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Perfectionism and School Engagement:

A Three-Wave Longitudinal Study

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### **Abstract**

Although perfectionism is a personality disposition that plays an important role in educational contexts, research on perfectionism and school engagement is limited. School engagement is a key process in predicting educational outcomes in students. Consequently, it is important to know how perfectionism relates to school engagement and whether perfectionism predicts relative changes in school engagement over time. Using a sample of 486 students from 6th-12th grade (54% female) and employing a longitudinal design with three waves spaced 4-5 months apart, the present study investigated whether perfectionism (perfectionistic strivings and perfectionistic concerns) predicted relative changes in students' school engagement (behavioral, emotional, and cognitive engagement). Results showed that both perfectionistic strivings and concerns were related to school engagement, but only perfectionistic strivings predicted relative increases in school engagement. Implications for the understanding of how perfectionistic strivings contribute to school students' engagement are discussed.

*Keywords:* perfectionism; school engagement; school students; adolescents; age differences; gender differences; longitudinal data

## **1. Introduction**

### **1.1. Perfectionism**

Perfectionism is a personality disposition characterized by exceedingly high standards of performance and concerns about making mistakes and the social consequences of not being perfect, and is therefore best conceptualized as a multidimensional disposition (Frost, Marten, Lahart, & Rosenblate, 1990; Hewitt & Flett, 1991). Research has shown that different dimensions of perfectionism form two higher-order dimensions: perfectionistic strivings and perfectionistic concerns (Stoeber & Otto, 2006). Perfectionistic strivings capture aspects such as personal standards (i.e., setting exceedingly high personal standards of performance; Frost et al., 1990) and self-oriented perfectionism (i.e., having perfectionistic expectations of oneself; Hewitt & Flett, 1991). In contrast, perfectionistic concerns capture aspects such as concern over mistakes and doubts about actions (i.e., over-preoccupation for not making mistakes and uncertainty about actions and beliefs; Frost et al., 1990) and socially prescribed perfectionism (i.e., perceiving that others have perfectionistic expectations of oneself that one must fulfill; Hewitt & Flett, 1991).

### **1.2. School engagement**

School engagement has received increasing attention in psychological research because it has been shown to predict educational outcomes in school students (Ladd & Dinella, 2009; Wang & Peck, 2013). Like perfectionism, school engagement is best conceptualized as multidimensional (Fredricks, Blumenfeld, & Paris, 2004). The most comprehensive multidimensional conceptualization of school engagement comprises three broad dimensions: behavioral engagement, emotional engagement, and cognitive engagement (Fredricks, Blumenfeld, Friedel, & Paris, 2005; Fredricks et al., 2004). In this conceptualization, *behavioral engagement* reflects the presence of positive conduct (i.e., following rules, paying attention to class, completing schoolwork on time) and the absence of disruptive behaviors (i.e., getting in trouble, pretending to pay attention in class). *Emotional engagement* reflects the presence of positive school-related emotions such as excitement, fun, and interest and the absence of negative school-related emotions such as boredom. *Cognitive engagement* reflects investment in learning that goes beyond the school requirements, seeking challenges, and showing flexibility in problem solving and hard work as well as effort invested in understanding and mastering knowledge and skills and using metacognitive strategies in one's learning.

The importance of studying school engagement resides in its positive relations with educational outcomes such as academic achievement, educational aspiration, and college enrollment (e.g., Wang & Peck, 2013; see Fredricks et al., 2004, for a review). Psychological theories have proposed that school engagement is influenced by culture, community, family, education, and personality (Connell & Wellborn, 1991; Fredricks et al., 2004). To date, however, empirical research has focused mostly on educational factors whereas research investigating the role that personality dispositions play in students' school engagement is still scarce.

### 1.3. Perfectionism and school engagement

Perfectionism is a personality disposition that should play a role in students' school engagement because individual differences in perfectionism are closely linked to motivational processes that have shown to energize, direct, and regulate individuals' attitudes and behaviors (McClelland, 1985). Perfectionistic strivings have shown positive relations with hope of success, performance-approach and mastery goal orientations, and intrinsic motivation whereas perfectionistic concerns have shown positive relations with fear of failure, performance-approach and performance-avoidance goal orientations, and extrinsic motivation (e.g., Damian, Stoeber, Negru, & Băban, 2014; Stoeber & Eismann, 2007; Stoeber & Rambow, 2007). In addition, research with school students has shown that perfectionism is related to numerous characteristics

and processes that are closely linked to school engagement (e.g., effort invested in schoolwork, adaptive study strategies) and predictive of educational success (e.g., academic efficacy, academic achievement; Rice & Slaney, 2002; see also Stoeber, Edbrooke-Childs, & Damian, in press). In turn, school engagement has shown negative relations with fear of failure and positive relations with mastery goal orientations (e.g., Caraway, Tucker, Reinke, & Hall, 2003; Ryan & Patrick, 2001; Walker, Greene, & Mansell, 2006).

As regards perfectionism and school engagement, two studies with school students have been conducted. Results showed different relations of perfectionistic strivings and perfectionistic concerns with school engagement. The first study (Shih, 2011) found that perfectionistic strivings showed positive relations with indicators of behavioral engagement (effort and persistence), emotional engagement (positive academic emotions such as curiosity and enjoyment), and cognitive engagement (approach-oriented behaviors in the face of academic difficulties). Furthermore, perfectionistic strivings showed negative relations with self-handicapping strategies and emotional disengagement (negative academic emotions such as anxiety and boredom). In contrast, perfectionistic concerns showed positive relations with self-handicapping and emotional disengagement. The second study (Shih, 2012) found that perfectionistic strivings showed positive relations with schoolwork engagement (vigor, dedication, absorption) and negative relations with academic burnout. In contrast, perfectionistic concerns showed negative relations with engagement and positive relations with burnout.

#### 1.4. The present study

Whereas Shih's (2011, 2012) studies make an important contribution to our understanding of the relations between perfectionism and school engagement, they have two important limitations. First, the studies examined 8th graders (mean age 13.5 years). Consequently, it is unclear whether the relations the studies found also apply to younger or older school students. Second, the studies were cross-sectional. Consequently, it is unclear whether perfectionism is a mere correlate of school engagement, or whether interindividual differences in perfectionism also predict interindividual changes (relative increases/decreases) in school engagement longitudinally.

Against this background, the present study represents the first investigation of the longitudinal role of perfectionism in students' school engagement. The study examined a large sample of school students attending 6th-12th grade and employed a longitudinal design with three waves spaced four to five months. Based on previous research (see 1.3), we expected that

perfectionistic strivings would show positive relations with and predict relative increases in students' school engagement, whereas perfectionistic concerns would show negative relations with and predict relative decreases.

## 2. Method

### 2.1. Participants and procedure

A sample of students attending 6th-12th grade of two secondary schools (combining middle and high school) in north-western Romania was recruited for a longitudinal study with three time points over three academic semesters. Data collection for Time 1 took place at the end of the second semester of the academic year, for Time 2 five months later in the first semester of the next academic year (after a summer break of three months), and for Time 3 four months later in the second semester (after a winter break of three weeks). The total sample comprised 486 students (54% female) of whom 44% were early-to-middle adolescents (age 12-15 years) and 56% middle-to-late adolescents (age 16-19 years). All students were White and of Romanian ethnicity. Mean age of students at Time 1 was 15.9 years ( $SD = 1.8$ ). Across time points, students completed the same paper-and-pencil questionnaire in the classroom during school hours, but some students did not complete all time points (386 students completed the questionnaire at Time 1, 369 at Time 2, and 351 at Time 3). Students received no compensation for participating in the study. Participation was voluntary. The study was approved by the ethics committee of the Faculty of Psychology and Educational Sciences of the first author's university and by the schools' principals.

### 2.2. Measures

To measure perfectionism, we used the Child-Adolescent Perfectionism Scale (Flett et al., in press) capturing self-oriented perfectionism (12 items; e.g., "I try to be perfect in everything I do") and socially prescribed perfectionism (10 items; "Other people think that I have failed if I do not do my very best all the time"). In addition, we used three subscales from the Frost Multidimensional Perfectionism Scale (Frost et al., 1990) capturing personal standards (7 items; e.g., "I have extremely high goals"), concern over mistakes (9 items; "I should be upset if I make a mistake"), and doubts about actions (4 items; "I usually have doubts about the simple everyday things I do"). All scales have demonstrated reliability and validity in numerous studies with school students (e.g., Damian et al., 2014; Soenens et al., 2008). To obtain the two higher-order dimensions of perfectionism, we followed previous studies (e.g., Dunkley, Blankstein, Halsall, Williams, & Winkworth, 2000) combining (a) self-oriented perfectionism and personal standards

to capture perfectionistic strivings and (b) socially prescribed perfectionism, concern over mistakes, and doubts about actions to capture perfectionistic concerns.

To measure the three dimensions of school engagement, we used the School Engagement Measure–MacArthur (SEM–MacArthur; Fredricks et al., 2005) capturing behavioral engagement (5 items; e.g., “I pay attention in class”), emotional engagement (6 items; “I feel excited by my work at school”), and cognitive engagement (8 items; “I read extra books to learn more about things we do in school”). The measure has been used in previous studies with school students where it has demonstrated reliability and validity (e.g., Fredricks et al., 2005; Janosz, Archambault, Morizot, & Pagani, 2008).

All measures were translated into Romanian following standard back-translation procedures as recommended by Brislin (1986) using two independent translators. A third person then finalized the Romanian version. Participants responded to all items on a scale from 1 (*always false for me*) to 5 (*always true for me*).

### 2.3. Data screening

Because some students did not complete all time points (see 2.1) and those who completed all time points missed some items, overall 26% of data were missing: 24% of participants did not complete the questionnaires at all time points (but only once or twice), and 2% of missing data were single item responses missing. When we compared participants with and without missing data using Little’s (1988) Missing Completely at Random (MCAR) test, the test showed a normed chi-square ( $\chi^2/df$ ) of 1.02 suggesting that missing data were missing at random and that there was no attrition-related bias from Time 1 to Time 3 (Bollen, 1989). Scale scores were computed by averaging answers across items for all 486 students. We inspected the reliability of the scores by computing Cronbach’s alphas. All scores showed satisfactory alphas  $> .70$  (see Table 1).

## 3. Results

### 3.1. Bivariate correlations

Because of the missing data, the means, standard deviations, and bivariate correlations in Table 1 were estimated in *Mplus* Version 6.12 using full information maximum likelihood (FIML) which is the recommended method for estimating missing data (Graham, 2009) and allowed us to include all 486 students. As expected, the two perfectionism dimensions were positively interrelated within and across all time points, as were the three school engagement dimensions. Furthermore, perfectionistic strivings showed positive relations with behavioral,

emotional, and cognitive engagement within and across all time points. Unexpectedly, perfectionistic concerns too showed positive relations with cognitive engagement within and across all time points, but with emotional engagement only at Time 3.

In addition, age, gender, and school showed significant correlations with the study variables. Age showed a positive relation with perfectionistic strivings at Time 1 and negative relations with behavioral engagement at all time points, indicating that older students showed higher perfectionistic strivings and lower behavioral engagement than younger students. Gender (coded 0 = male, 1 = female) showed positive relations with perfectionistic strivings and cognitive engagement at Time 3 and behavioral engagement at all time points, indicating that girls showed higher perfectionistic strivings, behavioral engagement, and cognitive engagement than boys. Finally, school (coded 0 = School A, 1 = School B) showed significant correlations (see Table 1) indicating that students at School B showed higher perfectionistic strivings and concerns and higher behavioral, emotional, and cognitive engagement than students at School A.

### 3.2. Cross-lagged analyses

To examine the longitudinal relations between perfectionism and school engagement, we conducted cross-lagged analyses in *Mplus* using MLR (maximum likelihood estimation with robust standard errors). In particular, we examined whether interindividual differences in perfectionism predicted interindividual changes (i.e., relative changes) in school engagement over time and vice versa. We compared alternative cross-lagged models following a model comparison approach (Kline, 2010) and evaluated the model fit through multiple indices (Byrne, 2012): the Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI), with values higher than .90 indicative of an acceptable fit and values higher than .95 suggesting an excellent fit; the Root Mean Square Error of Approximation (RMSEA) and the Standardized Root Mean Square Residual (SRMR), with values below .08 suggesting acceptable fit and values less than .05 good fit; and the Akaike information criterion (AIC) and Bayesian information criterion (BIC) with lower values indicating better fit. (Due to space restrictions, the model comparisons are reported in the Supplementary file.)

The bidirectional model including all cross-lagged effects between perfectionism and school engagement showed the best fit. In the model, perfectionistic strivings and perfectionistic concerns at Time 1 predicted each other and the three school engagement dimensions at Time 2, and school engagement dimensions at Time 1 predicted each other as well as perfectionistic strivings and perfectionistic concerns at Time 2. The exact same effects were estimated from

Time 2 to Time 3. In addition, we controlled for first-order autoregressive paths (i.e., stability paths from Time 1 to Time 2 and from Time 2 to Time 3) and second-order autoregressive paths (i.e., stability paths from Time 1 to Time 3) for all variables and also included within-time correlations among all variables (Geiser, 2013). To explore whether the cross-lagged effects were time-invariant (i.e., assumed to be stationary), we compared two models: Model 1 in which cross-lagged paths were constrained to be equal across time (fixed) and Model 2 in which cross-lagged paths were unconstrained (free to vary).

To examine whether Model 1 showed a better fit than Model 2, we compared the models based on the following three criteria of which at least two had to be met:  $\Delta\chi^2$  significant at  $p < .05$ ,  $\Delta CFI \geq -.010$ , and  $\Delta RMSEA \geq .015$  (Chen, 2007; Cheung & Rensvold, 2002). None of the criteria was met (see Table 2) indicating that both models fitted the data well and that the models were not significantly different. Hence, we retained Model 1, the more parsimonious time-invariant model as the final model. Figure 1 shows the significant longitudinal paths. (To avoid overloading the figure, the within-time correlations are shown in Table 3.) Results showed a positive unidirectional effect from perfectionistic strivings to cognitive engagement, and a positive unidirectional effect from behavioral engagement to cognitive engagement. Hence, perfectionistic strivings and behavioral engagement predicted longitudinal relative increases in cognitive engagement.

### 3.3. Additional analyses

Because age, gender, and school showed significant correlations with perfectionism and school engagement, we also explored whether the models were invariant across age groups, gender, and schools by conducting multi-group analyses examining whether the cross-lagged paths were significantly moderated by age group (coded 0 = 12-15 years, 1 = 16-19 years), gender (0 = male, 1 = female), and school (0 = School A, 1 = School B). Results showed that all change indices were nonsignificant (age group:  $\Delta\chi^2[20] = 14.23$ ,  $p = .82$ ,  $\Delta CFI = .003$ ,  $\Delta RMSEA = -.008$ ; gender:  $\Delta\chi^2[20] = 20.17$ ,  $p = .45$ ,  $\Delta CFI = .000$ ,  $\Delta RMSEA = -.004$ ; school :  $\Delta\chi^2[20] = 31.44$ ,  $p = .05$ ,  $\Delta CFI = -.005$ ,  $\Delta RMSEA = .004$ ) indicating that the model in Figure 1 fitted equally well for younger and older students, boys and girls, and students at School A and B.

## 4. Discussion

### 4.1. The present findings

The aim of the present study was to examine the role that perfectionism plays in school engagement of students attending 6th-12th grade using a longitudinal design with three waves.

As expected, results showed a positive effect from perfectionistic strivings to school engagement which however was restricted to cognitive engagement: Perfectionistic strivings predicted relative increases in cognitive engagement over time. In contrast, perfectionistic concerns did not predict any relative changes in school engagement.

The study's findings suggest that perfectionistic strivings may have academic benefits in terms of students' engagement at school. Perfectionistic strivings showed positive within-time relations with all three dimensions of school engagement. School students who set exceedingly high personal standards of performance and had perfectionistic expectations of themselves tended to exert more positive conduct and less disruptive behaviors at school (i.e., behavioral engagement). They also tended to experience more positive and less negative school-related emotions (i.e., emotional engagement) and put more effort in understanding the material taught at school and used more metacognitive strategies in their learning (i.e., cognitive engagement). These findings are in line with previous findings in the literature indicating that perfectionistic strivings have academic benefits in school students, being positively associated with adaptive characteristics and processes in school students (Stoeber, 2012; Stoeber et al., in press).

Furthermore, students high in perfectionistic strivings tended to *increase* their cognitive engagement over time. That is, they increasingly put effort in understanding the material taught in school, increasingly sought to expand their knowledge, and increasingly used metacognitive strategies in their learning. This finding is in line with previous findings showing that perfectionistic strivings predicted increased effort in terms of number of hours spent per week in doing schoolwork (e.g., Einstein, Lovibond, & Gaston, 2000). In addition, it supports the proposition that individual differences in perfectionism play a role in the development of school engagement. Perfectionistic strivings, however, predicted only increased cognitive engagement, but not increased behavioral and emotional engagement. This suggests that perfectionistic strivings may underscore only the cognitive aspects of motivation and achievement processes at school, but not the social or emotional aspects.

In contrast, perfectionistic concerns did not exert any longitudinal effects on students' school engagement. In addition, perfectionistic concerns showed no negative within-time relations with behavioral and emotional engagement. Instead, perfectionistic concerns showed positive within-time relations with cognitive engagement, which was unexpected (cf. 1.3): Students high in perfectionistic concerns put more effort in understanding the material taught at school, sought to expand their knowledge, and used metacognitive strategies in their learning to a

greater extent than students low in perfectionistic concerns. Although unexpected, this finding is not unprecedented as there are previous findings that perfectionistic concerns may sometimes show positive relations with adaptive processes and outcomes such as performance-approach orientations and academic achievement (e.g., Damian et al., 2014). In addition, cognitive engagement entails behaviors such as checking schoolwork for mistakes (Fredricks et al., 2005) which may be responsible for the positive relations with perfectionistic concerns because the latter also comprise concerns over mistakes.

#### 4.2. Limitations and future research

The present study has a number of limitations. First, the study relied on students' self-reports regarding their engagement in school, which may not represent an accurate account of their actual engagement levels. Even though self-reports provide invaluable information (Baldwin, 2000) and students' perceptions of the reality may be more important in predicting outcomes than reality itself (Eccles, 1993), future studies may profit from additionally including observational data and teacher reports to get a more comprehensive account of students' engagement. Second, the study found that behavioral engagement predicted relative increases in cognitive engagement. Whereas this effect is in line with research suggesting that dimensions of school engagement can influence one another (e.g., Li & Lerner, 2013), the effect was not predicted and needs replication. Finally, the present findings may be limited to the particular time spans examined (five months from Time 1 to Time 2, four months from Time 2 to Time 3). Hence, future studies may want to investigate whether the present findings replicate when other (e.g., longer) time spans are examined.

#### 4.3. Conclusions

The present study is the first to investigate, and to demonstrate, longitudinal effects of perfectionism on students' school engagement. School engagement has been shown to play a critical role for school students' educational success. Hence, it is of central importance to understand what personality dispositions underscore (or undermine) school engagement. The present findings indicate that perfectionism represents a disposition that underscores school engagement showing that perfectionistic strivings predicted relative increases in cognitive school engagement over a period of nine months. Consequently, the present study makes a significant novel contribution to the understanding of the role that personality and individual differences play in school engagement.

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Table 1

*Descriptive Statistics and Bivariate Correlations*

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<i>Time 1</i>																	
1. Perfectionistic strivings																	
2. Perfectionistic concerns	.64***																
3. Behavioral engagement	.23***	.01															
4. Emotional engagement	.18***	.06	.43***														
5. Cognitive engagement	.34***	.18***	.49***	.43***													
<i>Time 2</i>																	
6. Perfectionistic strivings	.74***	.47***	.20***	.13**	.31***												
7. Perfectionistic concerns	.43***	.67***	.01	-.02	.12**	.58***											
8. Behavioral engagement	.17***	-.00	.78***	.38***	.40***	.22***	-.02										
9. Emotional engagement	.15***	.04	.34***	.67***	.34***	.20***	.03	.45***									
10. Cognitive engagement	.37***	.19***	.51***	.30***	.63***	.48***	.28***	.54***	.42***								
<i>Time 3</i>																	
11. Perfectionistic strivings	.67***	.41***	.27***	.09*	.29***	.73***	.45***	.27***	.18***	.44***							
12. Perfectionistic concerns	.39***	.58***	.04	.07	.09*	.47***	.70***	.06	.10*	.22***	.64***						
13. Behavioral engagement	.21***	.04	.71***	.35***	.39***	.17***	-.02	.72***	.33***	.43***	.30***	.05					
14. Emotional engagement	.11*	.02	.33***	.54***	.27***	.12**	.00	.34***	.62***	.35***	.18***	.09*	.44***				
15. Cognitive engagement	.36***	.18***	.47***	.28***	.56***	.35***	.15***	.46***	.37***	.71***	.54***	.29***	.56***	.48***			
Control variables																	
16. Age	.16***	-.01	-.13**	-.05	-.02	.15***	-.03	-.12**	.02	.04	.11*	.02	-.18***	-.04	-.10*		
17. Gender (female)	.03	.04	.22***	.05	.08	.01	-.01	.22***	.04	.08	.10*	-.03	.26***	.03	.12**	-.10*	
18. School	.17***	.09*	.28***	.06	.16***	.18***	.08	.35***	.09*	.25***	.11*	.09*	.22***	.06	.18***	.06	.10*
<i>M</i>	3.00	2.36	3.70	2.89	2.65	3.01	2.34	3.76	2.95	2.76	2.94	2.30	3.67	2.89	2.75	15.86	n/a
<i>SD</i>	0.69	0.64	0.81	0.81	0.72	0.67	0.65	0.79	0.85	0.84	0.68	0.68	0.82	0.85	0.88	1.77	n/a
Cronbach's alpha	.88	.89	.78	.85	.84	.87	.90	.79	.82	.84	.89	.92	.77	.82	.85	n/a	n/a

*Note.*  $N = 486$ . All scores are mean scores (see 2.3 for details). Age = age at Time 1. Gender (female) was coded 0 = male, 1 = female. School was coded 0 = School A, 1 = School B. n/a = not applicable.

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

Table 2

*Cross-Lagged Model Fit Indices and Model Comparisons*

Model (M)	Model fit indices									Model comparisons			
	$\chi^2$	SF	<i>df</i>	CFI	TLI	RMSEA	SRMR	AIC	BIC	$\Delta\chi^2$	$\Delta df$	$\Delta CFI$	$\Delta RMSEA$
M1	59.49*	1.05	40	.992	.981	.032	.022	9445.89	9843.58	26.00	20	-.002	-.006
M2	33.71*	1.02	20	.994	.973	.038	.013	9457.78	9939.20				

*Note.*  $N = 486$ . M1 = bidirectional effects constrained to be equal across time; M2 = bidirectional effects unconstrained to be equal across time (free to vary; see 3.2 for details); SF = Satorra-Bentler  $\chi^2$  scaling correction factor; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion.

\* $p < .05$ .

Table 3

*Model 1: Within-Time Correlations*

Variable	Time 1				Time 2				Time 3			
	1	2	3	4	1	2	3	4	1	2	3	4
1. Perfectionistic strivings												
2. Perfectionistic concerns	.64***				.53***				.60***			
3. Behavioral engagement	.23***	.01			.17**	-.04			.17**	.01		
4. Emotional engagement	.18**	.06	.43***		.16**	.05	.34***		.13	.07	.33***	
5. Cognitive engagement	.34***	.18***	.49***	.43***	.36***	.29***	.31***	.34***	.44***	.29***	.38***	.38***

Note.  $N = 486$ .

\*\* $p < .01$ . \*\*\* $p < .001$ .

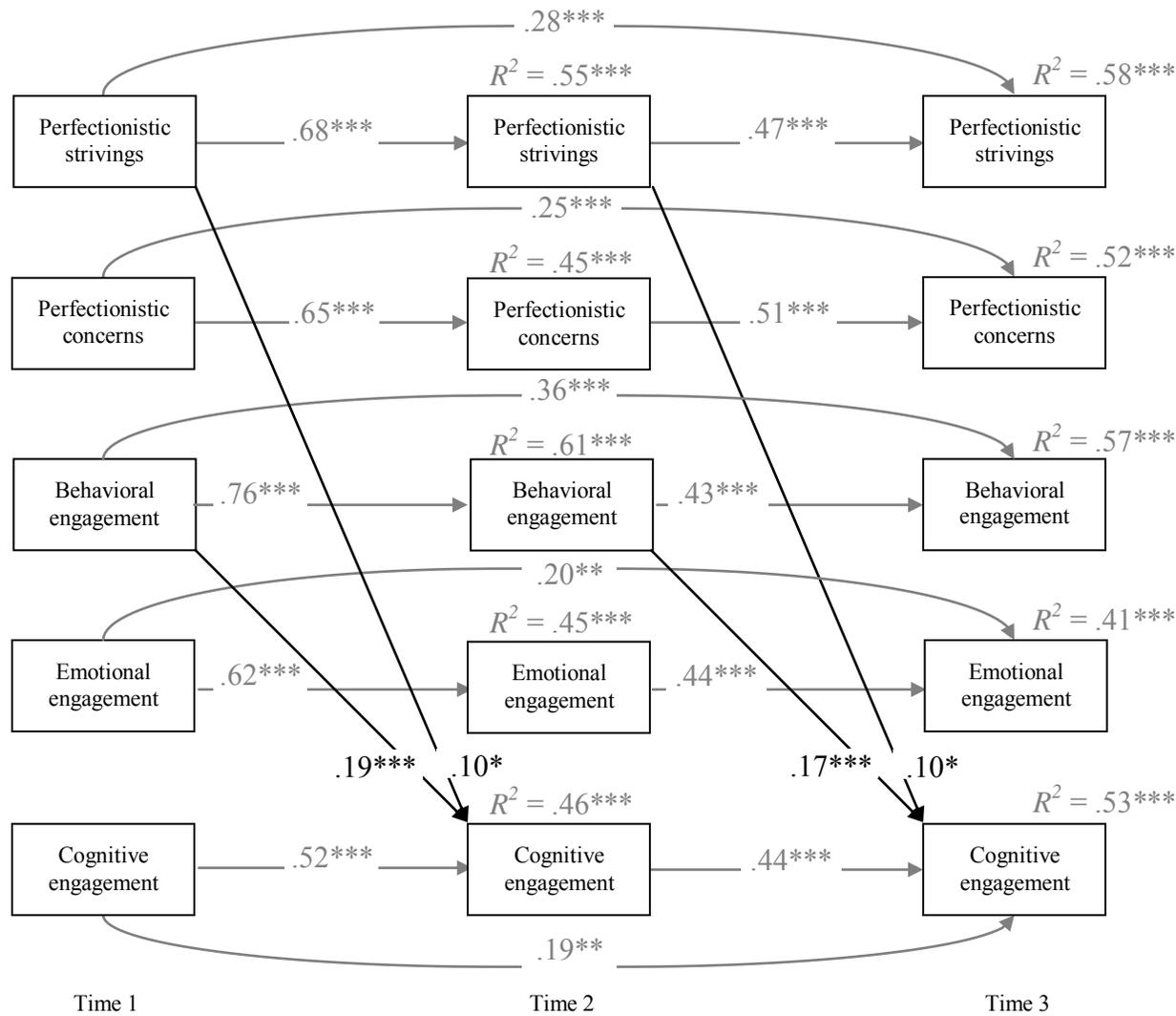


Figure 1.  $N = 486$ . Cross-lagged model between perfectionism and school engagement dimensions. To reduce model complexity, only significant longitudinal relations ( $p < .05$ ) are shown. See Table 3 for the within-time correlations.

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

### Supplementary Data

To examine the longitudinal relations between perfectionism and school engagement, we conducted cross-lagged analyses in *Mplus* Version 6.12 using MLR (maximum likelihood estimation with robust standard errors) and compared alternative cross-lagged models, following a model comparison approach (Kline, 2010). In this, we compared four alternative models (see Table 4). In Model 1, the baseline stability model, we specified two types of stability paths: first-order autoregressive paths (i.e., stability paths from Time 1 to Time 2 and from Time 2 to Time 3) and second-order autoregressive paths (i.e., stability paths from Time 1 to Time 3) for all variables (perfectionistic strivings, perfectionistic concerns, behavioral engagement, emotional engagement, and cognitive engagement) and also included within-time correlations among all variables (Geiser, 2013). No cross-lagged paths were specified in this model.

In Model 2, the perfectionism effects model, we added directional paths only from the two perfectionism dimensions to the three school engagement dimensions. Perfectionistic strivings and perfectionistic concerns at Time 1 predicted each other and the three school engagement dimensions at Time 2. The exact same effects were estimated from Time 2 to Time 3. In Model 3, the school engagement effects model, we added directional paths only from the three school engagement dimensions to the two perfectionism dimensions. School engagement dimensions at Time 1 predicted each other and the two perfectionism dimensions at Time 2. The exact same effects were estimated from Time 2 to Time 3.

In Model 4, the bidirectional effects model, we added all cross-lagged effects between perfectionistic strivings, perfectionistic concerns, behavioral engagement, emotional engagement, and cognitive engagement in school. Perfectionistic strivings and perfectionistic concerns at Time 1 predicted each other and the three school engagement dimensions at Time 2, and school engagement dimensions at Time 1 predicted each other as well as perfectionistic strivings and perfectionistic concerns at Time 2. The exact same effects were estimated from Time 2 to Time 3.

Each alternative model was compared to the previous model. To examine whether a model showed a better fit than the other model, we compared the models based on the following three criteria of which at least two had to be met:  $\Delta\chi^2$  significant at  $p < .05$ ,  $\Delta CFI \geq -.010$ , and  $\Delta RMSEA \geq .015$  (Chen, 2007; Cheung & Rensvold, 2002). Because at least two criteria were met (see Table 4), results indicated that Model 4 had the best fit. Hence, we retained Model 4, the bidirectional effects model as the final model.

Table 4

*Cross-Lagged Model Fit Indices and Model Comparisons*

Model	Model fit indices									Model comparisons				
	$\chi^2$	SF	<i>df</i>	CFI	TLI	RMSEA	SRMR	AIC	BIC	$\Delta\chi^2$	$\Delta df$	$\Delta CFI$	$\Delta RMSEA$	
M1	126.44***	1.06	60	.972	.956	.048	.075	9477.77	9791.73					
M2	79.97**	1.05	48	.987	.974	.037	.035	9451.04	9815.24	M1 vs M2	45.51***	12	-.015	.011
M3	107.71***	1.07	52	.977	.958	.047	.065	9474.09	9821.55	M3 vs M2	23.88***	4	-.010	.010
M4	59.49*	1.05	40	.992	.981	.032	.022	9445.89	9843.58	M3 vs M4	46.44***	12	-.015	.015

*Note.*  $N = 486$ . M1 = baseline stability model; M2 = perfectionism-effects model; M3 = school engagement-effects model; M4 = bidirectional effects model; SF = Satorra-Bentler  $\chi^2$  scaling correction factor; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion.

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