

Revealing associations between students' school-related well-being, achievement goals, and academic achievement

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ABSTRACT

The role of student well-being for academic outcomes is increasingly gaining attention. However, studies on the relationship between well-being and achievement are inconclusive, and evidence regarding associations between well-being and motives for achievement related behavior is scarce. The present study therefore investigates relations between students' school-related well-being, achievement goals and academic achievement, applying multidimensional measures to examine relations between sub-facets. We assumed achievement goals to mediate the relation between well-being and achievement. Data were collected from 1484 Austrian secondary school students. Whereas the mediation assumption was rejected, several effects of the school-related well-being components on achievement goals and academic achievement were identified, including associations of engagement, perseverance, and optimism in school with mastery goals, and optimism and perseverance in school with academic achievement. The study thus contributes to differentiating the evidence regarding the investigated constructs and supports the approach to apply multidimensional measures for both well-being and achievement goals.

1. Introduction

It is widely agreed that education in the 21st century should not be limited to academic learning but develop the whole student. Accordingly, in recent years, the Positive Youth Development (PYD) approach has contributed to a greater research focus on both adolescents' personal strengths and resources, as well as characteristics of their developmental contexts (e.g., Lerner, 2009; Pertegal & Oliva, 2017). This also includes a greater consideration of beneficial school assets and teaching for students' well-being, which is perceived as a great resource for positive development (Waters, 2011). Consequently, a growing body of research has pointed out associations of adolescent well-being with outcomes related to education. These include school attendance (Suldo et al., 2011), prosocial behavior in school (Schwab et al., 2015), higher self-control regarding academic-related tasks (Howell, 2009) and perceived self-efficacy when dealing with school-related challenges (Hascher, 2010). Evidence regarding the role of well-being for academic achievement is, however, inconclusive (e.g., Bücker et al., 2018; OECD, 2017), suggesting that low-achieving students do not automatically

report low levels of well-being, and that high-achieving students do not necessarily experience high well-being. However, a surprisingly small body of research has investigated associations between student well-being and motives for achievement related behavior such as learners' achievement goals. Besides, most of the available studies connecting well-being with achievement and motivational goals neglect both the multidimensionality of well-being (e.g., Kern et al., 2016) and context-related conceptualizations that explicitly take into the school setting (e.g., Hascher & Hagenauer, 2010). The present study addresses these gaps by investigating associations between students' school-related well-being, achievement goals, and academic achievement, applying differentiated and context-related measures.

1.1. Approaches to student's school-related well-being

A closer look at the body of research reveals that conceptualizations of well-being generally vary greatly across different studies. This also applies to operationalizations of student well-being, ranging from global life-satisfaction measures (e.g., OECD, 2017), recoded measures of

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psychopathology (e.g., Karvonen et al., 2018) to context-related measures of the school and learning-climate (e.g., Hascher & Hagenauer, 2010; Niclasen et al., 2018). Consequently, results lack comparability. Especially because well-being has for a long time predominantly been assessed on a global level (e.g., in terms of life-satisfaction), it has been difficult to derive conclusions as well as implications for interventions. This ultimately led to a rethinking of the well-being concept, primarily triggered by the positive psychology movement.

Following the theoretical rationale of positive psychology, well-being is conceptualized as a multidimensional construct, consisting of different building blocks: positive emotions, engagement, relationships, meaning, and accomplishment (PERMA model; Seligman, 2011). This development was accompanied by a rethinking in that well-being does not only include hedonic components in terms of positive affect, but is also understood as a process of self-actualization and unfolding potentials, i.e., eudaemonic well-being (Deci & Ryan, 2008). The application of the PERMA model on adolescents (Kern et al., 2015) resulted in the EPOCH model of adolescent well-being (Kern et al., 2016), consisting of the domains engagement, perseverance, optimism, connectedness, and happiness. Engagement refers to becoming absorbed in and focused on activities and tasks. Perseverance refers to keep striving towards one's goals, even in the face of obstacles. Optimism reflects hopefulness and confidence about the future. Connectedness refers to satisfying mutual relationships and friendships. Happiness reflects positive mood and feeling content. Thus, EPOCH covers a wide range of variables that are associated with living and functioning well and unites domains that have so far been studied as single aspects or have, in different constellations, been put together under the umbrella-term well-being.

However, the initial EPOCH model addresses well-being without context-specificity, limiting the possibility to locate concrete resources as well as specific needs for intervention. Moreover, considering the respective context as highly relevant for the understanding of well-being (Bradshaw et al., 2011), researchers have called for domain-specific measures of school-related well-being (e.g., Huebner et al., 2014). EPOCH was therefore adapted to the school context, resulting in the EPOCH-School (i.e., EPOCH-S and its corresponding measure in German language, the EPOCH-German-School, i.e., EPOCH-G-S; Buerger et al., 2022). Thus, engagement and perseverance according to the EPOCH-S model refer to school tasks and activities. Optimism refers to positive expectations of future academic success and future experiences at school. Connectedness refers to positive relationships in school in general, whether with peers or teachers, and happiness refers to positive mood in school and satisfaction with school life.

1.2. Achievement goal theory

While no clear associations between well-being and achievement have been established in literature (Bücker et al., 2018), substantial variation in achievement related behavior can be explained by learners' achievement goals (Meece et al., 2006), i.e., goal-directed ambitions as motives to engage in achievement situations and learning tasks (Elliot & McGregor, 2001). They are defined as future-focused cognitive representations, guiding behavior to states that individuals seek to either approach or avoid (Hulleman et al., 2010). Initially, research on achievement goals focused on two types of goals: mastery and performance goals. Mastery goals refer to the development of new skills, maximization of potential and to improve on prior successes. Individuals pursuing mastery goals value the process of learning itself and the attainment of mastery is seen as dependent on effort. In contrast, performance goals reflect a valuing of ability and normatively high outcomes. The individual strives to demonstrate ability e.g., by outperforming others, or by achieving successes with little effort (e.g., Ames & Archer, 1988). Initially, both goals were conceptualized as approach-based in terms of orientation towards success. In later refinements, an avoidance facet was added in that mastery and performance goals were also related to the avoidance of failure. This resulted

in the 2×2 achievement goal framework with four independent goal constructs, namely mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance goals (Elliot & McGregor, 2001). When applying the model in the school context, however, the mastery-avoidance construct received little empirical support (Lee & Bong, 2016; Strunk et al., 2020). Given that students are still developing their competences, mastery-avoidance goals may be of greater relevance for older populations. Research on achievement goals in the school context therefore usually applies the trichotomous model of achievement goals (e.g., Lüftenegger et al., 2017), distinguishing between a mastery-approach goal and two types of performance goals: performance-approach and performance-avoidance.

A more recent development in the conceptualization of goals relates to a further differentiation of adolescents' performance goals. Initially, the demonstration of competence was seen as the key element of performance goals (Dweck, 1986). However, Nicholls (1984), for instance, assumes that social comparison processes may also play a role and that those demonstrating their abilities might strive to do so by outperforming others. Subsequently, the conceptualization and measurement of performance goals included either one or both aspects (e.g., Senko & Dawson, 2017). This differentiation between the normative (outperforming others) and the appearance (demonstrating ability) aspect of performance-approach goals can also be applied to the performance-avoidance goal type. Accordingly, students either focus on avoiding the demonstration of lacking abilities (appearance) or performing worse than their peers (normative). Newer measurement instruments such as the Achievement Goal Inventory for Secondary Education (AGI-SE, Lüftenegger et al., 2019) consider both appearance and normative aspects for performance-approach and performance-avoidance goals.

As for the outcomes of the various goals, mastery-approach goals proved empirically most advantageous for intrinsic motivation, performance, and adaptive behavior in performance contexts (Elliot & Church, 1997; Kaplan & Maehr, 1999; Wolters, 2004). However, as for associations with academic achievement in terms of school grades, meta-analyses suggest only small effect of mastery-approach goals (Huang, 2012; Hulleman et al., 2010). Performance-approach goals have been shown to positively relate to achievement, but also to unfavorable consequences such as the use of superficial learning strategies (e.g., Bong, 2009). Avoidance goals, on the other hand, have consistently been associated with negative affect, less performance and less effort (e.g., Bong, 2009; Lau & Nie, 2008; Wolters, 2004). With regard to the differentiation of performance goals, normative performance goals were shown to improve academic achievement, whereas appearance-related performance goals have proven disadvantageous in this respect (Hulleman et al., 2010). Differentiated effects of normative vs. appearance performance goals have also been shown with respect to further educational outcomes, such as competence perceptions and self-regulation (Senko & Dawson, 2017). This provides a strong case for explicitly differentiating between these aspects.

1.3. Linking school-related well-being to achievement goals and academic achievement

Well-being and achievement goals represent two fields of research that have so far hardly been linked – neither empirically, nor theoretically. Only a small number of previous studies point to relations between well-being and achievement goals (Elliot et al., 1997; Kaplan & Maehr, 1999; Linnenbrink, 2005; Phan, 2016; Tuominen-Soini et al., 2012; Zhou et al., 2020). In these studies, positive associations of mastery and approach goals with well-being and negative links between well-being and performance and avoidance goals were shown. These studies' results provide an important basis for further research as they account for fundamental relationships between well-being and achievement goals. However, in terms of their theoretical foundation, most of these studies grounded their assumptions on the basic notion that both constructs,

well-being and achievement goals, represent relevant conditions for psychological functioning. They conceptualized well-being as it was traditionally seen: as a unidimensional outcome in terms of positive affect, respectively the absence of negative affect. Accordingly, achievement goals were treated as antecedents of well-being (e.g., Kaplan & Maehr, 1999; Zhou et al., 2020). However, more recent conceptualizations of well-being, such as EPOCH, underline the eudaemonic aspect of well-being, referring to well-being as a process that enhances development (see for example Deci & Ryan, 2008). In doing so, these positions challenge the theoretical premises of previous studies and suggest to treat well-being as facilitator of adaptive behavioral and motivational patterns. Moreover, the multidimensional approach of conceptualizing well-being that came with this change of perspective also allows for more differentiated assumptions regarding outcomes of well-being.

As for the EPOCH domains, previous studies that investigated resembling constructs provide initial clues regarding associations with both achievement goals and academic achievement. As for achievement goals, there are studies reporting relations between engagement (Tuominen-Soini et al., 2012), perseverance (Wolters, 2004), optimism (Phan, 2016), connectedness (Kaufman & Dodge, 2009; Lazarides & Raufelder, 2017), and happiness (Linnenbrink, 2005; Vassiou et al., 2016) with mastery goals. Also, success oriented, i.e. performance-approach oriented students were found to express higher school engagement (Tuominen-Soini et al., 2012) and higher persistence, respectively perseverance (Elliot et al., 1999). Optimism is considered to lead individuals to expect positive outcomes in achievement-related contexts (Lounsbury et al., 2005), thus adopting approach goals. Relatedness, i.e. connectedness has been found to be negatively related to competition among students (e.g., Loukas et al., 2006), possibly leading to a lesser adoption of normative goals. As for happiness, students with performance-approach goals were found to report higher levels of positive affect (Linnenbrink, 2005; Vassiou et al., 2016). Also, Fredrickson (2001) posits that positive emotions enable individuals to take up approach types of motivation. With regard to performance-avoidance goals, avoidance-oriented students were found to aim at minimizing effort and time spent on studying and thus being less engaged and perseverant (e.g., Tuominen-Soini et al., 2012). Study results also indicate negative associations of performance-avoidance with optimism (Pajares, 2001) and happiness (e.g., Tuominen-Soini et al., 2012; Vassiou et al., 2016).

As for relations of well-being and academic achievement, while studies on general well-being and academic achievement do not provide consistent results (Bücker et al., 2018), a different picture emerges for the single EPOCH dimensions. In this respect, previous findings indicate academic achievement to be positively related to engagement (Casuso-Holgado et al., 2013; Kern et al., 2016), perseverance (Duckworth et al., 2007; Eskreis-Winkler et al., 2014), optimism (Tetzner & Becker, 2018), and happiness (Frenzel et al., 2007; Pekrun et al., 2004). As for connectedness, previous findings are inconsistent. While some studies report students with positive relationships to display higher academic achievement (e.g., King, 2015), others suggest that these associations depend on other factors, such as motivational beliefs, and that no direct relations are identified when further relevant predictors are controlled for (e.g., Chen et al., 2010; Zee et al., 2013).

Overall, previous research indicates that positive associations between the EPOCH dimensions with approach goals and academic achievement can be expected. With all these findings, however, it must be kept in mind that except for the study by Kern et al. (2016), no scales of the EPOCH measure itself were applied in the studies cited above, and more importantly, that constructs were mostly not examined with respect to the school context. Also, it stands to reason that there is no simple linear relationship between well-being and academic achievement, and that mediation processes, e.g. via achievement goals, could play a role.

1.4. The present study

Building up on initial work (e.g., Elliot et al., 1997; Kaplan & Maehr, 1999; Linnenbrink, 2005; Phan, 2016; Tuominen-Soini et al., 2012; Zhou et al., 2020), the present study aims to further substantiate and differentiate available evidence regarding relations between students' school-related well-being, achievement goals, and academic achievement. In order to derive differentiated and in-depth conclusions, we apply multidimensional measures that allow investigating relations between sub-facets of both psychological constructs, as well as associations of the sub-facets of both constructs with academic achievement. In contrast to previous studies, this study explicitly focusses on students' context-specific school-related well-being.

1.4.1. Hypotheses

As general model (see Fig. 1), we assume linear effects of students' school-related well-being on achievement goals and academic achievement, as well as indirect effects on academic achievement, mediated via achievement goals. We accordingly test effects of school-related well-being on achievement goals (hypotheses sets 1–3), effects of achievement goals on academic achievement (hypotheses set 4), direct effects of school-related well-being on academic achievement (hypotheses set 5), and indirect effects of school-related well-being on academic achievement, mediated via achievement goals (hypotheses sets 6–10). Concretely we formulated the following hypotheses:

School-related well-being and achievement goals. Based on previous findings (Kaufman & Dodge, 2009; Lazarides & Raufelder, 2017; Linnenbrink, 2005; Phan, 2016; Tuominen-Soini et al., 2012; Vassiou et al., 2016; Wolters, 2004), we assume mastery approach goals to be positively predicted by all five domains of the EPOCH-S (Hypotheses 1a–1e). Moreover we hypothesize both types of performance-approach goals to be positively predicted by engagement (Tuominen-Soini et al., 2012) and perseverance (Elliot et al., 1999; Hypotheses 2a–2d). Apart from the study by Pajares (2001) who found no statistically significant relation, there are, to the best of our knowledge, no other studies indicating prior assumptions on the relation between optimism and performance-approach goals. However, as optimism is considered to lead individuals to expect positive outcomes in achievement-related contexts (Lounsbury et al., 2005), we assume positive relations with optimism and both types of performance-approach goals (Hypotheses 2e, 2f). We hypothesize connectedness to negatively predict the normative aspect of performance-approach goals (Loukas et al., 2006, Hypothesis 2g) and expect connectedness to be unrelated to the appearance aspect (Hypothesis 2h). Referring to Linnenbrink (2005), Vassiou et al. (2016), and Fredrickson (2001), we hypothesize positive associations between happiness and both performance-approach goals (Hypotheses 2i, 2j). We further hypothesize both types of performance-avoidance goals to be negatively predicted by engagement and perseverance (see e.g., Tuominen-Soini et al., 2012; Hypotheses 3a–3d). Referring to Pajares (2001), we assume optimism to negatively predict both aspects of performance-avoidance goals (Hypotheses 3e, 3f). As for connectedness, previous studies do not consistently indicate significant associations with performance-avoidance goals. While some research identified relatedness to negatively predict performance-avoidance goals (e.g., Duchesne et al., 2017) other studies report no significant associations (e.g., Kaufman & Dodge, 2009). We consider that there might be different relations with respect to the normative and the appearance aspect and assume that connectedness might lead students to less orientate towards performing worse than their peers. Accordingly, we hypothesize connectedness to negatively predict the normative aspect of performance-avoidance goals (Hypothesis 3g) and expect connectedness to be unrelated to the appearance aspect (Hypothesis 3h). As for happiness, based on previous work (Tuominen-Soini et al., 2012; Vassiou et al., 2016), we assume happiness to negatively predict performance-avoidance with respect to the normative (Hypothesis 3i) and the appearance aspect (Hypothesis

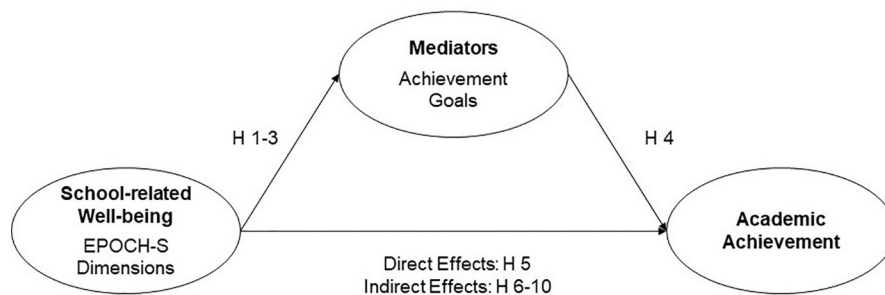


Fig. 1. Overview of the assumed effects in this study.

3j).

Achievement goals and academic achievement. Concerning associations between achievement goals and academic achievement, in line with previous meta-analyses (Huang, 2012; Hulleman et al., 2010), we assume mastery goals to positively predict academic achievement (Hypothesis 4a). Consistent with the findings by Hulleman et al. (2010), we assume the normative aspect of performance goals to positively predict academic achievement (Hypothesis 4b), and appearance-related performance goals to negatively predict academic achievement (Hypothesis 4c). As avoidance goals have consistently been associated with less performance (e.g., Bong, 2009; Lau & Nie, 2008; Wolters, 2004), we hypothesize both aspects of performance-avoidance goals to negatively predict academic achievement (Hypotheses 4d, 4e).

School-related well-being and academic achievement. In line with previous research, we assume engagement (Casuso-Holgado et al., 2013; Kern et al., 2016; Hypothesis 5a), perseverance (Duckworth et al., 2007; Hypothesis 5b) and optimism to positively predict academic achievement (Tetzner & Becker, 2018; Hypothesis 5c). As for connectedness, previous findings are inconsistent. While some studies report students with positive relationships to display higher academic achievement (e.g., King, 2015), others suggest that these associations depend on the level of the students' competence or their motivational beliefs (Chen et al., 2010; Zee et al., 2013) and no direct relations are identified when other relevant predictors are controlled for. Accordingly, we assume that connectedness will be unrelated to academic achievement (Hypothesis 5d). As for happiness, a surprisingly small body of research has linked positive emotions to achievement. These studies report positive relations of achievement with joy, hope, and pride (Frenzel et al., 2007; Pekrun et al., 2004). We accordingly assume happiness to positively predict academic achievement (Hypothesis 5e).

Mediation hypotheses. Based on the conceptualization of well-being as a feature that enhances development (Kern et al., 2016) and on previous research that identified achievement related behavior to be set in motion by the learners' goals (Elliott & Dweck, 1988; Meece et al., 2006), the present study investigates whether achievement goals mediate the effect of well-being on academic achievement. We investigate indirect effects of all EPOCH-S domains on academic achievement, mediated via mastery goals (Hypotheses 6a–6e), both performance-approach goals (Hypotheses 7a–7e, 8a–8e), and both performance-avoidance goals (Hypotheses 9a–9e, 10a–10e).

Previous findings on adolescent well-being found that older adolescents tend to experience lower levels of well-being (e.g., Ronen et al., 2016). There is also consistent evidence for age-related differences with regard to achievement goals (e.g., Bong, 2009), as well as academic achievement (e.g., Wijsman et al., 2016). In addition, there are also some indications in the literature regarding associations of gender with well-being (e.g., Bortes et al., 2021; Palsdottir et al., 2012), achievement goals (e.g., Diaconu-Gherasim et al., 2018; Theis & Fischer, 2017), and academic achievement (e.g., Bortes et al., 2021; Voyer & Voyer, 2014). Thus, we controlled for participants' age and gender in our model.

2. Method

2.1. Sample and procedure

The sample comprised 1484 students (47.5% males, 52.0% females, 0.5% diverse) from 87 secondary school classes in Vienna, Austria. Their mean age was 12.95 years ($SD = 2.10$, $Mdn = 13.00$, $Range = 10-19$). Data were collected in January 2020 as part of a larger research project on well-being and motivation in school. Please note that the present study's data therefore overlaps with the publication by Lüftenegger et al. (2021) about associations of implicit theories of ability and the academic self-concept with school-related well-being. The projects' full codebook and data are available under [link to OSF project retracted for review]. Students filled out paper-pencil questionnaires in their classrooms, supervised by trained research assistants. Participation in the study was completely voluntary. Only those who gave active consent took part. Additionally, parental consent was obtained for participation in the study as well as data usage. Students were assured complete anonymity of their data.

Austrian federal law requires that studies conducted in schools involving students need not be reviewed by institutional review boards, but by local school boards with regard to the fulfillment of ethical guidelines. Accordingly, prior to conducting the research, the complete survey instrument, as well as the planned procedure and a description of the research objectives were submitted to the competent local school review board, which approved of the study. Moreover, all procedures performed were in accordance with the 1964 Helsinki declaration and its later amendments.

2.2. Measures

School-related well-being was assessed using the EPOCH-G-S measure of school-related adolescent well-being (Buerger et al., 2022), a 19-item measure developed for secondary school students. The measures' scales address the five EPOCH-S dimensions with respect to the school context; *engagement* (4 items, e.g., "When I do an activity for school, I enjoy it so much that I lose track of time"; $Composite Reliability = 0.72$), *perseverance* (4 items; e.g., "When I have started a school task, I finish it"; $CR = 0.80$), *optimism* (3 items; e.g., "I am optimistic about my future at school"; $CR = 0.69$), *connectedness* (4 items; e.g., "When something good happens to me, I have people at school who I like to share the good news with"; $CR = 0.72$), and *happiness* (4 items; e.g., "I feel happy at school"; $CR = 0.86$). The measure uses a 5-point response format (1 = not true at all; 5 = completely true). The CR of the overall EPOCH-G-S was 0.87.

Achievement goals were assessed using the Achievement Goal Inventory for Secondary Education (AGI-SE; Lüftenegger et al., 2019). To correspond to the contextual level of our research question, i.e., the general school context, we slightly adapted the items by removing the reference to the school subject. The 19-item measure addresses five different goal constructs with the subscales *Mastery-Approach* (7 items; e.g., "I mainly study so I can expand my knowledge"; $CR = 0.85$), *Performance-Approach Normative* (3 items; e.g., "I mainly study so I will be

better than other students”; $CR = 0.87$), *Performance-Approach Appearance* (3 items; e.g., “I mainly study so other people will be impressed by me”; $CR = 0.86$), *Performance-Avoidance Normative* (3 items; e.g., “I mainly study so I won’t be worse than other students”; $CR = 0.90$), and *Performance-Avoidance Appearance* (3 items; e.g. “I mainly study so I won’t look bad in front of other people”; $CR = 0.91$). All items were measured on a 4-point response format (1 = disagree; 4 = agree).

Academic achievement was operationalized by the most recent grades on exams and in school reports in the subjects German, mathematics and English. These six grades were combined into one academic achievement score ($CR = 0.84$). Grades in Austria use a 5-point grading scale with lower values indicating better performance. The school grades were re-coded for the analyses, so that higher values reflected higher academic achievement. As first graders have not yet received an English grade in their last school report, these data points were missing.

2.3. Data analysis

Data were analyzed using SPSS version 25.0 (IBM, 2017) and Mplus version 8.4 (Muthén & Muthén, 2017). In addition to analyzing internal consistency by calculating composite reliabilities (CR, Raykov, 2009), we conducted confirmatory factor analyses (CFA) to ensure construct validity of the implemented measures. Robust maximum likelihood estimation (MLR) was applied. Goodness-of-fit was evaluated using χ^2 test of model fit, the comparative fit index (CFI), and the root mean square error of approximation (RMSEA). We considered CFI > 0.95 and 0.90, RMSEA and SRMR < 0.06 and 0.08 as cutoff scores accounting for excellent, respectively adequate model fit (Hu & Bentler, 1999). For the main analyses, we conducted statistical mediation analysis to investigate direct effects of the school-related well-being components on achievement goals, direct effects of achievement goals on academic achievement, direct effects of the school-related well-being components on academic achievement, and indirect effects of the school-related well-being components on academic achievement, mediated via achievement goals. The conceptual diagram of the assumed relations is depicted in Fig. 1. For both CFA and the mediation analysis, the hierarchical data structure of students nested within school classes was controlled for using cluster-robust standard errors (Bardach et al., 2020).

The proportion of missing values ranged from 0.1% to 1.4% on the item level for school-related well-being and achievement goals. Because an alternative grading scheme was used in 15 school classes and because first graders were not yet graded in English in their last school report, the missing values for academic achievement were between 16.2% and

26.8% on the item level. To deal with the missing values, the full information maximum likelihood approach (FIML) implemented in MPlus was employed.

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. When interpreting the results, rather than relying on statistical significance, we focused on the effect sizes of the regression parameters. In doing so, we followed Cohen (1988), according to whom standardized values varying around 0.10, 0.30, and 0.50 reflect small, moderate, and large effects.

3. Results

3.1. Preliminary analyses

The results of the CFA models revealed adequate to excellent fit indices for the EPOCH-G-S ($\chi^2 (142) = 684.796, p < .001, RMSEA = 0.051, SRMR = 0.045, CFI = 0.934$), excellent fit indices for the AGI-SE, ($\chi^2 (142) = 519.573, p < .001, RMSEA = 0.042, SRMR = 0.042, CFI = 0.974$), and acceptable CFI and excellent SRMR for academic achievement ($\chi^2 (6) = 160.492, p < .001, RMSEA = 0.14, SRMR = 0.04, CFI = 0.91$). Table 1 provides bivariate latent correlations, descriptive statistics, and composite reliabilities for all variables.

3.2. Mediation analyses

The results of the mediation analysis as well as bias-corrected bootstrapping confidence intervals for each of the effects are presented in Table 2. The effects of the control variables (age and gender) are shown in Table S1 in the Supplemental material.

3.2.1. Effects of school-related well-being on achievement goals (H 1-3)

In line with Hypotheses 1a–1c, engagement, perseverance, and optimism, positively predicted mastery goals with moderate effect sizes, respectively. Contrary to Hypotheses 1d and 1e, connectedness and happiness were not significantly related to mastery goals. In line with Hypotheses 2a and 2b, engagement positively predicted both types of performance-approach goals with a moderate and a large effect. Contrary to Hypotheses 2c and 2d, perseverance was not statistically significantly related to the normative aspect of performance-approach goals and was statistically significantly negatively related to the appearance aspect with a moderate effect. Contrary to Hypotheses 2e and 2f, as well as 2i and 2j, here were no statistically significant associations of optimism and happiness with performance-approach goals.

Table 1
Bivariate latent correlations, descriptive statistics and composite reliabilities.

	1	2	3	4	5	6	7	8	9	10	11
1. Engagement	–										
2. Perseverance	0.77	–									
3. Optimism	0.52	0.64	–								
4. Connectedness	0.17	0.24	0.50	–							
5. Happiness	0.45	0.52	0.84	0.56	–						
6. Mastery-approach	0.66	0.67	0.62	0.24	0.51	–					
7. Performance-approach normative	0.32	0.29	0.22	–0.00	0.15	0.36	–				
8. Performance-approach appearance	0.29	0.15	0.11	–0.03	0.06	0.26	0.76	–			
9. Performance-avoidance normative	0.22	0.22	0.04	–0.04	0.05	0.22	0.63	0.62	–		
10. Performance-avoidance appearance	0.25	0.16	0.02	–0.04	0.01	0.24	0.57	0.68	0.75	–	
11. Achievement	0.17	0.35	0.36	0.16	0.21	0.24	0.07	–0.04	0.02	–0.02	–
12. Age	–0.24	–0.29	–0.19	–0.02	–0.28	–0.19	–0.11	–0.10	–0.16	–0.20	–0.33
Number of items	4	4	3	4	4	7	3	3	3	3	6
<i>M</i>	2.93	3.70	3.43	4.00	3.61	3.00	2.19	2.14	2.81	2.51	3.37
<i>SD</i>	0.86	0.82	0.87	0.80	0.93	0.63	0.94	0.91	0.98	0.98	0.89
Skewness	0.08	–0.44	–0.37	–1.08	–0.48	–0.51	0.37	0.43	–0.44	–0.05	–0.22
Kurtosis	–0.74	–0.52	–0.48	0.87	–0.45	–0.42	–1.09	–0.97	–1.03	–1.22	–0.93
Range	4	4	4	4	4	3	3	3	3	3	5
CR	0.72	0.80	0.69	0.72	0.86	0.85	0.87	0.86	0.90	0.91	0.84

Note. $N = 1484$. CR = Composite Reliability. Statistically significant results at $\alpha = 0.05$ are in boldface.

Table 2
Results of mediation analysis.

	Est. (SE)	Std. Est.	95% CI
Direct effects			
Engagement → mastery-approach	0.32 (0.05)	0.34	[0.22, 0.43]
Engagement → performance-approach normative	0.31 (0.09)	0.25	[0.14, 0.51]
Engagement → performance-approach appearance	0.53 (0.11)	0.45	[0.33, 0.76]
Engagement → performance-avoidance normative	0.17 (0.09)	0.13	[-0.01, 0.36]
Engagement → performance-avoidance appearance	0.43 (0.08)	0.33	[0.28, 0.60]
Perseverance → mastery-approach	0.20 (0.07)	0.21	[0.06, 0.32]
Perseverance → performance-approach normative	0.08 (0.10)	0.06	[-0.12, 0.26]
Perseverance → performance-approach appearance	-0.24 (0.11)	-0.20	[-0.46, -0.04]
Perseverance → performance-avoidance normative	0.25 (0.11)	0.19	[0.04, 0.47]
Perseverance → performance-avoidance appearance	-0.03 (0.10)	-0.02	[-0.22, 0.16]
Optimism → mastery-approach	0.26 (0.10)	0.32	[0.10, 0.47]
Optimism → performance-approach normative	0.18 (0.12)	0.17	[-0.04, 0.45]
Optimism → performance-approach appearance	0.12 (0.14)	0.12	[-0.14, 0.41]
Optimism → performance-avoidance normative	-0.20 (0.14)	-0.18	[-0.50, 0.05]
Optimism → performance-avoidance appearance	-0.12 (0.13)	-0.10	[-0.39, 0.12]
Connectedness → mastery-approach	-0.04 (0.05)	-0.03	[-0.15, 0.06]
Connectedness → performance-approach normative	-0.12 (0.09)	-0.06	[-0.33, 0.04]
Connectedness → performance-approach appearance	-0.04 (0.09)	-0.03	[-0.24, 0.12]
Connectedness → performance-avoidance normative	-0.03 (0.09)	-0.02	[-0.23, 0.12]
Connectedness → performance-avoidance appearance	0.09 (0.08)	0.04	[-0.09, 0.23]
Happiness → mastery-approach	-0.01 (0.07)	-0.01	[-0.14, 0.12]
Happiness → performance-approach normative	-0.11 (0.09)	-0.11	[-0.31, 0.06]
Happiness → performance-approach appearance	-0.13 (0.09)	-0.14	[-0.33, 0.04]
Happiness → performance-avoidance normative	0.02 (0.11)	0.02	[-0.19, 0.24]
Happiness → performance-avoidance appearance	-0.12 (0.11)	-0.11	[-0.32, 0.09]
Mastery-approach → achievement	0.02 (0.10)	0.01	[-0.19, 0.20]
Performance-approach normative → achievement	0.09 (0.09)	0.08	[-0.09, 0.26]
Performance-approach appearance → achievement	-0.15 (0.09)	-0.13	[-0.31, 0.04]
Performance-avoidance normative → achievement	0.03 (0.08)	0.03	[-0.11, 0.18]
Performance-avoidance appearance → achievement	-0.06 (0.06)	-0.06	[-0.19, 0.05]
Engagement → achievement	-0.25 (0.12)	-0.19	[-0.49, -0.03]
Perseverance → achievement	0.33 (0.15)	0.24	[0.04, 0.62]
Optimism → achievement	0.73 (0.21)	0.61	[0.41, 1.23]
Connectedness → achievement	0.14 (0.12)	0.07	[-0.10, 0.35]
Happiness → achievement	-0.51 (0.16)	-0.47	[-0.88, -0.26]
Indirect effects			
Engagement → achievement			
Mastery-approach	0.01 (0.03)	0.00	[-0.06, 0.07]
Performance-approach normative	0.03 (0.03)	0.02	[-0.02, 0.10]

Table 2 (continued)

	Est. (SE)	Std. Est.	95% CI
Performance-approach appearance	-0.08 (0.05)	-0.06	[-0.19, 0.01]
Performance-avoidance normative	0.01 (0.02)	0.00	[-0.02, 0.05]
Performance-avoidance appearance	-0.03 (0.03)	-0.02	[-0.09, 0.02]
Perseverance → achievement			
Mastery-approach	0.00 (0.02)	0.00	[-0.04, 0.04]
Performance-approach normative	0.01 (0.01)	0.01	[-0.01, 0.05]
Performance-approach appearance	0.04 (0.03)	0.03	[0.00, 0.12]
Performance-avoidance normative	0.01 (0.02)	0.01	[-0.03, 0.07]
Performance-avoidance appearance	0.00 (0.01)	0.00	[-0.01, 0.04]
Optimism → achievement			
Mastery-approach	0.00 (0.03)	0.00	[-0.06, 0.06]
Performance-approach normative	0.02 (0.02)	0.01	[-0.01, 0.08]
Performance-approach appearance	-0.02 (0.03)	-0.02	[-0.11, 0.01]
Performance-avoidance normative	-0.01 (0.03)	-0.01	[-0.09, 0.02]
Performance-avoidance appearance	0.01 (0.01)	0.01	[-0.01, 0.06]
Connectedness → achievement			
Mastery-approach	0.00 (0.01)	0.00	[-0.02, 0.01]
Performance-approach normative	-0.01 (0.02)	-0.01	[-0.07, 0.01]
Performance-approach appearance	0.01 (0.02)	0.00	[-0.01, 0.06]
Performance-avoidance normative	0.00 (0.01)	0.00	[-0.03, 0.01]
Performance-avoidance appearance	0.01 (0.01)	0.00	[-0.04, 0.01]
Happiness → achievement			
Mastery-approach	0.00 (0.01)	0.00	[-0.02, 0.01]
Performance-approach normative	-0.01 (0.01)	-0.01	[-0.06, 0.01]
Performance-approach appearance	0.02 (0.02)	0.02	[0.00, 0.09]
Performance-avoidance normative	0.00 (0.01)	0.00	[-0.01, 0.03]
Performance-avoidance appearance	0.01 (0.01)	0.01	[-0.01, 0.05]
Explained variance (R²)			
Mastery-approach	0.56		
Performance-approach normative	0.14		
Performance-approach appearance	0.12		
Performance-avoidance normative	0.08		
Performance-avoidance appearance	0.12		
Achievement	0.28		

Note. Est. = unstandardized parameter estimate; SE = standard error; Std. Est. = standardized estimate; 95% CI = 95% bias-corrected bootstrap confidence interval; statistically significant results at $\alpha = 0.05$ are in boldface.

Connectedness was also unrelated to both performance-approach goals, contradicting Hypothesis 2g, but supporting Hypotheses 2h. Contradicting Hypotheses 3a and 3b, engagement was unrelated to the normative aspect of performance-avoidance goals and positively predicted the appearance aspect with a moderate effect. Contrary to Hypotheses 3c and 3d, perseverance positively predicted the normative aspect with a small effect but was unrelated to the appearance aspect. As optimism was unrelated to both aspects of performance-avoidance goals, Hypotheses 3e and 3f were not supported. Connectedness was unrelated to both aspects of performance-avoidance, thus contradicting Hypothesis 3g, but supporting Hypothesis 3h. Hypotheses 3i and 3j were not supported, as happiness was unrelated to both performance-avoidance goals.

3.2.2. Effects of achievement goals on academic achievement (H 4)

Contrary to Hypotheses 4a–4e, no significant associations between achievement goals and academic achievement were identified.

3.2.3. Direct effects of school-related well-being on academic achievement (H 5)

Contrary to Hypothesis 5a, engagement was significantly negatively related to academic achievement with a small effect. In line with Hypotheses 5b–5d, both perseverance and optimism positively predicted academic achievement with a moderate and a large effect, whereas connectedness was unrelated to academic achievement. Contrary to

Hypothesis 5e, happiness was not positively, but negatively related to academic achievement with a large effect.

3.2.4. Indirect effects of school-related well-being on academic achievement via achievement goals (H 6–10)

Contrary to Hypotheses sets 6–10, no significant indirect effects of school-related well-being on academic achievement, mediated via achievement goals were identified.

A table summarizing all supported or rejected hypotheses is provided in the Supplemental material (Table S2).

4. Discussion

The present study aimed to further differentiate and substantiate evidence regarding relations between students' school-related well-being, achievement goals, and academic achievement. As a general model, we assumed school-related well-being to relate to achievement goals and academic achievement and hypothesized that achievement goals mediate the effect of school-related well-being on academic achievement. Several identified effects were in line with our hypotheses and previous findings, speaking in favour of the robustness of effects when examining the constructs explicitly with reference to the school setting. These results include, for instance, associations of mastery goals with engagement, perseverance, and optimism (Phan, 2016; Tuominen-Soini et al., 2012; Wolters, 2004), performance-approach goals and engagement (Tuominen-Soini et al., 2012), and relations of optimism and perseverance with academic achievement (Duckworth et al., 2007; Eskreis-Winkler et al., 2014; Tetzner & Becker, 2018). In total, our model accounted for 56% of the explained variance for mastery goals and 28% of the explained variance for academic achievement. Thus, although the effects of the individual EPOCH-S components tended to be in the medium range, cumulatively, a clear association is evident.

Some results showed discrepancies with previous findings as well as our hypotheses. First, contrary to our assumptions and previous studies (Bong, 2009; Hulleman et al., 2010; Kaplan & Maehr, 1999; Lau & Nie, 2008; Wolters, 2004), no significant associations between achievement goals and academic achievement emerged. Consequently, the mediation assumption had to be rejected. While this seems surprising at a first glance, meta-analyses (e.g., Hulleman et al., 2010) suggest only small effects of the various goals on academic achievement. They also state that publication status moderates the reported effects of achievement goals on performance outcomes. Accordingly, the so-called file-drawer problem might represent a possible bias in the field of achievement goal research in this respect. On the other hand, it must be recognized that the indicators for academic achievement in our study included grades from only three different subjects (i.e., mathematics, German, and English). A more comprehensive measure of academic achievement, including natural and social sciences, could have accounted for further aspects of school performance beyond logical-linguistic and logical-mathematical abilities.

Further discrepancies with previous findings might be explained by differences in operationalizations across studies. For instance, in contrast to our hypothesis and former work (Kaufman & Dodge, 2009; Lazarides & Raufelder, 2017), connectedness did not significantly relate to mastery goals. However, while the EPOCH-S addresses students' connectedness on an individual level, (e.g., "When something good happens to me, I have people at school who I like to share the good news with"), studies that identified connectedness to relate to mastery goals applied measures focussing on perceived connectedness in class (e.g., "Whenever a student does not know what to do, the other students in this class will help", Lazarides & Raufelder, 2017). In this respect, previous studies suggest that a favourable class climate might positively impact the adoption of mastery-goals, while the present study suggests that perceived connectedness on an individual level is unrelated to mastery goals. However, on a general level, it must also be pointed out that the EPOCH-S does not distinguish between connectedness with

peers or teachers. While peer connectedness is not a factor clearly associated with academic achievement (e.g., Chen et al., 2010), which is in line with the present study's results, various authors emphasize the relevance of positive relations between teachers and students for achievement in school (e.g., Pertegal & Oliva, 2017). Therefore, it might be beneficial to add this differentiation in future studies to obtain even more informative results.

Moreover, in contrast to previous work (Pajares, 2001), optimism was not negatively, but unrelated to performance-avoidance goals. However, according to the EPOCH-S, optimism in school does not only relate to school-related challenges, but to one's future at school as a whole. Given that everyday life in school is not only shaped by performance situations, but by an abundance of social interactions as well as the general school and learning-climate (e.g., Hascher & Hagenauer, 2010; Niclasen et al., 2018), it is a little less surprising that optimism was not significantly related to performance-avoidance goals in this study.

Further results that differ from previous findings may be related to the adoption of a multidimensional model of well-being. Accordingly, when investigating associations of multiple components of well-being with other constructs, all well-being components are included in the analysis and thus controlled for when deriving single effects. In our study, this is particularly evident for effects of happiness. Contrary to our hypotheses and former work indicating positive associations (Frenzel et al., 2007; Pekrun et al., 2004), happiness was negatively related to academic achievement with a large effect. However, in the present study, in contrast to previous work, the effect of happiness was controlled for by the effects of other components of school-related well-being such as optimism. Optimism, in turn, was positively related to academic achievement with a large effect. In this respect, the present study suggests that happiness in school might be related to lower academic achievement, when further relevant components of school-related well-being are controlled for. Likewise, contrary to our hypotheses and former work (Fredrickson, 2001; Linnenbrink, 2005; Vassiou et al., 2016) happiness was unrelated to both performance-approach goals, suggesting that happiness is unrelated to performance-approach goals, when taking the influence of other components of school-related well-being into account.

Finally, another surprising finding is that engagement did not only positively relate to approach goals in line with our hypotheses, but also to performance-avoidance appearance goals. Contrary to a previous study (Tuominen-Soini et al., 2012), engagement was unrelated to normative performance-avoidance goals. This study, however, relied on a sample with different characteristics (e.g., with respect to age) and applied a different methodology. Thus, while our study suggests that engagement may be relevant to goal-directed behavior in general, except for the avoidance of demonstrating normative incompetence, further studies are needed to investigate these associations more thoroughly.

Overall, manifold differentiated patterns for the investigated associations depending on sub-facets of the constructs were identified. For instance, perseverance was unrelated to the normative aspect (outperforming others) of performance-approach goals, and negatively associated with the appearance aspect (demonstrating ability). This indicates that perseverance might not be relevant for the adoption of normative performance-approach goals but hinder the adoption of performance-approach appearance goals. These and further findings of the present study support applying models and measures accounting for the multidimensionality of both well-being and achievement goals.

4.1. Limitations and future directions

The present study included a large sample size and applied highly differentiated measures with explicit reference to the school context, thus expanding and refining the body of literature. Despite these noteworthy strengths, its cross-sectional nature limits the possibility for causal inferences. How achievement goals and academic achievement

develop along with the school-related well-being components over time, and whether there are bidirectional effects, needs to be examined in a longitudinal study. At present, there is a lack of both clear theory as well as evidence from longitudinal studies on this matter. Specifically, as discussed above, future longitudinal studies should include more comprehensive measures of academic achievement beyond grades in three different subjects. It might also be beneficial to further differentiate certain components of school-related well-being in order to examine their association with academic achievement. For example, distinguishing between connectedness with peers and connectedness with teachers would provide greater clarity. Likewise, it would be conceivable to examine effects of the connectedness, but also the happiness component more comprehensively, namely in terms of school connectedness in the sense of school identification or sense of belonging, and happiness in the sense of school satisfaction. This could provide added value to clarify associations of school-related well-being with both motivational and achievement-related factors. Also, it must be acknowledged that students tend to have more than one goal orientation. The bivariate correlations of the goals in our study also suggest this. Person-centered approaches that examine various goal profiles (see for example the study by Tuominen-Soini et al., 2012) would fruitfully complement this study's findings. In this respect, the present study represents an initial, variable-oriented exploration on how students' school-related well-being, achievement goals, and academic achievement are associated, when the multidimensionality of school-related well-being and achievement goals is accounted for, and the school setting is explicitly considered. For educational practice, our findings cautiously suggest that interventions to promote school-related well-being in terms of the EPOCH-S dimensions could impact both learners' achievement goals and academic achievement. Depending on the desired outcome - e.g., to foster approach goals – this study offers clues as to which dimensions of school-related well-being are most efficient to be promoted. Conducting intervention studies and thereby measuring changes in achievement goals and academic achievement would support the identified effects as well as the mechanisms hypothesized in this study. Intervention approaches of this type are, in turn, consistent the PYD approach, according to which setting youth on positive developmental trajectories will lead them to reach their potentials and meet the challenges they may face (Taylor et al., 2017).

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Declaration of competing interest

We have no conflicts of interest to disclose.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.lindif.2022.102140>.

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