or later in life. The present study found a potential mechanism for reducing that risk.

The proposed mechanism for supporting emotion regulation is through growth mindset, which in the present sample, was mediated by school belonging. Past longitudinal research has linked social inclusion at school with reduced emotional and behavioural issues (Arslan et al., 2020), which would suggest that the capacity for emotion regulation is present and functioning well. Also consistent are Fong Lam et al.'s (2015) findings that students with

a stronger sense of school belonging experience more positive emotions and less negative emotions. Taken together, past research looking at belonging and emotion regulation would support the present findings. The significant mediated pathway through school belonging, suggests that adolescents who experience greater inclusion and connectedness to school, report better emotion regulation.

Further, the present finding suggests that growth mindset development is associated with more positive emotion regulation processes. This would mirror the work of Moser et al. (2011), De Castella et al (2013), Schroder et al. (2015, 2017) and Schroder (2021) who have previously linked mindset with emotion regulation. Mediation through school belonging would suggest that the positive association between growth mindset and emotion regulation is stronger in students situated within a supportive school environment where they experience acceptance, respect and inclusion, and this was expected since social-emotional skills develop in conducive social contexts (Jones & Bouffard, 2012; Jones et al., 2019). The present findings underline the importance of contextual factors, such as the classroom and school environment, for the developing adolescent. This suggests that the school has a 'key window of opportunity' to promote the healthy development of adolescents' capacity for growth mindset, which in turn, supports emotion regulation (Cefai & Cavioni, 2015, p. 62). In line with past empirical work, the present findings clarify that the role of the school should not be underestimated (Longaretti, 2020).

Furthermore, students' beliefs around their ability and competency seems to be related to their experiences of school belonging and this has consequences on emotion regulation. Past research has found that school belonging provides adolescents with a psychological basis for feeling more positive about themselves, the people around them and their futures (Šeboková et al., 2018). This positive self-perception would appear to be at the heart of a growth mindset, wherein students build a sense of confidence in their abilities and potential

(Yilmaz, 2022). This, in turn, contributes to improved emotion regulation skills in students, such as the ability to up-regulate positive emotions and manage emotional experiences more effectively (Tugade & Fredrickson, 2007; Silton et al., 2020). In the context of this study, mindset seems to be, not only related to appraisals of academic challenges (Yeager & Dweck, 2023), but also related to evaluations of school, students' perception of their place in this context, and ultimately their sense of belonging in this setting.

Taken together, these findings suggest that students with a fixed mindset might be more likely to experience lower perceived school belonging, leading to a disconnect with the school environment and important others, such as peers and teachers. These students may, therefore, be more vulnerable to developing feelings of social rejection and isolation in the school environment, a social context where substantial time is spent (Goldberg et al., 2019). Fixed-minded beliefs might lead to misperception of social cues and situations as threats or conflicts. This misperception might lead to problematic social dynamics and negative interactions in school, giving rise to poor school belonging, which seems to be associated with the development of weaker emotion regulation strategies, such as aggressive outbursts or avoidance behaviours (Rolston & Lloyd-Richardson, 2017; Schroder et al., 2015).

Thus growth-minded beliefs seem to influence individuals' perceptions and experience of the social context, which is a robust finding that has been made in different research settings. For example, in a sample of undergraduate students in STEM programs, Williams et al. (2021) positioned growth mindset as a filter of contextual cues. Consistent with the large body of evidence presented, a positive mindset seems to support a more positive appraisal of the school environment and experience of belonging, which in turn, supports positive emotional outcomes in adolescents.

As for the second aim, the results did not support the hypothesis. To align with the literature, it was expected that the mediating effect of school belonging on the association

between growth mindset on emotion regulation would be stronger in adolescent girls. While controlling for child-level covariates and socioeconomic status, there was no evidence of moderation of the indirect effect of school belonging by gender in the present sample.

The present study did however find statistically significant differences between genders. The adolescent boys in our sample scored significantly higher than their female peers on both school belonging and emotion regulation, but not growth mindset. Past empirical work has reliably replicated Neel & Fuligni's (2013) finding of stronger school belonging in girls compared to boys, with the significance of this difference dissipating in later schooling. Therefore, this unexpected finding of lower levels of school belonging in girls, relative to boys, stands in stark contrast to the large body of research that has consistently supported the opposite pattern (e.g., Aliyev & Tunc, 2015; Goodenow & Grady, 1993).

Within the context of adolescence as a time of social reorienting, a period when the opinions of peers become more important than the opinion of family, the school becomes an influential setting for socialisation (Larson & Richards, 1991; Larson et al., 1996). Relatedly, research has shown that adolescent girls are more sensitive to perceived social threats, peer evaluation (Guyer et al., 2012; Rose & Rudolph, 2006) and are more reactive to interpersonal stress (Telzer & Fuligni, 2013), relative to adolescent boys. Navigating social conflict with peers and managing relationships with teachers (which are considered 'critical components' to school belonging; Allen et al., 2021, p. 532) are just some of the factors weighing in on adolescent girls' experience of school. This might also help to explain the finding of lower school belonging in girls in the present study.  Therefore, by strengthening students' growth mindsets, their 'filter' for perceiving the school context can be shifted in such a way that fewer social stimuli are perceived to be threats and the school is viewed more favourably, as a safe setting for socialisation and belonging (Williams et al., 2021, p. 492). Future studies with

adolescents would benefit from measuring interpersonal influences on school belonging, as the present findings would suggest that this might be related to growth mindset and in turn, have consequences for emotion regulation.

Taken together, the results of the moderated mediation analysis provide a novel and promising direction for the design and delivery of growth mindset interventions in schools. This study finds that students' sense of school belonging offers a mechanism for intervention. School interventions aiming to bolster growth mindset, and in turn, emotion regulation, through school belonging, may not need to target gender groups with distinct approaches. Rather, a whole-school intervention directed to all gender groups might be effective in buffering the negative effects of a fixed mindset on emotion regulation. This would support meta-analytic findings that whole-school interventions produce significant improvements in social, emotional, behavioural and cognitive outcomes in students (Allen, Jamshidi, et al., 2022; Goldberg et al., 2019). Indeed, the school affords a common setting for a majority of young people (Jimerson et al., 2007) and since social-emotional skills are especially malleable in school settings (West et al., 2020), these findings are especially attractive to policy-makers and those working in the school intervention space.

Although these findings are preliminary and therefore, replication is warranted, there would appear to be other mechanisms at play in the adolescents' environment. Findings revealed that approximately one-quarter of the variance in emotion regulation could be explained by the model. Other authors have similarly reported low amounts of variance being explained by the school in their models (e.g., Grace et al., 2022; West et al., 2020). This does not invalidate the present study's findings and instead, it is worthwhile noting that there are forces outside of the control of the school at play. Furthermore, there are factors within the school that have not been included in the present model, including the interaction of home and community with school, as well as teacher-student relationships (Allen et al., 2021).

Bronfenbrenner's Ecological Systems Model (1977) theorises that the developing adolescent is largely influenced by the surrounding environment and context in which they live. The school is just one of the forces influencing the developing adolescent. Therefore, given Bronfrenbrenner's theory (1977), it is unsurprising that the present model could only explain a portion of the variance in emotion regulation. Further research is needed to disentangle the many factors contributing to the variance in the associations between growth mindset, school belonging and emotion regulation and to discern the amounts of variance attributed to each variable in the adolescent's environment (Ker, 2014).

## 4.2 Strengths and Limitations

This study made use of a large population-based dataset to gather information regarding the cognitive, social and emotional factors contributing to South Australian adolescents' SWB. Linking students' WEC responses with school enrolment data allowed for community-level (SES) and student-level demographic characteristics to be included as covariates in the moderated mediation analysis. This was a noteworthy strength since the researchers could control for these influences on the hypothesised paths in the model (Yzerbyt et al., 2004). Furthermore, the inclusion of a large sample of students ($n = 6,786$), enhanced the generalisability of findings to adolescents in Australia and other parts of the world (Crossley et al., 2002).

The nature of the WEC as the present data source meant the researchers had no control over the items or scales used to measure constructs. Being mindful of the time and cognitive demands of surveying, the developers of the WEC opted for single or dual-item scales for some measures. The measure of school belonging is one of them. Future research could incorporate Allen & Kern's (2018) School Belonging Scale which measures students' connection with their teachers, parents and peers, their learning experiences, help-seeking

behaviours and sense of self within the context of the school. This might allow future researchers to more holistically capture adolescents' experience of school belonging.

A further limitation of this research is that the findings are couched in terms of the gender binary (boys and girls). Transgender and gender non-conforming (TGNC) students have not been acknowledged or included in the present study. Research suggests that children, from quite early on, are capable of accurately self-reporting their gender (Olezeski et al., 2020; Olson & Gülgöz, 2018) and gender (and sexual) diverse groups have unique needs in a number of settings, including the school (Clark et al., 2018; Day et al., 2019; Liszewski et al., 2018), making this an important area of research. Therefore, a more inclusive self-report measure of gender identity in the WEC and in future research would be particularly useful. Looking forward, this could allow researchers to capture self-reported gender in a way that reflects the full spectrum of gender identity (Ben Hagai et al., 2022).

## 4.3 Implications for Future Research and Practice

Students are nested within classrooms and school environments. Therefore, future research could extend the present model, by measuring classroom and teacher pedagogy and school culture and use methods that reveal the influence of these predictors on adolescent outcomes. Future work could further explore Walton and Yeager's (2020) assertion that certain contexts (i.e., where students feel they belong) afford certain ways of thinking (growth-mindedness), given the preliminary nature of these findings. Future research could also investigate whether mediation through school belonging is consistent for other social-emotional skills that are targeted by school interventions, like self-efficacy, self-management and self-awareness. Since these social-emotional skills have been identified as particularly time-sensitive, malleable and key complements in determining success (West, 2020), future research is needed and worthwhile to investigate whether school belonging provides an intervening influence, in a mechanism similar to the one found in the present study.

This study provides important directions for school policy, practice and intervention approaches. Schools' attention should be directed toward the value in instilling growth mindset beliefs in students, as this seems to facilitate more positive perceptions and evaluations of the school environment and ultimately students' belonging in this space. This is associated with more positive emotion regulation, which supports social and emotional well-being (Gross & John, 2003) and academic outcomes (Gumora & Arsenio, 2002).

The present findings also highlight the need for early intervention efforts. Depression and anxiety tend to be most pronounced in students who lack a sense of connection to school during the first two years of secondary school (Lester et al., 2013). This highlights the importance of intervening during the transition to high school, a period when students are engaged in increasingly complex social and emotional interactions and are likely under elevated social-emotional stress (Eccles et al., 1993). The present findings propose that during this time of navigating a new and uncertain landscape with many social dynamics unfolding, fixed-mindedness might have negative effects on school belonging and subsequently, emotion regulation.  The school, therefore, has a central role to play by identifying and addressing the challenges students face during this period.

Implementing classroom activities and school-wide programs that foster adaptive cognitions in students might strengthen growth mindset beliefs. These early intervention efforts might mitigate the adverse effects of a fixed mindset before students approach higher levels of secondary education, and are also more efficacious and cost-effective approaches than reactive clinical services which are consulted once well-being drops and psychopathology arises (Jimerson et al., 2007). Targeted interventions administered by school psychologists can be informed by these findings too. Identifying, challenging and restructuring students' cognitions related to fixed-minded beliefs (e.g., addressing fixed-trait attributions; Yeager & Dweck, 2023) might be beneficial to address poor school belonging,

negative perceptions of the school environment, and in turn, poor emotion regulation.
Evidently, the school is well-placed to support students, not only as they navigate the
academic and social landscape, but also as they mature and develop emotionally.

## 4.4 Conclusion

The present findings lend support to the well-established link between mindset and
emotion regulation, reinforcing earlier calls for growth mindset to move beyond its
previously held position as a purely academic competency. The present study suggests that
growth mindset holds significant social-emotional value and it might offer a filter for
perceiving the school setting and students' belonging within this context. The potential for
health promotion is promising, and these findings might pave the way for meaningful
intervention efforts and policy development in schools. Ultimately, this study highlights the
importance that schools instill growth mindset and nurture these beliefs in their students, in
order to promote both their academic success and social-emotional development.

# References

Abu-Bader, S., & Jones, T. V. (2021). Statistical Mediation Analysis Using the Sobel Test and Hayes SPSS Process Macro. *International Journal of Quantitative and Qualitative Research Methods*, *9*(1), 42-61. https://ssrn.com/abstract=3799204

Afzal, A., Atta, M., & Malik, N. (2016). Role of positive psychological capital in prediction of emotions and subjective wellbeing among adolescents. *Journal of the Indian Academy of Applied Psychology*, *42*(1), 72-81.

Ahmadi, S., Hassani, M., & Ahmadi, F. (2020). Student- and school-level factors related to school belongingness among high school students. *International Journal of Adolescence and Youth*, *25*(1), 741-752. https://doi.org/10.1080/02673843.2020.1730200

Aldao, A., Gee, D. G., De Los Reyes, A., & Seager, I. (2016). Emotion regulation as a transdiagnostic factor in the development of internalizing and externalizing psychopathology: Current and future directions. *Development and Psychopathology*, *28*(4), 927-946. https://doi.org/10.1017/S0954579416000638

Aliyev, R., & Tunc, E. (2015). The Investigation of Primary School Students' Perception of Quality of School Life and Sense of Belonging by Different Variables. *Revista de Cercetare si Interventie Sociala*, *48*(1), 164-174.

Allen, K.-A., Jamshidi, N., Berger, E., Reupert, A., Wurf, G., & May, F. (2022). Impact of School-Based Interventions for Building School Belonging in Adolescence: a Systematic Review. *Educational Psychology Review*, *34*(1), 229-257. https://doi.org/10.1007/s10648-021-09621-w

Allen, K.-A., & Kern, M. (2018). *School Belonging Scale*. Figshare. https://figshare.com/articles/Classroom_Belonging_Scale_docx/7042478

Allen, K.-A., & McKenzie, V. (2015). Adolescent Mental Health in an Australian Context and Future Interventions. *International Journal of Mental Health*, *44*(1), 80-93. https://doi.org/10.1080/00207411.2015.1009780

Allen, K.-A., Slaten, C. D., Arslan, G., Roffey, S., Craig, H., & Vella-Brodrick, D. A. (2021). School Belonging: The Importance of Student and Teacher Relationships. In M. L. Kern & M. L. Wehmeyer (Eds.), *The Palgrave Handbook of Positive Education* (pp. 525-550). Springer International Publishing. https://doi.org/10.1007/978-3-030-64537-3_21

Allen, K.-A., Waters, L., Arslan, G., & Prentice, M. (2022). Strength-based parenting and stress-related growth in adolescents: Exploring the role of positive reappraisal, school belonging, and emotional processing during the pandemic. *Journal of Adolescence*, *94*(2), 176-190. https://doi.org/10.1002/jad.12016

Arslan, G., Allen, K.-A., & Ryan, T. (2020). Exploring the Impacts of School Belonging on Youth Wellbeing and Mental Health among Turkish Adolescents. *Child Indicators Research*, *13*(5), 1619-1635. https://doi.org/10.1007/s12187-020-09721-z

Australian Bureau of Statistics. (2022). *Socio-Economic Indexes for Areas*. Australian Bureau of Statistics Census. https://www.abs.gov.au/websitedbs/censushome.nsf/home/seifa

Bailham, D., & Harper, P. B. (2004). Attachment Theory and Mental Health. In *Promoting the emotional well-being of children and adolescents and preventing their mental ill health: A handbook.* (pp. 49-68). Jessica Kingsley Publishers.

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality & Social Psychology*, *51*(1), 1173-1182. https://doi.org/10.1037/0022-3514.51.6.1173

Begen, F. M., & Turner-Cobb, J. M. (2015). Benefits of belonging: Experimental manipulation of social inclusion to enhance psychological and physiological health parameters. *Psychology & Health*, *30*(5), 568-582. https://doi.org/10.1080/08870446.2014.991734

Ben Hagai, E., Zurbriggen, E. L., & Lugo, N. R. (2022). The Transgender Spectrum. In E. Ben Hagai & E. L. Zurbriggen (Eds.), *Queer Theory and Psychology: Gender, Sexuality, and Transgender Identities* (pp. 99-121). Springer International Publishing. https://doi.org/10.1007/978-3-030-84891-0_5

Benner, A. D., Boyle, A. E., & Bakhtiari, F. (2017). Understanding students' transition to high school: Demographic variation and the role of supportive relationships. *Journal of Youth and Adolescence*, *46*(10), 2129-2142. https://doi.org/10.1007/s10964-017-0716-2

Blakemore, S. J., & Mills, K. L. (2014). Is adolescence a sensitive period for sociocultural processing? *Annual Review of Psychology*, *65*(1), 187-207. https://doi.org/10.1146/annurev-psych-010213-115202

Breusch, T. S., & Pagan, A. R. (1979). A Simple Test for Heteroscedasticity and Random Coefficient Variation. *Econometrica*, *47*(5), 1287-1294. https://doi.org/10.2307/1911963

Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist*, *32*(7), 513-531. https://doi.org/10.1037/0003-066X.32.7.513

Brooks, A. W. (2014). Get excited: Reappraising pre-performance anxiety as excitement. *Journal of Experimental Psychology: General*, *143*(3), 1144-1158. https://doi.org/10.1037/a0035325

Cefai, C., & Cavioni, V. (2015). Mental Health Promotion in School: An Integrated, School-Based, Whole School. In B. Kirkcaldy (Ed.), *Promoting Psychological Well-Being in Children and Families* (pp. 52-67). Palgrave Macmillan UK. https://doi.org/10.1057/9781137479969_4

Clark, B. A., Veale, J. F., Townsend, M., Frohard-Dourlent, H., & Saewyc, E. (2018). Non-binary youth: Access to gender-affirming primary health care. *International Journal of Transgenderism*, *19*(2), 158-169. https://doi.org/10.1080/15552739.2017.1394954

Claro, S., & Loeb, S. (October, 2019). Students with Growth Mindset Learn More in School: Evidence from California's CORE School Districts. In: Working Paper, Policy Analysis for California Education.

Compas, B. E., Connor-Smith, J. K., Saltzman, H., Thomsen, A. H., & Wadsworth, M. E. (2001). Coping with stress during childhood and adolescence: problems, progress, and potential in theory and research. *Psychological Bulletin*, *127*(1), 87-127. https://doi.org/10.1037/0033-2909.127.1.87

Cousineau, D., & Chartier, S. (2010). Outliers detection and treatment: a review. *International Journal of Psychological Research*, *3*(1), 58-67. https://doi.org/10.21500/20112084.844

Crossley, J., Davies, H., Humphris, G., & Jolly, B. (2002). Generalisability: a key to unlock professional assessment. *Medical Education*, *36*(10), 972-978. https://doi.org/10.1046/j.1365-2923.2002.01320.x

D'Silva, M. U., Smith, S. E., Della, L. J., Potter, D. A., Rajack-Talley, T. A., & Best, L. (2016). Reflexivity and Positionality in Researching African-American Communities: Lessons from the Field. *Intercultural Communication Studies*, *25*(1), 94-109.

Daniel, S. K., Abdel-Baki, R., & Hall, G. B. (2020). The protective effect of emotion regulation on child and adolescent wellbeing. *Journal of Child and Family Studies*, *29*(7), 2010-2027. https://doi.org/10.1007/s10826-020-01731-3

Day, J. K., Loverno, S., & Russell, S. T. (2019). Safe and supportive schools for LGBT youth: Addressing educational inequities through inclusive policies and practices. *Journal of School Psychology*, *74*(1), 29-43. https://doi.org/10.1016/j.jsp.2019.05.007

De Castella, K., Jazaieri, H., Ziv, M., Dweck, C., & Gross, J. (2013). Beliefs About Emotion: Links to Emotion Regulation, Well-Being, and Psychological Distress. *Basic and Applied Social Psychology*, *35*(1), 497-505. https://doi.org/10.1080/01973533.2013.840632

De France, K., & Evans, G. W. (2021). Expanding context in the role of emotion regulation in mental health: How socioeconomic status (SES) and developmental stage matter. *Emotion*, *21*(4), 772. https://doi.org/10.1037/emo0000743

Deming, D. J. (2017). The Growing Importance of Social Skills in the Labor Market*. *The Quarterly Journal of Economics*, *132*(4), 1593-1640. https://doi.org/10.1093/qje/qjx022

Destin, M., Hanselman, P., Buontempo, J., Tipton, E., & Yeager, D. S. (2019). Do student mindsets differ by socioeconomic status and explain disparities in academic achievement in the United States? *AERA Open*, *5*(3), 1-12. https://doi.org/10.1177/2332858419857706

Diener, E., Lucas, R., & Oishi, S. (2002). Subjective well-being: The science of happiness and life satisfaction. In C. R. S. Snyder & S. J. Lopez (Eds.), *The handbook of positive psychology* (pp. 63-73). Oxford University Press.

Dweck, C. S. (2006). *Mindset: The new psychology of success*. Random House Publishing Group.

Dweck, C. S., & Molden, D. C. (2000). *Self theories*. London.

Dweck, C. S., & Yeager, D. S. (2019). Mindsets: A View From Two Eras. *Perspectives on Psychological Science*, *14*(3), 481-496. https://doi.org/10.1177/1745691618804166

Eccles, J. S., Midgley, C., Wigfield, A., Buchanan, C. M., Reuman, D., Flanagan, C., & Mac Iver, D. (1993). Development during adolescence: The impact of stage-environment fit on young adolescents' experiences in schools and in families. *American Psychologist*, *48*(2), 90-101. https://doi.org/10.1037/0003-066X.48.2.90

Eccles, J. S., & Roeser, R. W. (2011). Schools as developmental contexts during adolescence. *Journal of Research on Adolescence*, *21*(1), 225-241. https://doi.org/10.1111/j.1532-7795.2010.00725.x

El Zaatari, W., & Maalouf, I. (2022). How the Bronfenbrenner Bio-ecological System Theory Explains the Development of Students' Sense of Belonging to School? *SAGE Open*, *12*(4), 21582440221134089. https://doi.org/10.1177/21582440221134089

Field, A. (2018). Discovering Statistics Using IBM SPSS Statistics. In J. Seaman (Ed.), (5 ed.). SAGE.

Fong Lam, U., Chen, W.-W., Zhang, J., & Liang, T. (2015). It feels good to learn where I belong: School belonging, academic emotions, and academic achievement in adolescents. *School Psychology International*, *36*(4), 393-409. https://doi.org/10.1177/0143034315589649

Furlong, M. J., You, S., Renshaw, T. L., Smith, D. C., & O'Malley, M. D. (2014). Preliminary Development and Validation of the Social and Emotional Health Survey for Secondary School Students. *Social Indicators Research*, *117*(3), 1011-1032. https://doi.org/10.1007/s11205-013-0373-0

Gajda, M., Małkowska-Szkutnik, A., & Rodzeń, W. (2022). Self-Regulation in Adolescents: Polish Adaptation and Validation of the Self-Regulation Scale. *International Journal of Environmental Research and Public Health*, *19*(12), 7432. https://doi.org/10.3390/ijerph19127432

Goldberg, J. M., Sklad, M., Elfrink, T. R., Schreurs, K. M. G., Bohlmeijer, E. T., & Clarke, A. M. (2019). Effectiveness of interventions adopting a whole school approach to enhancing social and emotional development: a meta-analysis. *European Journal of Psychology of Education*, *34*(4), 755-782. https://doi.org/10.1007/s10212-018-0406-9

Goodenow, C. (1993). The psychological sense of school membership among adolescents: Scale development and educational correlates. *Psychology in the Schools*, *30*(1), 79-90. https://doi.org/10.1002/1520-6807(199301)30:1<79::AID-PITS2310300113>3.0.CO;2-X

Goodenow, C., & Grady, K. E. (1993). The relationship of school belonging and friends' values to academic motivation among urban adolescent students. *Journal of Experimental Education*, *62*, 60-71. https://doi.org/10.1080/00220973.1993.9943831

Grace, B. S., Gregory, T., Collier, L., & Brinkman, S. (2022). Clustering of Wellbeing, Engagement and Academic Outcomes in Australian Primary Schools. *Child Indicators Research*, *15*(6), 2171-2195. https://doi.org/10.1007/s12187-022-09974-w

Granziera, H., Collie, R. J., Martin, A. J., & Nassar, N. (2021). Behavioral self-regulation among children with hyperactivity and inattention in the first year of school: A population-based latent profile analysis and links with later ADHD diagnosis. *Journal of Educational Psychology*. https://doi.org/10.1037/edu0000677

Greenbank, P. (2003). The Role of Values in Educational Research: The case for reflexivity. *British Educational Research Journal*, *29*(1), 791-801. https://doi.org/10.1080/0141192032000137303

Greenberg, M., Domitrovich, C., & Bumbarger, B. (2001). The Prevention of Mental Disorders in School-Aged Children: Current State of the Field. *Prevention & Treatment*, *4*, 1a-1a. https://doi.org/10.1037/1522-3736.4.1.41a

Gregory, T., & Brinkman, S. A. (2020). *Wellbeing and engagement collection (WEC): History of the wec in the south australian school system and psychometric properties of the WEC survey instrument.* SA Department for Education and the Telethon Kids Institute Adelaide.

Gregory, T., Engelhardt, D., Lewkowicz, A., Luddy, S., Guhn, M., Gadermann, A., Schonert-Reichl, K., & Brinkman, S. (2019). Validity of the Middle Years Development Instrument for Population Monitoring of Student Wellbeing in Australian School Children. *Child Indicators Research*, *12*(3), 873-899. https://doi.org/10.1007/s12187-018-9562-3

Gregory, T., Lewkowicz, A., Engelhardt, D., Stringer, A., Luddy, S., & Brinkman, S. A. (2021). Data Resource Profile: The South Australian Well-being and Engagement Collection (WEC). *International Journal of Epidemiology*, *51*(1), 16a-16g. https://doi.org/10.1093/ije/dyab103

Gross, J. J. (1998a). The Emerging Field of Emotion Regulation: An Integrative Review. *Review of General Psychology*, *2*(3), 271-299. https://doi.org/10.1037/1089-2680.2.3.271

Gross, J. J. (1998b). Antecedent-and response-focused emotion regulation: divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology*, *74*(1), 224-237.

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, *85*(2), 348-362. https://doi.org/10.1037/0022-3514.85.2.348

Güemes-Hidalgo, M., González-Fierro, M. J., & Vicario, M. I. (2017). Desarrollo durante la adolescencia. Aspectos físicos, psicológicos y sociales. *Pediatria Integral*, *21*(1), 233-244.

Gullone, E., & Taffe, J. (2011). The Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CA): A Psychometric Evaluation. *Psychological Assessment*, *24*(1), 409-417. https://doi.org/10.1037/a0025777

Gumora, G., & Arsenio, W. F. (2002). Emotionality, Emotion Regulation, and School Performance in Middle School Children. *Journal of School Psychology*, *40*(5), 395-413. https://doi.org/10.1016/S0022-4405(02)00108-5

Gurera, J. W., & Isaacowitz, D. M. (2019). Emotion regulation and emotion perception in aging: A perspective on age-related differences and similarities. In *Emotion and cognition* (pp. 329-351). Elsevier Academic Press. https://doi.org/10.1016/bs.pbr.2019.02.007

Gurnsey, F. N. (2018). *Statistics for research in psychology: a modern approach using estimation*. SAGE.

Guyer, A. E., Choate, V. R., Pine, D. S., & Nelson, E. E. (2012). Neural circuitry underlying affective response to peer feedback in adolescence. *Social Cognitive and Affective Neuroscience*, *7*(1), 81-92. https://doi.org/10.1093/scan/nsr043

Halliday, S., Taylor, A., Turnbull, D., & Gregory, T. (2022). The Relationship Between Traditional and Cyber Bullying Victimization in Early Adolescence and Emotional Wellbeing: A Cross-Sectional, Population-Based Study. *International Journal of Bullying Prevention*. https://doi.org/10.1007/s42380-022-00144-8

Hayes, A. F. (2017). *Part II. Mediation Analysis. In Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach* (2 ed.). Guilford Publications.

Hofmann, S. G., Sawyer, A. T., Fang, A., & Asnaani, A. (2012). Emotion Dysregulation Model of Mood and Anxiety Disorders *Depression and Anxiety*, *29*(5), 409-416. https://doi.org/10.1002/da.21888

Hope, E. C., Brugh, C. S., & Nance, A. (2019). In search of a critical stance: Applying qualitative research practices for critical quantitative research in psychology. *Community Psychology in Global Perspective*, *5*(2), 63-69. https://doi.org/10.1285/i24212113v5i2p63

Huynh, V., & Gillen-O'Neel, C. (2013). Discrimination and Sleep: The Protective Role of School Belonging. *Youth & Society*, *48*(5), 649-672. https://doi.org/10.1177/0044118X13506720

IBM. (2020). *IBM SPSS Statistics: Features and modules*. https://www.ibm.com/au-en/products/spss-statistics/details

Jamieson, M. K., Govaart, G. H., & Pownall, M. (2023). Reflexivity in quantitative research: A rationale and beginner's guide. *Social and Personality Psychology Compass*, *17*(4), 1-15. https://doi.org/10.1111/spc3.12735

Jiang, X., Mueller, C., & Paley, N. (2023). A Systematic Review of Growth Mindset Interventions Targeting Youth Social–Emotional Outcomes. *School Psychology Review*, *Advance online publication*. https://doi.org/10.1080/2372966X.2022.2151321

Jimerson, S. R., Burns, M. K., & VanDerHeyden, A. M. (2007). *Response to intervention at school: The science and practice of assessment and intervention*. Springer. https://doi.org/10.1007/978-0-387-49053-3_1

Jones, S. M., & Bouffard, S. M. (2012). Social and Emotional Learning in Schools: From Programs to Strategies. Social Policy Report. *Society for Research in Child Development*, *26*(4), 1-33. https://doi.org/10.1002/j.2379-3988.2012.tb00073.x

Jones, S. M., McGarrah, M. W., & Kahn, J. (2019). Social and emotional learning: A principled science of human development in context. *Educational Psychologist*, *54*(3), 129-143. https://doi.org/10.1080/00461520.2019.1625776

Judd, C. M., & Kenny, D. A. (1981). Process Analysis:Estimating Mediation in Treatment Evaluations. *Evaluation Review*, *5*(5), 602-619. https://doi.org/10.1177/0193841x8100500502

Kalubi, J., Riglea, T., Doré, I., Potvin, L., & O'Loughlin, J. (2023). Mental health-promoting interventions in elementary schools: School context correlates of availability and alignment with evidence-based practices. *Population Medicine*, *5*. https://doi.org/10.18332/popmed/164685

Kennewell, E., Curtis, R. G., Maher, C., Luddy, S., & Virgara, R. (2022). The relationships between school children's wellbeing, socio-economic disadvantage and after-school activities: a cross-sectional study. *BMC Pediatrics*, *22*(1), 297. https://doi.org/10.1186/s12887-022-03322-1

Ker, H. (2014). Application of hierarchical linear models/linear mixed-effects models in school effectiveness research. *Universal Journal of Educational Research*, *2*(2), 173-180.

Kern, M. L. (in press). PERMAH: A useful model for focusing on wellbeing in schools. In K. A. Allen, M. Furlong, S. S., & D. Vella-Brodrick (Eds.), *The handbook of positive psychology in schools* (3 ed.). Taylor and Francis.

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives Of General Psychiatry*, *62*(6), 593-602. https://doi.org/10.1001/archpsyc.62.6.593

Keyes, C. L. M., & Martin, C. C. (2017). The complete state model of mental health. In M. Slade, L. Oades, & A. Jarden (Eds.), *Wellbeing, recovery and mental health* (pp. 86–98). Cambridge University Press.

Knollmann, M., Reissner, V., & Hebebrand, J. (2019). Towards a comprehensive assessment of school absenteeism: development and initial validation of the inventory of school attendance problems. *European Child and Adolescent Psychiatry*, *28*(3), 399-414. https://doi.org/10.1007/s00787-018-1204-2

Krishnan, V. (2010). Early child development: A conceptual model. Early Childhood Council Annual Conference, New Zealand.

Lang, K. M., & Little, T. D. (2018). Principled Missing Data Treatments. *Prevention science: the official Journal of the Society for Prevention Research*, *19*(3), 284-294. https://doi.org/10.1007/s11121-016-0644-5

Larson, R., & Richards, M. H. (1991). Daily companionship in late childhood and early adolescence: changing developmental contexts. *Child Development*, *62*(2), 284-300. https://doi.org/10.1111/j.1467-8624.1991.tb01531.x

Larson, R. W., Richards, M. H., Moneta, G. B., Holmbeck, G. N., & Duckett, E. (1996). Changes in adolescents' daily interactions with their families from ages 10 to 18: Disengagement and transformation. *Developmental Psychology*, *32*(4), 744-754. https://doi.org/10.1037/0012-1649.32.4.744

Ledgerwood, A., Hudson, S. T. J., Lewis, N. A., Jr., Maddox, K. B., Pickett, C. L., Remedios, J. D., Cheryan, S., Diekman, A. B., Dutra, N. B., Goh, J. X., Goodwin, S. A., Munakata, Y., Navarro, D. J., Onyeador, I. N., Srivastava, S., & Wilkins, C. L. (2022). The Pandemic as a Portal: Reimagining Psychological Science as Truly Open and Inclusive. *Perspectives on Psychological Science: A Journal of the Association for Psychological Science*, *17*(4), 937-959. https://doi.org/10.1177/17456916211036654

Lester, L., Waters, S., & Cross, D. (2013). The relationship between school connectedness and mental health during the transition to secondary school: a path analysis. *Journal of Psychologists and Counsellors in Schools*, *23*(2), 157-171. https://doi.org/10.1017/jgc.2013.20

Liszewski, W., Peebles, J. K., Yeung, H., & Arron, S. (2018). Persons of Nonbinary Gender — Awareness, Visibility, and Health Disparities. *New England Journal of Medicine*, *379*(25), 2391-2393. https://doi.org/10.1056/NEJMp1812005

Longaretti, L. (2020). Perceptions and experiences of belonging during the transition from primary to secondary school. *Australian Journal of Teacher Education*, *45*(1), 31-46. https://doi.org/10.14221/ajte.2020v45n1.3

Macnamara, B. N., & Rupani, N. S. (2017). The relationship between intelligence and mindset. *Intelligence*, *64*(1), 52-59. https://doi.org/10.1016/j.intell.2017.07.003

Matthews, D. J., & Folsom, C. (2008). Making connections: cognition, emotion and a shifting paradigm. . In T. Balchin, B. Hymer, & D. J. Matthews (Eds.), *The Routledge International Companion to Gifted Education* (1 ed.). Routledge. https://doi.org/https://doi.org/10.4324/9780203609385

McCormick, C. M., Mathews, I. Z., Thomas, C., & Waters, P. (2010). Investigations of HPA function and the enduring consequences of stressors in adolescence in animal models. *Brain and Cognition*, *72*(1), 73-85. https://doi.org/10.1016/j.bandc.2009.06.003

Milojevich, H. M., Norwalk, K. E., & Sheridan, M. A. (2019). Deprivation and threat, emotion dysregulation, and psychopathology: Concurrent and longitudinal associations. *Development and Psychopathology*, *31*(3), 847-857. https://doi.org/10.1017/S0954579419000294

Moser, J. S., Schroder, H. S., Heeter, C., Moran, T. P., & Lee, Y. H. (2011). Mind your errors: evidence for a neural mechanism linking growth mind-set to adaptive posterror adjustments. *Psychological Science*, *22*(12), 1484-1489. https://doi.org/10.1177/0956797611419520

National Research Council. (2012). *Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century*. The National Academies Press. https://doi.org/10.17226/13398

Neel, C. G.-O., & Fuligni, A. J. (2013). A longitudinal study of school belonging and academic motivation across high school. *Child Development*, *84 2*, 678-692. https://doi.org/10.1111/j.1467-8624.2012.01862.x

Olezeski, C. L., Pariseau, E. M., Bamatter, W. P., & Tishelman, A. C. (2020). Assessing gender in young children: Constructs and considerations. *Psychology of Sexual Orientation and Gender Diversity*, *7*(3), 293-303. https://doi.org/10.1037/sgd0000381

Olson, K. R., & Gülgöz, S. (2018). Early Findings From the TransYouth Project: Gender Development in Transgender Children. *Child Development Perspectives*, *12*(2), 93-97. https://doi.org/10.1111/cdep.12268

Pandey, A., Hale, D., Das, S., Goddings, A. L., Blakemore, S. J., & Viner, R. M. (2018). Effectiveness of Universal Self-regulation-Based Interventions in Children and Adolescents: A Systematic Review and Meta-analysis. *JAMA Pediatrics*, *172*(6), 566-575. https://doi.org/10.1001/jamapediatrics.2018.0232

Paolini, A. C. (2020). Social Emotional Learning: Key to Career Readiness. *Anatolian Journal of Education*, *5*(1), 125-134. https://doi.org/10.29333/aje.2020.5112a

Park, N. (2004). The Role of Subjective Well-Being in Positive Youth Development. *The Annals of the American Academy of Political and Social Science*, *591*(1), 25-39. http://www.jstor.org/stable/4127633

Parr, N. J. (2022). Differences in the age-varying association of school belonging with socioemotional flourishing among minority and non-minority college and university students. *Journal of American College Health*, *70*(5), 1336-1340. https://doi.org/10.1080/07448481.2020.1808662

Peterson, C. (2006). *A primer in positive psychology*. Oxford University Press.

Rolston, A., & Lloyd-Richardson, E. (2017). *What is emotion regulation and how do we do it?* Cornell Research Program on Self-Injury and Recovery.

Rose, A. J., & Rudolph, K. D. (2006). A review of sex differences in peer relationship processes: Potential trade-offs for the emotional and behavioral development of girls and boys. *Psychological Bulletin*, *132*(1), 98-131. https://doi.org/10.1037/0033-2909.132.1.98

Scarf, D., Moradi, S., McGaw, K., Hewitt, J., Hayhurst, J. G., Boyes, M., Ruffman, T., & Hunter, J. A. (2016). Somewhere I belong: Long-term increases in adolescents' resilience are predicted by perceived belonging to the in-group. *British Journal of Social Psychology*, *55*(3), 588-599. https://doi.org/10.1111/bjso.12151

Schonert-Reichl, K. A., Guhn, M., Gadermann, A. M., Hymel, S., Sweiss, L., & Hertzman, C. (2013). Development and Validation of the Middle Years Development Instrument (MDI): Assessing Children's Well-Being and Assets across Multiple Contexts. *Social Indicators Research*, *114*(2), 345-369. https://doi.org/10.1007/s11205-012-0149-y

Schroder, H. S. (2021). Mindsets in the clinic: Applying mindset theory to clinical psychology. *Clinical Psychology Review*, *83*, 101957. https://doi.org/10.1016/j.cpr.2020.101957

Schroder, H. S., Dawood, S., Yalch, M. M., Donnellan, M. B., & Moser, J. S. (2015). The Role of Implicit Theories in Mental Health Symptoms, Emotion Regulation, and Hypothetical Treatment Choices in College Students. *Cognitive Therapy and Research*, *39*(2), 120-139. https://doi.org/10.1007/s10608-014-9652-6

Schroder, H. S., Yalch, M. M., Dawood, S., Callahan, C. P., Brent Donnellan, M., & Moser, J. S. (2017). Growth mindset of anxiety buffers the link between stressful life events and psychological distress and coping strategies. *Personality and Individual Differences*, *110*, 23-26. https://doi.org/10.1016/j.paid.2017.01.016

Šeboková, G., Uhláriková, J., & Halamová, M. (2018). Cognitive and social sources of adolescent well-being: Mediating role of school belonging. *Studia Psychologica*, *60*, 16-29. https://doi.org/10.21909/sp.2018.01.749

Seligman, M. E. P., & Csikszentmihalyi, M. (2000). *Positive psychology: An introduction* (Vol. 55). American Psychological Association.

Shochet, I. M., Smyth, T., & Homel, R. (2007). The impact of parental attachment on adolescent perception of the school environment and school connectedness. *Australian and New Zealand Journal of Family Therapy*, *28*(2), 109-118. https://doi.org/10.1375/anft.28.2.109

Silton, R. L., Kahrilas, I. J., Skymba, H. V., Smith, J., Bryant, F. B., & Heller, W. (2020). Regulating positive emotions: Implications for promoting well-being in individuals with depression. *Emotion*, *20*(1), 93-97. https://doi.org/10.1037/emo0000675

South Australia Department for Education. (2021). *About the wellbeing and engagement collection*. https://www.education.sa.gov.au/department/research-and-data/wellbeing-and-engagement-collection/about-wellbeing-and-engagement-collection

Storek, J., & Furnham, A. (2013). Gender, g, gender identity concepts, and self-constructs as predictors of the self-estimated IQ. *The Journal of Genetic Psychology: Research and Theory on Human Development*, *174*(6), 664-676. https://doi.org/10.1080/00221325.2013.772501

Suldo, S., Thalji, A., & Ferron, J. (2011). Longitudinal academic outcomes predicted by early adolescents' subjective well-being, psychopathology, and mental health status yielded from a dual factor model. *The Journal of Positive Psychology: Special Issue on Positive Youth Psychology*, *6*(1), 17-30. https://doi.org/doi.org/10.1080/

Telzer, E. H., & Fuligni, A. J. (2013). Positive daily family interactions eliminate gender differences in internalizing symptoms among adolescents. *Journal of Youth and Adolescence*, *42*(1), 1498-1511. https://doi.org/10.1007/s10964-013-9964-y

Temple, B., & Young, A. (2004). Qualitative Research and Translation Dilemmas. *Qualitative Research*, *4*(2), 161-178. https://doi.org/10.1177/1468794104044430

Tucker-Drob, E. M., Briley, D. A., Engelhardt, L. E., Mann, F. D., & Harden, K. P. (2016). Genetically-mediated associations between measures of childhood character and academic achievement. *Journal of Personality and Social Psychology*, *111*(5), 790-815. https://doi.org/10.1037/pspp0000098

Tugade, M. M., & Fredrickson, B. L. (2007). Regulation of positive emotions: Emotion regulation strategies that promote resilience. *Journal of Happiness Studies: An Interdisciplinary Forum on Subjective Well-Being*, *8*(3), 311-333. https://doi.org/10.1007/s10902-006-9015-4

Uchino, B. N. (2006). Social support and health: a review of physiological processes potentially underlying links to disease outcomes. *Journal of Behavioral Medicine*, *29*, 377-387. https://doi.org/10.1016/0006-2944(75)90147-7

Walton, G. M., & Yeager, D. S. (2020). Seed and Soil: Psychological Affordances in Contexts Help to Explain Where Wise Interventions Succeed or Fail. *Current Directions in Psychological Science*, *29*(3), 219-226. https://doi.org/10.1177/0963721420904453

Weninger, R. L., & Holder, M. D. (2014). Extraversion and subjective well-being. In A. D. Haddock & A. P. Rutkowski (Eds.), *Psychology of Extraversion* (pp. 1-26). Nova Science Publishers.

West, M. R., Pier, L., Fricke, H., Hough, H., Loeb, S., Meyer, R. H., & Rice, A. B. (2020). Trends in Student Social-Emotional Learning: Evidence From the First Large-Scale Panel Student Survey. *Educational Evaluation and Policy Analysis*, *42*(2), 279-303. https://doi.org/10.3102/0162373720912236

Williams, C. L., Hirschi, Q., Hulleman, C. S., & Roksa, J. (2021). Belonging in STEM: Growth Mindset as a Filter of Contextual Cues. *International Journal of Community Well-Being*, *4*(4), 467-503. https://doi.org/10.1007/s42413-021-00111-z

World Health Organisation. (2014). *Health for the World's Adolescents. A Second Chance in the Second Decade.* World Health Organisation. http://apps.who.int/adolescent/second-decade/files/1612_MNCAH_HWA_Executive_Summary.pdf

Yeager, D. S., & Dweck, C. S. (2023). Mindsets and adolescent mental health. *Nature Mental Health*, *1*(2), 79-81. https://doi.org/10.1038/s44220-022-00009-5

Yeager, D. S., Lee, H. Y., & Jamieson, J. P. (2016). How to Improve Adolescent Stress Responses: Insights From Integrating Implicit Theories of Personality and Biopsychosocial Models. *Psychological Science*, *27*(8), 1078-1091. https://doi.org/10.1177/0956797616649604

Yilmaz, E. (2022). Development Of Mindset Theory Scale (Growth And Fixed Mindset): A Validity And Reliability Study (Turkish Version). *Research on Education and Psychology*, *6*(1), 1-26. https://doi.org/10.54535/rep.1054235

Yough, M. (2009). *English language learners and distinctions between student-teacher relationships and school climate*. The Ohio State University. https://kb.osu.edu/handle/1811/45254

Yzerbyt, V. Y., Muller, D., & Judd, C. M. (2004). Adjusting researchers' approach to adjustment: On the use of covariates when testing interactions. *Journal of Experimental Social Psychology*, *40*(3), 424-431. https://doi.org/10.1016/j.jesp.2003.10.001

Zhang, M. X., Mou, N. L., Tong, K. K., & Wu, A. M. (2018). Investigation of the effects of purpose in life, grit, gratitude, and school belonging on mental distress among Chinese emerging adults. *International Journal of Environmental Research and Public Health*, *15*(10), 2147. https://doi.org/10.3390/ijerph15102147

Zijlstra, W. P., van der Ark, L. A., & Sijtsma, K. (2011). Outliers in questionnaire data: can they be detected and should they be removed? *Journal of Educational and Behavioral Statistics*, *36*(2), 186-212. https://doi.org/ 10.3102/1076998610366263

**Appendix A**

**OSF Preregistration**

Exploring school belonging as a mediator in the relationship between growth mindset and adolescent emotional regulation, and gender differences - a moderated mediation model.

Public registration     Updates

≡                                                                                    **Metadata**

**This is an update to the original registration**

This update was made on May 25, 2023

Reason for update:
*After a thorough scope of the literature, age, gender, language spoken at home and SES (as per the SEIFA indexes) have been selected as covariates in the mediation model, due to their documented relationships with the variables of interest. Age has been found to be related to differences in growth mindset (Claro & Loeb, 2019), school belonging (Parr, 2022) and emotional regulation (Granziera et al., 2021). SES has been linked to growth mindset (Destin et al., 2019), school belonging (Ahmadi et al., 2020) and emotional regulation (De France & Evans, 2021; Kennewell et al., 2022). English speaking background is a well-documented student-level factor related to differences in growth mindset (Claro & Loeb, 2019), school belonging (Yough, 2009) and emotional regulation (Granziera et al., 2021). Finally, gender differences have been observed in growth mindset (Claro & Loeb, 2019), school belonging (Aliyev & Tunc, 2015; Goodenow & Grady, 1993; Neel & Fuligni, 2013) and emotional regulation (Granziera et al., 2021). In the moderated mediation*

## Study Information                                                              ≡

### Hypotheses

The researchers hypothesise that:

1. The effect of growth mindset on emotional regulation will be partially mediated by school belonging, such that higher levels of growth mindset will lead to higher levels of emotional regulation through enhanced school belonging.
2. Gender will moderate the indirect effect of the mediation, specifically the associations between growth mindset and school belonging and the associations between school belonging and emotional regulation. The researchers hypothesise that the indirect effect of growth mindset on emotional regulation through school belonging will be stronger in adolescent girls.

## Design Plan

### Study type

Observational Study - Data is collected from study subjects that are not randomly assigned to a treatment. This includes surveys, "natural experiments," and regression discontinuity designs.

### Blinding

No blinding is involved in this study.

### Is there any additional blinding in this study?

*No response*

### Study design

This study is correlational in nature, and will use a mediation model to test hypothesis one and a moderated mediation model for hypothesis two.

*No files selected*

**Randomization**

*No response*

# Sampling Plan

**Existing Data**

Registration prior to analysis of the data

**Explanation of existing data**

This project uses a pre-existing, population-based dataset, the Wellbeing and Engagement Collection (WEC). This project will be utilising the dataset from a previous project, which has had ethics approval by both the HREC subcommittee in the School of Psychology at the University of Adelaide and the South Australian Department of Education (#20/02 and #2020-0007, respectively). An application will be made to the South Australian Department of Education to grant approval to use this dataset for the present project. This project will examine the year 9 South Australian students of 2019.

The primary researcher has had no contact with or access to the data. They are unaware of patterns, correlations or summary statistics of the data - other than a rough estimate of sample size and the variables within the dataset. Access to the data set will be granted to the primary researcher by the primary supervisor after ethics approval is granted and preregistration is complete.

**Data collection procedures**

This research project will use de-identified, administrative data on student's wellbeing held by the South Australian Department for Education (DfE). No direct contact with those who complete or have completed the survey for the DfE will be made for this study. The data set does not contain any participant names – instead participants are assigned identifier numbers by the DfE. There will be no way of tracing participant numbers back to individuals in the WEC dataset and the data will be stored in a secure Box folder.

*No files selected*

**Sample size**

The researchers will focus on students who completed the Wellbeing and Engagement Collection in Grade 9 in 2019. The researchers estimate that the sample size will be approximately 7,000 total students. The exact n value will be determined when ethics approval is granted and the researchers access the database.

**Sample size rationale**

The researchers seek to analyse a sample as high as this to ensure statistical power.

**Stopping rule**

Not relevant. The data has already been collected.

# Variables

**Manipulated variables**

Not applicable to this correlational observational study.

*No files selected*

**Measured variables**

Predictor - Growth mindset (as measured by 'Cognitive Engagement' in the WEC)
Items about cognitive engagement included "No matter who you are, you can change your intelligence" and "When I found something hard, I tried another way". The response options to these statements ranged from 1 = none of time to 5 = all of the time.

Mediator - School belonging
There were two items, "I feel like I belong in this school" and "I feel like I am important to this school". The response options to these items ranged from 1 = strongly disagree to 5 = strongly agree.

Outcome - Emotional regulation.
Measured using the cognitive reappraisal scale of the 'Emotion Regulation Questionnaire for Children and Adolescents' and includes the following questions: 'When I want to feel happier, I think about something different', 'When I want to feel less bad (e.g. sad, angry, or worried), I think about something different', 'When I'm worried about something, I make myself think about it in a different way and that helps me feel better', 'I control my feelings about things by changing the way I think about them' and 'When I want to feel less bad (e.g. sad, angry, or worried), I change the way I think about it'. The response options for these item ranged from 1 = 'strongly disagree' to 5 = 'strongly agree'.

Moderator - Gender

*No files selected*

**Indices**

*No response*

*No files selected*

# Analysis Plan

**Statistical models      Updated**

The analysis will be conducted using IBM SPSS statistics. Dr ███████████ and ███████████ will be undertaking analysis of the dataset, with support from Dr ████████ as needed.

Descriptive statistics will be conducted to explore the variables of interest: growth mindset, school belonging and emotional regulation. Descriptive statistics will be followed by mediation analysis using the PROCESS macro.

Mediation analysis is a statistical approach that is suitable for examining the mediating role of a variable in the relationship between two other variables. In this study, the researchers will examine the mediating role of school belonging in the relationship between growth mindset and emotional regulation in mid-adolescent students. The researchers will use mediation analysis to test the first hypothesis that the effect of growth mindset on emotional regulation will be partially mediated by school belonging, such that higher levels of growth mindset will lead to higher levels of emotional regulation through enhanced school belonging. The mediation model (using the PROCESS macro in IBM SPSS) is appropriate as it can provide estimates of both the direct effect of growth mindset on emotional regulation and the indirect effect of growth mindset on emotional regulation through school belonging.

A moderated mediation analysis will subsequently be conducted, also via the PROCESS macro in IBM SPSS. Thus, a moderated mediation model will be run to examine whether the relationship between growth mindset and emotional regulation through school belonging is moderated by gender.

After a thorough scope of the literature, age, gender, language spoken at home and SES (as per the SEIFA indexes) have been selected as covariates in the mediation model, due to their documented relationships with the variables of interest. Age has been found to be related to differences in growth mindset (Claro & Loeb, 2019), school belonging (Parr, 2022) and emotional regulation (Granziera et al., 2021). SES has been linked to growth mindset (Destin et al., 2019), school belonging (Ahmadi et al., 2020) and emotional regulation (De France & Evans, 2021; Kennewell et al., 2022). English speaking background is a well-documented student-level factor related to differences in growth mindset (Claro & Loeb, 2019), school belonging (Yough, 2009) and emotional regulation (Granziera et al., 2021). Finally, gender differences have been observed in growth mindset (Claro & Loeb, 2019), school belonging (Aliyev & Tunc, 2015; Goodenow & Grady, 1993; Neel & Fuligni, 2013) and emotional regulation (Granziera et al., 2021). In the moderated mediation, age, language spoken at home and SES selected as covariates following the same rationale.

*No files selected*

**Transformations**

The categorical gender variable will be coded in a way where 0 = males and 1 = females.

**Inference criteria**

Model 4 of PROCESS Macro will be used to test the mediating effect of school belonging on the relationship between growth mindset and emotional regulation. Emotional regulation will be entered as the outcome variable, school belonging as the mediator and growth mindset as the the independent variable (predictor). Covariates entered as per the analysis plan. The researchers will also test the total effect size (= c-path, the standardised effect size of the indirect effect and R-squared to explain how much of the variance is explained by the variables in the model.

The researchers will report on:
- the significance (p-value), coefficient (unstandardised regression coefficient b), t-scores, standard error (SE) and lower and upper level confidence intervals (LLCI and ULCI) of the a-path of the mediation (growth mindset --> school belonging)
- the significance (p-value), coefficient (unstandardised regression coefficient b), t-scores, SE, and lower and upper level confidence intervals (LLCI and ULCI) of the c'-path (direct effect) of growth mindset --> emotional regulation
- the significance (p-value), coefficient (unstandardised regression coefficient b), SE, t-scores, and lower and upper level confidence intervals (LLCI and ULCI) of the b-path of the mediation (school belonging --> emotional regulation).

Model 58 of PROCESS Macro will be used to test the moderating effect of gender on the a-path (growth mindset --> school belonging) and the b-path (school belonging --> emotional regulation) . Emotional regulation will be entered as the outcome variable, school belonging as the mediator, growth mindset as the the independent variable (predictor) and gender as the

moderator. Covariates entered as per the analysis plan. The researchers will also test the total effect size (= c-path, the standardised effect size of the indirect effect and R2 change to explain how much of the variance is explained by the variables in the model.

The researchers will report on:
- the index of moderated mediation - infer significance of the moderation if zero is not included in the confidence interval.
- (if significant), the indirect effect of the moderator, at each level (i.e. male and female).
- the significance (p-value), coefficient (unstandardised regression coefficient b), standard error (SE), t-scores and lower and upper level confidence intervals (LLCI and ULCI) of the direct effect of growth mindset on emotional regulation.
- the significance (p-value), coefficient (unstandardised regression coefficient b), SE, t-scores and lower and upper level confidence intervals (LLCI and ULCI) of the a-path of the moderation (growth mindset --> school belonging)
- the significance (p-value), coefficient (unstandardised regression coefficient b), SE, t-scores and lower and upper level confidence intervals (LLCI and ULCI) of the b-path of the moderation (school belonging-->emotional regulation)

The researchers will use the standard p<.05 criteria for determining statistical significance. Since the researchers have a very large sample size, bootstrapping will not be conducted. Likewise, the Sobel test will not be employed to assess the significance of the indirect effect in the (moderated) mediation model. The Sobel test may yield highly significant results even for small indirect effects, leading to potential issues with inflating the mediating role of school belonging and therefore, lead to an over-interpretation of the findings. Instead, the researchers will rely on significance, CI and effect sizes.

**Data exclusion**

Outliers will be included in the analysis.

**Missing data**

Participants with missing data will be removed from the final analysis sample.

**Exploratory analysis**

*No response*

# Other

**Other**

*No response*

**Appendix B**

**Quantitative Reflexivity Statement (QRS):**

Historically, quantitative methodologies have remained detached from reflexivity, the practice of actively and willingly considering the researchers' positionality and how it may shape the planning of research, analysis and interpretation of data and reporting of findings (Jamieson et al., 2023). Recently, calls have been made to challenge the "veneers of objectivity" in *quantitative* psychological research (Jamieson et al., 2023, p. 5), acknowledge the subjective and biased nature of data interpretation and prompt researchers to operate from a critical epistemological standpoint (Greenbank, 2003; Hope et al., 2019). Temple and Young (2004) contend that positionality ultimately influences research as one's position within the social world influences the way they see it. Through reflexive practice, the primary researcher was critical of motivators for making specific decisions and remained cognisant of the influence of their own values, beliefs, past experiences and underlying assumptions on the research process (D'Silva et al., 2016).

As per recommendations by Jamieson et al. (2023) and D'Silva et al. (2016), an audit trail was kept as a concrete tool for transparency, logging analytic decisions and evaluating data and the primary researcher critically engaged with a diverse evidence base during the literature review. The researcher's concentrated efforts to ensure cultural and gender representation in previously cited work, gave voice to researchers of many backgrounds. The present QRS was used to centralise and confront biases (Ledgerwood et al., 2022), acknowledging the primary researcher as a white, cis-gendered male, recognising their own identity (and privilege) as a middle-class citizen with their own experience of South Australian schooling. In the present study, concerted efforts for reflexivity, alongside pre-registration, was not tangential or inconsistent, but rather a persistent commitment towards transparent, rigorous research.

**Appendix C**

**Assumption Testing:**

A Kolmogorov-Smirnov (K-S) test was conducted and found none of the variables of interest to be normally distributed. It is well documented that normality tests, such as the K-S, are sensitive and often report significant deviations in larger samples (recall: n=6,786), when data is in fact normally distributed (Field, 2018). Pearson's skew and kurtosis coefficient assessment (within range of -1 and +1; Abu-Bader & Jones, 2021) and visual inspection of histograms and QQ-plots revealed normality for all variables. The homoscedasticity assumption was met, confirmed by a significant finding for the Breusch-Pagan test that tests for global heteroscedasticity in linear models (Breusch & Pagan, 1979). Multicollinearity was absent, as indicated by a variance inflation factor (VIF) of 1.0 for both predictor and moderator (Gurnsey, 2018). Since Likert-scale data does not provide clear indications of linearity through scatterplot, a pair-wise correlation was conducted (see Table 2 in-text). Satisfaction of the moderated mediation and linear regression assumptions ensured a robust and properly specified model (Baron & Kenny, 1986; Judd & Kenny, 1981).

# Appendix D

## Table 5

*Testing the mediation effect of growth mindset on emotion regulation through school belonging.*

| Paths | Path Coefficients | | Model Statistics | |
|---|---|---|---|---|
| | $\beta$ (SE) | t | $R^2$ | F |
| Growth Mindset → School Belonging | .471 (0.12)* | 44.19 | .237 | 421.94* |
| School Belonging → Emotion Regulation | .303 (0.10)* | 26.57 | .325 | 543.64* |
| Growth Mindset → Emotion Regulation | .342 (0.12)* | 30.06 | | |
| Growth Mindset ⇢ School Belonging ⇢ Emotion Regulation | .485 (0.11)* | 46.05 | .254 | 463.01* |

*Note.* Dotted arrow (⇢) signifies a mediated path. Solid arrow (→) signifies a direct path.

$\beta$ = standardised beta coefficient, *SE* = standard error, *t* = t-statistic, $R^2$= proportion of variance in the dependent variable that can be explained by the independent variables, *F* = f-statistic. * $p < 0.01$ level

## Appendix E

## Research Proposal (May 2023):

## Psychology Honours Project 2023 – Research Plan

Student ID

Design Plan

Sampling Plan

Analysis Plan

## Study Information

Title:

Growth Mindset, School Belonging and Adolescent Emotional Regulation: A Mediation Model.

Target Journal: All via Taylor and Francis Online (Open Access)

- Research in Middle-Level Education *(40 pages max, no word limit).*
- **Educational Psychology *(8,000 words).* ***
- Research Papers in Education *(7,000-10,000 words).*
- **International Journal of School & Educational Psychology *(8,000 words).* ***
- International Journal of Adolescence and Youth *(8,000 words).*
- **The Journal of Psychology *(no word limit).* ***

*\* Indicates that these are the ultimate target journals as they have the highest impact factor (a measure of how frequently the articles published are cited by other researchers, which is generally considered a proxy for the journal's influence and quality)*

Research Aim/s:

The primary research aim is to examine the mediating role of school belonging in the relationship between growth mindset and emotional regulation in mid-adolescent students.

The second aim is to examine whether gender moderates the mediating role of school belonging in the relationship between growth mindset and emotional regulation in mid-adolescent students.

Research Question/s:

How does school belonging mediate the relationship between growth mindset and emotional regulation in mid-adolescent students?

How does growth mindset predict emotional regulation differently in boys and girls and to what extent are these relationships mediated by school belonging?

**Study Materials (optional):**

Access to use (granted by DfE) the Wellbeing and Engagement (WEC) dataset.

**Study Procedure:**

As we are using a pre-existing, dataset, the Wellbeing and Engagement Collection (WEC), this project will be utilising the dataset from a previous project, which has had ethics approval by both the HREC subcommittee in the School of Psychology at the University of Adelaide and the South Australian Department of Education (#20/02 and #2020-0007, respectively).

Once ethics approval is granted by the HREC subcommittee in the School of Psychology at the University of Adelaide AND the South Australian Department of Education, we will be able to use the dataset, which ▆▆▆▆▆▆▆▆▆ (primary supervisor) already holds.

## Sampling Plan

**Existing Data/Partial Existing Data/Original Data (choose one)**

WEC Dataset – full and existing.

**Data Collection Procedures**

Application to DECS for data use. ▆▆▆▆▆▆▆▆▆▆▆▆

**Type of Data Collected:**

WEC dataset includes self-report responses.

We will be looking at the following variables for **descriptive** statistics (demographic information) obtained from school census admissions records held by the South Australian Department for Education, completed by parents/guardians at school enrolment, or questions at the beginning of the WEC):

- Age
- Gender
- Aboriginal and Torres Strait Islander status
- English Speaking Status
- Socio-economic status (SES): SES was measured using the 2016 Socio-Economic Indexes for Areas (SEIFA) Index of Relative Disadvantage based on the child's postcode of residence (Australian Bureau of Statistics, 2018).

This template is modified from Haven, Tamarinde L. & Van Grootel, Leonie. (2019). Preregistering qualitative research. 10.1080/08989621.2019.1580147.

We will be looking at the following variables for the moderated mediation model:

- **Growth mindset** (as measured by *Cognitive Engagement* in the WEC)
  Items about cognitive engagement included "No matter who you are, you can change your intelligence" and "When I found something hard, I tried another way". The response options to these statements ranged from 1 = none of time to 5 = all of the time
- **School belonging**
  There were two items, "I feel like I belong in this school" and "I feel like I am important to this school". The response options to these items ranged from 1 = strongly disagree to 5 = strongly agree.
- **Emotional regulation**
  Measured using the cognitive reappraisal scale of the 'Emotion Regulation Questionnaire for Children and Adolescents' and includes the following questions: 'When I want to feel happier, I think about something different', 'When I want to feel less bad (e.g. sad, angry, or worried), I think about something different', 'When I'm worried about something, I make myself think about it in a different way and that helps me feel better', 'I control my feelings about things by changing the way I think about them' and 'When I want to feel less bad (e.g. sad, angry, or worried), I change the way I think about it'. The response options for these item ranged from 1 = 'strongly disagree' to 5 = 'strongly agree'.
- **Gender**

**Sample Size:**

The exact sample size will not be determined until after access to the WEC is granted and once data cleanup is complete.

The researchers anticipate however that the sample size will be ~8000, and this would be appropriate to generate the statistical power that is desired.

**Stopping Rule:**

N/A

## Analysis Plan

**Data Analyses:**

**Who is involved in the data analyses?**

[REDACTED]

**What software will you depend on?**
IBM SPSS, but specifically, the PROCESS
Macro for SPSS

**What type of analysis will you conduct?**
- Descriptive Statistics
- Mediation Model (using PROCESS macro)
- Moderated Mediation Analysis (using PROCESS marco)

1. Data clean-up – removal of cases where there are missing values for the variables of interest.
2. Descriptive statistics and demographics – of the analysis sample.
3. Mediation Analysis
   a. Satisfy assumptions.
   b. Run the models using PROCESS syntax.
4. Moderated Mediation Analysis.
   a. Satisfy assumptions.
   b. Run the models using PROCESS syntax.
5. Generate a (moderated) mediation model diagram.

**What assumptions does your analysis approach make and how will you test them?**

H[1]: Mediation Analysis

1. **Independence** of observations
2. **Normality** – tested by Kolmogorov-Smirnov test or Shapiro Wilk.
   a. In general, if the sample size is large, either test can be used to test for normality, and the choice between the two may depend on personal preference or convention in your field.
   b. Kolmogorov-Smirnov and Shapiro-Wilk, if $p > .05$, data is normally distributed.
3. **Linearity** of variables - inspect the scatterplot.
   a. Look for a clear pattern of points that follow a straight line.
4. **Homoscedasticity**: The variance of the errors should be equal across the levels of the independent variable.
   a. Examine residual plot of regression model – should show a random pattern of residuals, scattered around the zero line.
   b. A cone or runnel shape in the residuals would indicate that the variance of errors is not equal across the levels = therefore, there is heteroscedasticity (unequal variances).
   c. Can also run a Breush-Pagan test, with a p-value $.05>$ indicating homoscedasticity ($p < .05$ indicating heteroscedasticity).
5. **Absence of multicollinearity**: The independent variable should not be highly correlated with each other. Check for multicollinearity using statistical tests like the variance inflation factor (VIF).
   a. calculate the variance inflation factor (VIF) for growth mindset in the regression model. The VIF measures the degree of correlation between each independent variable and all the other independent variables in the model.
   b. A high VIF value (greater than 5 or 10) indicates that the independent variable is highly correlated with other independent variables and may be problematic for the interpretation of the regression coefficients. Therefore, would want a VIF value of <5, but the rule of thumb for is that VIF is not below 0.1 and should not be above 10 (Miles, 2005).
   c. Another way to check for multicollinearity is to examine the correlation matrix of the independent variables. If there are high correlations (above 0.8 or 0.9), this may indicate multicollinearity.

## H₂: Moderated Mediated Analysis

1. **Linearity**: The relationships between the variables in the model are assumed to be linear.
   a. Same as the mediation model, plus: examine the scatterplot of the moderator and outcome variable.
2. **Normality**
   a. Same as the mediation model, plus:
      i. Since the moderator variable has only two levels, one way to test for normality is to examine a histogram of the outcome variable separately for each level of the moderator. If the histograms are approximately symmetric and bell-shaped, then the assumption of normality may be met.
      ii. Alternatively, you can use a statistical test, such as the Shapiro-Wilk test, to test for normality separately for each level of the moderator.
3. **Homoscedasticity:** The variance of the residuals is assumed to be constant across all levels of the independent variable and the moderator. This assumption ensures that the error terms are not systematically related to the levels of the independent variable and moderator.
   a. visually inspect a scatterplot of the residuals against the moderator variable to check for the assumption of homoscedasticity. If the scatterplot shows a random pattern with no clear relationship between the residuals and the moderator, then the assumption of homoscedasticity may be met.
   b. Breusch-Pagan test, to test for the homoscedasticity of the residuals across levels of the moderator.
4. **Independence** of observations.
5. **Absence of multicollinearity:** The independent variables should not be highly correlated with each other. Check for multicollinearity using statistical tests like the variance inflation factor (VIF).
   a. calculate the variance inflation factor (VIF) for the moderator variable, which measures the degree to which the moderator is correlated with the independent variable and the mediator. A VIF value of 1 indicates no multicollinearity, while a value >1 suggests some degree of multicollinearity.

**How will you change your analysis plan if assumptions are violated?**

**Normality and Homoscedasticity:**

It is not uncommon in psychological, health and social research, for the assumptions of normality and homoscedasticity to be violated and this can be due to a range of reasons:

- Heavy tails.
- Skewness.
- Outliers.
- Contamination.
- Multimodality.

This will change the analysis plan and there are a range of options to navigate the violation of normality for the mediation model:

1. Bootstrap – does not need to satisfy the assumptions.
   A resampling technique that can provide estimates of standard errors and confidence intervals for the moderated mediation model.
2. Robust regression.
3. Transform data into logarithmic or square root transformations (might be normal).

There are also options to navigate the violation of homoscedasticity for the mediation model:

1. Weighted least squares regression - accounts for unequal variances.
2. Heteroscedasticity-consistent standard error estimator (e.g., White's estimator) to estimate the standard errors of the regression coefficients in the presence of heteroscedasticity. These estimators adjust for the unequal variances across different levels of the independent variable and can help to improve the accuracy of the model.
3. Bootstrap
4. Robust regression
5. Transform data (as above)

**Linearity:**

In the case that the data is not linear, there are a range of methods for navigating this and building a robust moderated mediation model:

1. Logarithmic or quadratic transformations
2. Polynomial regression
3. Spline regression – more flexible regression model that can capture non-linear relationships.

**Absence of Multicollinearity:**

If there is multicollinearity in the data:

1. Centering the variables can help to reduce the effects of multicollinearity, by subtracting the mean from each score.
2. Regularization techniques, such as ridge regression or lasso regression, can help to reduce the effects of multicollinearity by shrinking the regression coefficients towards zero.