

Striving to learn and feeling well? The effects of students' achievement goal-orientation on their psychological and physical well-being over one school year

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Abstract Students' motivation and well-being are not only highly relevant for success at school, they also facilitate students' inherent growth, optimal functioning, and health. However, both motivation and well-being tend to decline over the school year, presenting a risk for students' academic achievement and health. Although both constructs are closely related, longitudinal evidence of their relationship is still lacking. Following achievement goal theory and the broaden-and-build theory of positive emotions, it is the goal of the current study to explore how achievement goal-orientation is related to students' physical and psychological well-being. A total of 733 seventh- and eighth-grade students ($M_{Age} = 14.73$, $SD = 0.69$; 52% girls) participated in the study, completing the questionnaire once at the beginning and again at the end of the school year. By applying path analysis in Mplus, this study shows that students who tend to exhibit an avoidance goal orientation at the beginning of the school year tend to report lower levels of psychological and physical well-being at the end of the school year. Students who exhibit appearance performance approach goals reported higher levels of physical well-being at the end of the school year. Results also indicate that boys tend to report higher physical and psychological well-being at both time points.

Keywords Students' physical and psychological well-being · Path analysis · Achievement goal-orientation

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Motiviert lernen und sich dabei wohl fühlen? Die Auswirkungen der Leistungsmotivation von Schüler:innen auf ihr psychisches und physisches Wohlbefinden im Verlauf eines Schuljahres

Zusammenfassung Die Motivation und das Wohlbefinden von Schüler:innen (SuS) sind nicht nur für den schulischen Erfolg von großer Bedeutung, sondern fördern auch das innere Wachstum, die optimale Funktionsweise und die Gesundheit. Allerdings nehmen die Motivation sowie das Wohlbefinden tendenziell im Laufe des Schuljahres ab, was ein Risiko für den schulischen Erfolg und die Gesundheit der SuS darstellt. Obwohl beide Konstrukte eng miteinander verbunden sind, fehlt es bislang an längsschnittlichen Studien zum Zusammenhang von Motivation und Wohlbefinden. Basierend auf der Theorie der Lern- und Leistungsmotivation und der „broaden-and-build“ Theorie positiver Emotionen untersucht die vorliegende Studie, wie die Leistungsmotivationsorientierung mit dem physischen und psychischen Wohlbefinden der SuS zusammenhängt. Insgesamt nahmen 733 SuS der siebten und achten Klasse ($M_{\text{Alter}} = 14,73$, $SD = 0,69$; 52 % Mädchen) an der Studie teil und füllten den Fragebogen sowohl zu Beginn als auch am Ende des Schuljahres aus. Die Ergebnisse einer Pfadanalyse in Mplus zeigen, dass SuS, die zu Beginn des Schuljahres eine Vermeidungsmotivationsorientierung aufweisen, am Ende des Schuljahres ein tendenziell niedrigeres psychisches und physisches Wohlbefinden berichten. SuS, die eine Annäherungs-Leistungszielorientierung (performance-approach goal orientation) berichten, zeigen ein höheres physisches Wohlbefinden am Ende des Schuljahres. Die Ergebnisse zeigen auch, dass Jungen tendenziell zu beiden Zeitpunkten ein höheres physisches und psychisches Wohlbefinden berichten.

Schlüsselwörter Lern- und Leistungsmotivation · Physisches und psychisches Wohlbefinden · Pfadanalyse

1 Introduction

Students' motivation is not only a strong contributor to their success at school (Valiente et al. 2012), it also facilitates their inherent growth, optimal functioning, and health (Hascher and Hagenauer 2010; Ryan and Deci 2000). However, students' motivation and well-being tend to decline throughout their school lives (Marquez and Long 2021; Obermeier et al. 2022; Wigfield and Eccles 2001), leading to poor health (Wormington et al. 2012; Woods and Pooley 2016) and impaired academic achievement (Cárdenas et al. 2022). Students' motivation is significantly influenced by their achievement goal orientation, which represents a cognitive state of the future that a student is working to either achieve or avoid (Elliot and Fryer 2008). Hence, goals activate, initiate, guide, amplify, and sustain behaviour, particularly when students engage in academic work (Geen 1995; Reeve 1996). Consequently, achievement goal-orientations can impact students' well-being by influencing students' attitudes, behaviours, and experiences in academic settings (Holzer et al. 2022; Wirthwein and Steinmayr 2021). This relationship between students' achievement goal-orientations and well-being is of immense importance for school practice and is noted in

various theories (e.g., achievement goal theory; Ames 1992; Chazan et al. 2022; Elliot 1999). Nonetheless, longitudinal empirical evidence amongst secondary school students is lacking.

2 Students' well-being

Well-being encompasses a state of overall health, happiness, and satisfaction, including physical, psychological, emotional, and social aspects (OECD 2017; Ryff 1995). It includes mental clarity, emotional resilience, physical health, and a sense of fulfilment in one's personal and social relationships. A high level of well-being is characterised by frequent and intense positive states (e.g., joy, satisfaction) and a low level of negative states (Hascher 2004). In this study, we define "well-being" in accordance with Hernandez et al. (2017), who assess well-being through the two dimensions of psychological and physical health. Hence, we consider students to have a high level of well-being when they experience a positive state of mind, feelings of happiness, and contentment in the absence of mental and physical complaints (Pressman et al. 2013).

In the school context, studies have shown that students who report high levels of well-being tend to achieve better academic performance (Hascher and Edlinger 2009), adapt more effectively to processes of change (Putwain et al. 2020), show curiosity in learning new things (Hoferichter et al. 2020), and are more capable of focusing on their studies (Kiuru et al. 2020). Furthermore, well-being serves as a protective resource for students when they are confronted with learning difficulties and school-related problems. Research shows that students with high well-being generally exhibit greater resilience and better coping mechanisms when dealing with academic challenges (Hascher and Hagenauer 2020) and feel less stressed (Tomczyk and Hoferichter 2022).

Ultimately, well-being amongst students requires the promotion of a positive emotional life, achieved through a harmonious balance between specific environmental factors and individuals' personal needs and expectations regarding school (Engels et al. 2004). Therefore, an achievement goal-orientation may contribute to well-being, as shown in the following sections.

3 Students' achievement goal-orientations

In achievement goal theory (Ames 1992; Chazan et al. 2022; Elliot 1999), goals are commonly operationalised as either "mastery" or "performance" oriented. Mastery goals involve the pursuit of personal skill development and curiosity and the exploration of new challenges, and they facilitate intrinsic motivation (Ryan and Deci 2000). In contrast, performance goals include demonstrating one's abilities to others (performance-approach goals) or concealing any perceived shortcomings (performance-avoidance goals; Ames 1992; Elliot 1999). Some research further distinguishes performance goals by differentiating between normatively-focused (surpassing others) and appearance-based performance goals (appearing competent, ir-

respective of one's own competence; Daumiller 2023; Senko et al. 2011; Wirthwein and Steinmayr 2021). The current study applies the trichotomous framework (Elliot and Harackiewicz 1996) by distinguishing mastery goals, performance-approach goals (additionally, normative and appearance approach goals), and performance-avoidance goals.

Whilst goal theory (Dweck 1986) originally proposed mastery and performance goals as desired-undesired dualisms of student motivation, assuming that students pursued either mastery or performance goals, various studies have indicated that both can offer advantages and be sought simultaneously (Darnon et al. 2018; Harackiewicz et al. 1998; Pintrich 2000; Rawsthorne and Elliot 1999; Senko 2019). Therefore, it is not constructive to consider performance goals as maladaptive or contrary to mastery goals. In fact, correlational studies have revealed that mastery and performance goals are positively related (Barron and Harackiewicz 2001; Darnon et al. 2006, 2018).

4 The interplay between students' goal-orientations and their well-being

As well-being involves positive emotional states and traits, we firstly outline the relationship between students' goal-orientations and their emotions and then highlight the connection with their well-being. Seeking to connect mastery and performance goals with students' emotional experiences in the academic setting, numerous studies have explored how goal-orientation influences emotion, following the rationale that mastery goals entail positive activating emotions such as enjoyment and excitement (Datu et al. 2022; Pekrun et al. 2006; Ryan and Deci 2000; Schweder 2020; Sheldon and Kasser 1998), which consequently enhance students' well-being. In fact, Vanderammen et al. (2014) investigated a wide range of positive and negative emotions associated with intrinsic motivation, including positive associations with enthusiasm, cheerfulness, optimism, content, calmness, and relaxation, as well as negative associations with less favourable emotions in the learning context, such as feeling tense, gloomy, depressed, worried, miserable, and uneasy. However, students who strive to avoid failure and attempt to outperform others centre their activities around a negative object, which may present a source of stress, erode enjoyment of learning, and impair their well-being (Chen et al. 2000; Elliot and Sheldon 1997, 1998; Harackiewicz et al. 2002; Pekrun et al. 2006). Furthermore, performance-avoidance goals have been associated with negative outcomes, including feelings of hopelessness and shame and increased levels of stress and anxiety (Pekrun et al. 2006; Smith et al. 2002; Sideridis 2005).

In addition to research on school students, examining other populations could provide valuable insights into the underlying psychological processes involved in the relationship between achievement goals and well-being. This broader approach may help to identify generalizable mechanisms (Daumiller and Dresel 2022).

Research investigating university lecturers has found that mastery goals are positively related to enjoyment and negatively associated with boredom and anger. Both mastery and performance-approach goals contribute to instructors' well-being over

the semester. Furthermore, performance appearance approach goals have a positive relationship with pride, whereas performance appearance avoidance goals are positively related to shame and anxiety (Rinas et al. 2020). Further analyses have revealed that instructors' positive affect is related to changes in their mastery goals and negatively associated with work avoidance goals (Rinas et al. 2023).

The broaden-and-build theory of positive emotions (Fredrickson 2001) concerns how emotions relate to motivation. In the context of learning, this theory suggests that positive emotions associated with intrinsic or mastery goal orientation result in expanded thought-action repertoires, leading to greater resources and a heightened positive affect. Hence, positive learning emotions set in motion upward spirals, leading to improved well-being (Fredrickson and Joiner 2002). The link between positive emotions and enhanced resources has also been emphasised by neuroscientific research suggesting that intrinsically motivated behaviour is supported by dopaminergic systems, rewarding and encouraging the individual's behaviour whilst cultivating well-being (Alexander et al. 2021; Di Domenico and Ryan 2017).

In sum, there is empirical evidence of a close relationship between students' achievement goals and emotional experiences in the academic context, as supported by the broaden-and-build theory of positive emotions (Fredrickson 2001). However, longitudinal research investigating how achievement goal-orientations relate to students' well-being remains scarce.

To date, few studies under the framework of achievement goal theory (Ames 1992; Elliot 1999) have investigated how achievement goal-orientation relates to school students' well-being, and those few studies were mainly cross-sectional in nature. The general finding is that a mastery goal-orientation is linked to higher well-being, compared to performance goal-orientation (Kaplan and Maehr 1999; Mastrotheodoros et al. 2017; Tian et al. 2017). However, in these studies, "well-being" has been used as an umbrella term, under which, for example, aspects such as teachers' instructional methods and quality (Tian et al. 2017), quality of peer relationships, general emotional tone, behavioural control (Kaplan and Maehr 1999), psychological symptoms (e.g., depression and anxiety), and self-esteem (Mastrotheodoros et al. 2017) are subsumed. Hence, so far, it remains unclear how mastery and performance goal-orientations relate to students' psychological and physical well-being over the school year. However, one longitudinal study and several person-oriented studies have indicated that students oriented towards mastery goals in the academic context tend to experience positive learning emotions and enjoy learning. For example, a longitudinal study with Chinese secondary school students found that students who exhibit mastery goal-orientations and who align themselves with other mastery goal-oriented students in their class report higher school satisfaction and stronger positive affect over one school year (Zhou et al. 2020). Person-oriented longitudinal studies have also indicated that school students assigned to a mastery-goal profile are more likely to experience joy during learning (Zhang et al. 2023), whereas students with performance-avoidance goals revealed less favourable patterns of well-being (Tuominen-Soini et al. 2012).

The link between school students' achievement goal-orientation and their well-being is highly important, as secondary school students' intrinsic motivation and pursuit of mastery goals—along with their well-being—tend to decline over time

(Anderman et al. 1999; Gnambs and Hanfstingl 2016; Martin and Steinbeck 2017; Marquez and Long 2021; Obermeier et al. 2022; Raufelder et al. 2022; Tuominen et al. 2020; Twenge et al. 2018; Wigfield and Eccles 2001), which presents a risk factor for academic success and mental health (Cárdenas et al. 2022), as well as life satisfaction, innovative performance, and later job satisfaction (Hammond et al. 2011). Therefore, the current study was designed to investigate how mastery and performance approaches and avoidance goal-orientation relate to students' physical and psychological well-being, with the aim of deepening our understanding of this relationship.

5 Aims & hypotheses

For students, achievement goal-orientation and well-being are important assets for educational attainment, health, and satisfaction in life (Elliot et al. 2005; Inchley et al. 2016; Wang et al. 2017). However, motivation and well-being often diminish as the student's school career progresses (Marquez and Long 2021; Obermeier et al. 2022; Wigfield and Eccles 2001). Therefore, understanding the relationship between achievement goal-orientation and well-being among secondary school students could benefit them by helping to foster their motivation and well-being.

The current study aims to close the identified research gap by investigating how mastery goal-orientation, performance-approach goal-orientation (normative and appearance performance-approach goals), and performance-avoidance goal-orientation relate to students' physical and psychological well-being over one school year.

Following the broaden-and-build theory of positive emotions (Fredrickson 2001), as well as the rationale that mastery goals are linked to positive emotions (Datu et al. 2022; Elliot and Sheldon 1997, 1998; Schweder 2020; Sheldon and Kasser 1998), we expect students oriented towards mastery goals will report higher levels of psychological and physical well-being at the beginning (cross-sectional) and the end of the school year (longitudinal) than students with less orientation towards mastery goals (hypothesis 1).

However, whilst the literature clearly indicates that mastery goals have a positive impact on learning and positive affect, explorations of performance approach and avoidance goal orientation and students' outcomes are not as straight forward. As longitudinal studies investigating performance approach and avoidance goals and well-being are scarce, we do not formulate directed hypotheses and instead follow an exploratory approach.

6 Methods

6.1 Sample and procedures

A total of 733 students ($M_{Age} = 14.73$, $SD = 0.69$; 52% girls) from the seventh and eighth grade of 12 schools in northern Germany participated in an explorative longitudinal questionnaire study with two measurement time points—at the beginning

(T1) and the end (T2) of the 2018–2019 school year. In advance of the study, authorisation was acquired from the Ministry of Education and Child Day Care of Mecklenburg-Western Pomerania, as well as from the data protection officer and the ethics committee of the university medical centre. Consent forms were then sent to both the student participants and their parents. The data collection was carried out by trained university staff members during two consecutive class periods in school classrooms.

6.2 Measures

Achievement goal orientation. Students' achievement goal orientation was measured using SELMO (Spinath et al. 2002) distinguishing (1) mastery goal orientation (ICC = 0.095; skewness = -0.72 and kurtosis = 0.98), measured with eight items, e.g., "For me, school is about learning something interesting", $\omega_{\text{Mastery_goals1}} = 0.86$, (2) performance approach goal orientation which were further distinguished by (a) normative approach goal orientation (ICC = 0.033; skewness = -0.10 and kurtosis = -0.31) measured with four items, e.g., "For me, school is about doing better work than others" $\omega_{\text{norm_goals}} = 0.80$ (b) appearance performance approach goal orientation (ICC = 0.021; skewness = -0.75 and kurtosis = 0.89) measured with three items, e.g., "For me school is about showing what I can do and know", $\omega_{\text{appear_goals}} = 0.71$, and (3) performance avoidance goal orientation (ICC = 0.058; skewness = 0.06 and kurtosis = -0.35), measured with eight items, e.g., "For me, school is about not giving wrong answers to teachers' questions" $\omega_{\text{Avoidance_goals1}} = 0.86$. All scales were organized on a 5-point Likert-scale (1 = not true at all; 5 = exactly true). Hence, performance approach orientation was measured by two factors: normative approach goal orientation and appearance performance approach goal orientation, whereas performance avoidance goal orientation was represented by one factor. For transparency, factor loadings of each subscale along with items are presented in the Appendix A.

Well-being. Students' psychological and physical well-being were measured using four items for each scale from the KID-KINDL (Ravens-Sieberer and Bullinger 1998) on a 5-point Likert-scale (1 = never; 5 = always; e.g., "During last week, I laughed a lot and had fun" or "During the last week I felt ill"). Both scales contained inverse items that had to be inverted prior to calculations. For both scales, high values indicate high levels of well-being. Internal consistencies are good ($\omega_{\text{psychWB1}} = 0.76$; $\omega_{\text{physWB1}} = 0.77$) and ICCs are as follows: psychological well-being T1 ICC = 0.063; T2 ICC = 0.035; physical well-being T1 ICC = 0.036; T2 ICC = 0.045. Psychological well-being had a skewness of -0.84 (T1)/- 0.37 (T) and a kurtosis of 0.41 (T1)/- 0.58 (T2). For physical well-being the following was observed: skewness of -0.90 (T1)/- 0.54 (T) and kurtosis of 0.84 (T1)/- 0.25 (T2).

Covariates. In this study, we also asked for the students' biological gender coded as 1 = female; 2 = male. Research investigating gender difference in the well-being of students reveal inconsistent results, finding for example that secondary school boys tend to experience higher physical and psychological health compared to girls (Currie et al. 2008; Savoye et al. 2015; Sweeting and West 2003) whereas other studies find that girls report higher values in the positive well-being dimensions

(Hascher et al. 2011; Valtin et al. 2005) or indicate no disparities in well-being between genders (Froh et al. 2009).

Similarly, in achievement goal research, findings vary regarding gender differences: While some studies find no gender disparities in mastery, performance-approach or performance-avoidance goal orientations (Huang 2012), other findings are mixed (Giota 2001). As study results show considerable variation in how gender is associated with well-being and achievement goals, we include gender as a covariate for all variables under investigation.

6.3 Statistical analyses

We applied path analysis by using the software Mplus 8.8 (Muthén and Muthén 1998). As two students belonged each to only one school class, i.e., cluster, they were excluded from the analysis. To explore how the model fits the data, we used the model fit indices RMSEA (Root Mean Square Error of Approximation, Badness-of-Fit-Index, good approximative model fit $RMSEA \leq 0.05$), SRMR (Standardized Root Mean Square Individual, adequate between 0.05 and 0.10), and CFI (Comparative Fit Index, Goodness-of-Fit-Index, good fit index $CFI \geq 0.90$) recommended by Hu and Bentler (1999). At the outset, descriptive statistics were computed, and measurement invariance tests for physical and psychological well-being were performed. The measurement invariance assessment followed a stepwise approach, as suggested by Brown (2015): Firstly, a confirmatory factor analysis (CFA) was conducted assuming equal factor loadings. Subsequently, a second CFA was carried out under the additional assumption of equal factor structures. Lastly, a third CFA was modelled, assuming equal intercepts.

To investigate the complex relationship between the variables of interest, the path analysis was constructed with a set causal direction considering the following manifest independent variables (T1) mastery goals, normative performance approach goals, appearance performance approach goals, and performance avoidance goals; the dependent variables and auto-regressions of physical and psychological well-being (T1; T2), as well as biological gender as control variable which was regressed on all variables at T1 and T2. Thereby, the Maximum Likelihood Robust (MLR) estimator was applied with robust standard errors.

Because of rather low ICCs ($0.021 \leq ICC \leq 0.095$), we did not extend the path analysis with Level 1 and Level 2 predictors, but we accounted for the multilevel structure (students nested in classes) by using the cluster argument *type = complex* in Mplus, which adjusts the standard errors of the estimates. The number of clusters is 58 which indicates on average 12 to 13 students being in one cluster. The structure of the path analysis is presented in Fig. 1.

6.4 Missing data

To handle missing data, the Full Information Maximum Likelihood (FIML) method was employed for imputation. Unlike conventional methods such as mean imputation or listwise deletion, which are prone to bias (Rubin 1987), FIML offers a superior approach. Criticisms of traditional techniques like listwise deletion or mean imputa-

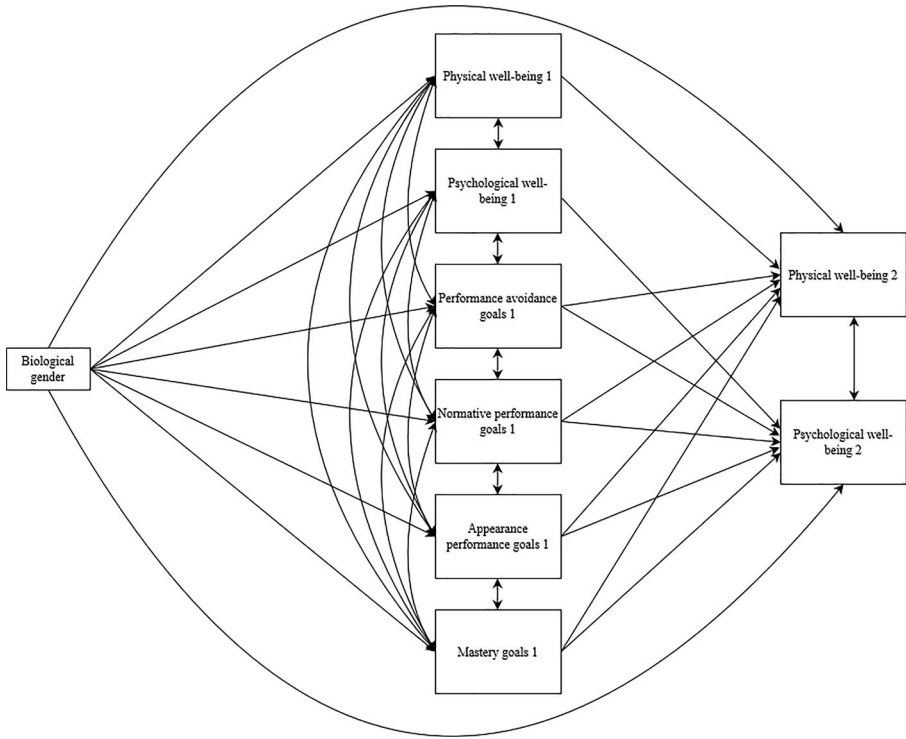


Fig. 1 Theoretical Model of How Achievement Goal Orientations (T1) Relate to Well-Being (T2)

tion have been well-documented (Little and Rubin 1989; Schafer and Graham 2002). Thus, this study opted for FIML to minimize bias. Maximum likelihood estimation, facilitated by FIML, enhances parameter estimate precision while maintaining statistical power. The FIML method relies on the assumption of missingness at random. To verify this assumption, Little's Missing Completely at Random (MCAR) test was conducted, confirming the MCAR condition ($\chi^2(218) = 218.731; p = 0.47$) for all manifest variables included in the model at both measurement points.

7 Results

Descriptive analyses show significant positive correlations within time points between students' psychological and physical well-being as well as their achievement goals (see Table 1 for all means, standard deviations, and correlations with confidence intervals): On the one hand, students' psychological and physical well-being are significantly negatively correlated with their performance avoidance goals in medium effect size range ($-0.25 \leq r \leq -0.19$). On the other hand, both psychological and physical well-being are significantly positively related with mastery goals ($0.20 \leq r \leq 0.22$). Intercorrelation of mastery goals and performance avoidance goals is not significant. Physical and psychological well-being are significantly correlated

Table 1 Means, Standard Deviations, and Correlations

Variable	Time	<i>M</i>	<i>SD</i>	ω	α	1	2	3	4	5	6	7	8
1	Mastery goals 1	T1	3.54	0.72	0.86	0.86	–	–	–	–	–	–	–
2	Avoidance goals 1	T1	2.72	0.85	0.86	0.84	0.07	–	–	–	–	–	–
3	Normative performance goals 1	T1	2.90	0.88	0.80	0.79	0.47***	0.57***	–	–	–	–	–
4	Appearance performance goals 1	T1	3.51	0.79	0.71	0.71	0.25***	0.36***	0.61***	–	–	–	–
5	Psychological well-being 1	T1	3.80	0.73	0.76	0.74	0.21***	–0.24***	–0.02	0.03	–	–	–
6	Psychological well-being 2	T2	3.86	0.71	0.76	0.73	0.15*	–0.25***	0.01	0.00	0.54***	–	–
7	Physical well-being 1	T1	3.60	1.00	0.77	0.77	0.22***	–0.18***	–0.05	0.09	0.62***	0.39***	–
8	Physical well-being 2	T2	3.66	1.01	0.82	0.81	0.20***	–0.17***	0.10	0.11	0.47***	0.63***	0.55***
9	Gender	T1	–	–	–	–	–0.06*	–0.01	0.04	0.03	0.15***	0.10**	0.18***

Note. Pearson's *r* was calculated for all bivariate correlations, except of correlations with biological gender (Kendall's τ). The minimum and maximum of all scales ranges from 1 to 5

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2 Summary of Results for Tests of Longitudinal Measurement Invariance

Model	Df	χ^2	p	CFI	RMSEA	90% CI	SRMR	Δ CFI	Δ RMSEA	Δ SRMR
1 configural MI	70	254.8281	< 0.001	0.919	0.060	[0.052–0.068]	0.058	–	–	–
2 metric MI	75	259.169	< 0.001	0.919	0.058	[0.051–0.066]	0.059	N/A	0.002	0.001
3 scalar MI	80	267.443	< 0.001	0.918	0.057	[0.049–0.064]	0.060	0.001	0.001	0.001
3b partial scalar	78	264.982	< 0.001	0.918	0.058	[0.050–0.065]	0.060	N/A	–0.001	N/A

Note. (Chen 2007): Δ CFI = decrease of ≤ 0.010 , Δ SRMR = decrease of ≤ 0.010 , Δ RMSEA = increase of ≤ 0.015
 MI measurement invariance; the final columns indicate model fit comparisons between the two subsequent models; N/A not applicable indicates no difference between previous indicator

Table 3 Results of the Path Analysis

Variable	Relation/ operation	Variable	β (stan- dard- ized)/ factor loadings	SE	<i>p</i>
<i>Regression paths</i>					
Physical well-being 2	←	Avoidance 1	-0.130	0.062	0.036
	←	Mastery goals 1	0.008	0.060	0.891
	←	Normative performance 1	0.033	0.069	0.628
	←	Appearance performance 1	0.124	0.052	0.018
	←	Physical well-being 1	0.418	0.053	0.000
	←	Gender	0.190	0.051	0.031
Psychological well-being 2	←	Avoidance 1	-0.162	0.050	0.001
	←	Mastery goals 1	-0.029	0.056	0.597
	←	Normative performance 1	-0.004	0.057	0.947
	←	Appearance performance 1	0.105	0.069	0.129
	←	Psychological well-being 1	0.428	0.059	0.000
	←	Gender	0.110	0.051	0.031
Avoidance 1	←	Gender	-0.010	0.04	0.762
Mastery goals 1	←	Gender	-0.078	0.039	0.042
Normative performance 1	←	Gender	0.054	0.038	0.155
Appearance performance 1	←	Gender	-0.046	0.039	0.230
Psychological well-being 1	←	Gender	0.163	0.041	0.000
Physical well-being 1	←	Gender	0.192	0.036	0.000
<i>Correlations</i>					
Psychological well-being 1	~~	Physical well-being 1	0.605	0.029	0.000
Psychological well-being 2	~~	Physical well-being 2	0.524	0.047	0.000
Avoidance 1	~~	Mastery goals 1	0.068	0.050	0.170
	~~	Normative performance 1	0.591	0.027	0.000
	~~	Appearance performance 1	0.283	0.039	0.000
	~~	Psychological well-being 1	-0.234	0.033	0.000
	~~	Physical well-being 1	-0.196	0.040	0.000
	~~	Normative performance 1	0.246	0.055	0.000
Mastery goals 1	~~	Appearance performance 1	0.612	0.039	0.000
	~~	Psychological well-being 1	0.221	0.039	0.000
	~~	Physical well-being 1	0.231	0.039	0.000
Normative performance 1	~~	Appearance performance 1	0.470	0.039	0.000
	~~	Psychological well-being 1	-0.049	0.033	0.141
	~~	Physical well-being 1	-0.025	0.035	0.485
Appearance performance 1	~~	Psychological well-being 1	0.103	0.042	0.013
	~~	Physical well-being 1	0.125	0.045	0.005

with large effect size ($r=0.62, p \leq 0.01$). Measurement invariance testing is reported in Table 2.

The path analysis shows a good fit (RMSEA = 0.076 (0.035–0.124, CFI = 0.99, SRMR = 0.04)). The syntax as well as the results (Mplus output) are depicted in Appendix B. Within-time associations revealed that students' psychological and physical well-being were significantly correlated with each other at both measurement points ($r_1=0.61, p \leq 0.001$; $r_2=0.52, p \leq 0.001$). We also found significant positive associations between students' mastery goal orientations and their psychological well-being ($r=0.22, p < 0.001$), physical well-being ($r=0.23, p < 0.001$), normative performance approach goals ($r=0.25, p < 0.001$), appearance performance approach goals ($r=0.61, p < 0.001$). Furthermore, performance avoidance goals were associated positively with normative performance approach goals ($r=0.59, p < 0.001$), appearance performance approach goals ($r=0.28, p < 0.001$), and negatively with psychological well-being ($r=-0.23, p < 0.001$) and physical well-being ($r=-0.20, p < 0.001$). Appearance performance approach goals were associated positively with normative performance approach goals ($r=0.47, p < 0.001$), psychological well-being ($r=0.10, p < 0.05$) and physical well-being ($r=0.13, p < 0.01$). 27% of the variance of psychological well-being and 30% of physical well-being can be explained with this model.

Longitudinal analyses revealed that avoidance approach orientation at the beginning of the school year was significantly and negatively related to psychological well-being ($\beta=-0.16, SD=0.05, p < 0.01$) and physical well-being ($\beta=-0.13, SD=0.06, p < 0.05$) at the end of the school year. Furthermore, appearance performance approach goals at the beginning of the school year were significantly and positively related to physical well-being at the end of the school year ($\beta=0.12, SD=0.05, p < 0.05$). Significant autoregressions regarding psychological well-being and physical well-being over the school year were found as follows, respectively: $\beta_{\text{PSYCH}}=0.43, SD=0.06, p < 0.001$. $\beta_{\text{PHYS}}=0.42, SD=0.05, p < 0.001$.

Results regarding the covariate biological gender revealed that male students reported significantly higher psychological well-being at T1 ($\beta=0.11, SD=0.05, p < 0.05$) and T2 ($\beta=0.16, SD=0.04, p < 0.001$) as well as physical well-being at T1 ($\beta=0.19, SD=0.04, p < 0.001$) and T2 ($\beta=0.19, SD=0.06, p < 0.001$). In addition, female students reported significantly higher mastery goal orientations ($\beta=-0.08, SD=0.04, p < 0.05$).

See Table 3 for all results of the path analysis.

8 Discussion

In this study, we investigated how mastery goal-orientation, performance-approach goal-orientation (normative and appearance performance-approach goals), and performance-avoidance goal-orientation relate to secondary school students' physical and psychological well-being at the beginning of the school year (T1, cross-sectionally) and over one school year (longitudinal). Our anticipation (hypothesis 1) that students oriented towards mastery goals would exhibit greater levels of physical and psychological well-being at the beginning as well as at the end of the school

year received partial support. In short, at the beginning of the school year, mastery-goal-oriented students report higher physical and psychological well-being. These cross-sectional findings are in line with previous research that indicates a positive association between mastery goal orientation and well-being (Kaplan and Maehr 1999; Mastrotheodoros et al. 2017; Tian et al. 2017; Zhang et al. 2023).

Educational and neuroscientific research has found that students who are oriented towards mastery goals, such as acquiring new skills and expanding their knowledge, also tend to experience more positive emotions and less unfavourable emotions during the learning process (Datu et al. 2022; Di Domenico and Ryan 2017; Pekrun et al. 2006; Ryan and Deci 2000; Schweder 2020; Sheldon and Kasser 1998; Vandercammen et al. 2014). Our cross-sectional findings also support Fredrickson's framework of the broaden-and-build theory of positive emotions (2001), according to which the experience of positive emotions broadens students' thought-action repertoires by increasing their resources and experiences of positive affect, which consequently leads to higher levels of well-being (cf. Fredrickson and Joiner 2002).

However, against hypothesis 1, students who exhibited mastery goal-oriented behaviour did not report significantly higher levels of psychological and physical well-being at the end of the school year. Hence, if students are oriented towards mastery goals at the beginning of the school year, they may experience immediate positive emotions and neurophysiological processes that cultivate well-being (Alexander et al. 2021; Di Domenico and Ryan 2017). However, in the long run, mastery-oriented students may feel that their needs are not met by the school and may also feel bored at school (Golle et al. 2022), which may explain the non-significant longitudinal results. In fact, the schools that participated in this study generally apply reward systems of grades, which may undermine intrinsic motivation (Deci 1971). Previous studies revealed that individuals often lose their initial interest and exhibit decreased innate engagement in activities that they were originally intrinsically motivated to pursue when they receive tangible rewards for these activities (Deci et al. 1999; Frey and Jegen 2001; Pink 2011). Hence, the school's system of rewards and the goal orientations of classmates play a significant role in determining the emphasis on mastery or performance-approach goals, as well as the degree to which students' orientation towards mastery goals is encouraged. In their study, King and Mendoza (2020) showed that the achievement goals of classmates predicted students' own achievement goals. As performance and competition among peers seem to be essential parts of the German school system (Graudenz and Randoll 1997), and as mainstream schools may often focus on conformity, accuracy, and appropriateness—rather than encouraging creative explorative mastery challenges (Kim 2011)—mastery-goal-oriented students may not feel that their needs are being met, which may lead to the non-significant results of mastery goal orientation and well-being over the school year.

An exploratory approach was taken to test how performance approach (i.e., normative and appearance approach goal orientation) and performance avoidance goal orientation were related to well-being. The results reveal multiple associations at the onset of the school year, including observations that students with performance avoidance goal orientations displayed reduced levels of psychological and physical well-being, which was also found over the school year. These results align with

prior studies indicating that students aiming to dodge failure and keen to showcase their competence or superiority in educational environments focus their efforts on a negative target. This can become a stressor, diminishing the joy of learning and negatively affecting their well-being (Chen et al. 2000; Elliot and Sheldon 1997, 1998; Harackiewicz et al. 2002; Pekrun et al. 2006). In fact, a performance-avoidance orientation has been consistently linked to negative affect, including anger, anxiety, and shame (Chen et al. 2000; Harackiewicz et al. 2002; Pekrun et al. 2006 Ryan et al. 2005), including feelings of hopelessness and shame and increased levels of stress and anxiety (Pekrun et al. 2006; Sideridis 2005; Smith et al. 2002). Students focused on avoiding failure may experience ongoing pressure which can lead to continuous stress and anxiety, along with a fear of receiving negative feedback or failing to meet these standards, all of which can negatively impact students' psychological and physical well-being (Hulleman et al. 2010).

Furthermore, the results revealed that students who exhibited appearance performance goals reported higher physical and psychological well-being at the beginning of the school year (cross-sectional) as well as higher physical well-being at the end of the school year (longitudinal). In comparison to normative approach goals, which emphasize outperforming others and gaining recognition for being clever, appearance performance approach goals focus on students' ability to master subject matters and demonstrate proficiency in a specific area and to appear talented (Senko and Dawson 2017). Research on how appearance performance approach goals relate to students' outcomes is scarce and reveals mixed results. For example, while Bardach et al. (2020) found negative associations related to achievement, Wirthwein and Steinmayr (2021) found positive correlations with school grades. In their study, Wirthwein and Steinmayr (2021) also found positive associations between appearance approach goals and academic-self concept in math and German as well as higher scholastic well-being.

In line with Wirthwein and Steinmayr (2021), the current results indicate that students who like to put their performance to the test feel better at school. Hence, the school seems to be a place where those students are given the opportunity to demonstrate their proficiency which may lead to the fulfilment of their needs and in turn increase their well-being.

Students' biological gender sex may also impact the link between achievement goal-orientation and well-being over the school year, as this study found that boys reported higher levels of physical and psychological well-being than girls at both the beginning and end of the school year. Although previous research on gender differences related to student well-being has produced inconsistent results, some studies—in line with the current finding—have revealed that boys tend to experience higher physical and psychological well-being than girls (Currie et al. 2008; Sweeting and West 2003).

9 Conclusions

The current study has revealed that achievement goal-orientations are associated with students' well-being at the beginning of the school year. There was an in-

verse effect of mastery goal orientation at the beginning of the school year and psychological well-being at the end of the school year, which should be further investigated in follow-up studies. Nevertheless, the current cross-sectional findings suggest that school curricula and teachers should emphasise mastery goals—rather than performance-avoidance and appearance performance-approach goals—in order to support secondary school students' psychological and physical well-being. When novel and challenging tasks that encourage students to stretch their abilities, learn, and explore are integrated into daily school routines, students are more inclined to positive learning emotions, which are linked to well-being.

10 Strengths, limitations, and future directions

This is one of the few studies to investigate how mastery, performance-approach (i.e., normative and appearance performance-approach goals), and performance-avoidance goal-orientation relate to psychological and physical well-being in secondary school students over the school year. Path analysis was applied to investigate the relationships between the variables of interest, controlling for students' biological gender. As in all studies, this study has some limitations.

For example, the high dropout rate may have led to a bias in the data. Furthermore, a longitudinal study design was implemented, but with only two measurement points. With an additional measurement point, a growth curve model could have been calculated, which might have provided deeper insights into the development and connections of the investigated variables. The lack of longitudinal evidence in the current study may be explained by the lack of data regarding the frequency with which students exhibit mastery, performance or avoidance-approach goal-orientations at school, with the study instead examining a more general domain-independent orientation towards learning. A previous study by Diener et al. (1991) found that the frequency—and not necessarily the intensity—of positive emotions was linked to well-being. Hence, future studies should investigate how frequently students follow achievement goal-orientations to examine possible longitudinal effects.

Furthermore, in this study, well-being was assessed by querying students about how they had felt over the previous week, without specifically evaluating their well-being related to school. An examination of school-related well-being may be more appropriate when exploring students' achievement goal-orientations in the educational environment.

Hence, future research should include a measure of school-related well-being (e.g., Hascher 2004). Follow-up studies should also include other constructs to measure motivation (e.g., attainment, cost, intrinsic value, and utility value) to investigate students' well-being (Raufelder et al. 2022) and the complex relationships between motivation related to well-being.

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Conflict of interest F. Hoferichter and J. Schlesier declare that they have no competing interests.

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