On the Relationship Between Student Well-being, School Engagement, and Academic Achievement

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Abstract

This dissertation explores the relationship between student well-being, school engagement, and academic achievement. The author provides three theses: (1) Student well-being and school engagement are related, but distinct constructs; (2) Student well-being and school engagement are related to academic achievement; (3) Student well-being and school engagement can be fostered. The theses are addressed based on theoretical frameworks, prior empirical evidence, as well as on three studies conducted by the author. Study 1 investigates the mediating role of school engagement in the relationship between student well-being and academic achievement. Study 2 explores the reciprocal relationships between the three constructs over time. Study 3 reports on differential effects of an intervention aimed at fostering student well-being using a person-centered approach. The presented evidence supports the theses put forward. The results imply that students with a higher well-being are also more likely to be more engaged and successful in school. Since both student well-being and school engagement can be fostered, schools may support students in exploiting their full potential by providing an environment that emphasizes their well-being.

List of Publications

Study 1 Schnell, J., Saxer, K., Mori, J., & Hascher, T. (2025). Feeling well and doing well. The mediating role of school engagement in the relationship between student well-being and academic achievement. *European Journal of Psychology of Education, 40*(1), 48. https://doi.org/10.1007/s10212-025-00947-5

Study 2 Schnell, J., Saxer, K., Mori, J., & Hascher, T. (2025). On the Longitudinal Relationship Between Swiss Secondary Students' Well-Being, School Engagement, and Academic Achievement: A Three-Wave Random Intercept Cross-Lagged Panel Analysis. *Education Sciences, 15*(3), 383. https://doi.org/10.3390/educsci15030383

Study 3 Schnell, J., Saxer, K., Mori, J., & Hascher, T. (submitted). One Size Does Not Fit All: Investigating the Effects of a Student Well-Being Intervention Using a Person-Centered Approach.

Dissertation at a Glance

Study 1	**Feeling well and doing well. The mediating role of school engagement in the relationship between student well-being and academic achievement.**
Aim	To apply a six-dimensional student well-being model and a three-component school engagement model to investigate the differential associations of the constructs with academic achievement.
Method	Longitudinal mediation analyses using a sample of N = 754 Swiss secondary school students and two measurement points (Grade 7 and Grade 8) were conducted.
Results	No student well-being dimension had any direct effect on academic achievement. Enjoyment in school had an indirect effect on academic achievement, mediated through behavioral engagement.
Conclusion	Fostering students' enjoyment in school may be a promising strategy to enhance their behavioral engagement and, in turn, promote their academic achievement.
Study 2	**On the Longitudinal Relationship Between Swiss Secondary Students' Well-Being, School Engagement, and Academic Achievement: A Three-Wave Random Intercept Cross-Lagged Panel Analysis.**
Aim	To investigate the reciprocal longitudinal associations between the six dimensions of student well-being, the three components of school engagement, and academic achievement.
Method	A random intercept cross-lagged panel model (RI-CLPM) using a sample of N = 757 Swiss secondary school students and three measurement points were conducted.
Results	Significant between-person associations between the constructs. Few significant within-person associations.
Conclusion	Students with higher well-being are also more engaged and achieve higher grades, suggesting that the constructs are mostly positively related, but that the causal associations are complex and may be influenced by third variables.
Study 3	**One Size Does Not Fit All: Investigating the Effects of a Student Well-Being Intervention Using a Person-Centered Approach.**
Aim	Exploring the multidimensionality of well-being and its relationship with the effectiveness of a 10-week intervention program aimed at fostering student well-being.
Method	Latent profile and transition analyses using data from 681 grade 8 students who participated in a 10-week intervention program.
Results	Four distinct well-being profiles, which could be classified into more and less favorable profiles. Participants in the intervention groups were more likely to transition into a more favorable profile.
Conclusion	The results support the thesis that student well-being can be fostered. They emphasize the necessity of considering the multidimensional nature of well-being and students' differential compositions thereof in developing dynamic and tailored interventions aimed at fostering student well-being.

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"Of all this the beginning and the greatest good is prudence. Wherefore prudence is a more precious thing even than philosophy: for from prudence are sprung all the other virtues, and it teaches us that it is not possible to live pleasantly without living prudently and honorably and justly, nor, again, to live a life of prudence, honor, and justice without living pleasantly. For the virtues are by nature bound up with the pleasant life, and the pleasant life is inseparable from them."

– Epicurus[1]

[1] Bailey, C. (Ed.). (1926). *Epicurus, the extant remains*. Clarendon Press.

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1 Introduction

What is the purpose of school? One might say that school serves to prepare young people for the “outside world”, to enable them to participate in all aspects of society and to give them the tools they need to exploit their full potential. At the same time, school is also expected to detect and foster talent, often assigning students to different tracks according to their academic achievement. These tracks influence their later career choices and opportunities in the labor market (Slominski et al., 2011; Watts, 2020). It is, therefore, evident that, at least in stratified school systems, academic achievement is an indicator of success at school.

If high-achieving students are successful students, this raises the question of what students need to perform well at school. It seems logical that students who work hard and are willing to put effort into their learning, in other words, engaged students, would have the best chances at academic success. However, individual predispositions like family socioeconomic background influence students’ chances at success in stratified education systems (Hanushek & Wössmann, 2006). This means that, while students’ individual engagement with school may be related to their academic achievement, it might not be the sole contributor.

But what about well-being? Do students need to feel well in school to do well in school? One could argue that, if the focus of school is on performance, then it is not important how students feel at school. Students may even have to sacrifice some of their well-being by pushing themselves to their limits, thereby achieving as highly as possible. This momentary phase of lower well-being would then pay off later in life. Conversely, one could argue that a higher well-being makes students more willing to engage with school, which could lead to higher academic achievement. Likewise, being good at school could also lead students to feel good. Students’ well-being and achievement may also be completely unrelated, as both constructs could be influenced by different factors.

If well-being and engagement are related to academic achievement, what are the consequences? Are these traits that some students possess and others do not, giving the former an advantage for success at school? Or are they assets that can be fostered by schools, making their promotion a central task of the education system?

And what are engagement and well-being, anyway? Are they even different constructs, or is engagement just a part of well-being, or do both terms essentially mean the same?

The aim of the present dissertation is to provide answers to these questions by addressing three theses: (1) Student well-being and school engagement are related, but distinct constructs; (2) Student well-being and school engagement are related to academic achievement; (3) Student well-being and school engagement can be fostered. Before addressing these theses by drawing from evidence of my own research, I will first provide an overview of the three constructs of student well-being, school engagement, and academic achievement, and describe how the constructs are defined in my work. After the discussion of the theses, the three studies that I refer to throughout this text are presented, followed by a general discussion. The theses and discussion serve both as a summary of the studies included in this dissertation, as well as a critical comment on the context in which these studies were conducted.

1.1 Student Well-being

The conceptualization of well-being as a psychological construct was first devised in the twentieth century, when two major theoretical approaches emerged. The theory of *subjective well-being,* founded by Diener (1984), defined well-being as individuals' cognitive and affective evaluation of their own lives, with life satisfaction, presence of positive, and absence of negative affect, as core dimensions. This theory emphasizes people's subjective judgement of their life's quality. The theory of *psychological well-being*, founded by Ryff (1989), defined well-being as positive human functioning and set self-acceptance, purpose in life, environmental mastery, positive relationships, autonomy, and personal growth as its core dimensions. This framework does not only focus on evaluations of life quality, but emphasizes the human need for meaning, accomplishment, and social relationships as foundations for well-being. Although the two concepts differ in their theoretical underpinnings, they agree on treating the construct of well-being as multi-dimensional.

Grob (1995) brought both lines of research together in a framework containing both cognitive and affective self-evaluations , as well as aspects related to purpose. In his conceptualization, well-being is not just the presence of positive or the absence of negative emotions and cognition, but a combination of both. He further introduced a

physical component to the concept of well-being by introducing the absence of physical complaints as an indicator. He thus identified six dimensions of well-being: Enjoyment, positive attitudes, self-concept, absence of problems, absence of physical complaints, and absence of worries.

While those general well-being models were and are still applied in the school context, scholars have argued that definitions of well-being may vary for different target groups or in different settings. What adults consider important for their well-being might differ from what children or adolescents emphasize (Grob, 1995). To the point, students' well-being in school may differ from their general life satisfaction (Hascher, 2007). A student could feel well at home, but not at school, or vice versa, a circumstance that is not reflected in a general well-being assessment. Scholars who follow this argumentation have noted that well-being should therefore not only be conceptualized as a multi-dimensional, but also as a context-specific construct. Following Grob's general concepts, Hascher (2004) developed a specific model of student well-being . By her definition, student well-being is the predominance of positive emotions and cognitions over negative emotions and cognitions in relation to school, people in school, and the school context. This model includes six dimensions: enjoyment in school, positive attitudes toward school, positive academic self-concept, worries in school, physical complaints in school, and social problems in school.

Throughout this dissertation, I refer to this model and definition when using the term "student well-being". I chose this model because it is both comprehensive and parsimonious. Comprehensive in that it includes cognitive, affective, physical, and social aspects and considers positive and negative facets. Parsimonious because it has a clear theoretical rationale for the inclusion of the six dimensions, which are all distinctly related to the school context. The model is not without limitations, which will be discussed later in this text, but it serves as a solid ground for assessing students' well-being in a multidimensional and context-specific manner.

1.2 School Engagement

One of the earliest studies that used the term "engagement" in the school context came from Natriello (1984), who defined it simply as the participation in activities offered at school. Since then, a plethora of definitions and conceptualizations of school engagement have emerged (for an overview, see Martins et al. (2022)). The

pioneer works for contemporary understandings of the construct were carried out by Fredricks et al. (2004), who unified various lines of research on school-related thoughts, feelings, and actions under the umbrella term “school engagement”. They argued that fusing these different aspects into one “metaconstruct” offers a richer characterization of students than treating them as singular components. Considering school engagement as a multidimensional construct suggests examining its different aspects simultaneously to identify potential additive or interactive effects. However, the authors do not provide an overall definition of school engagement but rather divide it into three clearly defined components: behavioral, cognitive, and emotional engagement. Behavioral engagement refers to positive conduct and participation in school-related activities. Cognitive engagement is defined as the psychological investment in school matters and a desire to learn. Emotional engagement encompasses students’ affective reactions in school.

In a growing body of literature on the topic, these definitions have since been refined and expanded, with foci on distinct components. For example, behavioral engagement has been differentiated into cooperative and autonomous participation (Rangvid, 2018). Cognitive engagement has been further subdivided into deep and shallow forms, with different antecedents and outcomes for each (Green et al., 2012). Additionally, new components of school engagement have emerged, such as agentic engagement, which refers to students’ contribution to and co-shaping of the instruction they receive at school.

Throughout this dissertation, I follow the basic tripartite model of school engagement as proposed by Fredricks et al. (2004). While I acknowledge the additional potential of more nuanced conceptualizations of the underlying components, I chose the more pragmatic approach because it allows for a more holistic assessment of the “bigger picture”. Splitting up each engagement component into multiple sub-components would further complicate the already complex relationship between student well-being, school engagement, and academic achievement. As Fredricks et al. (2004, p. 69f) stated themselves: “If the goal is to study and understand a particular construct in depth, then the typical measures of engagement that are more inclusive are insufficient. However, if the goal is to predict staying in school or academic success, then any disadvantages of using only a few items to tap each construct may be offset by the increased predictive strength of a streamlined single measure.”

Finally, while I consider the addition of agentic engagement as a fourth component to be a valuable contribution by more recent engagement literature, it was not measured in the studies that form the present dissertation and is thus not included in the conceptual foundation of this work.

1.3 Academic Achievement

Broadly speaking, academic achievement can be defined as intellectual performance outcomes in the academic context (Spinath, 2012). In many societies, an individual's academic achievement serves as a selection criterion for school careers, job opportunities and access to higher education. Academic achievement in compulsory school is thus linked to later income (Watts, 2020) and socioeconomic attainment (Slominski et al., 2011), making it an important prerequisite for success and prosperity.

Empirically, academic achievement can be measured either through standardized test scores or by directly examining the students' evaluations within the investigated education system. The advantage of measuring academic achievement through standardized test scores is that they reflect a students' skills more objectively, without including teachers' evaluations of competence, effort or progress (Spinath, 2012). Such standardized, objective measures can be used to assess to what extent a student has reached predefined learning outcomes and curricular requirements. They are also suitable for comparing individuals from different classes, schools, or nations and are therefore often used as indicators of academic achievement in large-scale assessments such as PISA (OECD, 2023).

Conversely, using actual evaluations of a student's performance within the system to measure academic achievement may not be objective, as they can be biased, for example by teachers' motivations and attitudes, or by the average achievement level of a class (Spinath, 2012). However, since these evaluations are in actual use for selection and tracking within the school system, they may be a more valid indicator of success at school. The most widely used evaluations of this type are school grades. From a methodological perspective, grades are a useful measure because they can be aggregated across school subjects, forming a single general indicator of academic achievement. A common practice of aggregation is calculating the mean of subject grades, known as a grade point average (GPA).

In the Swiss lower secondary school system, students receive grades in all mandatory subjects, with a grade report at the end of each school year. However, not all subjects are given equal importance. Only five subjects, Mathematics, German, English, French, and Nature & Technology, are relevant for assignment to an educational track and for admission to high school. Therefore, we used annual GPAs from these five subjects to measure academic achievement in the studies underlying this dissertation.

2 Theses

2.1 Well-being and Engagement are related, but distinct constructs

A major difficulty in research on student well-being and school engagement is the myriad ways in which the constructs can be defined and conceptualized. Constructs of student well-being often differ in their inclusion of dimensions and domains, making it hard to compare findings across studies (Hossain et al., 2023). The same is true for research on school engagement, which has been called a “conceptual jungle” (Appleton et al., 2008, p. 382).

Critiques of existing approaches to the engagement construct have noted the risk of a potential “jingle-jangle fallacy” (Reschly & Christenson, 2012). The “jingle” refers to the use of the same term for different indicators of school engagement. For example, Kang and Wu (2022) measured behavioral engagement by assessing students’ willingness to devote themselves to learning, while Green et al. (2012) used class participation, homework completion, and absenteeism as indicators of behavioral engagement.

The “jangle” part of the fallacy refers to the opposite case, where different terms may be used for the same indicator. For example, Lee (2014) used effort as an indicator of behavioral engagement, while for Archambault et al. (2009), effort is an indicator of cognitive engagement. Although attempts at resolving these issues have been made, such as by highlighting the different levels at which school engagement can be measured (Sinatra et al., 2015), or differentiating further between school and learning engagement (Reeve et al., 2025), the jingle-jangle problematic is still present in the field (Reschly & Christenson, 2022).

Furthermore, the issue can be extended beyond the construct of school engagement to its relationship with student well-being. As both constructs include

cognitive and emotional components related to school, their distinction is sometimes blurred. In multiple conceptualizations of student well-being, engagement is seen as an indicator. For instance, Lan and Moscardino (2019) define student well-being as a combination of academic engagement, satisfaction with social relationships, and commitment to school. Widlund et al. (2023)'s conceptualization of well-being includes the dimensions engagement and burnout. The well-being framework used in the Programme for International Student Assessment (PISA) subsumes learning engagement under its psychological dimension (Borgonovi & Pál, 2016).

In addition, certain indicators are conceptualized as dimensions of well-being in some studies, while in others they are employed as dimensions of engagement. There is particular overlap between student well-being and emotional engagement. Both enjoyment in school (Furlong et al., 2003) and positive attitudes toward school (Green et al., 2012) are used as indicators of emotional engagement. At the same time, they are both positive dimensions in the well-being construct used throughout this dissertation.

There are various reasons for this conceptual proliferation. For one, conceptualizations of well-being and engagement emerged from different psychological and educational sub-disciplines, with little exchange or collaborations between these fields. It is a common issue of psychological science that concepts targeting the same or similar phenomena are developed in different research areas and thus contribute to a fragmentation of these concepts (Pekrun, 2024). Student well-being and school engagement are no exception. Another issue that drives this proliferation is the fact that researchers often prefer to develop new concepts than reusing existing constructs (the "toothbrush problem"; Mischel, 2008). Although it has been argued that the proliferation of concepts and measures contributes to the advance of psychological science by facilitating the evolution of theories (Iliescu et al., 2024), it may lead to conceptual uncertainty. It is probably illusionary to expect scholars to agree on an overarching definition of student well-being or school engagement. Rather, multiple conceptualizations may complement and contrast each other. However, to not get lost in this conceptual jungle, it is important for researchers to clearly state which definitions and conceptualizations they follow, to acknowledge and discuss the ambiguity of these concepts, and to align the measurement of the constructs according to the chosen conceptualization (Bringmann et al., 2022). Following these recommendations, I outlined the definitions of student well-being and

school engagement which form the theoretical basis of the studies that are included in this dissertation, and I elaborated on their conceptualization. In this chapter, I highlighted the conceptual ambiguities and potential overlap of the constructs. I now proceed with an explanation why I consider the two constructs to be qualitatively different. I base my argumentation on theoretical and empirical considerations.

From a *theoretical* perspective, student well-being and school engagement can be distinguished by their approach towards the school experience. Student well-being encompasses the cognitive and affective evaluation of the school context, as well as emotional and physical reactions to school-related experiences. The emotional domain is focused on the sources of well-being, such as events in school which trigger students' enjoyment. School engagement, on the other hand, refers to students' active cognitive, emotional, and behavioral involvement with school matters. The emotional domain here focuses on students' emotional activation in school tasks and their emotional attachment to school. Emotional engagement is thus the extent to which students feel activated during school-related activities (Wong & Liem, 2022). While student well-being can refer to a rather passive state of just "being happy" in school, school engagement needs to contain an activating emotional component, such as feeling enthusiastic about a school topic.

From an *empirical* perspective, we could show that student well-being and school engagement as we measured them in the studies presented in this dissertation form distinct constructs. Exploratory factor analyses revealed the dimensions of student well-being and the components of school engagement to be distinct factors. Furthermore, by testing various models using confirmatory factor analysis, we were able to validate the proposed six-factor structure of student well-being and the three-factor structure of school engagement (see Study 1).

Based on the outlined theoretical assumptions and the empirical evidence, although student well-being and school engagement overlap, especially in the emotional domain, it makes sense to measure each construct separately and with different indicators. Moreover, including both constructs in the investigation of their relationship with academic achievement provides more insight than including only one, as student well-being and school engagement interact differently with academic achievement. Well-being dimensions and engagement components have differential relationships with academic achievement, as I expound in the next chapter.

2.2 Well-being and Engagement are related to academic achievement

In the introduction, I raised the question of whether students' engagement and achievement come at the expense of, or profit from their well-being. Theory and evidence mainly support the latter; student well-being, school engagement, and academic achievement seem to form a positive cycle, whereby students who feel well are also more engaged and therefore perform better. Higher performance, in turn, leads to greater engagement and well-being. The rationale underlying this adaptive cycle can be grounded in two theories: Broaden-and-build theory (BBT), and self-determination theory (SDT).

The broaden-and-build theory, developed by Barbara Fredrickson (2001), explains how positive emotions expand individuals' momentary thought–action repertoires and help build lasting personal resources. Unlike negative emotions, which narrow focus and promote immediate survival actions, positive emotions such as joy, interest, and contentment broaden awareness and encourage novel, varied, and exploratory thoughts and actions. Over time, these broadened behaviors accumulate into enduring resources – cognitive, social, psychological, and physical – that support overall psychological functioning. These resources further allow the development of adaptive strategies to cope with future challenges. Successfully mastering challenges again triggers positive emotions, creating an "upward spiral" (Fredrickson, 2013).

In educational settings, the theory offers a framework for understanding the interplay between student well-being, school engagement, and academic achievement. Positive emotions, such as enjoyment in school, are an integral part of students' well-being. Elevated well-being can foster engagement, as students become more curious, attentive, and motivated to participate in learning activities (Pietarinen et al., 2014). The broadened cognitive scope from positive emotional states also supports creativity and problem-solving (Kang & Wu, 2022). As engagement deepens, students are more likely to build skills that facilitate academic success. Negative emotions, on the other hand, diminish engagement and reduce academic performance (Arsenio & Loria, 2014).

The self-determination theory, developed by Richard Ryan and Edward Deci (2000), posits the innate basic human needs of competence, autonomy, and relatedness. According to this theory, well-being is the result of satisfying these basic needs(Deci & Ryan, 2008). At the same time, satisfying basic needs may serve as a

prerequisite for engagement. Drawing from the SDT, Ellen Skinner and colleagues (2008) developed the self-system model of motivational development (SSMMD), which links basic need satisfaction, school engagement, and academic achievement. According to this model, the satisfaction of basic needs is seen as a resource for positive self-perceptions, which in turn boost engagement. The self-system model was also used to explain the link between school engagement and academic achievement (Taylor et al., 2014). SDT and SSMMD also propose an adaptive cycle between academic achievement, school engagement, and student well-being, because academic achievement can satisfy the need for competence, therefore leading to a higher well-being and more positive self-perceptions (Bücker et al., 2018). Empirical evidence supports both the BBT and SSMMD in the school context. Previous studies have linked positive school experiences with school engagement and subsequent performance (King et al., 2015), as well as the satisfaction of basic needs with student well-being (Niemiec et al., 2006), school engagement, and academic achievement (Buzzai et al., 2021). Negative outcomes of basic need thwarting are also documented for student well-being (Vansteenkiste & Ryan, 2013), school engagement (Earl et al., 2023), and academic achievement (Wang et al., 2019). Furthermore, reciprocal relationships have been found between student well-being and both school engagement (Datu & King, 2018) and academic achievement (Kleinkorres et al., 2020), as well as between these latter two (Widlund et al., 2023). Thus, an adaptive cycle between all three constructs is suggested (Wong et al., 2024).

Considering the directionality of effects, both BBT and SSMMD suggest a causal effect chain from student well-being to school engagement, and from there to academic achievement, thus assigning school engagement the role of a mediator. These chains have also been confirmed empirically: Gutman & Vorhaus (2012) found positive effects of student well-being on school engagement, and of school engagement on academic achievement. While these results are mainly on a more general level, conflating well-being dimensions and engagement components, some research also reports differential results. Enjoyment in school was found to positively affect achievement, mediated through behavioral engagement (Kang & Wu, 2022). In our own work, we established an indirect effect of enjoyment in school on academic achievement, mediated through behavioral engagement (see Study 1). Positive attitudes toward school have similarly been linked to academic achievement, mediated through behavioral engagement (Green et al., 2012). Positive academic self-concept has also

been proven to be an antecedent of behavioral engagement, in turn predicting academic achievement (Schnitzler et al., 2021). Conversely, Pekrun et al. (2002) linked worries in school to a decline in indicators of emotional and behavioral engagement, resulting in lower academic achievement. Social problems in school may lead to lower behavioral engagement and thus to lower academic achievement (Olivier et al., 2018). Physical complaints in school have also been found to be negatively related to cognitive and emotional engagement, as well as to academic achievement (Conner & Pope, 2014).

Seen from the opposite direction, BBT and SSMMD propose direct effects of academic achievement on both student well-being and academic achievement. Evidence for this chain of effects can be found on a general level (Wong et al., 2024), but is rather scarce for differential analyses, with a few notable exceptions: Marsh et al. (2005) linked academic achievement to a positive academic self-concept and to interest, an indicator of emotional engagement. Duchesne et al. (2011) report negative correlations between academic achievement and later worries in school. Morinaj and Hascher (2022) found positive effects of academic achievement on enjoyment in school, positive attitudes toward school, and a positive academic self-concept.

As for our own research, we established consistent time-invariant positive relationships between the positive student well-being dimensions and academic achievement, as well as negative relationships between the negative student well-being dimensions and academic achievement (see Study 2). We also found positive relationships between the positive student well-being dimensions and behavioral and cognitive engagement, and negative relationships between worries in school and social problems in school and cognitive and behavioral engagement. Physical complaints in school, however, showed a positive relationship with cognitive engagement. Furthermore, behavioral, but not cognitive engagement was positively associated with academic achievement across time. We also found surprising causal effects: Positive academic self-concept negatively predicted later academic achievement and cognitive engagement. Possible explanations for these results are discussed in Study 2.

Taken together, theory and evidence support a positive relationship between student well-being, school engagement, and academic achievement. I thus conclude that those students who feel better at school are also those who are more engaged and more likely to achieve better grades. However, the causal directionality of these

relationships is not entirely clear. Still, fostering student well-being and school engagement seems to be beneficial for students' success at school. But can these resources be strengthened by schools? And if so, how? I provide answers to these questions in the next chapter.

2.3 Student Well-being and School Engagement can be fostered

Student well-being and school engagement are crucial factors for students' academic achievement. Moreover, students with higher well-being tend to be more adaptive in dealing with aversive situations in school (Hascher & Hagenauer, 2020) and report less distress (Antaramian, 2014). Students' well-being and engagement are thus important resources in their daily school lives. However, both student well-being (Virtanen et al., 2019) and school engagement (Wang & Eccles, 2012a) tend to decline over the school years, especially after the transition to secondary school (Symonds & Galton, 2014; Widlund, 2021). Schools therefore need to become increasingly equipped with the knowledge, resources, and competences necessary to maintain and foster their students' well-being and engagement.

A plethora of research on the improvement of student well-being has been published in the last two decades (Chuecas et al., 2022), with various intervention approaches, such as mindfulness, physical activity, or social-emotional learning. Most interventions, however, use approaches based on positive psychology. The discipline of positive psychology was founded by Martin Seligman and Mihaly Csikszentmihalyi (2000) and refers to "the study of the conditions and processes that contribute to the flourishing or optimal functioning of people, groups, and institutions" (Gable & Haidt, 2005, p. 104). As such, school-based interventions in the realm of positive psychology encompass approaches to fostering students' optimal psychological functioning by addressing their character strengths, positive outlook in life, and personal and social resources.

Positive psychology interventions aimed at fostering student well-being seem to be generally effective (Tejada-Gallardo et al., 2020). However, the effectiveness of such interventions for any particular individual depends on many factors. According to the positive-activity model (Lyubomirsky & Layous, 2013), features of positive activities (e.g., dosage, variety, type of activity) and of the individual (e.g., motivation, affective state, personality) need to be aligned for an intervention to unfold its maximum effects.

Our own research gives credit to this model: We conducted an intervention study with eight-grade secondary school students using activities from positive psychology. From a variable-centered perspective, the intervention had no significant effects on participants' well-being. However, we also conducted latent profile (LPA) and latent transition (LTA) analyses to investigate whether specific subgroups of students reacted differently to the intervention (see Study 3). We found that participants could be classified into more favorable (higher positive and lower negative well-being indicators) and less favorable (lower positive and higher negative well-being indicators) profiles. Transitions from less favorable to more favorable well-being profiles were more prevalent for participants in experimental groups compared to participants in the control group. Additionally, students who were already in a favorable profile at the beginning of the intervention were more likely to also be in a favorable profile at the end, which suggests a better fit between the activities and initial affective state for participants with higher well-being. Furthermore, we found that intrinsic and identified motivation positively predicted the probability of a favorable transition, thus supporting the claim that the effectiveness of an intervention depends on participants' motivation to get involved (Lyubomirsky et al., 2011). In sum, evidence suggests that student well-being can be fostered with targeted interventions, but that these interventions need to be tailored to individual students' needs and predispositions, and to be delivered in a way that students find personally relevant.

Although a multitude of interventions aimed at promoting students' school engagement have been developed and implemented (Martins et al., 2022), they often lack experimental evaluation and target all participants equally (Fredricks et al., 2019). However, like student well-being, the development of school engagement depends on contextual, individual, and transactional factors (Lawson & Lawson, 2013). Interventions designed specifically for the targeted participant group and their context are thus expected to be more effective than general approaches. A variety of such intervention designs have been applied and carefully evaluated (for an overview, see Archambault et al., 2019), with three emerging key factors of effectiveness: school organization, monitoring, and skill development. School organization approaches include, training teachers and other school staff in effective classroom management (e.g. Hawkins et al., 2005), proactive instruction, and feedback culture (e.g. McWhirter et al., 2019). Monitoring involves increasing teachers' and parents' knowledge about youth development and how to assess and manage students' engagement (e.g.

Pfiffner et al., 2016). Skill development targets students directly and aims at improving students' social skills (e.g. Hawkins et al., 2005), coping strategies (e.g. Gonzales et al., 2012), motivation, and organizational skills, such as planning and time management (e.g. Pfiffner et al., 2016).

When comparing well-being and engagement interventions, it is noticeable that many of its constituents overlap, such as the promotion of social skills or coping strategies. From a theoretical perspective, this is not surprising, as both constructs are related to the satisfaction of basic needs. In feeding the need for relatedness, the promotion of positive social relationships in school can enhance students' well-being (Saxer et al., 2024) and engagement (Wang & Eccles, 2012b). The same holds true when it comes to fostering students' strategies for coping with school-related challenges, as it may increase their sense of autonomy (Van Petegem et al., 2023). In consequence, it seems probable that interventions aimed at fostering student well-being could also increase their school engagement and vice versa. There is empirical evidence for this: For example, in an intervention study based on positive psychology, increases in students' school engagement were reported (Goldberg et al., 2022). Another study found positive intervention effects on student well-being, school engagement, and academic achievement (Shoshani et al., 2016).

Even though students' positive functioning can be enhanced through interventions that strengthen their individual resources, such approaches are not without their critics. Sellman and Buttarazzi (2019) argued that interventions focusing on students' abilities to cope with the challenges of school, rather than actually changing the school environment to be less challenging, may burden students with the responsibility of being solely accountable for their own thriving. Teaching students how to deal with the symptoms of a need-thwarting school environment without approaching the causes of this environment may lead to acceptance of these oppressive structures as a given. I concur with this critique, and I find it important to emphasize that fostering student well-being and engagement should not consist of telling students to "just think positive" or "just try your best". Rather, a change from within should be accompanied by a change of the outside as well. I therefore strongly advocate for whole-school approaches that target not only the individual students, but also the curriculum, the physical school environment, as well as organizational structures and policies, to create an education system that allows the thriving of all involved parties (Waters, 2011). Researchers and educational practitioners should

work on strengthening students' cognitive, emotional, and social resources. To this end, well-being and engagement interventions appear to be a useful means. At the same time, we should not forget the adversities of stratified, competition-oriented education systems and stand up for a change in these structures. For example, a higher socioeconomic status is still associated with higher student well-being, school engagement, and academic achievement (see Study 2 and Study 3). These findings show that the Swiss education system does not provide equal opportunities to all students. It is important to highlight and contest such inequalities. Education systems are inert ships that require a lot of force and time to change their course, and it is our responsibility to move them towards a future of equity and opportunity.

3 Overview of the Studies of the Dissertation

This section gives an overview of the three studies that constitute this dissertation. The major goals, methods, and findings of each study, as well as their contribution to the dissertation are provided.

The data for all three studies stems from the longitudinal research project "Well-being in School in Switzerland" (WESIR; 2021-2025). In this project, N = 756 students and their teachers from 17 German-speaking schools in Switzerland were followed over the three years of lower secondary school (seventh to ninth grade). Each year, the students and teachers filled out a survey questionnaire. Select students (n = 30) and teachers (n = 30) from 5 randomly chosen classes participated in additional annual interview sessions. In eighth grade, students participated in a 10-week intervention study with a pre-, mid- and post-test survey. Study 1 uses data from the first two annual student survey waves. Study 2 uses data from all three annual student survey waves. Study 3 uses data from the pre-, mid, and post-intervention surveys.

As the primary author of all three studies, I led the conceptualization, preparation, and presentation of the studies, including statistical analysis and interpretation of results. I was also responsible for the submission and publication process. All three studies were co-authored by the same three project members (Katja Saxer, Julia Mori, Tina Hascher), who provided valuable assistance in the preparation of the manuscripts by critically reviewing the contents and making suggestions for improvements. A team of two research assistants supported data collection.

All three studies were submitted to peer-reviewed scientific journals. Study 1 was published in the *European Journal of Psychology of Education* (EJPE). Study 2 was published in *Education Sciences*. Study 3 is currently under review. The studies included here are either the final accepted (Studies 1 and 2), or the submitted manuscript versions (Study 3).

3.1 Study 1

Aim. The first study applied a six-dimensional student well-being model and a three-component school engagement model to achievement outcome variables. Its aim was to untangle the differential associations of positive and negative well-being dimensions with the components of school engagement and academic achievement. It specifically tested whether student well-being was related to academic achievement, and whether this association was mediated by school engagement. Additionally, the proposed six-dimensional structure of student well-being and the three-dimensional structure of school engagement, as well as the statistical independence of the constructs, was evaluated.

Method. Longitudinal mediation analyses using a sample of N = 754 Swiss secondary school students and two measurement points (Grade 7 and Grade 8) were conducted using structural equation modelling (SEM). Six separate models were specified, with one student well-being dimension as predictor, all three school engagement components as mediators, and academic achievement (GPA) as outcome variable. To evaluate the validity of the constructs, a series of competing exploratory (EFA) and confirmatory factor analysis (CFA) models were specified.

Results. No student well-being dimension had any direct effect on academic achievement. Enjoyment in school, as a dimension of student well-being, had an indirect effect on academic achievement, mediated through behavioral engagement. The results imply that fostering students' enjoyment in school may be a promising strategy to enhance their behavioral engagement and, in turn, promote their academic achievement. EFA and CFA models using the proposed separate student well-being and school engagement factor structure fit the data better than models with higher-order combinations of student well-being and school engagement factors. These results support the statistical independence of the constructs.

Contribution to the dissertation. The study contributes to the dissertation in supporting the first thesis that student well-being and school engagement are related, but distinct constructs. It further provides evidence for the second thesis that student well-being and school engagement are related to academic achievement.

3.2 Study 2

Aim. The aim of the second study was to investigate the reciprocal longitudinal associations between the six dimensions of student well-being, the three components of school engagement, and academic achievement. It was expected that:

- the positive well-being dimensions would show positive relationships with school engagement and academic achievement;
- the negative well-being dimensions would show negative relationships with school engagement and academic achievement;
- school engagement would show positive relationships with academic achievement.

Method. A random intercept cross-lagged panel model (RI-CLPM) using a sample of N = 757 Swiss secondary school students and three measurement points (Grade 7, 8 and 9) were conducted using structural equation modelling (SEM). The RI-CLPM decomposes effects into stable, trait-like between-person differences and temporal, state-like within-person differences. Because of insufficient fit of the initial model to the data, we excluded the emotional engagement component from the model.

Results. The significant between-person associations between positive student well-being dimensions, school engagement components, and students' GPA were moderate to strong and positive, demonstrating that students reporting more positive attitudes toward school, more enjoyment in school, and higher levels of academic self-concept across the measurement waves exhibited higher cognitive and behavioral engagement, as well as higher GPA scores. The significant between-person associations between negative student well-being dimensions, behavioral engagement and students' GPA were small to moderate and negative, demonstrating that students reporting more worries, physical complaints, and social problems in school exhibited lower behavioral engagement and lower GPA scores across the measurement waves. The between-person association between physical complaints in school and cognitive engagement was positive. Behavioral engagement was significantly and strongly associated with students' GPA, while the between-person

association between cognitive engagement and students' GPA was nonsignificant. On the within-person level, GPA at *t*1 positively predicted GPA at *t*2. Positive academic self-concept at *t*1 negatively predicted GPA at *t*2, and positive academic self-concept at *t*2 negatively predicted cognitive engagement at *t*3. In other words, students with a positive academic self-concept above their average in Grade 7 had significantly lower GPA scores in Grade 8, while students with a positive academic self-concept above their average in Grade 8 appeared less cognitively engaged with school by Grade 9.

Contribution to the dissertation. The findings suggest that students with higher well-being are also more engaged and achieve higher grades, supporting the thesis that the three constructs are related. It provides a nuanced perspective on this thesis, suggesting that the constructs are mostly positively related, but that the causal associations are complex and may be influenced by third variables.

3.3 Study 3

Aim. Utilizing a person-centered approach, the third study explores the multidimensionality of well-being and how it relates to a 10-week intervention program aimed at fostering student well-being. The goal of this study was to identify sub-groups with different combinations of well-being indicator levels, and their differential reaction to the intervention. Additionally, the study investigated whether initial motivation to participate in the intervention influenced the individual trajectories throughout the intervention period.

Method. In a longitudinal project involving 681 grade 8 students, a 10-week intervention program with four experimental groups (3 intervention and 1 control group), containing diverse exercises was implemented. Student well-being was measured before, during and after the intervention. Motivation to participate was measured before the intervention. Latent profile analysis (LPA) and latent transition analysis (LTA) were applied to identify subgroups of well-being patterns and transitions of individuals between those groups across measurement points.

Results. Latent profile analysis revealed four distinct well-being profiles, which could be classified as either more favorable (higher positive and lower negative well-being indicators) or less favorable (lower positive and higher negative well-being indicators). Latent transition analysis indicated relative stability in profile membership, with differential shifts observed in the experimental groups, implying different positive

intervention effects for specific student subpopulations. Specifically, transitions from less favorable to more favorable well-being profiles were more prevalent for participants in experimental groups compared to participants in the control group. Furthermore, we found that intrinsic and identified motivation positively predicted the probability of a favorable transition, thus supporting the claim that the effectiveness of an intervention depends on participants' motivation to get involved.

Contribution to the dissertation. The results support the thesis that student well-being can be fostered. They emphasize the necessity for considering the multidimensional nature of well-being and students' differential compositions thereof in developing dynamic and tailored interventions aimed at fostering student well-being.

4 Feeling well and doing well. The mediating role of school engagement in the relationship between student well-being and academic achievement (Study 1)

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Abstract

Students' well-being has become an important part of education policy in many countries. Research shows that well-being contributes to students' engagement in school, thereby supporting academic achievement. However, prior research has often neglected the interplay and multidimensionality of the constructs. The present study applied a six-dimensional student well-being model and a three-component school engagement model to untangle the differential associations of positive and negative well-being dimensions with the components of school engagement and academic achievement. Longitudinal mediation analyses using a sample of N = 754 Swiss secondary school students and two measurement points (Grade 7 and Grade 8) revealed differential associations of well-being dimensions with engagement components, but no direct effects on academic achievement. Enjoyment in school, as a dimension of student well-being, had an indirect effect on academic achievement, mediated through behavioral engagement. The results imply that fostering students' enjoyment in school may be a promising strategy to enhance their behavioral engagement and, in turn, promote their academic achievement.

Keywords: Student well-being, School engagement, Academic achievement, Secondary education

4.1 Introduction

In most education systems, school is expected to identify and foster talent, therefore challenging students to achieve to the best of their abilities. To meet the many demands of school, students need to develop a broad set of competencies, while withstanding high time and performance pressure (Hascher et al., 2018). This is especially true within the lower secondary school setting, where substantial academic demands intersect with age-related developmental changes (Virtanen et al., 2019). Coping with these challenges while growing up in an increasingly complex world and facing an uncertain future poses a major risk to students' well-being. Mental and emotional problems among adolescents in school have increased in recent years, even before the onset of the COVID-19 pandemic (Keyes & Platt, 2023). Such challenges may not only lead to a decrease in student well-being (Widlund et al., 2018) but also in school engagement (Skinner et al., 2008a). Indeed, student well-being and school engagement seem to decline over the school years (Wang & Eccles, 2012), especially after the transition to secondary school (Symonds & Galton, 2014). Recently, awareness of these issues has been raised, and students' well-being has become an important part of education policy in many countries (OECD, 2019). A rising number of approaches to promote student well-being is being developed and implemented in schools' curricula, such as positive psychology interventions (Waters, 2011). Fostering student well-being may lead to positive outcomes in multiple ways: First, well-being is an indicator of students' mental health, both during school years (Antaramian, 2014) and later in life (Carta et al., 2015). Second, it seems likely that promoting well-being can support students' academic achievement, thereby facilitating the central goal of education (Hagenauer & Hascher, 2010). In other words: To *feel* well in school may help students *do* well in school. However, while students' well-being and academic achievement appear to be connected, direct links are rarely observed (Bücker et al., 2018). It seems that the influence of well-being on achievement is often more indirect and may be mediated by other variables. One such potential mediator is school engagement (Pietarinen et al., 2014).

Previous research has established relationships between student well-being and academic achievement (Bücker et al., 2018), between student well-being and school engagement (Datu & King, 2018), and between school engagement and

academic achievement (Green et al., 2012). Nevertheless, research combining all three constructs is still scarce and clear conceptualizations of these constructs are lacking. The present study aims to shed more light on the potential indirect effects of student well-being on achievement by investigating the mediating role of school engagement. A clearer understanding of how students' well-being may support their school engagement and how this could be related to their academic success can inform research and practice on creating a positive and supportive learning environment for students. It could offer insights on whether and how interventions aimed at fostering student well-being could also promote school engagement and subsequent achievement. Our longitudinal study in lower secondary education advances research on the multidimensional constructs of student well-being and school engagement and enriches prior literature on the association between these constructs and academic achievement. By distinguishing direct and indirect mechanisms involved in the relationship between student well-being and achievement, it also contributes to differentiating the relative importance of student well-being and school engagement for academic success.

4.1.1 Student Well-Being

The term *well-being* is currently used abundantly in various contexts, with a plethora of different underlying definitions (Hascher et al., 2018). It is sometimes used as a synonym for happiness, life satisfaction, or the absence of depressive symptoms (Medvedev & Landhuis, 2018). However, such single-dimension conceptualizations of well-being do not capture the complexity of the construct. Diener et al. (2009) coined the term *subjective well-being*, with life satisfaction as a core dimension along with the presence of positive and the absence of negative affect, thereby including cognitive and affective dimensions. This definition makes clear that well-being is considered a multidimensional construct. Still, it does not take the context-specific nature of well-being into account, meaning that a person can experience its dimensions differently in various areas of life. For instance, an adolescent's general life satisfaction may not necessarily reflect their satisfaction with school (Hascher, 2007). Such context-specific measures need to encompass a variety of aspects related to schoolwork, learning, teachers and peers, to capture student well-being as a whole. In recent decades, a variety of such context-specific definitions of student well-being have been proposed

(Hascher et al., 2018). While they often diverge on the specific dimensions, most definitions agree that student well-being is characterized by cognitive, affective, and social aspects related to school (Noble et al., 2008). In our study, we therefore support a multidimensional approach to student well-being, specifically integrating the school context. We align with Hascher's (2004) conceptualization of student well-being, defined as the predominance of students' positive emotions and cognitions toward school, persons in school, and the school context over the negative feelings and cognitions toward school life. This theory-derived concept of student well-being includes six dimensions that cover the broadness of well-being while differentiating relevant dimensions of the school context: enjoyment in school, positive attitudes toward school, positive academic self-concept, and the absence of worries in school, physical complaints in school, and social problems in school. This multidimensional model supports the coexistence of positive and negative factors and incorporates cognitive, emotional, social, and physical factors. It also considers the role of self-esteem as a dimension of subjective well-being (Grob et al., 1991; Veenhoven, 1991).

4.1.2 School Engagement

Similar to student well-being, school engagement is considered a multidimensional construct and has been defined ambiguously (Upadyaya & Salmela-Aro, 2013). Scholars differ not only in their understanding of which dimensions constitute school engagement, but also on how these dimensions should be conceptualized (Appleton et al., 2008). According to Fredricks et al. (2004), this conceptual unclarity stems from the issue that each type of engagement combines various subconstructs such as interest or effort, which are differently pronounced depending on the research focus. They argue that an engagement measure aimed at predicting broader outcomes like academic success should encompass a multitude of these subconstructs, if only superficially. In consequence, they introduced a conceptualization which divided school engagement into three components—behavioral, cognitive, and emotional engagement (Fredricks et al., 2005). According to this concept, behavioral engagement includes participation in academic and social activities related to school. Cognitive engagement indicates commitment and effort toward school matters, such as the willingness to take the extra steps needed to learn complex school matters and master difficult skills. Emotional engagement refers to

affective reactions to teachers, classmates, and school-related events. By integrating behavior, attitude, and affect, this conceptualization of school engagement is considered a “metaconstruct” (Fredricks et al., 2004, p. 60). In our study, we follow this conceptualization, as it allows us to investigate differential effects of engagement components on academic achievement.

4.1.3 The Relationship between Student Well-being, School Engagement, and Academic Achievement

By definition, student well-being and school engagement seem to share some overlap. Although based on different research domains – well-being research and motivation research –, both constructs include cognitive and emotional components related to school. Some scholars even conceptualize school engagement as part of student well-being. For example, Lan and Moscardino (2019) define student well-being as a combination of academic engagement, satisfaction with social relationships, and commitment to school. However, we argue that student well-being and school engagement are related, but distinct constructs: Student well-being encompasses cognitive and affective *appraisals of* and *reactions to* school and the school life and includes *sources of* well-being (e.g., whether experiences in school contribute to students’ enjoyment). School engagement refers to students’ active *investment in* and *emotional attachment to* school-related activities, with an emphasis on behaviors and intentions that reflect involvement (e.g., whether students actively and enthusiastically approach their schoolwork).

As such, both constructs are associated with academic outcomes. This association is probably reciprocal in nature: Previous studies showed evidence both for the influence of student well-being on school engagement, as for the influence of school engagement on student well-being (Datu & King, 2018). Academic achievement is influenced by school engagement (Green et al., 2012) but has also been shown to affect subsequent school engagement (Salmela-Aro & Upadaya, 2012). Likewise, academic achievement predicts student well-being and vice versa (Morinaj & Hascher, 2022). However, evidence for direct influences of student well-being on academic achievement is often weak and inconsistent (Bücker et al., 2018; Yang et al., 2019). These inconsistencies may be explained by two reasons: First, studies examining this relationship used different and not always school specific operationalizations of student

well-being, such as life satisfaction (Z. J. Ng et al., 2015) or general subjective well-being (Steinmayr et al., 2016), instead of multi-dimensional, context-specific measures. Using such unidimensional, general assessments may conflate potential effects of specific student well-being dimensions on achievement, since they could suppress or amplify each other. Second, it can be assumed that the effect of student well-being on achievement is more indirect. Well-being may serve as a facilitator for adaptive school-related attitudes, affect, and behavior, such as school engagement, which could ultimately lead to better learning outcomes (Hascher et al., 2018; Pietarinen et al., 2014). School engagement may therefore function as a mediator between students' well-being and academic achievement: Student well-being positively predicts school engagement, which in turn may support academic achievement (Gutman & Vorhaus, 2012). While this evidence hints at a causal connection between student well-being, engagement, and achievement, it does not differentiate between specific dimensions of well-being or engagement components. Therefore, it remains unclear which dimensions of well-being may predict which components of engagement. The present study addresses this research gap by integrating six student well-being dimensions and three school engagement components to investigate their differential effects on academic achievement.

Considering the multi-dimensional construct of well-being, it can be expected that different dimensions do not show the same pattern of relationship with engagement. For example, it is reasonable to consider that enjoyment in school is a crucial, but not the sole contributor to emotional engagement, as indicated by research (Ely et al., 2013). Pleasant school experiences may lead to a development of positive emotional involvement with school, such as increased interest in school matters. Positive attitudes toward school may have a primarily positive effect on cognitive engagement, given that positive attitudes, commitment, and effort are related (Fabiny & Lovaš, 2018). Similarly, it can be assumed that the different engagement components are not equally contributing to academic achievement. Previous studies have found relationships between all three engagement components and achievement, with the strongest evidence for behavioral engagement (for a meta-analysis see Lei et al., 2018). Furthermore, it is unclear whether the impact of well-being on academic achievement is mainly mediated by engagement, or if some dimensions of well-being directly contribute to achievement over and above school

engagement. This distinction has important implications for both theory and practice. If the association between well-being and achievement is mediated by engagement, then promoting both student well-being and engagement simultaneously may need to be addressed in fostering academic achievement. If there is a relationship between well-being and achievement beyond engagement, it may be essential to put more emphasis on a school environment that cultivates well-being. Also, it must be considered that other factors than engagement may play a role in the relationship between well-being and achievement, such as achievement goal orientations (Holzer et al., 2022).

Two theoretical models provide complementary explanations for the indirect pathway from student well-being to academic achievement through school engagement. According to the broaden-and-build theory (Fredrickson, 2001), the experience of positive emotions leads to an expanded thought-action repertoire and creates urges to take in new information and experiment, thereby facilitating learning, The experience of negative emotions, on the other hand, narrows one's thought-action repertoire, which hinders learning. Previous studies have used the broaden-and-build theory to explain the relationships between student well-being and school engagement (Datu & King, 2018), and between student well-being and academic achievement (Bücker et al., 2018). By following this theory, we therefore suggest a causal connection: Student well-being shapes the ground for commitment to, interest and participation in school (i.e., school engagement), which boosts academic achievement. In the school context, previous results confirmed that positive experiences can foster engagement and subsequent performance (King et al., 2015).

The broaden-and-build theory focuses mainly on affective processes and does not fully explain the associations between cognitive and social aspects of well-being with engagement and achievement. The self-determination theory (SDT; Ryan & Deci, 2000) provides a more detailed explanation for these associations. According to this theory, all human beings hold basic needs for competence, autonomy, and relatedness. Well-being may be an indicator for satisfaction of these needs (Niemiec et al., 2006). At the same time, basic need satisfaction serves as a resource for motivation and is positively related to students' engagement (Skinner et al., 2008a) and achievement (Buzzai et al., 2021). To date, no research has linked the six-dimensional well-being model used in our study with basic need satisfaction. Still, SDT

can theoretically explain the connection between specific well-being dimensions with engagement components and academic achievement. In the following, we present partial evidence for each of the six well-being dimensions and link it to SDT.

Sufficient need satisfaction may be a positive indicator of all three positive student well-being dimensions (i.e., enjoyment in school, positive attitudes toward school, positive academic self-concept) and predict school engagement and subsequent academic achievement. It has been shown that when students' basic psychological needs are met, students are more likely to experience schoolwork as joyful (Shernoff et al., 2003). *Enjoyment* in school, in turn, was found to positively affect achievement, and this effect was mediated through behavioral engagement (Kang & Wu, 2022). Likewise, basic need satisfaction may lead to *positive attitudes* toward school, which are able to reinforce behavioral engagement, thereby fostering academic achievement (Green et al., 2012). Positive self-evaluations of competence are related to students' *academic self-concept*, which has proven to be an important antecedent of behavioral engagement that in turn predicts academic achievement, even for students with low cognitive and emotional engagement (Schnitzler et al., 2021).

Insufficient need satisfaction, on the other hand, may be related with the negative student well-being dimensions (e.g. worries in school, physical complaints in school, and social problems in school), diminishing school engagement, and subsequent achievement. Pekrun et al. (2002) linked psychological need thwarting to *worries* in school and drew a path from worries to less interest and effort, resulting in lower academic achievement. Interest and effort are often conceptualized as factors of emotional and behavioral engagement (Groccia, 2018). *Social problems* in school may be an indicator of insufficient social relatedness, which in turn can negatively affect school engagement and academic achievement. Students who experience social problems with teachers and peers tend to exhibit less behavioral engagement and lower academic achievement (Olivier et al., 2018). Conversely, Pietarinen et al. (2014) showed that having positive social relations with teachers and peers in school impacts cognitive engagement both directly and mediated through student well-being, and that cognitive engagement positively predicts academic achievement. *Physical complaints* in school can be a symptom of insufficient need satisfaction as well. For example, peer victimization, which gravely harms students' need for relatedness, has been linked to somatic complaints in previous studies (Nixon et al., 2011). Regarding the effects of

physical complaints on school engagement and achievement, Conner & Pope (2014) found negative correlations between physical health symptoms and cognitive and affective engagement, as well as academic achievement.

Taken together, prior results suggest a connection between all dimensions of student well-being with school engagement components, in particular behavioral engagement, and academic achievement. However, the operationalizations of engagement in the presented studies differ, which limits the comparability of results. For example, Kang & Wu (2022) measured behavioral engagement using four items from the Engagement vs. Dissatisfaction with Learning Questionnaire (Skinner et al., 2008b), while Green et al. (2012) conceptualized behavioral engagement as a combination of class participation, homework completion, and absenteeism. Also, no previous study included all six well-being dimensions and all three engagement components simultaneously to investigate their associations with achievement. Additionally, when investigating the relationship between student well-being, school engagement, and academic achievement, it may be important to consider possible confounding variables. One potential confounding variable is students' socioeconomic status (SES), since it is related to both well-being and achievement (Bücker et al., 2008; OECD, 2019). School engagement of students from lower SES families is more likely to diminish over the school years (Y. Li & Lerner, 2011), which may contribute to achievement gaps between these students and their economically more advantaged peers (C. Ng et al., 2018). At the same time, school engagement can serve as a protective factor, as it may moderate the relationship between SES and academic achievement (L. Li et al., 2022). Since lower SES has also been negatively linked to student well-being (Hascher et al., 2018), research on the link between well-being, engagement, and achievement would profit from taking students' socioeconomic background into account.

4.1.4 The Present Study

Evidence suggests a connection between student well-being, school engagement, and academic achievement. However, previous studies concerning the relationship between student well-being and school engagement often measured either construct uni-dimensionally or included only certain aspects, neglecting other dimensions (Appleton et al., 2008; Upadyaya & Salmela-Aro, 2013). Additional

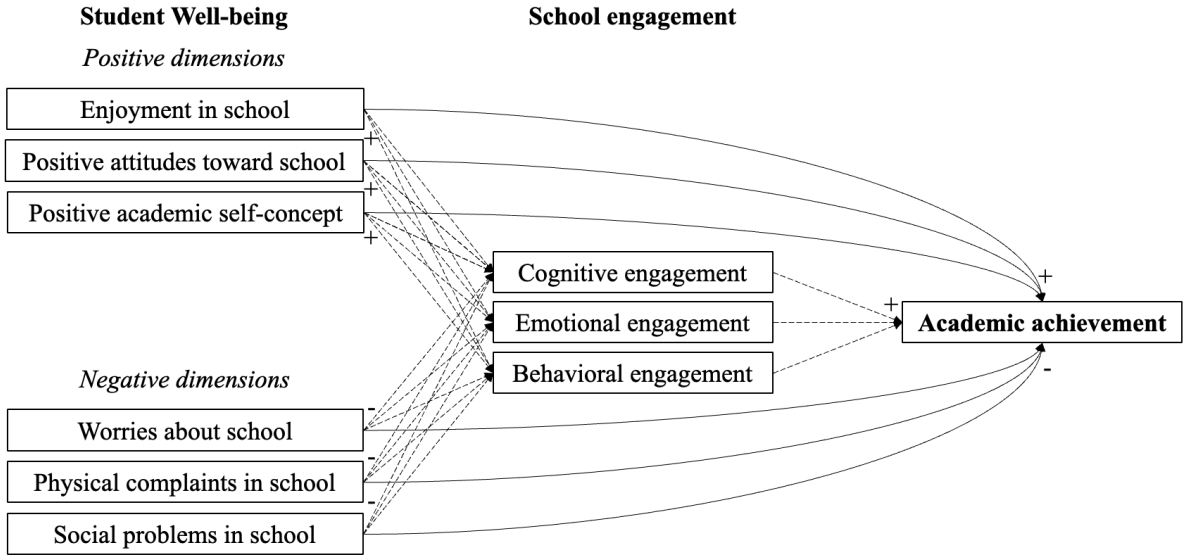
unclarity comes from the fact that the same scale items have been used to measure different components of engagement across studies (Jimerson et al., 2003). The present study aims at resolving some of the conceptual unclarity regarding the relevant constructs and their associations by applying a multi-dimensional approach.

Both academic achievement and student well-being may be considered as hallmarks of good schooling in the 21st century (OECD, 2019). Previous research has shown that well-being and achievement are connected (Bücker et al., 2018), and that this connection can be influenced by school engagement (Pietarinen et al., 2014). Although student well-being, as well as school engagement, have proven to be malleable and can be fostered in school (Abbot, 2017; Waters, 2011), it remains unclear which aspects of the multidimensional constructs are especially important for students' academic achievement. The present study is among the first that analyses the relationship between six student well-being dimensions and three school engagement components with the same sample, thereby following the suggested multi-dimensional conceptualization of the constructs.

The aim of the present study was to examine how dimensions of student well-being are associated with school engagement components and how these associations are related to students' academic achievement. Specifically, we were interested in the differential effects of positive and negative dimensions of student well-being on the emotional, cognitive, and behavioral components of engagement. Based on previous research, we expected positive relations of the positive student well-being dimensions (Hypothesis 1) and negative relations of the negative student well-being dimensions with achievement (Hypothesis 2). We also expected positive relations of the positive student well-being dimensions (Hypothesis 3) and negative effects of the negative student well-being dimensions with school engagement (Hypothesis 4). Further, we expected all three components of school engagement to positively relate with achievement and mediating the relationship of student well-being with achievement (Hypothesis 5). The proposed mediation model is displayed in Figure 1.

Figure 1

Mediation model for the effects of student well-being on academic achievement through school engagement



Note. Dashed lines indicate indirect pathways.

4.2 Material and methods

4.2.1 Participants and Procedure

Participants of the study were 754 lower secondary school students from three German-speaking cantons in Switzerland who participated in the longitudinal research project “Well-being in School in Switzerland” (WESIR), funded by the Swiss National Science Foundation (SNSF). Prior to the project start, a study and data management plan were presented to and approved by the SNSF. The study has not been preregistered otherwise. Ethical approval was obtained from the ethics committee at the researchers’ university prior to data collection (Ethics Application Nr 2021-08-00005, August 2021). Written consent for students’ participation in the study was obtained from their parents. Students were informed that their participation was optional and were assured that the information they provided would be confidential. Participants filled out an online survey during regular school lessons with both a teacher and a member of the research team present in the classroom. It took about 90 minutes to complete the whole survey. The survey was administered at two time points:

The first wave of data collection (*t*1) was conducted between January and April 2022, when participants were in Grade 7. The second wave (*t*2) was conducted between January and April 2023, when participants were in Grade 8. 46 classes from 17 schools participated at *t*1, with a total *N* of 754 students (M_{age} = 13.12 years, *SD* = 0.59; 48% female). One school dropped out of the study prior to *t*2. Thus, 43 classes participated at *t*2, with a total *N* of 719 students (M_{age} = 13.92 years, *SD* = 0.81; 48% female).

4.2.2 Measures

Student Well-being. Student well-being was measured using the 19-item Student Well-being Questionnaire (SWBQ; Hascher, 2007), which contains six subscales: (1) Enjoyment in school (3 items, e.g., "*In the past few weeks, it occurred that I was happy because I could do something I enjoy in school"*), (2) Positive attitudes toward school (3 items, e.g., "*I like going to school"*), (3) Positive academic self-concept (3 items, e.g., "*I have no problems with meeting the school requirements"*), (4) Worries in school (3 items, e.g., "*In the past few weeks, it occurred that I worried about school"*), (5) Physical complaints in school (4 items, e.g., "*In the past few weeks, it occurred that I had strong headaches during class"*), and (6) Social problems in school (3 items, e.g., "*In the past few weeks, it occurred that I had problems with my classmates"*). Responses were indicated on a 6-point Likert scale ranging from 1 = *never/disagree* to 6 = *very often/agree*. The internal reliability of the subscales as indicated by McDonald's ω ranged from 0.71 to 0.83. All items are presented in Table 4 in Appendix 1.

School Engagement. School engagement was assessed using the 19-item School Engagement Scale (Fredricks et al., 2005), comprising three subscales: (1) Behavioral engagement, which measures participation and involvement in academic activities (5 items, e.g., "*I pay attention in class"*), (2) Cognitive engagement, which measures thoughtfulness and effort (8 items, e.g., "*I check my schoolwork for mistakes"*), and (3) Emotional engagement, which measures positive and negative reactions to teachers, classmates, academics, or school (6 items, e.g., "*I feel excited by my work at school"*). Responses were indicated on a 5-point Likert scale ranging from 1 = *never* to 5 = *all of the time*. The internal reliability of the subscales as indicated by McDonald's ω ranged from 0.73 to 0.84. All items are presented in Table 5 in Appendix 1.

Academic Achievement. Academic achievement was measured using grade point average (GPA), which was computed based on students' grades in mathematics, German (school language), French (first foreign language), English (second foreign language), nature and technology, and history received from teachers at the end of the school years. The school grades varied from 1 (the lowest achievement level) to 6 (the highest achievement level), indicating that a higher score represents a better grade. Since there are no mandatory standardized achievement tests in Swiss schools and grades serve as the common indicator to evaluate students' school success used by teachers and officials, GPA was deemed the most useful informant of academic achievement.

Socioeconomic Status. Socioeconomic status was operationalized as economic, social, and cultural status (ESCS) using the PISA 2018 framework (OECD, 2019). ESCS is an index of highest parental occupation, highest parental education, and various household possessions such as the number of books at home.

4.2.3 Data Analysis

To explore the relationship between student well-being, school engagement, and academic achievement, mediation analyses using structural equation modeling (SEM) were conducted. Due to the complexity of the model, we performed separate SEMs for each student well-being dimension. Student well-being dimensions and school engagement components were included as latent variables. We tested for direct effects of student well-being at *t*1 on school engagement and academic achievement on *t*2, and for indirect effects of student well-being on academic achievement via school engagement. Statistical significance of the direct and indirect effects was tested using bias-corrected bootstrapping confidence intervals based on 10,000 bootstrap draws at the 0.05 level. In all analyses, we controlled for ESCS and prior academic achievement. The hierarchical data structure of students nested within school classes was controlled for using cluster-robust standard errors. The proportion of missing values on the item level ranged from 13.8% at *t*1 to 18% at *t*2. Because we did not receive grade reports from all participating schools, the missing values for academic achievement ranged between 14.7% at *t*1 and 37% at *t*2. We performed Little's (1988) test to check whether the missings were completely at random (MCAR). The MCAR test for the survey variables was nonsignificant ($\chi^2(38) = 42.73$, $p = .275$), indicating

that the missing data was MCAR. Thus, to deal with the missing values, we employed the full information maximum likelihood approach (FIML).

Due to the conceptual overlap between student well-being dimensions and school engagement components, we conducted various post-hoc analyses to corroborate our results and rule out potential confounding issues. First, we checked intercorrelations on the item level. We assessed whether items from the same subscales correlated relatively high with each other and lower with items from different subscales.

Second, we compared a series of exploratory factor analyses (EFA) to test the validity of the proposed factor structure and to identify potentially problematic cross-loadings for items from the engagement subscales on well-being factors. Items were considered problematic if they had cross-loadings above 0.32 (Tabachnick & Fidell, 2001).

Third, we compared a series of confirmatory factor analyses (CFA) to test the validity and distinctiveness of the student well-being and school engagement constructs. We compared eight models: (1) A one-factor model with all student well-being and school engagement variables loading on a single factor; (2) a two-factor model with one higher-order factor for all well-being dimensions and one higher-order factor for all engagement dimensions; (3) a two-factor model with one higher-order factor for the positive well-being dimensions together with the engagement components and one higher-order factor for the negative well-being dimensions; (4) a three-factor model with one higher-order factor for the positive student well-being dimensions and emotional engagement, one higher-order factor for the negative student well-being dimensions and one higher-order factor for the other two school engagement components; (5) a three-factor model with one higher-order factor for the positive student well-being dimensions, one higher-order factor for the negative student well-being dimensions and one higher-order factor for the school engagement components; (6) an eight-factor model with positive attitudes toward school and emotional engagement as one factor and all other dimensions as separate factors; (7) an eight-factor model with enjoyment in school and emotional engagement as one factor and all other dimensions as separate factors; (8) a nine-factor model with each well-being dimension and each engagement component loading on a separate factor. Given the conceptual similarity between enjoyment in school, positive attitudes toward

school, and emotional engagement, models 4, 6, and 7 were specified with combinations of those dimensions to test their distinctiveness.

Data preparation, descriptive and correlation statistics were conducted using R version 4.0.3 (R Core Team, 2020). CFA, EFA, and SEM analyses were performed in MPlus 8.10 (Muthén & Muthén, 1998-2017). Results were imported back to R using the mplusautomation package (Hallquist & Wiley, 2018). This package allows to convert the MPlus output to an R data frame, which facilitates the extraction and organization of results.

4.3 Results

4.3.1 Descriptive statistics

Means, standard deviations, reliability coefficients, and bivariate correlations are presented in Table 1. As expected, the positive student well-being dimensions positively correlated with each other, as did the negative dimensions, and positive and negative dimensions correlated negatively. Correlations were low to moderate, except for the high correlations between positive attitudes toward school and enjoyment in school. School engagement components also positively correlated with each other and with the positive well-being dimensions, while correlations with the negative well-being dimensions were negative for behavioral and emotional engagement. Cognitive engagement was positively correlated with worries in school and physical complaints in school. All correlations were low to moderate and significant, except for the associations between cognitive engagement and social problems in school. ESCS had low, but significant positive correlations with positive academic self-concept and emotional engagement, and negatively correlated with worries in school and physical complaints in school. GPA at both time points was highly positively correlated with each other, moderately positive with all three positive well-being dimensions, behavioral and emotional engagement and ESCS, and lowly negatively correlated with worries in school and physical complaints in school.

Table 1

Means, standard deviations, reliabilities, and correlations for dimensions of student well-being, school engagement and students' GPA

Variable	*M*	*SD*	ω	1	2	3	4	5	6	7	8	9	10	11
1. PAS_{t1}	4.28	1.04	0.79											
2. EIS_{t1}	4.33	1.01	0.71	.61***										
3. $PASC_{t1}$	4.31	1.02	0.77	.34***	.25***									
4. WIS_{t1}	3.29	1.42	0.81	-.14***	-.09*	-.33***								
5. PCS_{t1}	2.15	1.25	0.83	-.15***	-.09**	-.26***	.53***							
6. SPS_{t1}	1.67	0.97	0.79	-.21***	-.13**	-.14***	.27***	.38***						
7. $ENGB_{t2}$	4.00	0.59	0.73	.30***	.26***	.28***	-.10*	-.16***	-.15***					
8. $ENGC_{t2}$	2.63	0.75	0.80	.27***	.26***	.16***	.10*	.13**	.05	.36***				
9. $ENGE_{t2}$	3.23	0.74	0.84	.48***	.40***	.25***	-.13**	-.19***	-.20***	.52***	.45***			
10. GPA_{t1}	4.71	0.44	-	.20***	.18***	.40***	-.19***	-.20***	-.07	.23***	.08	.18***		
11. GPA_{t2}	4.79	0.46	-	.19***	.15**	.33***	-.11*	-.18***	-.11*	.29***	.14***	.21***	.80***	
12. ESCS	0.00	0.76	-	.01	.03	.17***	-.15***	-.20***	-.05	.05	.04	.09*	.25***	.30***

Note. PAS = positive attitudes toward school; EIS = enjoyment in school; PASC = positive academic self-concept; WIS = worries in school; PCS = physical complaints in school; SPS = social problems in school; ENGB = behavioral engagement; ENGC = cognitive engagement; ENGE = emotional engagement; GPA = Grade Point Average; ESCS = Socioeconomic Status; *M* = mean; *SD* = standard deviation; ω = McDonald's Omega; *t*1 = Wave 1; *t*2 = Wave 2. **p* < .05, ***p* < .01, ****p* < .001.

4.3.2 Path analyses

Table 2 displays all significant direct and indirect effects. The results revealed that no student well-being dimension had a significant direct effect on academic achievement. All positive student well-being dimensions had significant positive direct effects on all engagement components. For the negative well-being dimensions, social problems in school had a negative direct effect on behavioral and emotional engagement, while physical complaints had a positive direct effect on cognitive engagement. Behavioral engagement had a positive direct effect on academic achievement. One significant indirect pathway was found: Enjoyment in school had a positive effect on academic achievement, mediated through behavioral engagement. The full model results including effects of control variables can be found in Appendix 1.

Table 2

Significant direct and indirect paths from Student Well-being dimensions to School Engagement components and Academic Achievement

Path	Estimate	*SE*	95% CI
Direct Effects			
$EIS_{t1} \rightarrow ENGB_{t2}$	0.613***	0.092	[0.432, 0.787]
$PAS_{t1} \rightarrow ENGB_{t2}$	0.516***	0.076	[0.364, 0.661]
$PASC_{t1} \rightarrow ENGB_{t2}$	0.553**	0.192	[0.371, 1.065]
$SPS_{t1} \rightarrow ENGB_{t2}$	-0.201**	0.065	[-0.33, -0.075]
$EIS_{t1} \rightarrow ENGC_{t2}$	0.600***	0.075	[0.432, 0.723]
$PAS_{t1} \rightarrow ENGC_{t2}$	0.489***	0.060	[0.37, 0.604]
$PASC_{t1} \rightarrow ENGC_{t2}$	0.438*	0.180	[0.26, 0.937]
$PCS_{t1} \rightarrow ENGC_{t2}$	0.164*	0.064	[0.03, 0.281]
$EIS_{t1} \rightarrow ENGE_{t2}$	0.764***	0.090	[0.601, 0.943]
$PAS_{t1} \rightarrow ENGE_{t2}$	0.713***	0.055	[0.61, 0.821]
$PASC_{t1} \rightarrow ENGE_{t2}$	0.523*	0.205	[0.337, 1.098]
$SPS_{t1} \rightarrow ENGE_{t2}$	-0.237***	0.067	[-0.37, -0.111]
$ENGB_{t2} \rightarrow GPA_{t2}$	0.129*	0.054	[0.027, 0.242]
Indirect Effects			
$EIS_{t1} \rightarrow ENGB_{t2} \rightarrow GPA_{t2}$	0.079*	0.037	[0.020, 0.173]

Note. EIS = enjoyment in school; PAS = positive attitudes toward school; PASC = positive academic self-concept; WIS = worries in school; SPS = social problems in school; PCS = physical complaints in school; ENGB = behavioral engagement; ENGC = cognitive engagement; ENGE = emotional engagement; GPA = Grade Point Average; ESCS = Socioeconomic Status; 95% CI = 95% bias-corrected bootstrap confidence interval; *t*1 = Wave 1; *t*2 = Wave 2. *p < .05, **p < .01, ***p < .001.

4.3.3 Post-hoc Analyses

Inter-item correlations. Inter-item correlations were generally higher between items from the same subscales than between items from different subscales. Some items from the emotional engagement subscale also correlated moderately with some items from the enjoyment in school and positive attitudes toward school subscales. Since these correlations were lower than the intercorrelations within the specific scales, inter-item correlations were ruled out as possible confounding factor in our path analyses. The full item correlation matrix is available in the online supplementary.

Exploratory factor analyses. The fit indices of the EFA models improved with the number of factors. Although the 10-factor solution yielded a better fit than the 9-factor solution, the additional factor had an eigenvalue below 1. Therefore, we kept the 9-

factor solution to investigate cross-loadings between student well-being and school engagement variables. No item showed cross-loadings above 0.32 on other factors, indicating no confounding effects in our path analyses. The EFA results for all tested solutions are available in the online supplementary.

Confirmatory Factor Analysis. The CFA results are presented in Table 3. Each subsequent model yielded better fit statistics than the previous (lower χ^2 / *df* ratio, higher comparative fit and tucker-lewis indexes, lower root mean squared error of approximation, lower standardized root mean square residual), indicating that student well-being and school engagement are distinct constructs. The fact that the nine-factor model had a better fit than the three-factor model is an indicator that the student well-being dimensions and the school engagement components should be measured as single factors. Further, the models where emotional engagement was specified to load on a common factor with either positive attitudes toward school, enjoyment in school, or both yielded worse fit than the nine-factor model. This underlines the assumption that the well-being dimensions and emotional engagement are distinct constructs. Both the six-factor structure for student well-being (Hascher & Hagenauer, 2020) and the three-factor structure for school engagement (Ramos-Díaz et al., 2016) have been validated in previous studies. The results from the present CFA reflect these findings, supporting the treatment of all student well-being dimensions and school engagement components as separate factors in the path analyses.

Table 3

Model fit statistics of the CFAs testing competing models in terms of the factor structure of Student Well-being and School engagement

CFA Model	χ^2 (*df*)	CFI	TLI	RMSEA	90% CI	SRMR
one-factor model	5837.913 (665)	0.417	0.384	0.094	[0.092, 0.097]	0.126
two-factor model 1	1888.303 (665)	0.861	0.851	0.046	[0.044, 0.049]	0.088
two-factor model 2	1749.556 (665)	0.877	0.868	0.044	[0.041, 0.046]	0.079
three-factor model 1	1717.729 (653)	0.880	0.871	0.043	[0.041, 0.046]	0.075
three-factor model 2	1629.851 (653)	0.890	0.882	0.041	[0.039, 0.044]	0.072
eight-factor model 1	1910.738 (637)	0.857	0.842	0.048	[0.045, 0.050]	0.063
eight-factor model 2	1804.139 (637)	0.869	0.855	0.046	[0.043, 0.048]	0.062
nine-factor model	1478.686 (629)	0.904	0.893	0.039	[0.037, 0.042]	0.056

Note. χ2 = Chi-Square; df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis Index; RMSEA = root mean squared error of approximation; 90% CI = 90% confidence interval for the RMSEA; SRMR = standardized root mean square residual.

Two-factor model 1: Student Well-being, School engagement; Two-factor model 2: Positive Student Well-being dimensions + School engagement, Negative Student Well-being dimensions; Three-factor model 1: Positive Student Well-being dimensions + Emotional engagement, Negative Student Well-being dimensions, Behavioral engagement + Cognitive engagement; Three-factor model 2: Positive Student Well-being dimensions, Negative Student Well-being dimensions, School engagement; Eight-factor model 1: Positive attitudes toward school + Emotional engagement, other dimensions; Eight-factor model 2: Enjoyment in school + Emotional engagement, other dimensions.

4.4 Discussion

In the present study, we investigated the relationship between adolescent students' well-being, their school engagement, and academic achievement in a longitudinal study with two measurement points in Grade 7 and Grade 8. We expected the three positive student well-being dimensions (positive attitudes toward school, enjoyment in school, positive academic self-concept) to positively predict and the three negative student well-being dimensions (worries in school, social problems in school, physical complaints in school) to negatively predict school engagement and academic achievement. Further, we expected all three components of school engagement (behavioral, cognitive, emotional) to positively predict academic achievement, thereby mediating the effect of student well-being.

We found no student well-being dimension to be directly related to academic achievement. Therefore, we have to reject Hypotheses 1 and 2. While we expected direct relations based on our *theoretical* assumptions, our results are comparable to other empirical findings: Yang et al. (2019) found no direct effects of school well-being on academic achievement. They explain their null findings with the assumption that annual grades are rather stable, and that well-being might be more dynamically related to daily academic performance. The high correlation between t1 and t2 GPA found in our study corroborates the assumption of annual grade stability. Thus, our measurement of academic achievement may not capture the dynamic interplay between students' well-being and possible short-term fluctuations in their school performance. Another reason might be the potential influence of third variables not accounted for in our study. For example, the influence of emotions such as enjoyment in school on academic achievement has been shown to be dependent on the interplay with other factors, like motivation or self-regulated learning (Mega et al., 2014). The same holds true for positive attitudes toward school: Although various studies point out a direct link between students' attitudes and achievement (for a meta-analysis see Petscher, 2010), this link seems to be dependent on students' motivation such as academic goals and intentions (Abu-Hilal, 2000). Also, while positive academic self-concept is considered to be reciprocally related to academic achievement (Marsh & Martin, 2011), the influence of previous achievement on academic self-concept might be stronger than vice versa. Since we included previous achievement in our analyses,

this could explain why we found no direct associations. Additionally, we measured both well-being and academic achievement on a general level and did not investigate subject-specific differences. Some effects of well-being dimensions might only emerge for achievement in certain subjects. For example, it has been shown that worries are a source of task-irrelevant thoughts that block cognitive resources, thereby impairing performance (Keogh et al., 2004). A student who has difficulties with maths might have more of such worries during maths exams than during language exams. Such potential subject-specific relations are not reflected in a general GPA measure as used in our study.

As expected, all positive well-being dimensions showed positive direct relations with all engagement components, leading to acceptance of Hypothesis 3. Hypothesis 4, however, is only partially accepted: Social problems in school was a negative direct predictor of behavioral and emotional engagement, while physical complaints were unexpectedly positively related to cognitive engagement. One plausible explanation for this finding might be that students who have previously experienced school-related physical complaints may increase their engagement in cognitive tasks as a compensatory mechanism. Alternatively, a third variable such as performance pressure could influence both physical complaints and cognitive engagement. This notion is supported by research indicating that performance pressure can exacerbate physical symptoms (Murberg & Bru, 2004) and boost some forms of cognitive engagement, although in an unfavorable way. Greene (2015) differentiates between two forms of cognitive engagement – deep and shallow – and ties these forms to different achievement goal orientations. Within this distinction, deep cognitive engagement is induced by mastery goal orientation, i.e., a focus on learning how to master a task, while shallow cognitive engagement is induced by performance goal orientation, i.e., a students' comparison of their own performance with that of their peers (Pintrich, 2000). Deep cognitive engagement is characterized by adaptive self-regulated learning strategies, such as combining and comparing different pieces of information. In contrast, shallow cognitive engagement encompasses superficial and ineffective learning strategies, such as memorizing answers for tests. Performance pressure could thus induce a performance-oriented learning climate, leading students to shallow cognitive engagement. Since the scale to measure cognitive engagement

used in the present study does not differentiate between deep and shallow engagement, this interpretation remains to be tested.

Hypothesis 5 must be largely rejected, as we found only one significant indirect effect: Enjoyment in school indirectly predicted academic achievement, mediated through behavioral engagement. Behavioral engagement turned out to be the sole predictor of achievement in our model. This finding supports the self-determination theory: Enjoyment in school can be seen as a construct that captures students' basic need satisfaction (Ryan & Deci, 2000), which may lead to higher behavioral engagement and subsequent academic achievement (Green et al., 2012). Additionally, the link from enjoyment in school to academic achievement through behavioral engagement is in line with the broaden-and-build model, which states that positive emotions lead to adaptive learning behavior and thereby enhance academic performance (Fredrickson, 2001).

For the cognitive engagement component, we found no effect on academic achievement. Although many studies point to a positive connection between cognitive engagement and achievement (Lei et al., 2018), Greene (2015) posits that this might depend on the depth of engagement and the corresponding strategy use. As outlined above, cognitive engagement can be differentiated between deep and shallow forms. Shallow cognitive engagement has been shown to negatively predict academic achievement (Greene, 2015). The insignificant effect of cognitive engagement on achievement found in the present study might indicate that students who rely on shallow learning strategies still experience themselves to be cognitively engaged, but that this form of engagement does not translate to academic achievement.

While student well-being and emotional engagement seem to be closely related, as the direct effects of the well-being dimensions on emotional engagement in the regression analysis suggest, they did also not translate to achievement. The nonsignificant result of emotional engagement found in our study is in line with Fredricks (2004), who reported only weak evidence for a direct effect of emotional engagement on achievement. One possible explanation comes from Wang and Degol (2014), who suppose that emotional engagement could serve as a prerequisite for behavioral and cognitive engagement. According to this explanation, high emotional engagement leads to more participation in the classroom and better self-regulation of learning. This explanation is also supported by empirical evidence: Li and Lerner

(2013) found students' emotional engagement to predict later behavioral and cognitive engagement, and a study by Wu and Wu (2020) found a serial link from emotional to behavioral to cognitive engagement, leading to increased academic performance. In other words, having positive emotions and attitudes toward school seems not enough to succeed academically. Rather, when these emotions and attitudes are accompanied by adaptive learning behavior, they are related to students' achievement.

Besides the relationship between the internal well-being dimensions with engagement and achievement, external factors seem to play a role too, as suggested by the positive effects of socioeconomic status on achievement found in the present study. Socioeconomic status was a significant predictor of academic achievement in four models, but unrelated to school engagement (see Appendix 2). This finding implies that students from more advantaged socioeconomic backgrounds tend to have better grades, independent from the school engagement they report. This is in line with numerous other studies that proved a connection between socioeconomic status and academic achievement (for a meta-analysis see Sirin, 2005), especially in stratified education systems such as in Switzerland (Hanushek & Woessmann, 2006). Students from more advantaged socioeconomic backgrounds often have more resources at home, such as a quiet learning environment and parents who can support them academically (Thomson, 2018). On the other hand, it is also possible that teachers' grading behavior is somewhat biased and favors such students (Doyle et al., 2023). Swiss students get tracked into different performance levels between Grade 6 and 7, where the effects of socioeconomic background are strong (Neuenschwander & Malti, 2009). The participants in the present study were in the seventh grade and thus already assigned to different tracks. The finding that socioeconomic status is still associated with academic achievement within these more homogenous groups suggests that students from more advantaged socioeconomic backgrounds tend to have better grades regardless of their academic track.

4.4.1 Implications for practice

Some recommendations for school practice can be derived from our findings. One key implication is that fostering students' academic well-being may lead to positive outcomes in their school engagement. Second, when focusing on students' engagement, it seems most promising to work on the behavioral component. Giving

students opportunities and encouraging them to participate in learning activities may be the best way to help them reach their full potential. Teachers can contribute to their students' behavioral engagement also by giving goal-relevant feedback, as well as by emphasizing mastery-oriented achievement goals and not comparing individual students' achievements to those of others (Putwain et al., 2018). A third implication pertains to our finding enjoyment in school indirectly predicts achievement through behavioral engagement. This finding underscores the importance of creating enjoyable and engaging learning experiences to promote academic outcomes and therefore backs our premise that feeling well in school promotes doing well in school to some extent. However, we neither found strong links between well-being and academic achievement, nor between school engagement and academic achievement. It seems that other factors play a more crucial role in secondary school students' academic success.

4.4.2 Strengths and limitations

The present study has multiple strengths. First, the integration of multidimensional constructs of student well-being and school engagement allows for a more nuanced approach toward understanding the associations between the variables compared to previous studies that used only certain dimensions and components.

Further, this study design clearly distinguishes between student well-being dimensions and engagement components and therefore allows for the examination of the unique contribution of engagement components, in contrast to previous studies that combined different types of engagement in one measure (Fredricks, 2004). The results of our study confirmed that a more differentiated approach to the constructs under investigation is necessary to understand the complex associations between well-being dimensions, engagement components, and achievement. By examining well-being through various dimensions, researchers can better grasp the intricate interplay of these elements in shaping students' overall sense of well-being. This holistic perspective not only offers valuable insights into the factors that contribute to or hinder engagement and achievement. Moreover, the multidimensional approach is equally crucial for engagement research, as it allows for a nuanced examination of the factors that drive students to engage in school. In essence, adopting multidimensional models not only enhances our understanding of well-being and engagement, but offers

important insights on how well-being, engagement and achievement can be fostered simultaneously.

Also, some limitations must be noted. First, student well-being and school engagement were measured through self-reports of students. Since student well-being is a subjective evaluation of one's cognitions and emotions toward school, it is best measured using self-reports. Still, research using additional measures, such as teacher perceptions of student engagement and observations of classroom behavior, could contribute to additional clarification on the relationships among the variables.

The second limitation is given by the fact that only variables on students' individual level were investigated. Further studies could add school- and classroom-related variables, such as the influence of school policies or teacher behavior on students' well-being and engagement.

A third limitation lies in the theoretical and methodological ambiguity of the engagement construct. As Sinatra et al. (2015) pointed out, all three engagement components possibly intersect, and it is likely that measurement of one dimension reflects the other dimensions as well. In addition, the well-being dimension "enjoyment in school" and the emotional component of the engagement construct significantly overlap. This issue must be kept in mind when interpreting the present results and comparing them to other studies that used different conceptualizations of the construct. Future studies could tackle this ambiguity by using alternative, more nuanced instruments to measure school engagement (Reeve et al., 2020).

Fourth, while the data for student well-being and school engagement were collected one year apart, the engagement data and the school grades stem from the same school year. The mediation analysis would have been more straightforward if the time interval between the mediator and the outcome were identical with intervals between the predictors and the mediator. While the student survey on well-being and engagement took place in the middle of the school year, academic achievement was measured using official school records of grades at the end of the school year. Therefore, a time lag between the measurement of the mediator and the outcome was existent, which allows to investigate the influence of perceived well-being and engagement on academic success.

4.4.3 Directions for future research

Our results indicate that enhancing students' well-being may lead to increased school engagement, which, in case of behavioral engagement, may enhance academic achievement. At the same time, physical complaints in school were positively related to cognitive engagement in our study. Future research should aim at resolving this paradoxical finding. We see a promising approach to this in the inclusion of learning strategy-related variables, and by differentiating cognitive engagement further into deep and shallow engagement strategies. Examination of the causal relation between achievement goal orientation, engagement, and strategy use could offer valuable insights into the mechanisms involved in the interplay between student well-being, engagement, and achievement (Upadyaya & Salmela-Aro, 2013). Also, possible sequential effects of engagement components should be investigated. While our data suggests that student well-being has strong effects on cognitive and emotional engagement, these engagement components did not lead to higher academic achievement. As Wang and Degol (2014) suggested, this might be due to the serial mediation of emotional through cognitive and behavioral engagement. To explore the relationship between student well-being and academic achievement in more detail, it may be beneficial to use more nuanced measures, such as subject-specific and short-time indicators. While we found no direct associations between trait well-being and overall annual GPA, studies applying multiple measurement points for well-being and academic performance in different subjects might be able to reveal more dynamic mechanisms in these associations. Furthermore, future research could control for students' characteristics that may impact the association between students' well-being, engagement, and academic achievement such as gender identity or personality traits.

To further clarify and refine the conceptual relationship between well-being and engagement with regard to their manifold definitions and conceptualizations, it would be helpful to include multiple measures of both constructs within a single study. This approach would enable inferences about the convergent and discriminant validity of each measure, providing insights into where different conceptualizations of well-being and engagement overlap, where they diverge, and whether they genuinely capture two distinct constructs.

4.4.4 Conclusions

The results highlight the importance of considering the multidimensional nature of student well-being and school engagement. Behavioral engagement was the sole predictor of achievement in our study, and it mediated the indirect effect of enjoyment in school. This result implies that it is not enough to foster students' enjoyment in school, but that students also need guidance on how to turn their positive emotions into concrete action strategies to be able to succeed in school. While competition and pressure in school might lead students to cognitively engage with school, it might not necessarily foster the use of effective learning strategies. The value of these strategies for learning and achievement should be communicated by teachers and school staff, and room for learning the use of such strategies should be given at schools. Additionally, we found that the negative well-being dimensions had negative effects on school engagement. We therefore emphasize the need to take students' school-related worries, physical complaints, and social problems seriously, as they seem to be an indicator of low school-related well-being that is detrimental to their school engagement. Thus, teachers and school staff should strive for a school in which students feel well, so they can adaptively engage in their schoolwork and reach their full potential.

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4.6 Appendix 1

Table 4

Student Well-being Scale

Enjoyment In School (EIS)
In the past few weeks, it occurred that I was happy because I could do something I enjoy in school.
In the past few weeks, it occurred that I was happy because I could show what I have learned.
In the past few weeks, it occurred that I was happy because a teacher was friendly and understanding to me.
Positive Attitudes Toward School (PAS)
I like to go to school.
School makes sense to me.
Whatever will happen, school is a good thing.
Positive Academic Self-Concept (PASC)
I don't have problems with meeting the school requirements.
I can solve learning problems easily.
I'm able to achieve as good as most of my classmates.
Worries In School (WIS)
In the past few weeks, it occurred that I worried about school.
In the past few weeks, it occurred that I worried about the next school years / about the time after school.
In the past few weeks, it occurred that I worried about my grades.
Physical Complaints In School (PCS)
In the past few weeks, it occurred that I lacked appetite because of achievement-stress in school.
In the past few weeks, it occurred that I felt sick from all the agitation.
In the past few weeks, it occurred that I suffered from pain in the stomach because of school.
In the past few weeks, it occurred that I had strong headaches during class.
Social Problems In School (SPS)
In the past few weeks, it occurred that I had problems with my classmates.
In the past few weeks, it occurred that I had problems with single classmates.
In the past few weeks, it occurred that I felt like an outsider in my classroom.

Note. Responses were indicated on a 6-point Likert scale ranging from 1 = *never/disagree* to 6 = *very often/agree*.

Table 5

School Engagement Scale

Behavioral Engagement (ENGB)
I follow the rules at school.
I get in trouble at school. (reversed)
When I am in class, I just act as if I am working. (reversed)
I pay attention in class.
I complete my work on time.
Cognitive Engagement (ENGC)
I check my schoolwork for mistakes.
I study at home even when I don't have a test.
I try to watch TV shows about things we do in school.
When I read a book, I ask myself questions to make sure I understand what it is about.
I read extra books to learn more about things we do in school.
If I don't know what a word means when I am reading, I do something to figure it out.
If I don't understand what I read, I go back and read it over again.
I talk with people outside of school about what I am learning in class.
Emotional Engagement (ENGE)
I like being at school.
I feel excited by my work at school
My classroom is a fun place to be.
I am interested in the work at school.
I feel happy in school.
I feel bored in school. (reversed)

Note. Responses were indicated on a 5-point Likert scale ranging from 1 = *never* to 5 = *all of the time*.

4.7 Appendix 2

Table 6

Model 1: Enjoyment in School

Outcome	Predictor	Estimate	*SE*	95% CI
Direct Effects				
$ENGB_{t2}$	EIS_{t1}	0.613***	0.092	[0.432, 0.787]
	GPA_{t1}	0.114	0.079	[-0.051, 0.25]
	ESCS	-0.011	0.051	[-0.117, 0.082]
$ENGC_{t2}$	EIS_{t1}	0.6***	0.075	[0.432, 0.723]
	GPA_{t1}	-0.101	0.058	[-0.215, 0.012]
	ESCS	0.034	0.053	[-0.07, 0.137]
$ENGE_{t2}$	EIS_{t1}	0.764***	0.090	[0.601, 0.943]
	GPA_{t1}	-0.017	0.077	[-0.17, 0.127]
	ESCS	0.042	0.057	[-0.072, 0.151]
GPA_{t2}	EIS_{t1}	-0.171	0.126	[-0.472, -0.01]
	$ENGB_{t2}$	0.129*	0.054	[0.027, 0.242]
	$ENGC_{t2}$	0.005	0.060	[-0.119, 0.117]
	$ENGE_{t2}$	0.124	0.091	[-0.003, 0.319]
	GPA_{t1}	0.77***	0.048	[0.67, 0.849]
	ESCS	0.08	0.042	[0.002, 0.165]
Total Effect				
	$EIS_{t1} \rightarrow GPA_{t2}$	0.006	0.047	[-0.084, 0.103]
Indirect Effects				
	$EIS_{t1} \rightarrow ENGB_{t2} \rightarrow GPA_{t2}$	0.079*	0.037	[0.020, 0.173]
	$EIS_{t1} \rightarrow ENGC_{t2} \rightarrow GPA_{t2}$	0.003	0.037	[-0.067, 0.076]
	$EIS_{t1} \rightarrow ENGE_{t2} \rightarrow GPA_{t2}$	0.095	0.086	[0.002, 0.305]

Note. EIS = enjoyment in school; ENGB = behavioral engagement, ENGC = cognitive engagement, ENGE = emotional engagement, ESCS = Socioeconomic Status; GPA = Grade Point Average; 95% CI = 95% bias-corrected bootstrap confidence interval; *t*1 = Wave 1; *t*2 = Wave 2.

$\chi 2$ (260) = 1100.052, $p < .001$, RMSEA = 0.061, SRMR = 0.076, CFI = 0.823.

*$p < .05$, **$p < .01$, ***$p < .001$.

Table 7

Model 2: Positive Attitudes Toward School

Outcome	Predictor	Estimate	*SE*	95% CI
Direct Effects				
$ENGB_{t2}$	PAS_{t1}	0.516***	0.076	[0.364, 0.661]
	GPA_{t1}	0.151**	0.056	[0.047, 0.266]
	ESCS	-0.002	0.048	[-0.103, 0.087]
$ENGC_{t2}$	PAS_{t1}	0.489***	0.060	[0.37, 0.604]
	GPA_{t1}	-0.061	0.047	[-0.149, 0.037]
	ESCS	0.041	0.049	[-0.056, 0.139]
$ENGE_{t2}$	PAS_{t1}	0.713***	0.055	[0.61, 0.821]
	GPA_{t1}	0.01	0.048	[-0.082, 0.107]
	ESCS	0.057	0.048	[-0.044, 0.147]
GPA_{t2}	PAS_{t1}	-0.052	0.077	[-0.218, 0.079]
	$ENGB_{t2}$	0.102*	0.052	[0.001, 0.207]
	$ENGC_{t2}$	-0.023	0.054	[-0.137, 0.077]
	$ENGE_{t2}$	0.061	0.062	[-0.051, 0.19]
	GPA_{t1}	0.757***	0.040	[0.665, 0.822]
	ESCS	0.082*	0.041	[0.006, 0.165]
Total Effect				
	$PAS_{t1} \rightarrow GPA_{t2}$	0.033	0.041	[-0.043, 0.120]
Indirect Effects				
	$PAS_{t1} \rightarrow ENGB_{t2} \rightarrow GPA_{t2}$	0.053	0.029	[0.004, 0.121]
	$PAS_{t1} \rightarrow ENGC_{t2} \rightarrow GPA_{t2}$	-0.011	0.027	[-0.066, 0.040]
	$PAS_{t1} \rightarrow ENGE_{t2} \rightarrow GPA_{t2}$	0.043	0.048	[-0.035, 0.148]

Note. PAS = positive attitudes toward school; ENGB = behavioral engagement, ENGC = cognitive engagement, ENGE = emotional engagement, ESCS = Socioeconomic Status; GPA = Grade Point Average; 95% CI = 95% bias-corrected bootstrap confidence interval; *t*1 = Wave 1; *t*2 = Wave 2.

$\chi 2$ (260) = 1140.971, $p < .001$, RMSEA = 0.062, SRMR = 0.087, CFI = 0.827.

*$p < .05$, **$p < .01$, ***$p < .001$.

Table 8

Model 3: Positive Academic Self-concept

Outcome	Predictor	Estimate	*SE*	95% CI
Direct Effects				
$ENGB_{t2}$	$PASC_{t1}$	0.553**	0.192	[0.371, 1.065]
	GPA_{t1}	0.052	0.163	[-0.338, 0.223]
	ESCS	-0.075	0.065	[-0.227, 0.02]
$ENGC_{t2}$	$PASC_{t1}$	0.438*	0.180	[0.26, 0.937]
	GPA_{t1}	-0.114	0.132	[-0.412, 0.055]
	ESCS	-0.021	0.069	[-0.159, 0.105]
$ENGE_{t2}$	$PASC_{t1}$	0.523*	0.205	[0.337, 1.098]
	GPA_{t1}	-0.02	0.163	[-0.423, 0.155]
	ESCS	-0.021	0.071	[-0.165, 0.095]
GPA_{t2}	$PASC_{t1}$	-0.044	0.108	[-0.276, 0.129]
	$ENGB_{t2}$	0.107	0.066	[-0.012, 0.251]
	$ENGC_{t2}$	-0.025	0.055	[-0.142, 0.074]
	$ENGE_{t2}$	0.041	0.059	[-0.06, 0.17]
	GPA_{t1}	0.764***	0.052	[0.66, 0.844]
	ESCS	0.09	0.050	[0.001, 0.196]
Total Effect				
	$PASC_{t1} \rightarrow GPA_{t2}$	0.025	0.050	[-0.059, 0.128]
Indirect Effects				
	$PASC_{t1} \rightarrow ENGB_{t2} \rightarrow$	0.059	0.056	[-0.008, 0.210]
	$PASC_{t1} \rightarrow ENGC_{t2} \rightarrow$	-0.011	0.032	[-0.092, 0.038]
	$PASC_{t1} \rightarrow ENGE_{t2} \rightarrow$	0.021	0.050	[-0.031, 0.167]

Note. PASC = positive academic self-concept; ENGB = behavioral engagement, ENGC = cognitive engagement, ENGE = emotional engagement, ESCS = Socioeconomic Status; GPA = Grade Point Average; 95% CI = 95% bias-corrected bootstrap confidence interval; *t*1 = Wave 1; *t*2 = Wave 2.

$\chi 2$ (260) = 1232.026, $p < .001$, RMSEA = 0.065, SRMR = 0.106, CFI = 0.807.

*$p < .05$, **$p < .01$, ***$p < .001$.

Table 9

Model 4: Worries in School

Outcome	Predictor	Estimate	*SE*	95% CI
Direct Effects				
$ENGB_{t2}$	WIS_{t1}	-0.059	0.086	[-0.238, 0.102]
	GPA_{t1}	0.295***	0.058	[0.178, 0.408]
	ESCS	-0.031	0.057	[-0.15, 0.075]
$ENGC_{t2}$	WIS_{t1}	0.108	0.084	[-0.057, 0.273]
	GPA_{t1}	0.114	0.064	[-0.009, 0.243]
	ESCS	0.03	0.062	[-0.091, 0.152]
$ENGE_{t2}$	WIS_{t1}	-0.095	0.086	[-0.257, 0.078]
	GPA_{t1}	0.206**	0.067	[0.075, 0.337]
	ESCS	0.019	0.066	[-0.108, 0.151]
GPA_{t2}	WIS_{t1}	0.072	0.037	[-0.001, 0.147]
	$ENGB_{t2}$	0.09	0.049	[-0.005, 0.189]
	$ENGC_{t2}$	-0.048	0.050	[-0.158, 0.041]
	$ENGE_{t2}$	0.04	0.042	[-0.04, 0.123]
	GPA_{t1}	0.766***	0.038	[0.68, 0.831]
	ESCS	0.092*	0.042	[0.009, 0.172]
Total Effect				
	$WIS_{t1} \rightarrow GPA_{t2}$	0.057	0.037	[-0.015, 0.129]
Indirect Effects				
	$WIS_{t1} \rightarrow ENGB_{t2} \rightarrow GPA_{t2}$	-0.005	0.010	[-0.039, 0.006]
	$WIS_{t1} \rightarrow ENGC_{t2} \rightarrow GPA_{t2}$	-0.005	0.009	[-0.038, 0.003]
	$WIS_{t1} \rightarrow ENGE_{t2} \rightarrow GPA_{t2}$	-0.004	0.006	[-0.025, 0.003]

Note. WIS = worries in school; ENGB = behavioral engagement, ENGC = cognitive engagement, ENGE = emotional engagement, ESCS = Socioeconomic Status; GPA = Grade Point Average; 95% CI = 95% bias-corrected bootstrap confidence interval; *t*1 = Wave 1; *t*2 = Wave 2.

$\chi 2$ (260) = 1320.743, $p < .001$, RMSEA = 0.068, SRMR = 0.137, CFI = 0.793.

*$p < .05$, **$p < .01$, ***$p < .001$.

Table 10

Model 5: Social Problems in School

Outcome	Predictor	Estimate	*SE*	95% CI
Direct Effects				
$ENGB_{t2}$	SPS_{t1}	-0.201**	0.065	[-0.33, -0.075]
	GPA_{t1}	0.289***	0.056	[0.174, 0.397]
	ESCS	-0.037	0.055	[-0.15, 0.066]
$ENGC_{t2}$	SPS_{t1}	-0.019	0.073	[-0.171, 0.112]
	GPA_{t1}	0.087	0.062	[-0.028, 0.215]
	ESCS	0.017	0.064	[-0.105, 0.146]
$ENGE_{t2}$	SPS_{t1}	-0.237***	0.067	[-0.37, -0.111]
	GPA_{t1}	0.203**	0.065	[0.074, 0.329]
	ESCS	0.013	0.065	[-0.113, 0.142]
GPA_{t2}	SPS_{t1}	0.01	0.026	[-0.041, 0.059]
	$ENGB_{t2}$	0.09	0.047	[-0.003, 0.185]
	$ENGC_{t2}$	-0.034	0.049	[-0.136, 0.056]
	$ENGE_{t2}$	0.032	0.046	[-0.062, 0.12]
	GPA_{t1}	0.753***	0.039	[0.664, 0.819]
	ESCS	0.086*	0.041	[0.005, 0.166]
Total Effect				
	$SPS_{t1} \rightarrow GPA_{t2}$	-0.015	0.025	[-0.068, 0.030]
Indirect Effects				
	$SPS_{t1} \rightarrow ENGB_{t2} \rightarrow GPA_{t2}$	-0.018	0.013	[-0.051, 0.000]
	$SPS_{t1} \rightarrow ENGC_{t2} \rightarrow GPA_{t2}$	0.001	0.004	[-0.005, 0.017]
	$SPS_{t1} \rightarrow ENGE_{t2} \rightarrow GPA_{t2}$	-0.008	0.011	[-0.029, 0.016]

Note. SPS = social problems in school; ENGB = behavioral engagement, ENGC = cognitive engagement, ENGE = emotional engagement, ESCS = Socioeconomic Status; GPA = Grade Point Average; 95% CI = 95% bias-corrected bootstrap confidence interval; *t*1 = Wave 1; *t*2 = Wave 2.

$\chi 2$ (260) = 1277.625, $p < .001$, RMSEA = 0.067, SRMR = 0.134, CFI = 0.792.

*$p < .05$, **$p < .01$, ***$p < .001$.

Table 11

Model 6: Physical Complaints in School

Outcome	Predictor	Estimate	*SE*	95% CI
Direct Effects				
$ENGB_{t2}$	PCS_{t1}	-0.103	0.081	[-0.267, 0.044]
	GPA_{t1}	0.288***	0.060	[0.164, 0.402]
	ESCS	-0.043	0.060	[-0.169, 0.068]
$ENGC_{t2}$	PCS_{t1}	0.164*	0.064	[0.03, 0.281]
	GPA_{t1}	0.122	0.062	[0.001, 0.245]
	ESCS	0.048	0.065	[-0.08, 0.175]
$ENGE_{t2}$	PCS_{t1}	-0.145	0.080	[-0.309, 0.005]
	GPA_{t1}	0.199**	0.070	[0.06, 0.334]
	ESCS	0.003	0.067	[-0.125, 0.138]
GPA_{t2}	PCS_{t1}	0.056	0.037	[-0.017, 0.128]
	$ENGB_{t2}$	0.092	0.048	[-0.001, 0.19]
	$ENGC_{t2}$	-0.049	0.051	[-0.161, 0.044]
	$ENGE_{t2}$	0.04	0.046	[-0.053, 0.129]
	GPA_{t1}	0.76***	0.037	[0.677, 0.824]
	ESCS	0.096*	0.044	[0.012, 0.183]
Total Effect				
	$PCS_{t1} \rightarrow GPA_{t2}$	0.033	0.033	[-0.036, 0.094
Indirect Effects				
	$PCS_{t1} \rightarrow ENGB_{t2} \rightarrow GPA_{t2}$	-0.009	0.011	[-0.045, 0.002]
	$PCS_{t1} \rightarrow ENGC_{t2} \rightarrow$	-0.008	0.010	[-0.038, 0.005]
	$PCS_{t1} \rightarrow ENGE_{t2} \rightarrow GPA_{t2}$	-0.006	0.008	[-0.029, 0.004]

Note. PCS = physical complaints in school; ENGB = behavioral engagement, ENGC = cognitive engagement, ENGE = emotional engagement, ESCS = Socioeconomic Status; GPA = Grade Point Average; 95% CI = 95% bias-corrected bootstrap confidence interval; *t*1 = Wave 1; *t*2 = Wave 2.

$\chi 2$ (260) = 1358.838, $p < .001$, RMSEA = 0.066, SRMR = 0.135, CFI = 0.801.

*$p < .05$, **$p < .01$, ***$p < .001$.

5 On the longitudinal relationship between Swiss secondary students' well-being, school engagement, and academic achievement: A three-wave random intercept cross-lagged panel analysis (Study 2)

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Abstract

Contemporary education systems face the challenge of fostering academic achievement while also keeping students engaged and maintaining their well-being. Previous research has shown that student well-being, school engagement, and academic achievement are related. However, both student well-being and school engagement tend to decline over the school years, particularly after the transition to secondary school. To investigate how the three constructs are reciprocally related over time, the present study employed a longitudinal random intercept cross-lagged panel model using data from N = 757 Swiss students over three years of lower secondary school. Results revealed reciprocal between-person effects between student well-being, school engagement, and academic achievement across measurement points. Unexpected within-person effects between the measurement points were found. The findings suggest that students with higher well-being are also more engaged and achieve higher grades, but the associations between the constructs may be influenced by third variables.

Keywords: student well-being, school engagement, academic achievement

5.1 Introduction

In today's educational landscape and regarding future educational goals, it is crucial to broaden our perspective on educational success. While academic achievement has long been considered the primary indicator of school success, there is a growing recognition that a more holistic approach to education is needed (OECD, 2023). This approach complements students' cognitive development with their socio-emotional and motivational development, with students' well-being and school engagement as essential factors for sustainable learning and personal development (Upadyaya & Salmela-Aro, 2021). Previous studies illustrated significant associations between student well-being, school engagement, and academic achievement (Kwok & Fang, 2021; Wong & Liem, 2022; Morinaj & Hascher, 2022). A recent meta-analysis confirmed large average correlations of school engagement with both well-being and academic achievement (Wong et al., 2024). Causal relationships have been found between all three constructs, with positive effects of student well-being on school engagement, and from school engagement to academic achievement (Kang & Wu, 2022), as well as from school engagement to well-being indicators (Raniti et al., 2022). These associations are of particular interest in the secondary school context, because both student well-being (Virtanen et al., 2019) and school engagement (Widlund et al., 2021) tend to decline after the transition to secondary school. Additionally, the role of students' socioeconomic status (SES) in these relationships has to be considered, since previous research showed its connection with student well-being (Alivernini et al., 2020), school engagement (Archambault et al., 2022), and academic achievement (OECD, 2023). Although there is evidence for the relations between student well-being, school engagement, and academic achievement, the body of research on reciprocal relationships between the three variables is meager and rarely covering the whole span of lower secondary school. Also, comparison of results is limited since many studies did not use school-specific measures of well-being.

To address this research gap, the present study aimed at investigating the longitudinal relationships between student well-being, school engagement, and academic achievement in lower secondary school using multidimensional, context-specific measures for the constructs and an advanced methodological approach, namely Random Intercept Cross-lagged Panel Modeling (RI-CLPM). By adopting a

multidimensional approach for student well-being and school engagement, the present study also helps to identify the key dimensions of student well-being and school engagement related to each other and to academic achievement. Using longitudinal data further allows to investigate the direction of effects over time. Our results can inform researchers and practitioners by guiding intervention design, enhancing school practices, and providing schools with the knowledge necessary to focus on fostering both students' well-being and academic achievement, using evidence-based strategies that will help all students thrive.

5.1.1 Student Well-being

In recent years, there has been a tremendous increase in the body of literature documenting the important role of well-being in the school context. As scientific interest in well-being increased, so did the ways in which it was defined and conceptualized (Hossain et al., 2023). While there is no consensus on the definition of well-being, most scholars agree on the multidimensional nature of the construct and the coexistence of positive and negative aspects. One of the earlier approaches to a multidimensional understanding of well-being came from Diener (1984), who coined the term *subjective well-being.* According to Diener, subjective well-being consists of a cognitive component that includes life satisfaction and an affective component that includes positive and negative emotions (Diener & Sim, 2024). While this definition takes into account the multidimensional nature of the construct and the coexistence of positive and negative aspects, it focuses mainly on general evaluations of one's life. This model was later complemented by Ryff's (1989) *psychological well-being* framework, which contains six dimensions: self-acceptance, purpose in life, environmental mastery, positive relationships, autonomy, and personal growth. This framework does not consider emotional states, but rather the human need for meaning, accomplishment and social relatedness, as foundations for well-being. Combing both lines of research, Grob et al. (1996) then developed a framework containing both cognitive and affective evaluations, as well as aspects related to human strivings. They further included the physical domain into their framework and noted that well-being is not just the presence of positive or the absence of negative aspects, but rather a result of the balance between both. Thus, they identified six well-being dimensions: Enjoyment, positive attitudes, self-concept, problems, physical complaints, and worries.

Although this model accounts for the multidimensional nature of the construct, it does not consider the specificity of the school context. However, an individual's well-being may vary relative to different areas of life. For instance, an adolescent's general life satisfaction may not necessarily reflect their satisfaction with school (Maechel et al., 2023). Inspired by Grob's conceptualization of general well-being, Hascher (2004) developed a multidimensional model of student well-being that defines it as the predominance of positive emotions and cognitions over negative emotions and cognitions in relation to school, people in school, and the school context. This model includes six dimensions, whereby three dimensions consider positive aspects of school life, and three dimensions consider its negative aspects: (1) enjoyment in school, (2) positive attitudes toward school, (3) positive academic self-concept, (4) worries in school, (5) physical complaints in school, and (6) social problems in school.

5.1.2 School Engagement

School engagement, akin to student well-being, is considered a multidimensional construct and characterized by multiple and ambiguous definitions (Salmela-Aro et al., 2021). Scholars exhibit divergent perspectives on the dimensions that constitute school engagement, as well as on the way these dimensions should be conceptualized (Reeve et al., 2025). Fredricks et al. (2004) posit that this conceptual ambiguity stems from the fact that various sub-constructs such as interest or effort fall under the umbrella of school engagement. Studies differ in their emphasis on sub-constructs, depending on the research focus. Fredricks et al. (2004) argue that a school engagement measure intended to predict broader outcomes, such as academic achievement, should encompass a range of these subconstructs, albeit at a superficial level, instead of focusing only on a certain aspect. Consequently, they propose a conceptualization that partitions school engagement into three components: (1) cognitive, (2) behavioral, and (3) emotional engagement (Fredricks, 2022). According to this conceptual framework, cognitive engagement signifies commitment and effort directed towards school-related matters, including the willingness to invest additional time and effort in mastering complex academic tasks and acquiring challenging skills. Behavioral engagement encompasses participation in academic and social activities associated with the school curriculum. Emotional engagement includes affective reactions towards teachers, classmates, and school-related events. This

conceptualization of school engagement integrates behavior, cognition, and affect, thereby forming a „metaconstruct“ (Fredricks et al., 2004, p. 60). In the present study, we adhere to this multicomponent conceptualization as it covers the multiple facets of school engagement and because it facilitates our investigation of differential associations between school engagement components, student well-being dimensions, and academic achievement.

5.1.3 The Relationship Between Student Well-being, School Engagement, and Academic Achievement

Student well-being seems to positively influence academic achievement (Kiuru et al., 2020). Simultaneously, student well-being can be regarded as an outcome of successful learning experiences and academic performance (Kleinkorres et al., 2020). Thus, the relationship between student well-being and academic achievement is most likely reciprocal (Kaya & Erdem, 2021). However, direct links between student well-being and academic achievement are rarely reported (Amholt et al., 2020), suggesting an influence of further variables, one of them being school engagement. Increases in school engagement have been linked to improvements in academic outcomes (Lei et al., 2018) and reductions in school absenteeism and drop-out (Archambault et al., 2022). Conversely, academic success is considered a source of school engagement, demonstrating a reciprocal relationship between the two constructs as well (Widlund et al., 2023). While research on the simultaneous relationships between all three constructs is still scarce, previous studies suggest a cycle of mutual reinforcement over time (Appleton et al., 2008; Kwok & Fang, 2021; Wong et al., 2024). A rationale for this cycle can be drawn from two theoretical models: broaden-and-build theory (Fredrickson, 2001) and self-determination theory (SDT; Ryan & Deci, 2000).

The broaden-and-build theory posits that positive emotions, a key component of well-being, broaden an individual’s thought-action repertoire and allow them to build lasting resources (Fredrickson, 2001). Positive emotions like enjoyment or contentment expand attention, cognition, and action, leading to more flexible and creative thinking and more engaged learning. By building resources, such as improved learning skills, positive emotions enhance an individual’s capacity for future success, including academic achievement. The theory also suggests that positive emotions can trigger an upward spiral towards enhanced well-being, because the acquired strategies

and broadened mindset enable adaptive coping strategies (Fredrickson, 2013). Negative emotions, conversely, narrow one's thought-action repertoire, impeding learning processes and diminishing academic achievement (Gumora & Arsenio, 2002).

SDT focuses on the basic psychological needs of autonomy, competence, and relatedness, which are essential for intrinsic motivation, personality growth, social development, and well-being (Deci & Ryan, 2008). Well-being can be seen as an outcome of basic need satisfaction (Niemiec et al., 2006), and basic need satisfaction serves as a resource for motivation, which can enhance school engagement (Skinner et al., 2008) and subsequent academic achievement (Taylor et al., 2014). Additionally, academic achievement may increase well-being by fulfilling the need for competence (Bücker et al., 2018), creating an adaptive cycle. Conversely, when the basic needs are not met, lower well-being (Vansteenkiste & Ryan, 2013), disengagement (Earl et al., 2023), and lower academic achievement (Wang et al., 2019) may result. Thus, both the broaden-and-build theory and self-determination theory (SDT) highlight critical pathways linking student well-being, school engagement, and academic achievement. While the broaden-and-build theory emphasizes the role of positive emotions in expanding cognitive and behavioral capacities to foster academic success, SDT underscores the satisfaction of basic psychological needs as foundational for well-being and engagement. Together, these theories suggest that student well-being and school engagement interact dynamically to influence academic achievement, which in turn affects future well-being and school engagement.

In summary, theory and research suggest reciprocal associations between student well-being, school engagement, and academic achievement. However, the roles of specific student well-being dimensions and school engagement components in these associations are unclear. No prior study has simultaneously investigated the longitudinal associations between all six student well-being dimensions and all three school engagement components to assess their dependence of and impact on academic achievement. Given the multi-dimensionality of these constructs, research on the possible variety of associations among the dimensions is necessary to understand these complex relations.

5.1.4 The Present Study

Research shows that secondary education is a vulnerable phase of student development characterized by increasing achievement pressure and a decline in student well-being (Virtanen et al., 2019) and school engagement (Widlund et al., 2021). Given the lack of studies investigating the longitudinal relationships between well-being, school engagement, and academic achievement of secondary school students, the aim of the present study was to investigate the longitudinal relationships between student well-being, school engagement, and academic achievement in lower secondary school, using a three-wave RI-CLPM. Based on prior research, we posed the following hypotheses:

- H1: The positive student well-being dimensions are positively associated with school engagement and academic achievement across measurement points
- H2: The negative student well-being dimensions are negatively associated with school engagement and academic achievement across measurement points
- H3: School engagement is positively associated with academic achievement across measurement points
- H4a: The positive student well-being dimensions at one measurement point positively predict school engagement and academic achievement at the next measurement point
- H4b: School engagement at one measurement point positively predicts the positive student well-being dimensions and academic achievement at the next measurement point
- H4c: Academic achievement at one measurement point positively predicts the positive student well-being dimensions and school engagement at the next measurement point
- H5a: The negative student well-being dimensions at one measurement point negatively predict school engagement and academic achievement at the next measurement point
- H5b: School engagement at one measurement point negatively predicts the negative student well-being dimensions at the next measurement point
- H5c: Academic achievement at one measurement point negatively predicts the negative student well-being dimensions at the next measurement point

5.2 Material and Methods

5.2.1 Participants and Procedure

The present study has a longitudinal, quantitative design. The data was collected using self-report surveys on three measurement points. Study participants were Swiss secondary school students who took part in the three-wave longitudinal research project “Well-being in School in Switzerland” (WESIR, 2021–2025). The Swiss National Science Foundation (SNSF) and the Ethics Review Panel of the University of Bern have approved the study after careful examination of the entire study design and instruments in the student questionnaire. Prior to the first survey wave, written consent for students’ participation in the study was obtained from their parents. Students were informed that their participation was voluntary and were assured that the information they provided is confidential. Participants filled out an online survey during regular school lessons using devices (Laptops or Tablets) provided by the schools. Both a teacher and a member of the research team was present in the classroom during the survey. The survey was conducted annually between January and April 2022–2024 in Grade 7 (*t*1), Grade 8 (*t*2), and Grade 9 (*t*3). 46 classes from 17 schools participated at *t*1, with a total *N* of 756 students. The principal of one school decided to discontinue participation after the first survey wave, leading to drop-out of three classes. Thus, 43 classes participated at *t*2, with a total *N* of 720 students. After the second survey wave, seven teachers withdrew their classes from participation. Thus, 36 classes with a total *N* of 585 students participated at *t3*. Although some students changed classes between survey waves, these were a minority compared to the total sample (13 changes at *t*2, 28 changes at *t*3). New students also entered the classes between survey waves (33 new students at *t*2, 44 new students at *t*3). An overview of the sample characteristics for each survey wave is presented in Table 1. Little’s (1988) Missing Completely at Random (MCAR) test for the survey variables was found nonsignificant [χ^2 (570) = 568.68, p = .508], suggesting that there is no relationship between missingness and the observed data. We therefore kept the total sample of N = 756 students for analysis. Missing values were handled using Full Information Maximum Likelihood (FIML).

Table 1

Sample characteristics

Measurement point	Schools	Classes	Drop-out	New students	N Students	M_{age} (*SD*)	% female
*t*1	17	46	-	-	756	13.12 (0.59)	48%
*t*2	16	43	69	33	720	13.92 (0.81)	48%
*t*3	16	36	179	44	585	14.98 (0.98)	45%

5.2.2 Measures

Student Well-being. Student Well-Being was measured with the 19-item Student Well-Being Questionnaire (SWBQ; Hascher, 2007), which includes three positive and three negative dimensions: (1) positive attitudes toward school (PAS, 3 items; e.g., “I like to go to school”), (2) enjoyment in school (EIS, 3 items; e.g., “In the past few weeks, I experienced joy because a teacher was friendly to me”), (3) positive academic self-concept (PASC, 3 items; e.g., “I don’t have problems with meeting the school requirements”), (4) worries in school (WIS, 3 items; e.g., “In the past few weeks, I was worried about my school grades”), (5) physical complaints in school (PCS, 4 items; e.g., “In the past few weeks, I had a severe headache during class”), and (6) social problems in school (SPS, 3 items; e.g., “In the past few weeks, I had problems with my classmates”). Responses were indicted on a 6-point Likert scale ranging from 1 = never/disagree to 6 = very often/agree. The internal reliability of the SWBQ subscales as indicated by McDonald’s ω ranged from .71 to .90 across the three time points (see Table 2).

School Engagement. School engagement was assessed using the 19-item School Engagement Scale (Fredricks et al., 2005), comprising three subscales: (1) cognitive engagement, (ENGC, 8 items; e.g., “I check my schoolwork for mistakes”), (2) behavioral engagement (ENGB, 5 items; e.g., “I pay attention in class”), (3) emotional engagement (ENGE, 6 items; e.g., “I feel excited by my work at school”).

Responses were indicated on a 5-point Likert scale ranging from 1 = never to 5 = all of the time. The internal reliability of the subscales as indicated by McDonald's ω ranged from 0.79 to 0.86 (see Table 2).

Academic Achievement. Students' academic achievement was measured using grade point average (GPA), which was computed based on students' grades in mathematics, German (school language), French (first foreign language), English (second foreign language), nature and technology, and history received from teachers at the end of each school year. The school grades varied from 1 (the lowest achievement level) to 6 (the highest achievement level), indicating that a higher score represents a better grade. Likely due to the selective school system, not all schools provided the grade reports for the eighth and ninth grade, resulting in an amount of missing data of 41% for *t*2 and 51% for *t*3.

Socioeconomic Status. Socioeconomic status was operationalized as economic, social, and cultural status (ESCS) using the PISA 2022 framework (OECD, 2023). ESCS is an index of highest parental occupation, highest parental education, and various household possessions such as the number of books at home.

5.2.3 Data Analysis

Preliminary to the main analysis, we checked all student well-being dimensions and school engagement components for measurement invariance in order to assess whether the latent variables were stable over time and could thus be compared over the three measurement points (Little, 2013). We followed a sequential procedure with increasing restrictiveness. First, we assessed configural invariance using a model where all parameters were freely estimated. To assess metric invariance, we constrained the factor loadings to be equal over the three measurement points. We then assessed scalar invariance by additionally constraining the intercepts to be equal over time. We tested measurement invariance by comparing the fit indices (i.e., CFI and RMSEA) between the models. A change in $\Delta CFI < 0.01$ and a change in $\Delta RMSEA < 0.015$ was set as limit for acceptance of measurement invariance (Chen, 2007).

After establishing measurement invariance, we ran a measurement model containing the six latent factors of the SWBQ dimensions and three latent factors of school engagement components for all three measurement points. Model fit was evaluated based on the comparative fit index (CFI; optimal values > .90), root mean

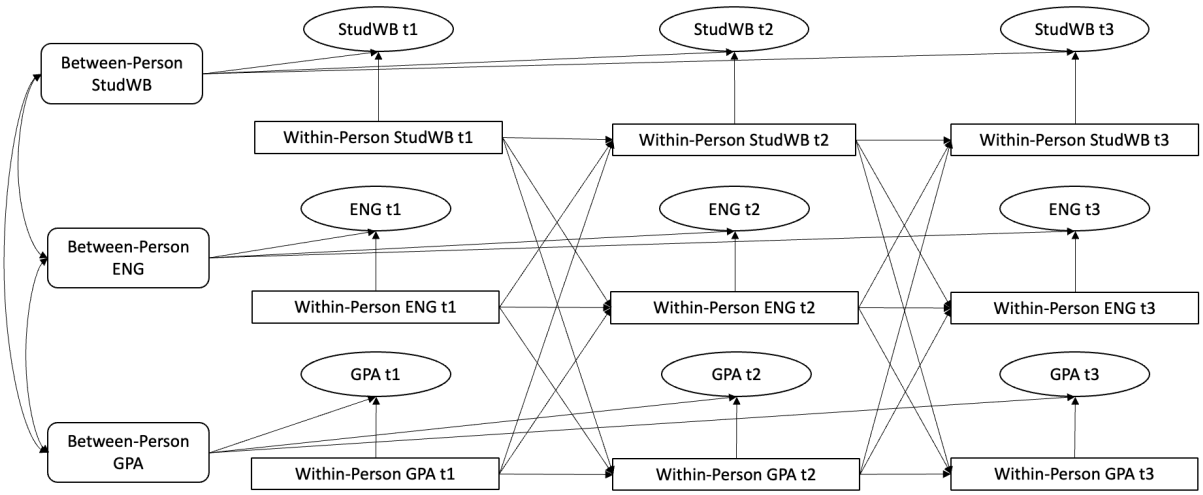
square error of approximation (RMSEA; optimal values < .08), and standardized root mean square residual (SRMR; optimal values < .08) (Little, 2013).

Once the measurement model was accepted, we used the best fitting factor structure for our main analysis. To analyze the longitudinal associations between student well-being dimensions, school engagement components, and students' GPA, we applied a three-wave multiple indicator random intercept cross-lagged panel model (RI-CLPM; (Mulder & Hamaker, 2021). In such a model, longitudinal data is decomposed into stable trait-like between-person differences and temporal within-person dynamics (see Figure 1). Following the modeling strategy described by Mulder and Hamaker (2021), we specified the higher-order random intercepts for each construct across all measurement points to model the proportion of the latent variables that are time-invariant (between-person effects), and included the lagged effects between the within-person centered latent variables to model their relationships over time (within-person effects). The correlations between the random intercepts reflect stable between-person relationships between student well-being, school engagement, and academic achievement. Autoregressive paths represent the within-person carry-over effects, indicating how deviations from individuals' expected scores at one measurement point predict future deviations in the same variables. Cross-lagged paths indicate whether a deviation from a person's expected score at one measurement point predicts a future deviation in their expected score on another variable. Again, model fit was accepted if CFI > .90, RMSEA < .08, and SRMR < .08.

Data preparation, descriptive statistics, and regression analyses were conducted in R 4.2.2 (R Core Team, 2020). Measurement invariance testing and RI-CLPM analyses were conducted in MPlus 8.10 (Muthén & Muthén, 1998-2017). Data was exported from R to MPlus and results back to R using the MPlusAutomation package (Hallquist & Wiley, 2018). To account for the hierarchical data structure (students within classes), we used the "type = complex" command in MPlus, which adjusts standard errors to account for the nested structure of the data. We used the class membership at *t1* as clustering variable.

Figure 1

Random intercept cross-lagged panel model of the relationship between student well-being (StudWB), school engagement (ENG), and students' grade point average (GPA) across three waves with one-year time lags.



Note. The model contains three random intercepts (between-person StudWB, between-person ENG, and between-person GPA) that reflect time-invariant trait-like between-person differences. Time-varying state-like within-person dynamics are illustrated by autoregressive paths between the latent factors of StudWB, ENG, and GPA across waves (within-person StudWB, within-person ENG, and within-person GPA) and cross-lagged paths between the three latent factors. Observed indicators to measure StudWB and ENG are omitted for simplicity.

5.3 Results

Table 2 shows the descriptive statistics for all variables at all three measurement points. The intercorrelations are presented in Table A.1 in the Appendix.

Table 2

Descriptive statistics for dimensions of Student Well-being, School engagement, and students' GPA at three time points

	t1			*t2*			*t3*		
Variable	*M*	*SD*	ω	*M*	*SD*	ω	*M*	*SD*	ω
1. PAS	4.28	1.04	0.79	4.06	1.10	0.83	3.76	1.21	0.86
2. EIS	4.33	1.01	0.71	3.97	1.14	0.80	3.66	1.25	0.85
3. PASC	4.31	1.02	0.77	4.36	1.03	0.81	4.22	1.21	0.88
4. WIS	3.29	1.42	0.81	3.45	1.46	0.82	3.28	1.54	0.85
5. PCS	2.15	1.25	0.83	2.28	1.34	0.86	2.35	1.42	0.90
6. SPS	1.67	0.97	0.79	1.81	1.08	0.81	2.07	1.34	0.90
7. ENGC	2.67	0.75	0.80	2.63	0.75	0.73	2.57	0.84	0.70
8. ENGB	4.00	0.55	0.81	4.00	0.59	0.81	3.81	0.61	0.86
9. ENGE	3.34	0.71	0.82	3.23	0.74	0.84	3.04	0.76	0.84
10. GPA	4.71	0.44	-	4.79	0.46	-	4.76	0.47	-
31. ESCS	0.02	0.74	-	-	-	-	-	-	-

Note. M = mean; *SD* = standard deviation; ω = McDonald's Omega; PAS = positive attitudes to school; EIS = enjoyment in school; PASC = positive academic self-concept; WIS = worries in school, PCS = physical complaints in school; SPS = social problems in school; ENGC = cognitive engagement; ENGB = behavioral engagement; ENGE = emotional engagement; GPA = grade point average; ESCS = index of economic, social, and cultural status; *t1* = measurement point 1; *t2* = measurement point 2; *t3* = measurement point 3.

At least metric invariance could be established for all student well-being dimensions and school engagement components, except for behavioral engagement (see Table 3). We therefore tested a model of partial invariance for this component by constraining the factor loadings of three items to be equal across measurement points, while freeing up the other two item loadings. This model did not yield a significantly worse fit than the configural model. Therefore, we assumed partial metric invariance for the latent behavioral engagement variable and at least metric invariance for all other latent variables in the measurement model.

Table 3

Model fit statistics for the tests of longitudinal measurement invariance of the student well-being dimensions and school engagement components.

	χ^2	df	χ^2/df	CFI	RMSEA	SRMR	$\Delta\chi^2$	Δdf	ΔCFI	ΔRMSEA
Positive Attitudes Toward School										
Configural	26.165	15	1.744	0.996	0.028	0.024	-	-	-	-
Metric	33.810	19	1.779	0.994	0.029	0.033	7.836	4	-0.002	0.001
Scalar	66.535	23	2.893	0.983	0.045	0.045	33.093***	4	-0.011	0.016
Enjoyment in School										
Configural	21.985	15	1.466	0.995	0.022	0.025	-	-	-	-
Metric	30.669	19	1.614	0.992	0.026	0.038	8.498	4	-0.003	0.004
Scalar	67.252	23	2.924	0.970	0.046	0.047	40.694***	4	-0.022	0.020
Positive Academic Self-concept										
Configural	18.746	15	1.250	0.998	0.016	0.017	-	-	-	-
Metric	25.845	19	1.360	0.997	0.020	0.03	7.377	4	-0.001	0.004
Scalar	42.905	23	1.865	0.99	0.031	0.039	17.841**	4	-0.007	0.011
Worries in School										
Configural	18.866	15	1.258	0.998	0.017	0.021	-	-	-	-
Metric	24.403	19	1.284	0.997	0.018	0.023	5.640	4	-0.001	0.001
Scalar	69.453	23	3.020	0.978	0.047	0.030	42.742***	4	-0.019	0.029
Physical Complaints in School										
Configural	77.872	40	1.947	0.988	0.032	0.038	-	-	-	-
Metric	88.082	46	1.915	0.987	0.031	0.040	9.872	6	-0.001	-0.001
Scalar	94.905	52	1.825	0.986	0.030	0.040	5.535	6	-0.001	-0.001
Social Problems in School										
Configural	11.566	15	0.771	1.000	0.000	0.019	-	-	-	-
Metric	14.293	19	0.752	1.000	0.000	0.022	2.749	4	0.000	0.000
Scalar	21.848	23	0.950	1.000	0.000	0.023	8.947	4	0.000	0.000
Cognitive Engagement										
Configural	587.457	216	2.720	0.934	0.043	0.055	-	-	-	-
Metric	606.851	230	2.638	0.933	0.042	0.055	14.306	14	-0.001	-0.001
Scalar	713.810	244	2.925	0.916	0.046	0.057	99.414***	14	-0.017	0.004
Behavioral Engagement										
Configural	169.956	69	2.463	0.943	0.040	0.073	-	-	-	-
Metric	237.602	77	3.086	0.909	0.048	0.091	67.646	8	-0.034	0.008
Partial Metric	173.850	73	2.382	0.943	0.039	0.076	5.605	4	0.000	-0.001
Partial Scalar	190.408	77	2.473	0.936	0.040	0.078	18.650**	4	-0.007	0.001
Emotional Engagement										
Configural	242.249	108	2.243	0.972	0.037	0.053	-	-	-	-
Metric	286.664	118	2.429	0.964	0.039	0.061	42.686***	10	-0.008	0.002
Scalar	333.595	128	2.606	0.957	0.042	0.062	46.422***	10	-0.007	0.003

Note. CFI = comparative fit index; RMSEA = root mean squared error of approximation; SRMR = standardized root mean square residual, $\Delta\chi^2$ = Satorra–Bentler scaled chi-square difference between the nonrestricted and restricted models; Δdf = changes in degrees of freedom between the nonrestricted and restricted models.

***p < .001; **p < .01.

Next, we calculated a measurement model containing all student well-being dimensions and school engagement components. This model did not optimally fit the data (CFI = 0.89, RMSEA = 0.28, SRMR = 0.65). An inspection of the correlation matrix revealed high intercorrelations between the positive well-being dimensions and the emotional engagement component (see Table A.1 in the Appendix). Due to possible confounding effects between these variables, we also tested a model excluding the emotional engagement component. This model fit the data significantly better (CFI = 0.91, RMSEA = 0.26, SRMR = 0.61). We therefore specified the RI-CLPM without including the emotional engagement component.

This RI-CLPM had a good fit to the data (CFI = 0.91, RMSEA = 0.26, SRMR = 0.65). Significant between-person effects, autoregressive and cross-lagged paths are demonstrated in Table 4. The significant between-person associations between positive student well-being dimensions, school engagement components, and students' GPA were moderate to strong and positive, demonstrating that students reporting more positive attitudes toward school, more enjoyment in school, and higher levels of academic self-concept across the measurement waves exhibited higher cognitive and behavioral engagement, as well as higher GPA scores. The significant between-person associations between negative student well-being dimensions, behavioral engagement and students' GPA were small to moderate and negative, demonstrating that students reporting more worries, physical complaints, and social problems in school exhibited lower behavioral engagement and lower GPA scores across the measurement waves. Unexpectedly, the between-person association between physical complaints in school and cognitive engagement was positive. Behavioral engagement was significantly and strongly associated with students' GPA, while the between-person association between cognitive engagement and students' GPA was nonsignificant. Students' socioeconomic status was positively associated with positive academic self-concept, behavioral engagement, and GPA, and negatively associated with all three negative student well-being dimensions.

On the within-person level, GPA at *t*1 positively predicted GPA at *t*2. Positive academic self-concept at *t*1 negatively predicted GPA at *t*2, and positive academic self-concept at *t*2 negatively predicted cognitive engagement at *t*3. In other words, students with a positive academic self-concept above their average at *t*1 had significantly lower

GPA scores at *t*2, while students with a positive academic self-concept above their average at *t*2 had significantly lower cognitive engagement at *t*3.

Table 4

Standardized parameter estimates for the cross-lagged panel model of the relationship between dimensions of student well-being, school engagement and students' GPA

	β	SE
Between-person effects		
PAS ⇔ ENGB	0.71***	0.11
PAS ⇔ ENGC	0.60***	0.07
PAS ⇔ GPA	0.37***	0.06
EIS ⇔ ENGB	0.63***	0.12
EIS ⇔ ENGC	0.58***	0.08
EIS ⇔ GPA	0.31***	0.06
PASC ⇔ ENGB	0.67***	0.10
PASC ⇔ ENGC	0.36***	0.06
PASC ⇔ GPA	0.68***	0.05
PASC ⇔ ESCS	0.29***	0.05
WIS ⇔ ENGB	-0.23**	0.09
WIS ⇔ GPA	-0.20***	0.05
WIS ⇔ ESCS	-0.21***	0.04
PCS ⇔ ENGB	-0.30**	0.09
PCS ⇔ ENGC	0.21*	0.08
PCS ⇔ GPA	-0.30***	0.06
PCS ⇔ ESCS	-0.26***	0.05
SPS ⇔ ENGB	-0.44**	0.13
SPS ⇔ GPA	-0.22**	0.06
SPS ⇔ ESCS	-0.15**	0.05
ENGB ⇔ GPA	0.61***	0.09
ENGB ⇔ ESCS	0.17*	0.07
GPA ⇔ ESCS	0.29***	0.05
Within-person autoregressive effects		
GPA_{t1} → GPA_{t2}	0.13*	0.06
Within-person cross-lagged effects		
$PASC_{t1}$ → GPA_{t2}	-0.12*	0.05
$PASC_{t2}$ → $ENGC_{t3}$	-0.24**	0.09

Note. Only significant estimates are reported. β = standardized regression coefficient; *SE* = standard error; PAS = positive attitudes to school; EIS = enjoyment in school; PASC = positive academic self-concept; WIS = worries in school, PCS = physical complaints in school; SPS = social problems in school; ENGC = cognitive engagement; ENGB = behavioral engagement; GPA = grade point average; ESCS = index of economic, social, and cultural status; *t1* = measurement point 1; *t2* = measurement point 2; *t3* = measurement point 3.

***p < .001; **p < .01; *p < .05.

5.4 Discussion

The present study aimed at investigating the longitudinal relationships between student well-being, school engagement, and academic achievement over the three years of lower secondary school in Switzerland. Findings on these relationships are important because both student well-being and school engagement tend to decline during secondary education. A differential view on the mechanics between those constructs can help identify crucial buffering factors against this decline.

Our analyses showed some expected, but also surprising results. As hypothesized (H1), the positive student well-being dimensions were positively associated with school engagement components and academic achievement across measurement points.

H2 could be partially accepted as the negative student well-being dimensions were negatively associated with school engagement and academic achievement across measurement points, with one exception: Physical complaints in school showed a positive relationship with cognitive engagement. This finding might be explained through several mechanisms: First, both cognitive engagement and physical complaints could be a symptom of overcommitment. While students who show an excessive commitment to school seem to be more cognitively engaged (Lin & Muenks, 2022), they are also at a greater risk of developing physical complaints because of stress (Laftman et al., 2015). A second possible explanation is that there are two qualitatively different kinds of cognitive engagement with their own origins and outcomes. Greene (2015) differentiates between deep and shallow cognitive engagement: While deep cognitive engagement is induced by mastery goal orientation and characterized by adaptive self-regulated learning strategies, shallow cognitive engagement is induced by performance goal orientation and characterized by superficial and ineffective learning strategies. It has been shown that students with a performance goal orientation experience more performance pressure (Church et al., 2001), and that both performance pressure and performance goal orientation is linked to more school-related physical complaints (Murberg & Bru, 2004; Randall et al., 2019).

H3 could also be partially accepted, as behavioral engagement was positively associated with academic achievement across measurement points. This finding is consistent with prior studies who found the strongest associations between school

engagement and academic achievement in the behavioral component (for a meta-analysis see Wong et al., 2024). Conversely, the association between cognitive engagement and academic achievement was nonsignificant. This unexpected finding could also be explained by the relationship between goal orientation and cognitive engagement style: Although both deeply and shallowly engaged students experience cognitive engagement, only the former seems to be positively related to academic achievement (Greene, 2015). Since the scale we used to assess cognitive engagement does not differentiate between deep and shallow engagement forms, this assumption remains to be tested.

On the within-person level, only few cross-lagged associations could be found and those were contrary to our expectations, leading to rejection of H4-H6. Above-average positive academic self-concept at *t*1 negatively predicted to academic achievement at *t*2. This finding is contrary to our hypotheses and needs explanation. Possibly, it may result from the so-called “overconfidence effect”. According to this effect, students tend to overestimate their academic performance because they do not rely on their previous achievement when predicting their future school success (Geraci et al., 2023). This overconfidence seems to be stronger for students with lower competences, while those with higher competence even tend to underestimate their abilities (“Dunning-Kruger effect”; (Kruger & Dunning, 1999). This effect has been found consistently across multiple countries (Yang Hansen et al., 2024). However, it is also possible that the students in our study did base their assessment of self-concept on their previous achievement, but that this assessment was biased. Our study began after the transition from primary to secondary education when students enter a new school setting. Students’ ratings of their academic self-concept at *t*1 might have been especially biased because it was assessed during their first year of secondary school, months before they received their first annual grade report in this new school setting. Therefore, students probably based their estimations on their performance during primary school. This would also explain why the effect was no longer observed between *t*2 and *t*3.

Above-average positive academic self-concept at *t*2 negatively predicted cognitive engagement at *t*3, which is also not in line with our hypotheses. Again, this effect could be due to different cognitive engagement styles: It is possible that students with a higher academic self-concept are more oriented toward mastery goals and thus

pursue more deep and less shallow cognitive engagement strategies. Indeed, prior studies found stronger effects of academic self-concept on mastery goal orientation compared to performance goal orientation (Pérez et al., 2012; Seaton et al., 2017). Interestingly, a study from Portugal found similar effects, in that the younger adolescents from their sample with high self-concept also expressed high cognitive engagement, while the older adolescents with high self-concept displayed lower levels of cognitive engagement (Veiga et al., 2015). The authors explain their findings with the rising importance of peer acceptance and the devaluing of school-related efforts during adolescence.

Additionally, for students' socioeconomic status, we found positive relationships with positive academic self-concept, behavioral engagement, and academic achievement, and negative relationships with the negative student well-being dimensions. These findings are in line with previous studies which documented higher student well-being (Alivernini et al., 2020), school engagement (Archambault et al., 2022), and school success (OECD, 2023) for students from more advantaged socioeconomic backgrounds. Our results suggest that students with a lower SES are at a greater risk of having negative feelings and attitudes towards school as well as being less engaged. These negative effects of social background may be due to a lack of resources at home, such as a quiet learning environment and adults who can give academic support (Thomson, 2018). Without these resources, students may struggle more with school tasks and perceive school as strenuous, diminishing their well-being and engagement (Li & Lerner, 2011).

5.4.1 Implications for Theory and Practice

We mostly found positive relationships between student well-being, cognitive engagement, and academic achievement on the between-person level. While these effects were in line with our expectations, we found some counter-intuitive effects on the within-person level. This has several implications: From a theoretical perspective, our results lend support to the multidimensional conception of the constructs. The differential effects show that not all dimensions of student well-being are equally related to school engagement, and student well-being dimensions and school engagement components differ in their association with academic achievement. Further, the results imply that, while student well-being and school engagement are intertwined and related

to academic achievement, their relations in secondary education might be influenced by earlier school experiences in primary education. Both constructs are probably evolving over the entire school career, mutually reinforcing each other, as well as influenced by third variables, such as the fulfillment of basic needs. Future studies could investigate how differences in well-being and engagement at the beginning of school emerge and how they are related to their development over time.

For school practice, the first and foremost insight of our study is that those students who feel better at school are also those who are more engaged and achieve better grades. This means that students' well-being is not just a nice-to-have attribute, but crucial to their academic success. A school environment that provides students opportunities to broaden their interests, build on their skills, and respects their needs for competence, autonomy, and relatedness enables them to strive for their full potential. Second, the most important engagement component for academic success seems to be behavioral engagement. Encouraging students to participate in learning activities can be an effective lever for their achievement. Teachers can contribute to students' behavioral engagement by providing goal-relevant feedback and emphasizing mastery-oriented achievement goals instead of performance-oriented goals (Putwain et al., 2018). Such an approach could also foster adaptive learning strategies and lead to deep rather than shallow cognitive engagement (Greene, 2015). Third, cognitive engagement may increase physical complaints in school. While the reasons for this association are unclear and need more research, educators should be aware that high cognitive engagement might have potential negative side-effects. An overemphasis on academic outcomes and performance goal orientation can lead to heightened stress, and in turn to more physical complaints (Laftman et al., 2015; Murberg & Bru, 2004; Randall et al., 2019). Fourth, our findings suggest that students may not be very accurate in assessing their own abilities, especially at the beginning of secondary school. Regular formative feedback during the school year could help them gauge their abilities and progress, therefore attaining a realistic academic self-concept (Miller & Lavin, 2007). Fifth, it is important that schools take special care of students with lower SES and ensure that they compensate for the resources those students might lack at home. Fostering these students' school engagement is crucial, because it can serve as a buffer from the negative effects of low SES on academic achievement (Li et al., 2022).

5.4.2 Strengths and Limitations

The strengths of the present study lie in the multidimensional conceptualization of the constructs, the longitudinal design, and the statistical modelling which differentiates between- and within-level effects. However, there are also a few limitations: First, all measures of student well-being and school engagement relied on self-reports, which pose the risk of bias and social desirability. Future studies could add other informant sources, such as teacher perceptions of school engagement or observations of classroom behavior, to corroborate the validity of the school engagement measures. Second, our originally proposed model including all three school engagement dimensions did not fit the data well. We therefore had to exclude the emotional engagement component, which shares some overlap with the positive student well-being dimensions. Studies with a bigger sample size could test different competing models, for example including emotional engagement as a mediator between well-being and the other engagement components. Third, our measure of behavioral engagement was only partially invariant over measurement points. It is not clear whether this invariance stems from a change in the importance of certain items relative to the factor, or whether it is merely an artifact of the different measurement occasions. Further studies using diverse samples could determine whether this effect is generalizable to the secondary school setting or is exclusive to our sample. Fourth, three measurement points are the bare minimum for a RI-CLPM (Mulder & Hamaker, 2021) and student well-being and school engagement might fluctuate throughout the school year. Adding more measurement points could paint a more fine-grained picture of the relationship between the variables and might reveal dynamics beyond those appearing in a one-year interval.

5.4.3 Conclusions

Prior evidence suggests reciprocal relations between student well-being, school engagement, and academic achievement. In this study, we employed a multidimensional, longitudinal approach, using a six-dimensional well-being measure and a three-component school engagement instrument. We collected data from Swiss students over the three years of lower secondary education and analyzed the data using a RI-CLPM. Results revealed differential associations between the student well-being dimensions and the school engagement components, as well as with academic

achievement. For the school engagement components, only behavioral engagement was directly related to achievement. The results support the idea of the multidimensionality and the interdependence of the constructs. Across all three measurement points, students with higher well-being scores also reported higher school engagement and had better grades. Well-being and academic achievement do therefore not exclude each other but are rather two sides of the same coin. As the OECD (2015, pp. 4) put it: “academic achievement that comes at the expense of students’ well-being is not a full accomplishment”.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of the University of Bern (protocol code 2021-08-00005, 18. August 2021).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The datasets presented in this article are not readily available because the data are part of an ongoing study.

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5.5 Appendix A

Table A.1

Correlations for dimensions of Student Well-being, School engagement and students' GPA

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. PAS$_{t1}$															
2. EIS$_{t1}$	.61**														
3. PASC$_{t1}$	.34**	.25**													
4. WIS$_{t1}$	-.14**	-.09*	-.33**												
5. PCS$_{t1}$	-.15**	-.09**	-.26**	.53**											
6. SPS$_{t1}$	-.21**	-.13**	-.14**	.27**	.38**										
7. ENGC$_{t1}$	.34**	.32**	.23**	.01	.03	-.06									
8. ENGB$_{t1}$	.43**	.37**	.35**	-.25**	-.26**	-.23**	.19**								
9. ENGE$_{t1}$	.68**	.55**	.34**	-.22**	-.28**	-.29**	.45**	.45**							
10. GPA$_{t1}$	.20**	.18**	.40**	-.19**	-.20**	-.07	.03	.35**	.19**						
11. PAS$_{t2}$	.53**	.40**	.25**	-.07	-.12**	-.13**	.28**	.33**	.47**	.21**					
12. EIS$_{t2}$	.44**	.48**	.17**	-.04	-.07	-.12**	.23**	.34**	.41**	.16**	.66**				
13. PASC$_{t2}$	.23**	.18**	.50**	-.20**	-.22**	-.09*	.16**	.33**	.26**	.35**	.34**	.30**			
14. WIS$_{t2}$	-.11**	-.12**	-.16**	.49**	.42**	.22**	.00	-.20**	-.18**	-.06	-.09*	-.06	-.23**		
15. PCS$_{t2}$	-.10*	-.12**	-.16**	.36**	.59**	.26**	.07	-.26**	-.20**	-.16**	-.25**	-.16**	-.19**	.59**	
16. SPS$_{t2}$	-.14**	-.08	-.13**	.21**	.30**	.39**	.01	-.27**	-.12**	-.16**	-.20**	-.11**	-.13**	.30**	.48**
17. ENGC$_{t2}$	.27**	.26**	.16**	.10*	.13**	.05	.50**	.20**	.30**	.08	.39**	.37**	.23**	.16**	.12**
18. ENGB$_{t2}$	.30**	.26**	.28**	-.10*	-.16**	-.15**	.21**	.53**	.31**	.23**	.45**	.40**	.38**	-.10**	-.25**
19. ENGE$_{t2}$	.48**	.40**	.25**	-.13**	-.19**	-.20**	.31**	.38**	.56**	.18**	.77**	.62**	.37**	-.16**	-.27**
20. GPA$_{t2}$	.19**	.15**	.33**	-.11*	-.18**	-.11*	.04	.34**	.16**	.80**	.26**	.18**	.45**	-.06	-.15**
21. PAS$_{t3}$	.40**	.34**	.17**	-.05	-.09	-.10*	.19**	.34**	.38**	.19**	.54**	.40**	.25**	-.06	-.19**
22. EIS$_{t3}$	.32**	.38**	.10*	-.01	-.03	-.10*	.21**	.20**	.35**	.08	.39**	.42**	.22**	-.10*	-.11*
23. PASC$_{t3}$	.10*	.20**	.26**	-.13**	-.15**	-.10*	.11*	.27**	.19**	.22**	.25**	.17**	.38**	-.15**	-.22**
24. WIS$_{t3}$	.04	-.01	-.11*	.40**	.38**	.18**	-.02	-.11*	-.13**	-.01	-.01	.00	-.17**	.42**	.35**
25. PCS$_{t3}$	-.09	-.06	-.11*	.27**	.45**	.28**	.06	-.20**	-.18**	-.16**	-.12**	-.06	-.20**	.31**	.48**
26. SPS$_{t3}$	-.10*	-.09*	-.06	.20**	.27**	.29**	.03	-.24**	-.20**	-.15**	-.15**	-.09*	-.11*	.12**	.25**
27. ENGC$_{t3}$	.19**	.15**	.16**	.08	.07	-.05	.39**	.09*	.21**	.07	.27**	.19**	.11*	.06	.08
28. ENGB$_{t3}$	.27**	.25**	.14**	-.07	-.10*	-.16**	.18**	.48**	.30**	.18**	.32**	.28**	.24**	-.10*	-.22**
29. ENGE$_{t3}$	.39**	.35**	.19**	-.13**	-.17**	-.21**	.23**	.33**	.48**	.16**	.50**	.36**	.26**	-.16**	-.25**
30. GPA$_{t3}$	.15**	.09	.25**	-.08	-.12*	-.11*	.04	.30**	.17**	.62**	.26**	.14**	.34**	-.06	-.13**
31. ESCS	.00	.01	.16**	-.15**	-.22**	-.06	.06	.07	.04	.22**	.10*	.00	.26**	-.16**	-.17**

(cont.)

Table A.1 (continued)

Variable	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
17. ENGC $_{t2}$	.04														
18. ENGB $_{t2}$	-.34**	.36**													
19. ENGE $_{t2}$	-.28**	.45**	.52**												
20. GPA $_{t2}$	-.13**	.14**	.29**	.21**											
21. PAS $_{t3}$	-.10*	.28**	.33**	.51**	.23**										
22. EIS $_{t3}$	.02	.26**	.24**	.44**	.12*	.64**									
23. PASC $_{t3}$	-.17**	.13**	.23**	.25**	.32**	.44**	.36**								
24. WIS $_{t3}$	.22**	.10*	-.04	-.09*	.00	.04	.04	-.02							
25. PCS $_{t3}$	.28**	.13**	-.12**	-.15**	-.20**	-.16**	-.09*	-.17**	.57**						
26. SPS $_{t3}$	.29**	.04	-.16**	-.18**	-.12*	-.19**	-.07	-.08*	.35**	.56**					
27. ENGC $_{t3}$	.07	.49**	.17**	.28**	.14**	.32**	.31**	.16**	.20**	.22**	.23**				
28. ENGB $_{t3}$	-.18**	.27**	.52**	.34**	.31**	.45**	.36**	.43**	-.09*	-.29**	-.33**	.21**			
29. ENGE $_{t3}$	-.13**	.26**	.28**	.61**	.22**	.70**	.62**	.36**	-.09*	-.23**	-.22**	.45**	.44**		
30. GPA $_{t3}$	-.15**	.15**	.28**	.26**	.75**	.28**	.16**	.40**	.00	-.21**	-.09	.16**	.41**	.27**	
31. ESCS	-.11**	.03	.04	.08*	.31**	.04	.09*	.08	-.05	-.07	.00	.09	-.02	.07	.19**

Note. PAS = positive attitudes to school; EIS = enjoyment in school; PASC = positive academic self-concept; WIS = worries in school, PCS = physical complaints in school; SPS = social problems in school; ENGC = cognitive engagement; ENGB = behavioral engagement; ENGE = emotional engagement; GPA = grade point average; ESCS = index of economic, social, and cultural status; t1 = wave 1; t2 = wave 2; t3 = wave 3.

**$p < .01$; *$p < .05$.

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6 One size does not fit all: Investigating the effects of a Student Well-being Intervention using a person-centered approach (Study 3)

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Abstract

Student well-being has positive effects on important school-related outcomes, like engagement and achievement. However, students' well-being often decreases over their academic trajectory, especially during secondary school. While interventions to foster student well-being have proven to be effective, their efficacy may be dependent on participants' initial well-being characteristics and motivation. Utilizing a person-centered approach, the present study explores the multidimensionality of well-being and its relationship with intervention effectiveness. In a longitudinal project involving 681 grade 8 students, a 10-week intervention program with four experimental groups (3 intervention and 1 control group), containing diverse exercises was implemented, and student well-being was measured before, during and after the intervention. Latent profile analysis revealed four distinct well-being profiles. Latent transition analysis indicated relative stability in profile membership, with differential shifts observed in the experimental groups, implying different positive intervention effects for specific student subpopulations. Motivation to participate in the intervention was associated with a higher probability of favorable transitions. The results emphasize the necessity of considering the multidimensional nature of well-being and students' differential compositions thereof in developing dynamic and tailored interventions aimed at fostering student well-being.

Keywords: Student well-being, Intervention, Motivation, Secondary school, Person-centered approach

6.1 Introduction

Contemporary school systems face the challenging task of teaching children and youth the necessary skills to succeed in a rapidly changing society in an uncertain future. By providing a supportive environment that nurtures both students' academic development and their well-being, schools can better prepare students for the challenges of an evolving world and help students maximize their potential. Promoting well-being can contribute to students' engagement in school and support their academic achievement (Pietarinen et al., 2014).

Notably, student well-being exhibits a diminishing trajectory over the course of the academic years (Wang & Eccles, 2012), a trend which is accentuated following the transition to secondary school (Symonds & Galton, 2014). These concerns have found their way in the contemporary school discourse, prompting the integration of students' well-being as a pivotal component within the educational policy frameworks of numerous nations (OECD, 2019).

This shift has instigated the development and implementation of an increasing array of approaches aimed at fostering student well-being, such as positive psychology interventions (Tejada-Gallardo et al., 2020). While such interventions have generally proven to be effective (Sin & Lyubomirsky, 2009), not all approaches work equally well for all students, indicating the shortcomings of a one-size-fits-all-solution for fostering student well-being. It was found that effectiveness of school interventions depends not only on contextual factors, but also on individual characteristics such as motivation or initial well-being (Lyubomirsky & Layous, 2013). To ascertain the relations between these personal characteristics and the efficacy of particular interventions, it is beneficial to examine student subgroups who exhibit disparate characteristics by employing a person-centered approach. This approach can help distinguish differential intervention effects and support the design of interventions tailored to students' individual needs.

In the present study, we applied a person-oriented approach, namely, Latent Profile Analysis (LPA), to examine how student well-being varied across different profiles in a [country anonymized] sample of lower secondary school students. Additionally, changes in profile membership during a 10-week intervention were observed using Latent Transition Analysis (LTA). Finally, we tested how motivation to participate in the intervention was related to well-being profiles and whether it

influenced changes in profile membership. This study thus advances person-centered well-being research and contributes to the literature on student well-being interventions by examining the role of initial well-being characteristics and motivation in the effectiveness of a school-based intervention.

6.1.1 Student Well-being

The term “well-being” has become highly prevalent in the scientific discourse, with a vast array of definitions across diverse contexts (Hascher et al., 2018). It is often measured as a unidimensional construct and used synonymous with happiness, life satisfaction, or the absence of depressive symptoms (Medvedev & Landhuis, 2018). Nevertheless, such unidimensional conceptualizations of well-being inadequately encapsulate its intricate nature. Diener et al. (1984) introduced the term “subjective well-being,” encompassing life satisfaction as a core dimension along with positive affect and the absence of negative affect, thereby integrating positive and negative dimensions as well as cognitive and affective components. Consequently, well-being is acknowledged as a multidimensional construct with a dominance of positive over negative aspects and not merely the absence of negative affect or cognition.

While subjective well-being refers to a general evaluation of one’s life, well-being can also be construed as a context-specific concept, implying that an individual may experience its dimensions disparately in various life domains; for instance, an adolescent’s overall life satisfaction may not necessarily mirror their satisfaction with school (Hascher, 2007). In recent decades, various context-specific definitions of student well-being have emerged (Hascher et al., 2018), with most conceptions converging on cognitive, affective, and social facets pertinent to the school environment (Noble et al., 2008).

In our study, we advocate for a context-specific approach to student well-being within the school context, adopting a multidimensional perspective. We align with Hascher’s (2004) conceptualization of student well-being, characterized by a predominance of students’ positive emotions and cognitions toward school, persons in school, and the school context over the negative feelings and cognitions toward school life. This multidimensional framework accommodates both positive and negative elements, encompassing cognitive, emotional, social, and physical factors. It therefore comprises six dimensions: enjoyment in school, positive attitudes toward school,

positive academic self-concept, and the absence of worries in school, physical complaints in school, and social problems in school.

6.1.2 Well-being Profiles

To this date, the majority of studies concerned with student well-being used variable-centered approaches, which describe interrelationships between variables under the assumption that these relationships apply equally to all individuals in the sample (Collins & Lanza, 2009). While such investigations undoubtedly added valuable and important insights to the understanding of student well-being and its precursors and outcomes, they might miss differential effects on groups of individuals sharing particular combinations of well-being characteristics. This is especially true for the analysis of intervention effects, where findings are often conflicting (Renshaw & Olinger Steeves, 2016). As Schueller and Parks (2014) noted, the efficacy of a given intervention may vary depending on the characteristics of the individual or group receiving it. Person-centered approaches could help resolve such ambiguities, since they are able to distinguish effects on groups with differential attributes (Spurk et al., 2020).

A handful of previous studies examined student well-being using a person-centered approach. For example, Virtanen et al. (2019) derived six distinct profiles of students' psychological well-being (conceptualized as school enjoyment, future educational aspirations, self-esteem and the absence of school burnout, externalizing and internalizing problems). A longitudinal approach was used by Cao et al. (2023), who applied a dual-factor model of psychological well-being (subjective well-being and psychological distress) to examine the well-being profiles and transition probabilities among secondary school students. The authors identified four distinct profiles with differential stability and unique transition patterns linked to students' educational aspirations. A recent study used the six-dimensional student well-being model by Hascher (2004) to derive four latent profiles, which tended to be relatively stable over time (Held & Hascher, 2023).

Overall, person-centered research on student well-being remains scarce. No previous study that we are aware of has examined intervention effects on school student well-being using latent transition analyses, although a large body of research on school-based well-being interventions exists.

6.1.3 Well-being Interventions

Over the past several decades, numerous studies on school-based interventions aimed at improving student well-being have been conducted, with a multitude of positive effects (for a meta-review see Šouláková et al., 2019). One major field of research related to student well-being is the area of positive psychology, which includes the understanding and promoting of positive emotions as well as character strengths in school along with enabling institutions to enhance well-being and optimal functioning in individuals, groups, and communities (Gable & Haidt, 2005).

School-based positive psychology interventions have shown promising results in improving student well-being (Tejada-Gallardo et al., 2020). They encompass various exercises which can be grouped into two broad categories: (1) Self-oriented exercises including complex cognitive activities that evoke grateful thinking and provide an opportunity to learn about oneself and recognize one's priorities in life. Examples for these category are counting one's blessings (M. E. P. Seligman et al., 2009), expressing gratitude (Froh et al., 2008), or visualizing ideal future selves (Oyserman et al., 2007). (2) Social-behavioral exercises including activities that benefit other people or evoke ones and others positive emotions**.** Exercises like performing acts of kindness (Layous et al., 2012), giving compliments (Tomba et al., 2010), or sharing positive experiences (Rydell Altermatt, 2010) can be subsumed under this category. Such interventions seem to be particularly effective when they consist of a combination of different exercises (Shankland & Rosset, 2016), which might surpass the positive effects of a single activity (Seligman et al., 2005).

However, the current body of intervention studies addressing adolescents that incorporate several activities simultaneously is scarce. Differences between self- and socially oriented exercises or combinations of both are rarely investigated. Furthermore, some of the previous intervention studies had either no control group (Tomba et al., 2010), or groups that received no treatment at all during the intervention itself (Oyserman et al., 2007). Such intervention designs may lead to biased results due to potential placebo effects (Patterson et al., 2016). In our study, we therefore incorporated three intervention groups that were assigned to either a self-oriented, a social-oriented, or a mixed condition; and a placebo control group that received the

treatment in the same form as the experimental conditions, but with a content unrelated to well-being.

Additionally, the effectiveness of positive psychology interventions seems dependent on multiple factors. According to the positive-activity model (Lyubomirsky & Layous, 2013), features of positive activities (e.g., dosage and variety) and of the individual (e.g., motivation and initial well-being) influence the degree to which an intervention improves well-being. Based on this model, our research interest lies in studying how different combinations of activity features interact with varying individual features. To assess differential effects of these activities on subgroups of participants, we measured two individual features: motivation to participate and initial well-being characteristics.

6.1.4 Individual Influences on the Effectiveness of an Intervention

Motivation to participate. Participating in an activity of interest, entertainment, and the belief in its effectiveness might make it more fruitful than just "getting done" with it. For example, when participants deliberately choose to take part in an activity to boost their well-being, the effects of the activity tend to be larger than when they are not aware of the activity's goals (Lyubomirsky et al., 2011). The authors therefore assumed self-selection to be an indicator of motivation to participate. However, they did not directly assess participant motivation. In our study, we aimed at measuring students' motivation to participate in the intervention by following an established approach to the concept of motivation, namely, Self-Determination Theory (SDT; Ryan & Deci (2000)). SDT identifies three basic human needs for motivation: competence (control over outcomes), autonomy (acting in line with one's values and free will), and relatedness (social connection). Motivation is divided into more intrinsic (driven by joy and internal reward) and more extrinsic forms (driven by external rewards or avoiding punishment) (Deci & Ryan, 2008). Extrinsic motivation can be internalized, ranging from controlled (e.g., actions driven by external pressures) to more autonomous forms like identified regulation, where behaviors align with personal values (Ryan, 2012). While both intrinsic and extrinsic forms of motivation are characterized by intentions to behave, people can also be in a state without such intentions, which is called amotivation. According to SDT, this state is likely to arise when a task is perceived as neither feasible nor personally relevant (Deci & Ryan, 2000). Self-selecting an activity

can be seen as intrinsically motivated behavior. But even when participation is mandatory, participants who are more intrinsically motivated to follow the activity tend to get higher well-being gains (Skarin & Wästlund, 2020). Still, the question remains open as to how the different forms of motivation including amotivation are related to the effectiveness of an intervention.

Initial Well-being Characteristics. While there is general evidence for differential intervention effects depending on participants' initial well-being, results about the direction of influence are mixed. Some studies observed stronger effects for students with lower well-being (Barnes & Mongrain, 2020; Froh et al., 2009), others found detrimental effects for some groups of participants with lower well-being indicators (Sergeant & Mongrain, 2011; Sin et al., 2011). These mixed results suggest considering the importance of person-activity fit: Some activities may be more helpful for students low in well-being, for example because they have a higher need for improvement (Lyubomirsky & Layous, 2013). Other activities, for example those reflective in nature, may be helpful for students with higher well-being because they can capitalize on their positive outlook in life when reflecting upon challenges or problems. For students with lower well-being, this task might be too burdensome or even detrimental, because they pose the risk of focusing even more on problematic thoughts (Allara et al., 2019). Thus, little is known about the role of initial well-being and previous studies mostly compared effects for differentiating between well-being groups using a single indicator (e.g., positive affect or depressive symptoms). Given the multi-dimensional character of well-being, even less is known about differential effects of specific activities on subgroups characterized by their prior scoring on multiple well-being indicators. A more precise understanding of prior well-being, however, would help inform the tailoring of interventions and improve intervention effectiveness.

6.1.5 Research Questions and Hypotheses

In the current study, we aimed at identifying differential well-being profiles and investigating whether profile membership changed over time as a function of intervention participation. Given the multi-dimensional character of well-being, we expected various well-being profiles among students to emerge. Also, we expected profile membership to affect how students respond to well-being interventions.

In the following, we use the terms “favorable” and “unfavorable” when referring to profiles and transitions. Since student well-being is defined as an imbalance between the positive and the negative dimensions (Hascher, 2004), higher well-being can be characterized by higher values on the positive dimensions relative to the negative dimensions. We therefore classify those profiles as more favorable which are composed of higher values on the positive dimensions and lower values on the negative dimensions, compared to the other profiles. Consequently, we classify changes from a less favorable to a more favorable profile as favorable transitions and changes from a more favorable to a less favorable profile as unfavorable transitions.

Moreover, we wanted to assess whether motivation to participate in the intervention influenced the profile transition over time. Our study was guided by the following research questions:

- RQ1: What kind of student well-being profiles can be derived from the data?
- RQ2: How does profile membership change during the intervention?
- RQ3: What differences in profile transition patterns can be observed between different intervention groups?
- RQ4: How are changes in profile membership related to motivation to participate in the intervention?

Based on previous research, we tested the following hypotheses:

- H1: Profiles derived from the data can be classified into more favorable (higher positive, lower negative well-being indicators) and less favorable (lower positive, higher negative well-being indicators).
- H2a: Changes from less favorable to more favorable well-being profiles are more prevalent for participants in experimental groups compared to participants in the control group.
- H2b: Changes from more favorable to less favorable well-being profiles are less prevalent for participants in experimental groups compared to participants in the control group.
- H3: Motivation to participate in the intervention increases the probability of a favorable transition.

6.2 Methods

6.2.1 Participants

Participants of the study were N = 681 lower secondary school students from Switzerland (15 schools, 38 classes) who participated in the longitudinal research project “Well-being in School in Switzerland (WESIR, 2022–2025) funded by the Swiss National Science Foundation. Prior to data collection, ethical approval was obtained from the ethics committee at the researchers’ university (Ethics Application Nr 2021-08-00005, August 2021). Written consent for students’ participation in the study was obtained from their parents. Students were informed that their participation was optional and were assured that the information they provided is confidential. At the time when the intervention was implemented, the students were in 8th grade, which was their second year of lower secondary school. The participants’ mean age was 13.92 years (*SD* = 0.83), 48% of participants were female.

6.2.2 Procedure

The intervention study was based on six positive psychology exercises. Three of those exercises were self-oriented, namely expressing gratitude, savoring positive experiences, imaging one’s future selves; and three exercises were socially oriented, namely sharing positive experiences, giving compliments and doing acts of kindness. Prior to the main intervention, members of the research team visited the classes and explained the exercises to the teachers and students. The exercises were completed using an online diary developed by the authors. The main intervention lasted 10 weeks and was carried out by the class teachers between April and June 2023.

To investigate differences in effects between activity features, we assigned the 38 classes randomly to one of four intervention groups. All participants completed one exercise per week, with the specific combination of exercises varying between the intervention groups. Group 1, the self-oriented condition (N = 187), completed exercises related to gratitude, savoring positive experiences, and imagining their future selves. Group 2, the social-oriented condition (N = 161), completed exercises related to interactions with their peers and teachers: sharing positive experiences, giving compliments, and doing acts of kindness. Group 3, the mixed condition (N = 166), completed both self- and social-oriented exercises, namely savoring positive

experiences, giving compliments, and doing acts of kindness. Group 4 (N = 167) served as control condition. The participants in this group reported what they had learnt in school during the previous week. Once a week, the students logged in to the online diary and completed the respective exercise. Prior to the first, the fifth, and after the tenth exercise, participants were filled in a short online questionnaire. We refer to these questionnaires as pre-test, mid-test, and post-test, respectively.

6.2.3 Measures

In the questionnaire, the following measures were used:

Student well-being was measured at all three measurement points using the 19-item Student Well-being Questionnaire (SWBQ; Hascher, 2007), which contains six subscales: (1) Enjoyment in school (3 items, e.g., "*In the past few weeks, it occurred that I was happy because I could do something I enjoy in school"*), (2) Positive attitudes toward school (3 items, e.g., "*I like going to school"*), (3) Positive academic self-concept (3 items, e.g., "*I have no problems with meeting the school requirements"*), (4) Worries in school (3 items, e.g., "*In the past few weeks, it occurred that I worried about school"*), (5) Physical complaints in school (4 items, e.g., "*In the past few weeks, it occurred that I had strong headaches during class"*), and (6) Social problems in school (3 items, e.g., "*In the past few weeks, it occurred that I had problems with my classmates"*). Responses were indicated on a 6-point Likert scale ranging from 1 = *never/disagree* to 6 = *very often/agree*. The internal reliability of the subscales as indicated by McDonald's ω ranged from 0.85 to 0.95.

Participation motivation was measured during the pre-test using the 16-item Situational Motivation Scale (SIMS; Guay et al., 2000), which contains four subscales: 1) Intrinsic motivation (4 items, e.g., "*I participate because I think the exercises will be interesting"*), (2) Identified regulation (4 items, e.g., "*I participate for my own good"*), (3) External regulation (4 items, e.g., "*I participate because I am supposed to do it"*), (4) Amotivation (4 items, e.g., "*I don't know; I don't see what this activity brings me"*). Responses were indicated on a 7-point Likert scale ranging from 1 = *corresponds not at all* to 7 = *corresponds exactly*. The internal reliability of the subscales as indicated by McDonald's ω ranged from 0.88 to 0.95.

6.2.4 Analysis

Missing data. To be able to start with the first exercise, participants had to fill out the pre-test, therefore no data is missing for the first measurement point. However, some classes dropped out of the intervention before week 5 and therefore did not fill out the mid-test, resulting in missing data for 102 participants (15%). The post-test was presented after the final exercise in week 10. Some classes did not fill out the post-test, even though we reminded teachers to give students time to complete the questionnaire. This resulted in a substantial amount of missing data for 395 participants (58%). To deal with the missing data, we used full information maximum likelihood estimation (FIML), including 44 auxiliary variables. This procedure enhances estimation of missing data (Graham, 2003).

Confirmatory factor analysis. Confirmatory factor analyses (CFA) were conducted for the SWBQ construct and the SIMS construct separately. For both constructs, all subscales were included in one model. The fit indices of comparative fit index (CFI) > 0.90, root mean squared error of approximation (RMSEA) < 0.07, standardized root mean square residual (SRMR) < 0.08, and factor loadings (λ) > 0.50 were used to assess the model fit (Tabachnick & Fidell, 2012). Both constructs showed good fit (SWBQ: CFI = 0.93, RMSEA = 0.04, SRMR = 0.04, λ > 0.70; SIMS: CFI = 0.96, RMSEA = 0.05, SRMR = 0.06, λ > 0.70).

Measurement invariance. Longitudinal measurement invariance was tested for the SWBQ to control whether the latent variables were stable over time and could thus be compared over the three measurement points (Little, 2013). We followed a sequential procedure by testing competing models with increasing restrictiveness and comparing their fit indices (i.e., CFI and RMSEA). A change in ΔCFI < 0.01 and a change in ΔRMSEA < 0.015 was set as limit for acceptance of measurement invariance (F. F. Chen, 2007). Within this range, it can be assumed that the more restrictive model does not have significantly poorer fit than the previous model (Little, 2013) and the data can therefore be compared longitudinally. Measurement invariance was accepted for all subscales on at least metric level (see Table S.1 in the Appendix).

Latent profile analysis and latent transition analysis. For the principal analyses, latent profile analysis (LPA) and latent transition analysis (LTA), we used measurement error-corrected factor scores according to the effects coding method by Little et al. (2006). Because our sample consisted of four different experimental groups, we first

tested the similarity of profile solutions across these subsamples following guidelines by Morin et al. (2016). This procedure allows to verify whether the number, composition, and size of latent profiles are comparable across groups. We first calculated LPA models with 2 to 10 profiles for each experimental group separately and chose the best model based on a combination of fit indices: the Bayesian information criterion (BIC), the sample-size-adjusted Bayesian information criterion (aBIC), the consistent Akaike information criterion (CAIC), the Lo, Mendell, and Rubin likelihood ratio test (LMR), and the entropy value. Lower BIC, aBIC, and CAIC values indicate a better model fit (Nylund et al., 2007). However, those indices may continue to decrease without reaching a minimal point. Therefore, we graphically illustrated the changes using elbow plots (Morin et al., 2016). The point where the graph has an "elbow", i.e., the decrease of fit indices tends to flatten, indicates that solutions with more profiles do not lead to a significantly better model. A significant p-value associated with the LMR indicates that the k-1 profile model should be rejected in favor of a k-profile model. The entropy value summarizes the precision with which the cases are allocated to profiles, with values closer to 1 indicating a better fit (Muthén, 2000). Additionally, we compared profile sizes and differences in profile structure to decide which LPA solution to choose. After the optimal number of profiles was chosen for each subgroup, a single model with the overall sample was calculated to establish a model of configural similarity. We then compared response probabilities between the experimental groups by constraining the profile indicator means to be equal across groups to test structural similarity, which was accepted when the fit indices (i.e., BIC and CAIC) were lower than for the model of configural similarity. When structural similarity was accepted, we tested dispersion similarity by constraining the profile indicator variances to be equal across groups. After acceptance of dispersion similarity, we tested for distributional similarity by constraining the size of the latent profiles to be equal across groups. After multigroup similarity was accepted, the same procedure was then repeated for all three measurement points to test for longitudinal similarity (Morin & Litalien, 2017). This procedure allows to verify whether the number, composition, and size of latent profiles are comparable across measurement points. We first calculated LPA models with 2 to 10 profiles for each measurement point and chose the best model based on fit indices, profile sizes, and differences in profile structure. We then integrated data from all measurement points into one longitudinal

LPA model. We then tested models of structural and dispersion similarity as well. The most similar model of the longitudinal LPA was converted to an LTA model, by including the estimation of transition probabilities between profiles across adjacent time points. We also calculated transition probabilities separately for each experimental group.

Influence of participation motivation on profile transition. To investigate the influence of motivation to participate in the intervention on latent transitions, we classified the transitions into favorable and unfavorable. A transition was classified as favorable when it was from a less favorable to a more favorable profile or when it was stable (favorable profile at both measurement points). A transition was classified as unfavorable when it was from a more favorable to a less favorable profile or when it was stable (unfavorable profile at both measurement points). We then ran binary logistic regressions with the motivation dimensions as predictors and a binary variable for transition (favorable vs. unfavorable) as outcome. We calculated separate regressions for each predictor and transition time, resulting in eight analyses.

Data preparation, descriptive statistics, and regression analyses were conducted in R 4.2.2 (R Core Team, 2020). CFA, measurement invariance testing, LPA and LTA analyses were conducted in MPlus 8.10 (Muthén & Muthén, 1998-2017). Data was exported from R to MPlus and results back to R using the MPlusAutomation package (Hallquist & Wiley, 2018).

6.3 Results

6.3.1 Well-being Profiles

The elbow plot for the comparison of fit indices between experimental groups showed plateaus at 3 to 6 profiles (see Figure S.1 in the Appendix). Therefore, we further examined the BIC, aBIC, CAIC, LMR, and entropy values of these solutions. The respective values are depicted in Table S.1. Based on these criteria, a four-profile solution was chosen. This solution was consistent for all experimental groups, indicating configural similarity. Further tests of structural, dispersion, and distributional similarity all resulted in better fit indices, leading to acceptance of distributional similarity for the multi-group model (see Table S.2 in the Appendix).

The elbow plot for the comparison of fit indices between measurement points showed plateaus at 3 to 6 profiles as well (see Figure S.2 in the Appendix). The further

examination of the BIC, aBIC, CAIC, LMR, and entropy values of these solutions resulted in the selection of a four-profile solution for all measurement points, indicating longitudinal configural similarity. (see Table S.3 in the Appendix).

This model was then tested for dispersion similarity by constraining the profile indicator variances to be equal across all time points. The resulting model yielded poorer fit, indicating that the profile structure was not equal across time points. We therefore tested various models of partial structural similarity until we identified a better fitting model. The best fit was yielded by a model with indicator means fixed for two profiles at the mid- and post-test measurement point. Based on this model of partial structural similarity, we tested partial dispersion similarity by constraining the variances for these two profiles to be equal across the mid- and post-test as well, which resulted in better fit statistics. Next, the model was tested for partial distributional similarity by constraining the profile sizes for the two profiles across the mid- and post-test. This model did not yield a better fit than the previous one, indicating that profile sizes changed over measurement points. Therefore, we kept the model of partial dispersion similarity for the further analyses. Longitudinal similarity fit statistics are presented in Table S.3.

A four-profile solution was specified for all three measurement points, with differing profile structures between measurement points. For the first measurement point, the following four profiles were found (see Figure 1 for a graphical depiction): 1. High positive well-being, moderate worries in school; 2. High on all dimensions, moderate physical complaints in school; 3. Moderate levels on all dimensions; 4. High positive, low negative well-being.

The profile structures slightly changed for the second and third measurement point, with the following profiles: 1. Moderate levels on all dimensions; 2. High to moderate positive dimensions, moderate negative dimensions; 3. High positive well-being, high worries in school; 4. High positive well-being, moderate worries in school. The indicator means are presented in Figure 2.

6.3.2 Latent Transitions

Estimated transition probabilities between the three measurement points are presented in Table 1. These probabilities show several overall trends: (1) between t1 and t2, the most probable transitions are from profiles 1 and 4 to profile 4, followed by

transitions from profile 2 to profile 3. This indicates relative stability of profile membership, as the profiles 1 and 4 at t1 have a similar structure as profile 4 at t2. (2) between t2 and t3, the most probable transitions were between the same profile, indicating stability of profile membership as well. (3) changes from a more favorable profile to a less favorable profile were less likely than vice versa.

6.3.3 Differences in Transition between Intervention Groups

We also examined the probability of students' transition between profiles based on their intervention group membership (see Table 2). Overall, trends similar to those in the whole sample could be observed: Between t1 and t2, the most probable transitions were from profiles 1 and 4 to profile 4, followed by transitions from profile 2 to profile 3. Also, between t2 and t3, the most probable transitions were between the same profile. However, comparison of the transition probabilities between the intervention groups revealed differential effects: (1) transitions were more stable in the intervention groups compared to the control group. (2) favorable transitions were more probable in the intervention groups compared to the control group, especially for the self-oriented and the mixed group. (3) unfavorable transitions were most probable in the control group and least probable in the self-oriented group. The group-specific changes between profiles are illustrated in Figure 3.

6.3.4 Effects of Motivation to Participate on Profile Transitions

Results of the eight separate binomial logistic regression analyses are presented in Table 3. For both transition points, significant effects were found for intrinsic and identified motivation. From pre- to mid-test, the odds of a favorable transition occurring increased by 30% (95% CI [1.16, 1.47]) for a one-unit increase in intrinsic motivation and by 29% (95% CI [1.16, 1.46]) for a one-unit increase in identified motivation. From mid- to post-test, the odds of a favorable transition occurring increased by 33% (95% CI [1.17, 1.51]) for a one-unit increase in intrinsic motivation and by 30% (95% CI [1.15, 1.48]) for a one-unit increase in identified motivation.

6.4 Discussion

The present study aimed at identifying latent profiles of student well-being and examining profile transitions during a 10-week intervention. Additionally, the influence of motivation to participate in the intervention on profile transition was investigated.

Our first hypothesis was that we could identify favorable profiles with higher positive and lower negative well-being indicators and less favorable profiles with lower positive and higher negative well-being indicators. This hypothesis could be accepted: At t1, we found three profiles with high positive well-being. One of those profiles had low negative well-being indicators, one had simultaneously high negative indicators, and one had moderate levels of worries in school. A fourth profile with moderate levels on all indicators was also identified. Interestingly, the most favorable profile with high positive and low negative indicators could no longer be found at t2 and t3. Instead, we found two profiles with high positive indicators and moderate to high levels of worries in school. The profile with high levels on all indicators vanished as well, being replaced by a profile of high to moderate positive and moderate negative dimensions. The profile of moderate levels on all indicators could still be found at all measurement points. The results indicate a general increase of worries in school for the whole population, which is in line with previous research. Held and Hascher (2023) also identified four well-being profiles, with moderate to high levels of worries in all profiles. Another interesting finding is that we found no profile with low positive well-being indicators at any time point, which implies that most participants generally reported fairly high levels on these indicators. This finding shows that the positive and negative well-being indicators are distinct and independent dimensions and further prove that students can think and feel positive about some aspects of school while simultaneously having negative thoughts and feelings about other aspects. This is in line with Hascher's (2004) conceptualization of student well-being as a predominance of the positive over the negative dimensions.

Our second hypothesis was that changes from less favorable to more favorable well-being profiles are more prevalent for participants in experimental groups compared to participants in the control group and vice versa. This hypothesis could also be confirmed: Favorable transitions happened more often in the intervention groups compared to the control group, especially in the self-oriented and the mixed

group. For example, students in the control group who were in the most favorable profile at t3 (profile 4), had almost all already been in this profile at t2, while there were more differential transitions to this profile in the intervention groups. Notably, transitions from the least favorable to the most favorable profile were most prevalent in the social-oriented group. Conversely, unfavorable transitions were more prevalent in the control group and happened least in the self-oriented group. For example, transitions to the least favorable profile at t3 (profile 1) were more diverse in the control group compared to the intervention groups. Transitions from the most favorable to the least favorable profile between t2 and t3 were not prevalent in the self- and the social-oriented groups and more prevalent in the control group than in the mixed group. While our analyses allow no inferences about the effectivity of certain exercises, it seems that those students who savored positive experiences (the self-oriented and the mixed group) benefited most from the intervention. Nevertheless, profile transition was rather stable in all groups, and the probability to end up in the most favorable profile at t3 was highest for those who were already in the most favorable profiles at t1. This effect was consistent for all groups, but stronger in the intervention groups compared to the control group, indicating that those students who were already in a favorable profile could benefit more from the intervention than their peers with less favorable well-being patterns. This result hints at a better person-activity fit for participants with higher well-being: As Sin et al. (2011) suggested, exercises which involve a lot of self-reflection might be more suitable for people with more positive initial affective states, as they have more positive aspects to think about, while for those with more negative affect, such activities may even lead to more rumination about negative aspects.

Our third hypothesis was that motivation to participate in the intervention increases the probability of a favorable transition. This hypothesis could be accepted as well: Intrinsic and identified motivation positively predicted the probability of a favorable transition. However, we found no significant effect for extrinsic motivation and amotivation. This might be due to the relative stability of profile membership, meaning that those students who were intrinsically motivated to participate were more likely to benefit from the intervention, while those who were amotivated tended to have a more stable trajectory, regardless of it being favorable or unfavorable. The results further imply that intrinsic and extrinsic motivation are not just opposed poles of a

continuum, but that students can be simultaneously intrinsically and extrinsically motivated (Chemolli & Gagne, 2014).

Taken together, our results confirm the notion that “one size does not fit all” when it comes to well-being interventions. Students reacted differently to the intervention dependent on their initial well-being patterns. Students with higher initial well-being (higher levels on positive, lower levels on negative dimensions) benefited more in the self-oriented and in the mixed condition. Students with lower initial well-being benefited most in the social-oriented condition. These findings call for more custom-tailored interventions, adapted to the individual needs of the participants, to reach an optimal person-activity fit. Such a fit could be attained for example by using a questionnaire to determine participants’ dispositions (Lyubomirsky, 2008), or by choosing activities based on their preferences (Schueller, 2011).

Furthermore, when designing interventions, it is important to consider participants’ motivational dispositions. An intervention tends to be more fruitful when participants see a personal importance to engage in it. Highlighting this personal importance could raise adherence to the activities. One possibility to do so is involving the participants in the development and implementation of the intervention (Halliday et al., 2019).

Our study has several strengths. First, the novel and complex intervention design integrates various activities that have proven to be effective in increasing well-being; and the present study is among the first that tested the effects of these activities using a multidimensional, context-specific measure of student well-being. Second, the application of a person-centered analysis to longitudinal intervention data allows for a differential perspective on the interplay between multiple well-being dimensions and their development over time.

Nevertheless, our study holds multiple limitations which should be addressed in future research. First, the identification of latent profiles and decision on the number of profiles is based on a mixture of quantitative results and qualitative or theory-driven assumptions, which makes it somewhat arbitrary. Profile solutions using the same criteria can differ in relation to the sample size and structure. For example, our finding of four distinct well-being profiles is similar to that of another study which used the same six-dimensional well-being measure (Held & Hascher, 2023). However, the profiles we found are structurally different from those, if only slightly. To date, these are

the only two studies applying LPA to this well-being framework. Further analyses using different datasets could help determine whether some profiles can be generalized for multiple samples. Second, we did not reach full longitudinal similarity according to the guidelines of Morin and Litalien (2017). Therefore, our profile solutions differ between measurement points, which limits the interpretation of transitions between t1 and t2. The changes in profile structure could in itself be a cause of the intervention (Morin et al., 2016). Further intervention studies using the same design are necessary to test this assumption. Third, it was not possible to integrate the motivation variables directly into the LTA model as predictors of transition probability, because such a model led to empty cells in the joint distribution matrix. Therefore, we had to classify the transitions and run separate post-hoc regression analyses. Further analyses with a larger sample size might not encounter this issue and could allow the investigation of predictor effects on individual transition probabilities. Moreover, initial well-being and motivation to participate in well-being interventions are possibly related. As was found by Seligman et al. (2005), participants who self-selected to take part in an online well-being intervention were slightly more depressed on average, which implies that people with lower well-being might be more motivated to participate in such an intervention. Conversely, in another study, happier participants reported greater liking for the intervention and anticipated more benefits from it (Proyer et al., 2015). This could hint at a positive connection between well-being and participation motivation. We did not control for potential effects of students' initial well-being characteristics on their motivation to participate in the intervention. A fourth limitation is the large amount of missingness in our post-test data. Although we handled those missings using FIML, which tends to provide solid estimates even for large amounts of missing data (P.-Y. Chen et al., 2020), the high amount of drop-out is an indicator of insufficient adherence to the intervention toward its end, which might have negatively influenced its effectiveness. It's important to maintain participant fidelity in future studies. We asked teachers about their reasons to discontinue adherence to the intervention; the main issue they named was lack of time during class hours. Addressing this issue might lead to more robust outcomes and a clearer assessment of the intervention's effectiveness. However, it is difficult to overcome this obstacle, as teachers are already facing high time pressure with implementing all the contents of the regular curriculum. One

possible approach is to design shorter interventions with exercises that do not take a whole lesson's time to be completed.

6.4.1 Conclusions

The results of our study contribute to existing school-based well-being intervention research by providing person-centered analyses of intervention effects. The findings confirmed that secondary school students' well-being profiles can be classified in distinct combinations of positive and negative dimensions. Profile transition trajectories differ dependent on initial profile membership and intervention group, supporting the need for tailored interventions that consider individual well-being patterns. Intrinsic motivation plays a key role in predicting positive transitions, further emphasizing the importance of personal relevance in intervention design.

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6.6 Tables

Table 1

Transition probabilities

		t2			
		Profile 1	Profile 2	Profile 3	Profile 4
t1	Profile 1	0.008	0.126	0.262	0.604
	Profile 2	0.028	0.105	0.771	0.096
	Profile 3	0.362	0.464	0.147	0.027
	Profile 4	0.149	0.080	0.042	0.730
		t3			
t2	Profile 1	0.753	0.172	0.052	0.023
	Profile 2	0.055	0.880	0.051	0.013
	Profile 3	0.079	0.173	0.699	0.050
	Profile 4	0.012	0.045	0.033	0.911

Note. t1 = Pre-test, t2 = Mid-test, t3 = Post-test.

Table 2

Group-specific Transition Probabilities

		Self-oriented				Social-oriented				Mixed				Control			
	t2	Profile 1	Profile 2	Profile 3	Profile 4	Profile 1	Profile 2	Profile 3	Profile 4	Profile 1	Profile 2	Profile 3	Profile 4	Profile 1	Profile 2	Profile 3	Profile 4
t1	Profile 1	0.000	0.137	0.184	0.679	0.000	0.123	0.291	0.586	0.000	0.091	0.231	0.678	0.033	0.152	0.366	0.449
	Profile 2	0.000	0.000	0.660	0.340	0.106	0.114	0.781	0.000	0.000	0.079	0.831	0.089	0.000	0.181	0.775	0.044
	Profile 3	0.315	0.557	0.128	0.000	0.491	0.441	0.050	0.018	0.341	0.326	0.285	0.048	0.300	0.538	0.120	0.042
	Profile 4	0.127	0.082	0.000	0.790	0.155	0.112	0.101	0.632	0.183	0.045	0.035	0.737	0.146	0.086	0.072	0.696
	t3	Profile 1	Profile 2	Profile 3	Profile 4	Profile 1	Profile 2	Profile 3	Profile 4	Profile 1	Profile 2	Profile 3	Profile 4	Profile 1	Profile 2	Profile 3	Profile 4
t2	Profile 1	0.821	0.156	0.000	0.023	0.761	0.123	0.063	0.053	0.821	0.179	0.000	0.000	0.588	0.260	0.151	0.000
	Profile 2	0.014	0.965	0.000	0.022	0.084	0.850	0.037	0.030	0.000	0.897	0.103	0.000	0.107	0.811	0.082	0.000
	Profile 3	0.093	0.204	0.608	0.095	0.089	0.151	0.695	0.065	0.037	0.214	0.720	0.029	0.104	0.129	0.736	0.031
	Profile 4	0.000	0.055	0.029	0.916	0.000	0.072	0.059	0.869	0.019	0.022	0.043	0.915	0.035	0.031	0.000	0.934

Note. t1 = Pre-test, t2 = Mid-test, t3 = Post-test.

Table 3

Results of Binomial Logic Regressions for the Effects of Students' Motivation on Profile Transition

	Transition t1-t2					Transition t2-t3				
	Estimate	*SE*	*z*	*OR*	95% *CI*	Estimate	*SE*	*z*	*OR*	95% *CI*
(Intercept)	-0.128	0.221	-0.578	0.880	[0.57, 1.36]	0.197	0.235	0.838	1.218	[0.77, 1.93]
INTRM	0.266	0.060	4.442***	1.304	[1.16, 1.47]	0.283	0.065	4.342***	1.328	[1.17, 1.51]
(Intercept)	-0.092	0.215	-0.426	0.912	[0.60, 1.39]	0.282	0.229	1.232	1.325	[0.85, 2.08]
IDENR	0.260	0.059	4.402***	1.297	[1.16, 1.46]	0.263	0.064	4.104***	1.301	[1.15, 1.48]
(Intercept)	0.586	0.267	2.195	1.797	[1.06, 3.03]	1.027	0.291	3.529	2.792	[1.58, 4.94]
EXTR	0.048	0.056	0.860	1.050	[0.94, 1.17]	0.034	0.061	0.547	1.034	[0.92, 1.17]
(Intercept)	0.791	0.284	2.789	2.207	[1.27, 3.85]	1.046	0.307	3.406	2.846	[1.56, 5.19]
AMO	0.003	0.066	0.052	1.003	[0.88, 1.14]	0.033	0.072	0.451	1.033	[0.90, 1.19]

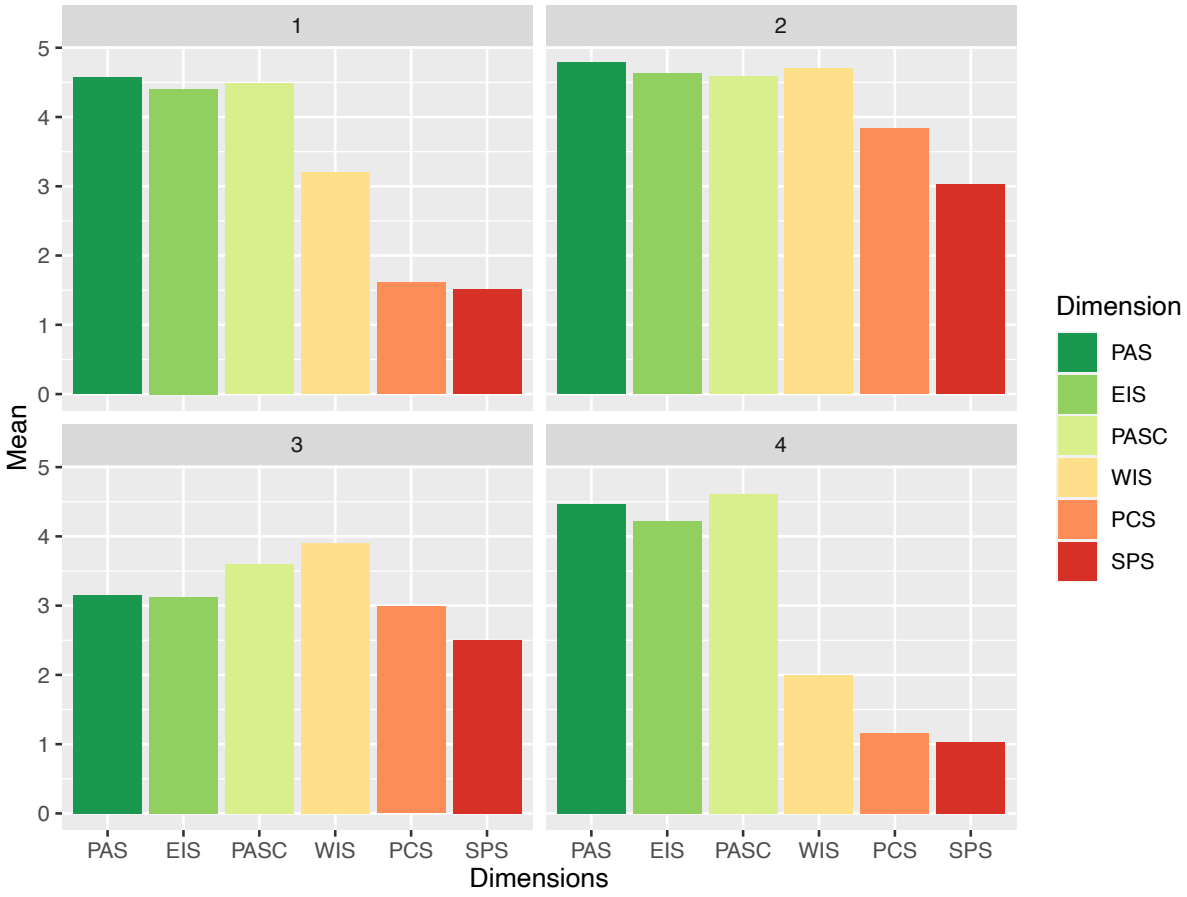
Note. Dependent variable: Transition classification (favorable vs. unfavorable). *SE* = Standard Error; *OR* = Odds Ratio; *CI* = Confidence Interval; INTRM = Intrinsic Motivation; IDENR = Identified Motivation; EXTR = Extrinsic Motivation; AMO = Amotivation.

*** $p < .001$.

6.7 Figures

Figure 1

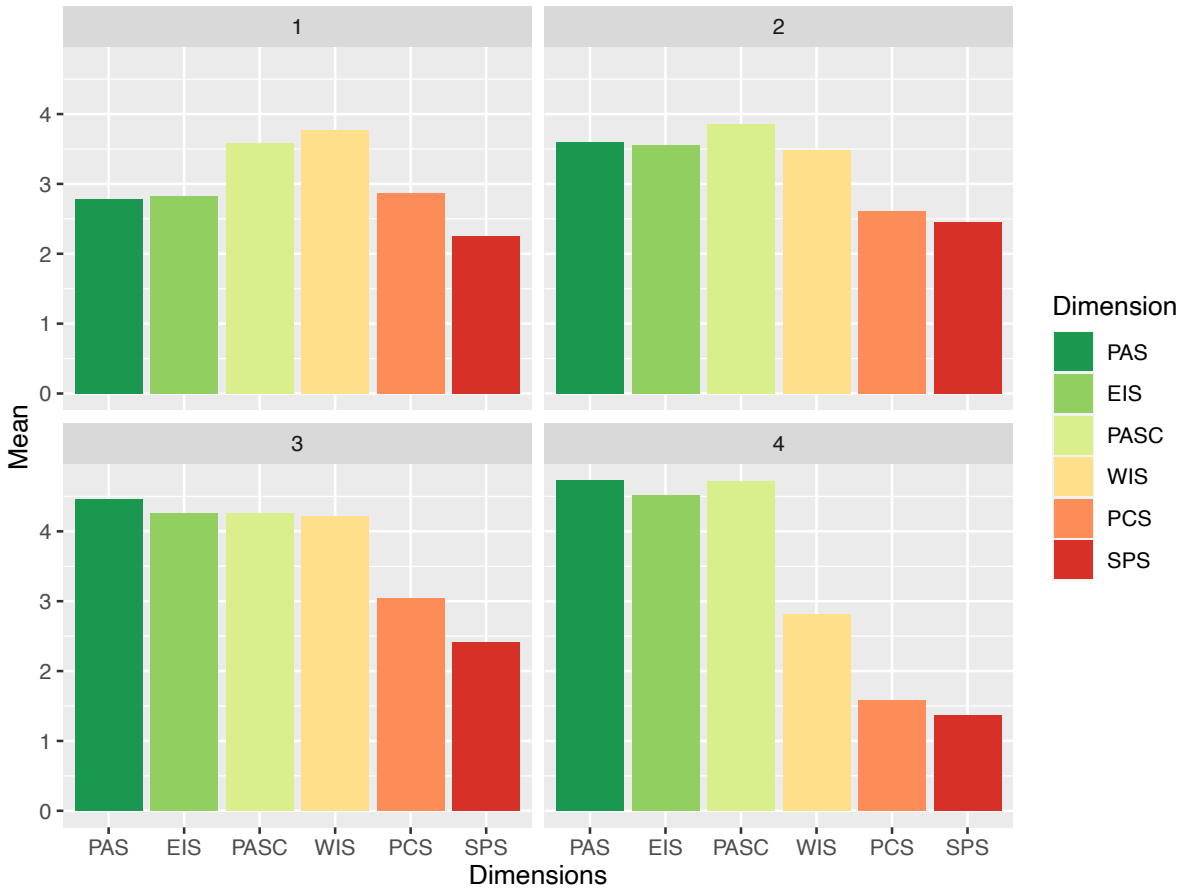
Profile Indicator Means at t1



Note. PAS = positive attitudes toward school; EIS = enjoyment in school; PASC = positive academic self-concept; WIS = worries in school; PCS = physical complaints in school; SPS = social problems in school.

Figure 2

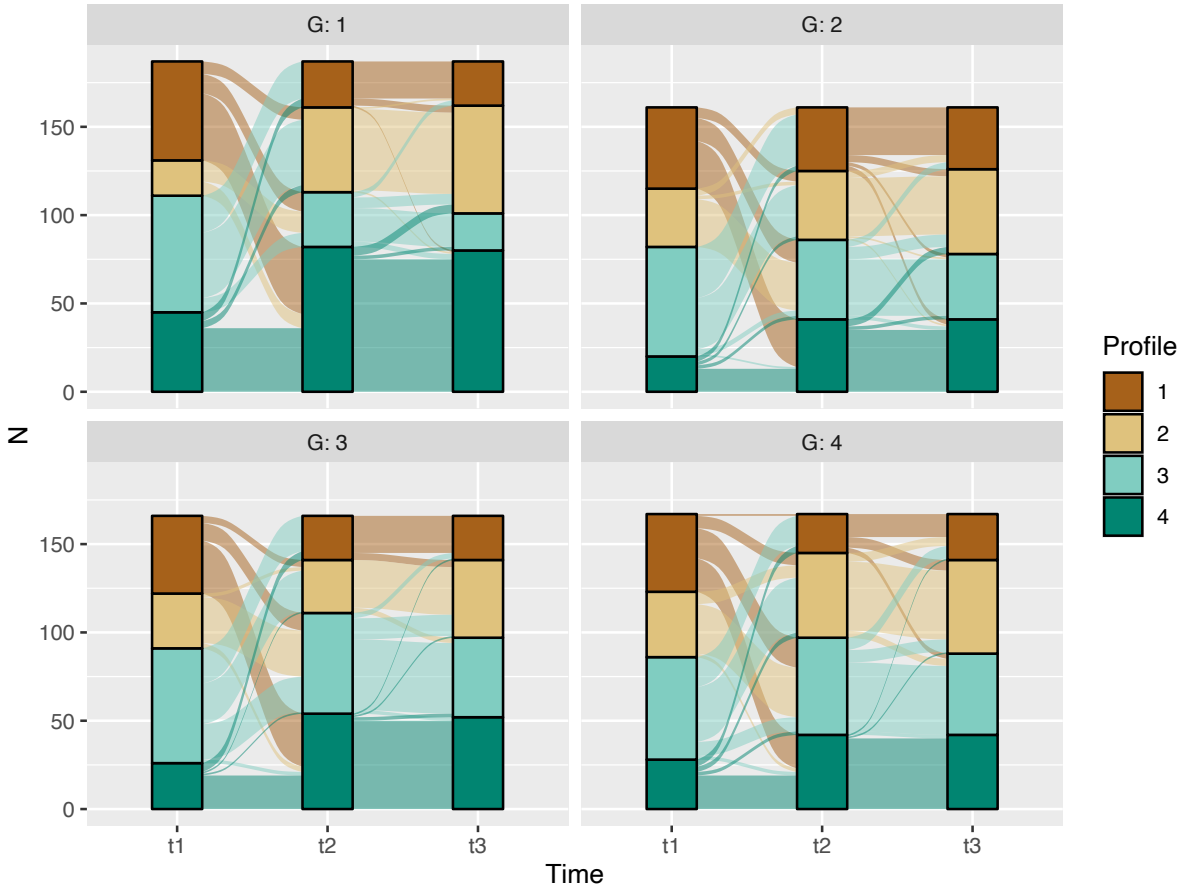
Profile Indicator Means at t2 and t3



Note. PAS = positive attitudes toward school; EIS = enjoyment in school; PASC = positive academic self-concept; WIS = worries in school; PCS = physical complaints in school; SPS = social problems in school.

Figure 3

Group-specific Latent Transitions



Note. Proportions of students for each change between latent profiles across time. The width of the streams is proportional to the quantity represented in the change (number of students). G:1 = Self-oriented group, G:2 = Social-oriented group, G:3 = Mixed group, G:4 = Control group; N = Number of students; t1 =Pre-test, t2 = Mid-test, t3 = Post-test.

6.8 Appendix

Table S.1

Longitudinal Measurement Invariance

Model	χ^2	df	CFI	RMSEA	SRMR	ΔCFI	ΔRMSEA
Positive Attitudes Toward School							
Configural	35.549	15	0.994	0.045	0.026		
Metric	43.821	19	0.992	0.044	0.034	-0.002	-0.001
Scalar	51.891	23	0.991	0.043	0.034	-0.001	-0.001
Enjoyment in School							
Configural	22.953	15	0.997	0.028	0.02		
Metric	29.869	19	0.996	0.029	0.026	-0.001	0.001
Scalar	39.616	23	0.994	0.033	0.032	-0.002	0.004
Positive Academic Self-concept							
Configural	35.125	15	0.993	0.044	0.024		
Metric	45.483	19	0.991	0.045	0.042	-0.002	0.001
Scalar	79.068	23	0.982	0.06	0.054	-0.009	0.015
Worries in School							
Configural	23.589	15	0.997	0.029	0.029		
Metric	30.54	19	0.996	0.03	0.037	-0.001	0.001
Scalar	41.227	23	0.994	0.034	0.039	-0.002	-0.004
Physical Complaints in School							
Configural	95.427	39	0.989	0.046	0.034		
Metric	99.965	45	0.989	0.042	0.036	0.000	-0.004
Scalar	117.057	51	0.987	0.044	0.044	-0.002	0.002
Social Problems in School							
Configural	11.835	15	1.000	0.000	0.013		
Metric	13.535	19	1.000	0.000	0.016	0.000	0.003
Scalar	16.651	23	1.000	0.000	0.017	0.000	0.001

Note. df = degrees of freedom; CFI = comparative fit index; RMSEA = root mean squared error of approximation; SRMR = standardized root mean square residual.

Table S.2

Multiple Group Similarity

	k	df	BIC	aBIC	CAIC	LMR	entropy
Class Enumeration: Experimental Group 1							
3 Profiles	3	26	3152.14	3069.79	3178.14	0.649	0.83
4 Profiles	4	33	3072.87	2968.35	3105.87	0.293	0.90
5 Profiles	5	40	3007.59	2880.90	3047.59	0.519	0.92
6 Profiles	6	47	2978.90	2830.03	3025.90	0.670	0.92
Class Enumeration: Experimental Group 2							
3 Profiles	3	26	2889.16	2806.85	2915.16	0.092	0.90
4 Profiles	4	33	2823.94	2719.47	2856.94	0.535	0.90
5 Profiles	5	40	2788.61	2661.98	2828.61	0.234	0.93
6 Profiles	6	47	2780.93	2632.14	2827.93	0.804	0.88
Class Enumeration: Experimental Group 3							
3 Profiles	3	26	2864.15	2781.83	2890.15	0.219	0.89
4 Profiles	4	33	2822.75	2718.27	2855.75	0.522	0.88
5 Profiles	5	40	2793.60	2666.96	2833.60	0.590	0.89
6 Profiles	6	47	2769.32	2620.51	2816.32	0.730	0.92
Class Enumeration: Experimental Group 4							
3 Profiles	3	26	2813.56	2731.24	2839.56	0.277	0.89
4 Profiles	4	33	2774.28	2669.80	2807.28	0.368	0.88
5 Profiles	5	40	2731.10	2604.45	2771.10	0.520	0.91
6 Profiles	6	47	2698.05	2549.25	2745.05	0.586	0.92
Cross-group Similarity							
Configural	4	129	13563.10	13153.51	13692.10		
Structural	4	57	13219.74	13038.76	13276.74		
Dispersion	4	39	13135.83	13012.00	13174.83		
Distributional	4	36	13125.35	13011.04	13161.35		

Note. k = number of profiles; df = degrees of freedom; BIC = Bayesian information criterion; aBIC = sample-size-adjusted Bayesian information criterion; CAIC = consistent Akaike information criterion; LMR = Lo, Mendell, & Rubin likelihood ratio test.

Table S.3

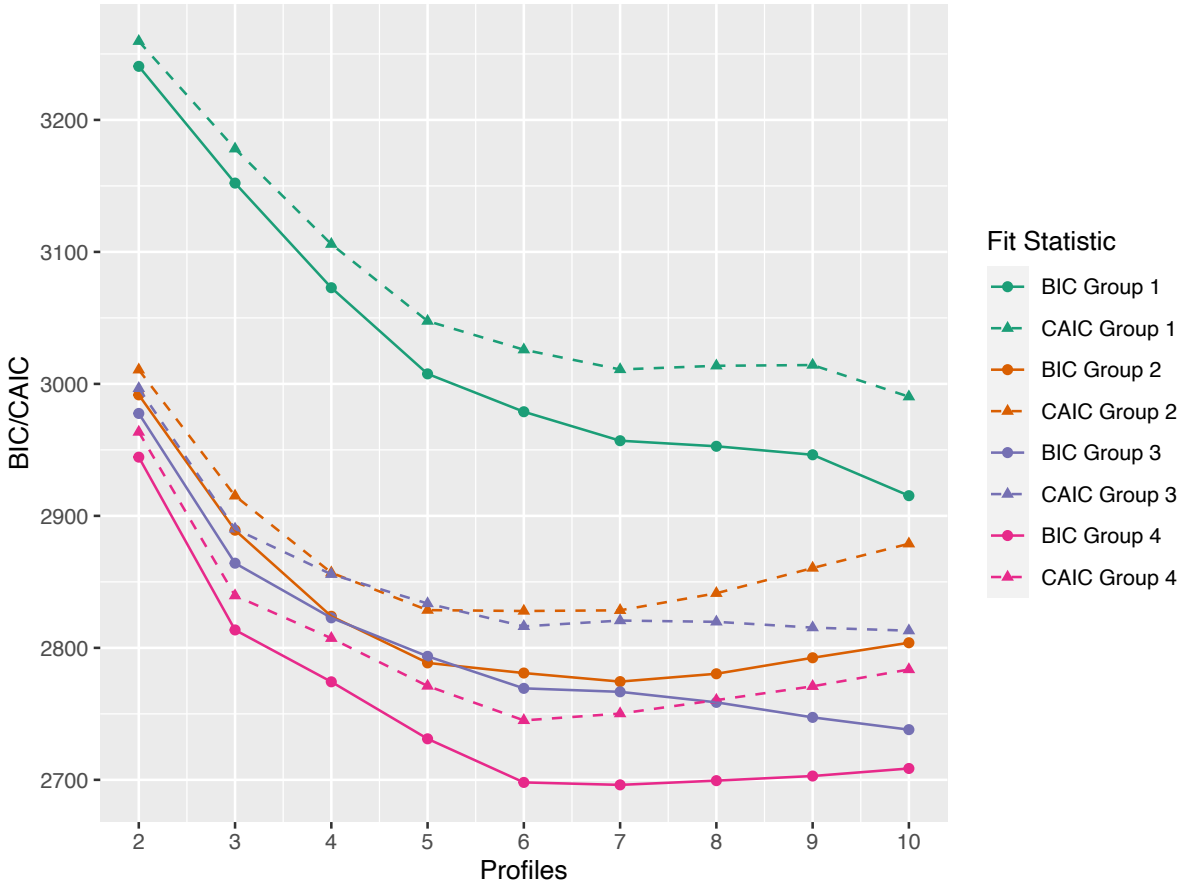
Longitudinal Similarity

	k	df	BIC	aBIC	CAIC	LMR	entropy
Class Enumeration: t1							
3 Profiles	3	26	11576.30	11493.74	11602.3	0.556	0.82
4 Profiles	4	33	11219.92	11115.14	11252.92	0.001	0.86
5 Profiles	5	40	11066.84	10939.84	11106.84	0.077	0.86
6 Profiles	6	47	10862.65	10713.42	10909.65	0.274	0.88
Class Enumeration: t2							
3 Profiles	3	26	11521.16	11438.61	11547.16	0.194	0.89
4 Profiles	4	33	11251.26	11146.48	11284.26	0.054	0.92
5 Profiles	5	40	11069.44	10942.44	11109.44	0.576	0.89
6 Profiles	6	47	10871.45	10722.22	10918.45	0.245	0.89
Class Enumeration: t3							
3 Profiles	3	26	10921.83	10839.28	10947.83	0.100	0.91
4 Profiles	4	33	10445.85	10341.07	10478.85	0.038	0.93
5 Profiles	5	40	10226.69	10099.69	10266.69	0.286	0.91
6 Profiles	6	47	10016.54	9867.31	10063.54	0.108	0.92
Longitudinal similarity							
Configural	4	153	31009.38	30523.59	31162.38		0.91
Structural	4	105	31586.43	31253.04	31691.43		0.89
Partial structural	4	141	30977.62	30529.93	31118.62		0.91
Partial dispersion	4	129	30919.70	30510.10	31048.70		0.90
Partial distributional	4	127	30914.30	30511.06	31041.30		0.90

Note. k = number of profiles; df = degrees of freedom; BIC = Bayesian information criterion; aBIC = sample-size-adjusted Bayesian information criterion; CAIC = consistent Akaike information criterion; LMR = Lo, Mendell, & Rubin likelihood ratio test.

Figure S.1

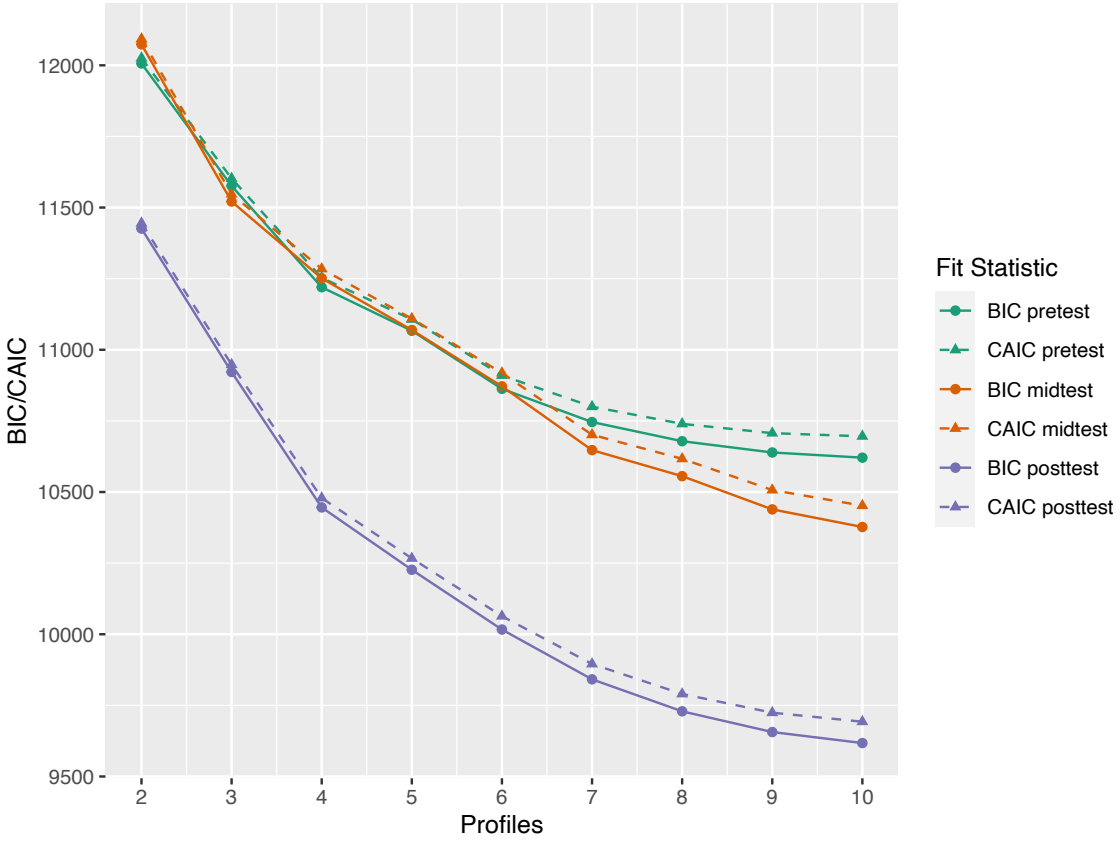
Elbow plot for multigroup similarity



Note. BIC = Bayesian information criterion; CAIC = consistent Akaike information criterion.

Figure S.2

Elbow plot for longitudinal similarity



Note. BIC = Bayesian information criterion; CAIC = consistent Akaike information criterion.

7 Summary and Discussion

The present dissertation delves into the relationship between student well-being, school engagement, and academic achievement. I brought forward three theses concerning these relationships and underpinned them with theoretical and empirical findings from the scientific community, as well as from my own research. The three studies that form the core of this dissertation all contain findings related to the three theses. The first thesis I brought forward was that student well-being and school engagement are related, but distinct constructs. I provided an overview of prior conceptualizations of the constructs and pointed out that they are not always properly discriminated. I also acknowledged overlaps between the constructs, particularly between student well-being and emotional engagement. Finally, I argued why I think that the constructs are different on a theoretical level and backed up that claim using empirical evidence from Study 1.

The second thesis, that student well-being and school engagement are related to academic achievement, was addressed using theoretical rationales explaining the cause and direction of these relationships, namely BBT (Fredrickson, 2001); SDT (Deci & Ryan, 2000); and SSMMD (E. A. Skinner et al., 2008). I further provided empirical evidence for these theoretical assumptions from various studies, including my own research (Study 1 and Study 2).

My third thesis was that student well-being and school engagement can be fostered. I presented evidence from studies that successfully increased these assets through interventions, including my own research on the effects of an intervention aimed at fostering student well-being (Study 3). I elaborated on how interventions fostering student well-being and school engagement overlap, and that it therefore seems possible to increase both constructs simultaneously. I also pointed out the risk that such interventions may also reproduce oppressive dynamics. Any attempt at fostering students' well-being and engagement on an individual level should be accompanied by efforts at changing education systems to be more supportive and equitable. In this chapter, I discuss the implications of these theses for theory and practice. I close with mentioning some limitations of the present work.

7.1 Implications for Theory and Practice

Student well-being and school engagement are related, but distinct constructs. They are associated with each other and with academic achievement, and they can be fostered. Notably, the associations between student well-being dimensions and school engagement components are complex. From a theoretical standpoint, this complexity necessitates that both constructs be conceptualized multidimensionally. Not all dimensions of student well-being are equally related to school engagement, and student well-being dimensions and school engagement components differ in their association with academic achievement. There may be disagreement on how the constructs should be defined and what their essential aspects are, and this ambiguity can probably not be solved on a theoretical level. However, transparent definitions and theoretically grounded conceptualization within a specific study allow inferences about the proposed underlying structures. Rather than dwelling on the discussion about which aspect is or is not part of either construct, I advocate for focusing on the associations between the underlying dimensions, which help in exploring what characterizes successful students. In the end, the means of all this research should be to collect evidence on what students need to thrive. BBT, SDT and SSMMD serve as a solid theoretical foundation for the investigation of the relationships between student well-being, school engagement, and academic achievement on a more general level. The differential associations of the underlying dimensions and components, however, need to always be interpreted through the lens of a study's specific applied theoretical framework. For further theory development, it may be helpful to combine such different theoretical frameworks by including multiple measures of both constructs within a single study. This approach could provide insights into where different conceptualizations of well-being and engagement overlap, where they diverge, and how they relate to academic achievement.

A further implication of the constructs' complexity is that they should be regarded as a continuum, both temporally and regarding their valence. Both constructs probably evolve across an entire school career, mutually reinforcing each other and potentially changing their relationships. In Study 2, we found different relationships between well-being dimensions and engagement components from the first to the second and from the second to the third measurement point, indicating that these

relationships may change over time. Also, it is difficult to determine when a student has high or low well-being, or when they are highly or poorly engaged. A student may report strong positive attitudes toward school but simultaneously be very worried (see Article 3). Likewise, some students can be behaviorally but not emotionally engaged (Wang & Peck, 2013). Rather than dichotomizing either construct by using such terms as “high” or “low”, they should therefore be treated as dynamic, complex states with compositions that vary between individuals and over time.

The confirmation of the theses also offers implications for educational practice. First, our findings support the claim that that those students who feel better at school are also those who are more engaged and achieve better grades. This means that students’ well-being and engagement is indeed positively related to their academic success. Schools are therefore required to create an environment that fosters their students’ well-being and engagement so that they may realize their full potential. According to our research, a promising approach to this end is increasing students’ enjoyment in school, thereby fostering their behavioral engagement (see Study 1).

Second, we found positive relationships between physical complaints in school and cognitive engagement (see Study 1 and Study 2). While cognitive engagement is often associated with positive effects on academic achievement (Lei et al., 2018), certain forms of it may increase physical complaints in school. While the reasons for this association cannot be inferred from these results, educators should be aware of the potential negative side-effects of cognitive engagement. As explained in Article 1, I suppose that the reason for this finding lies within different forms of cognitive engagement (i.e. deep vs. shallow; see Greene, 2015), but this assumption needs to be tested empirically.

Third, the relationship of student well-being, school engagement, and academic achievement with students’ socioeconomic status is concerning. If schools are expected to foster each students’ talents and enable them to reach their full potential, they need to ensure that students from modest socioeconomic backgrounds see their education as positive and engaging.

Fourth, students’ individual composition of well-being indicators should be kept in mind when designing interventions with the goal of fostering well-being. Interventions should be adapted to the individual needs of the participants, in order to achieve an optimal person-activity fit (Lyubomirsky & Layous, 2013). Such an approach

may also enhance students' motivation to participate in an intervention, which is a determinant of its effectiveness (see Article 3).

7.2 Limitations

The studies that form this dissertation have many strengths: the conceptualizations of student well-being and school engagement follow clearly defined models and frameworks which are grounded in theory. The applied methodologies are sophisticated and use modern, effective statistical techniques, such as SEM, RI-CLPM, LPA and LTA. Also, we introduced a new and extensive intervention design. Still, some limitations apply to the studies.

On a conceptual level, the frameworks we used offer some challenges. The six-dimensional well-being model is quite complex and includes various aspects that all have their own theoretical embedding and research tradition, making it difficult to incorporate the characteristics of all dimensions within the limited scope of a journal article. Some of the dimensions we use are in itself constructs that have been conceptualized as multidimensional. For example, academic self-concept can be further split up into multiple dimensions, such as subject-specific facets (O'Mara et al., 2006). The same is true for school engagement. The scale we used to measure the construct is more than 20 years old. Much has happened since then in engagement research, with conceptual refinements and development (Reeve et al., 2025). Newer studies not only added school engagement components such as agentic engagement but also developed more nuanced instruments for measuring the "classic" engagement components. For example, cognitive engagement can be further split up into deep and shallow facets, with different implications for learning and achievement for each facet (Greene, 2015). Although the benefit of using more parsimonious conceptualizations to investigate relations between constructs is to gain insight into their broader associations, research on these associations could profit from studies that focus more deeply on specific dimensions and components.

I argued that student well-being and school engagement are related, but distinct constructs. We could prove this empirically by showing their differential factor structures (see Study 1). Still, I cannot deny that enjoyment in school, positive attitudes toward school, and emotional engagement how me measured it in our studies overlap. Our three-wave RI-CLPM fit the data better when the emotional engagement variables

were removed (see Study 2). Future studies could resolve this issue by using a different measure of emotional engagement which is more distinguished from the well-being dimensions. A promising approach would be the application of an instrument that differentiates between affectual activation and valence (Wong & Liem, 2022).

On the methodological level, some limitations are noteworthy as well. One limitation is the fact that student well-being and school engagement were measured using self-report questionnaires. While student well-being consists of subjective evaluation, it makes sense to measure it using self-reports. Self-reported Engagement, especially the behavioral component, may be subject to bias, however. Future research would profit from using additional measures, such as teacher perceptions of student engagement and observations of classroom behavior, to corroborate the validity of student self-reports.

Further limitations apply to our study sample. First, it was a convenience sample. The class teachers at the participating schools voluntarily chose to let their students take part in the study. This might lead to a bias towards including schools and classes with teachers that had the timely resources to participate and saw a benefit for their students. Also, it was not tested whether the sample is representative of the Swiss lower secondary school population. Second, the sample size, although considerable, poses a challenge to complex statistical analyses. The sample did not hold enough statistical power for multilevel analyses, which could have given more insights on the differential dynamics on the classroom or school level. A bigger sample size would also allow the testing of different competing models, for example serial mediation effects. I assume that with a larger sample, it would have been possible to include all engagement dimensions in one model in Study 2, and to integrate the motivation variables directly into the LTA model as predictors of transition probability in Study 3.

Another limitation lies within our survey schedule. The students filled out a long questionnaire once per year. While this procedure is efficient, it poses two major challenges: first, student well-being and school engagement are dynamic constructs, that may fluctuate daily. Measuring them only once a year cannot capture these fluctuations. Adding more measurement points could reveal more fine-grained dynamics. Second, filling out the questionnaire for 45 minutes or longer afforded a lot of concentration from the students and may have led to bias in their answers due to exhaustion. We tried to counter time-effects by presenting the survey questions in a

random order to the students. Still, such a lengthy questionnaire brings the risk of poorer data quality (Galesic & Bosnjak, 2009).

To sum up, future research in the field of student well-being, school engagement, and academic achievement could benefit from using nuanced, multi-informant instruments to measure the constructs using a large and representative sample to further contextualize and explain the findings from the studies presented in this dissertation.

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