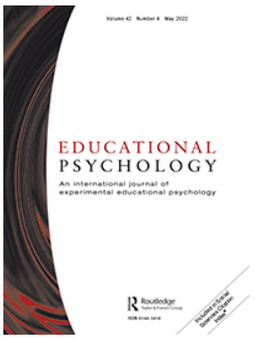

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Perceived teacher support, student engagement, and academic achievement: a meta-analysis

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ABSTRACT

Guided by the self-system process model, the aim of this study was to unravel the relationship between students' perceived teacher support and academic achievement as well as to address the role of student engagement, using a meta-analytic approach. Based on 71 empirical articles, we found that there was a small to medium correlation between perceived teacher support and achievement ($r = 0.16$), moderated by grade level, dimensions of teacher support, and measures of academic achievement. Perceived teacher support had the greatest impact on achievement among upper-secondary students, while also had a larger influence on student course grades than standardised test scores. Meanwhile, perceived emotional support had a larger effect size than autonomy or academic support on student achievement. In terms of mediating analysis, both general student engagement and its sub-types (behavioural, cognitive, and emotional engagement) partially mediated the relation between perceived teacher support and student achievement.

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Teacher support; student engagement; academic achievement; meta-analytic approach

Introduction

Academic achievement has long been in the spotlight of scholarly research as it is often viewed as a yardstick of students' knowledge attainment and their adjustment to school. Ecological systems theory (Bronfenbrenner, 1977, 1986) provides an exhaustive description of the nested environmental structure influencing individual achievement at different levels, starting with the microsystems, advancing through the mesosystems and the exosystems, into the macrosystems. A teacher-supported classroom environment is one of the most crucial and direct microsystems that influence learning outcomes. In their role as key agents that interact frequently and form interpersonal relationships with, teachers play an essential facilitating role in fostering student learning and growth in many ways, including caring for students' well-being,

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Supplemental data for this article can be accessed here.

acknowledging their opinions, and valuing academic learning (Johnson et al., 1983; Patrick et al., 2007). In short, teachers can support and facilitate student learning and development socially and psychologically in schools.

Numerous previous empirical studies (e.g. Chen, 2005; Fall & Roberts, 2012; Leon et al., 2017; Patrick et al., 2007) have examined the association between teacher support and student achievement. In addition, there have been three previous meta-analyses discussing the relation between teacher support, student engagement, and academic achievement (Lei et al., 2018; Roorda et al., 2011; 2017). Overall, the association of positive teacher-student relationship with engagement was medium ($r = 0.34$), while the average size of correlation between positive relationship and achievement was small to medium ($r = 0.16$, Roorda et al., 2011; $r = 0.27$, Lei et al., 2018). Even though Roorda et al. (2011) examined the relationship between teacher support, engagement, and achievement, they failed to verify the mediating effect of student engagement. Addressing this defect, a recent meta-analysis (Roorda et al., 2017) contended that student engagement partly mediated the association of teacher-student relationship with achievement. Only teacher emotional support, however, was considered in their study and the sub-types of student engagement have been neglected.

In a nutshell, three points remain pending and ought to be addressed urgently. First of all, the delineation of the dimensions of teacher support is contentious, resulting in inconsistent findings regarding the impact of teacher support on student achievement. Few studies have revealed the strength of the overall relation between teacher support and achievement, and little is known about the effect of sub-dimensions of teacher support. The second issue relates to whether and how student engagement explains the association between teacher support and student achievement. This study adopted self-determination theory's (SDT; Deci & Ryan, 2000; Ryan & Deci, 2000) classification of teacher support, Fredricks et al. (2004) taxonomy of student engagement, and self-system process model's (Connell & Wellborn, 1991; Klem & Connell, 2004) theoretical framework. Finally, an analysis of several potential factors that may moderate the relationship between teacher support and student achievement can shed light on the inconsistent findings and illuminate researchers to gain a more comprehensive understanding.

As a result, the present study utilised a meta-analytic approach to explore the impact of multiple dimensions of teacher support on student academic achievement and potential moderators. In addition, a meta-analytic structural equation modelling (MASEM) was applied to examine the extent to which student engagement (both general student engagement and its sub-types) mediated the association of teacher support with academic achievement.

Literature review

Teacher support and its relationship with academic achievement

A large volume of literature has confirmed that teacher support is conducive to students' academic motivation, engagement, and achievement in school (e.g. Federici & Skaalvik, 2014; Patrick et al., 2007; Wang & Eccles, 2013; Wentzel, 1998). Having studied over 10,000 U.S. secondary students, Fall and Roberts (2012) concluded that teacher

support was critical to students' academic engagement and achievement. Diseth and Samdal (2014) discovered that Norwegian students' perceptions of autonomy support were related to their motivational goals and academic performance.

Nevertheless, the operational definitions, dimensions, and measurements of teacher support are inconsistent across studies. Diverse definitions can be identified in the existing literature. For example, Chen (2005) described it as a collection of resources offered by teachers encompassing emotional, cognitive, behavioural, and instrumental aspects to facilitate student achievement, whereas Virtanen et al. (2020) considered it as an affective aspect of interpersonal relationships. Similar debate has emerged with regard to the dimensions and measurements, with emotional, informational, appraisal, and instrumental support as one example (e.g. Tardy, 1985), emotional and academic support as another (e.g. Patrick et al., 2007), and autonomy support also as a research spotlight (e.g. Jang et al., 2012; Mih & Mih, 2013). The chaotic state of teacher support and its multifaceted nature may hamper relevant theory building and empirical research, so it is imperative that this study clarifies this construct first.

According to SDT (Deci & Ryan, 2000; Ryan & Deci, 2000), students have an innate need to exert control over their learning, make their own decisions, maintain caring relationships with teachers, and achieve desired competencies. Students become engaged learners and are intrinsically motivated to improve their academic performance when they perceive that the surrounding learning environments fulfill their basic psychological needs for autonomy, competence, and relatedness (Deci & Ryan, 2000).

Teacher autonomy support can be represented as understanding students' perspectives, providing relevant rationales for learning tasks, providing choices that students can follow their interests, offering opportunities for self-initiative, allowing free expression, and minimising the use of controlling language (Deci & Ryan, 2000; Reeve & Jang, 2006; Su & Reeve, 2011). Within SDT, autonomy pertains to the self-choice of actions that are in accordance with one's consciousness. When autonomy is satisfied during action, students feel a sense of volition and internal locus, and experience that their inner thoughts and values endorse their behaviours (Reeve et al., 2003). Thus, teachers who provide autonomy support can contribute to students' positive motivational and academic outcomes (Diseth & Samdal, 2014; Jang et al., 2012; Patall et al., 2010), while a controlling or even coercive environment may undermine students' learning strategies and academic outcomes, and weaken their learning goal orientations (Madjar et al., 2013; Reeve, 2009; Soenens et al., 2012).

Competence supported by teachers is represented by academic support, which refers to the extent to which students perceive that their teachers concern about their studies, provide them with instructional assistance and guidance, and encourage them to do their utmost to succeed in their studies (Federici & Skaalvik, 2014; Patrick et al., 2007). Hence, by providing instructional help, assigning learning activities that are appropriate to their abilities, and providing informational feedback, teachers can help students achieve competence (Leon et al., 2017; Skinner & Belmont, 1993).

Consisting with relatedness which students require, teachers are suggested to provide emotional support to satisfy their emotional needs. Relatedness is the need for warm and affective relationships with teachers and is fulfilled through teachers' care, liking, and unconditional regard (Connell & Wellborn, 1991; Skinner & Belmont, 1993).

Therefore, emotional support is characterised by teachers' concern for students' well-being and students' perceptions of warmth, trust, and respect, resulting in an affective teacher-student relationship (Federici & Skaalvik, 2014; Patrick et al., 2007; Song et al., 2015).

Taken together, the above synthesis suggests that teacher support should be viewed as a multidimensional construct based on the perspective of SDT, including autonomy, academic, and emotional support. Teachers can serve as social-contextual facilitators in making the learning environment suitable (e.g. Skinner & Belmont, 1993; Stroet et al., 2013; Wang & Holcombe, 2010).

Yet, research findings regarding the impact of teacher support on student achievement do appear contradictory. In general, there is a positive relationship between students' perceptions of teacher support and academic achievement (e.g. Chen, 2005; Federici & Skaalvik, 2014; González & Verónica-Paoloni, 2014 ; Lam et al., 2012). Some studies have reported a non-significant correlation (e.g. King & Ganotice, 2014; Zysberg & Schwabsky, 2021), still others have found a negative association between teacher individualised support and student academic skills (e.g. Kikas et al., 2015). The complexity and diversity of this topic are urgently in need of an in-depth meta-analysis. Thus, the primary focus of the current study is to inquire into the relationship between perceived teacher support and academic achievement. Furthermore, this study is timely to provide researchers with a full understanding, as relatively few studies have compared the impact of three different dimensions of teacher support on student achievement.

Potential moderating variables and their influences

A number of sample-related and research-related characteristics may moderate the relationship between students' perceptions of teacher support and their academic achievement, including grade level, cultural circle, dimensions of teacher support, and indicators of academic achievement.

Grade level

Despite the lack of research examining whether the effect of students' perceived teacher support on their achievement varies across grade levels, Chen (2008) found a significant positive effect of teacher support for younger adolescents (in Grade 9) but not for upper-secondary students (in Grades 10 and 11). In addition, the association between positive teacher-student relationships and achievement became stronger at the secondary level than at the elementary level since older adolescents may be more sensitive to teacher support (Roorda et al., 2011). Based on these results, grade level may potentially moderate the relationship between teacher support and student achievement.

Cultural circle

The teacher-student relationships are more hierarchical in the East Asian cultural context like China, Korea, and Singapore as a result of '*li*' (rites) in Confucianism. Chinese culture expects students to respect their teachers who have more authority (Bond,

1991). Essentially, a core principle of Confucianism highlights teachers' intellectual and moral paragons, as well as students' obligation to honour teachers and esteem truth. As another corroboration, Jin and Cortazzi's (1998) study showed that British secondary students perceived good teachers as being patient and sympathetic to them, while Chinese students considered them as friendly and warm-hearted. This perception by Chinese students seems to embody the Confucian philosophy of '*ren*' (humanity or love) (Jin & Cortazzi, 1998). Likewise, Chinese students also felt they received more support from teachers than their American counterparts (Jia et al., 2009). Thus, we conjecture that cultural circle may also serve as a moderator.

Dimensions of teacher support

As stated above, in spite of the fact that the construct of teacher support is multidimensional, few studies have compared the impact of three distinct categories. Within SDT, Leon et al. (2017) summarised the multiple teaching behaviours that favoured autonomy (e.g. teaching for relevance, acknowledging negative feedings), competence (e.g. optimal challenge, positive feedback), and relatedness (e.g. caring). Furthermore, as several researchers have noted (e.g. Johnson et al., 1983; Patrick et al., 2007), students are able to differentiate between academic and emotional support, indicating that different forms of support may affect student perceptions. Thus, we believe that the different dimensions of support may have different effects on student achievement. Additionally, this distinction implies a practical benefit for practitioners.

Indicators of academic achievement

Various measures of academic achievement have been used in previous research, including course grades (e.g. grade point average), standardised test scores (e.g. PISA achievement), and specific task performance. We speculate that the use of multiple achievement indicators could yield different research conclusions when exploring the relationship between teacher support and student academic achievement.

Student engagement and its mediating role

Basically, student engagement refers to students' active participation in learning tasks and activities (Fredricks et al., 2004). Education researchers have long been interested in this subject as a promising avenue to ameliorate academic underperformance and high dropout rates (e.g. Fall & Roberts, 2012; Wu et al., 2010).

Yet, scholars have categorised the aspects of this construct differently. Skinner and Belmont (1993) proposed two components of engagement--behavioural and emotional, while Appleton et al. (2006) identified four subtypes: academic, behavioural, cognitive, and psychological engagement. In their seminal paper, Fredricks et al. (2004) elaborated on the behavioural, emotional, and cognitive components of engagement, which are currently widely accepted. With these in mind, the present study draws on a three-part typology and conceptualises each engagement by synthesising previous definitions. First, behavioural engagement refers to how students engage in academic activities, including some observable behaviours such as efforts, persistence as well as homework completion (Fredricks et al., 2004; Skinner et al.,

2009). Second, emotional or affective component concerns students' positive feelings about academics (e.g. enjoyment, interest) and emotional attitudes towards school (e.g. school belonging, school liking, identification with school) (Appleton et al., 2006; Fredricks et al., 2004). Finally, cognitive engagement is interpreted as the level of students' psychological investment in learning, which involves both motivational and cognitive aspects (e.g. intrinsic and extrinsic motivation, self-competence and self-efficacy, learning strategies and self-regulation, goal approaches, value) (Appleton et al., 2006; Fredricks et al., 2004; Walker et al., 2006).

Grounded in SDT and Connell's self-system process model (Connell & Wellborn, 1991; Klem & Connell, 2004), there is a substantial body of research examining the role that student engagement plays between students' perceptions of social context and their academic outcomes (e.g. Jelas et al., 2016; Van Ryzin, 2011). These theories postulate that environmental perceptions exert an impact on students' patterns of action, which, in turn, influences individual's academic performance. Several studies have documented that student engagement mediates the relation between perceived teacher support and their achievement. For example, Wang and Holcombe (2010) utilised 1,046 secondary students to confirm that their perceptions of the school environment influenced academic performance directly and indirectly via three subtypes of school engagement. Their findings also suggest that engagement partially mediates the relation between teacher support and achievement.

In a longitudinal study, however, Hughes et al. (2008) found that the correlation between teacher support and achievement became insignificant after controlling for student engagement, indicating that student engagement served as a full mediator. It would be desirable for the current meta-analytical research to clarify the mediating effect of student engagement in the light of the mixed results.

The current study

Given the research gaps identified above, the current study aims to synthesise quantitatively relevant research using a meta-analytic approach in order to provide a comprehensive review of the relationship among teacher support, student engagement, and academic achievement. Our research will specifically address three research questions. First, what is the average correlation between teacher support and academic achievement? Second, to what extent is such a relationship moderated by potential variables? Finally, to what extent does student engagement mediate the relation between teacher support and academic achievement?

Method

Literature search

We searched systematically three academic databases (APA PsycINFO, Education Resources Information Centre (ERIC), and Social Sciences Citation Index (SSCI) in Web of Science) for journal articles published ranging from January 2000 to December 2020. For each database three sets of keywords were conducted with Boolean techniques: (AB=(teacher support OR academic support OR instructional support OR

affective support OR emotional support OR autonomy support OR social support OR teacher-student relationship* OR structure OR competence OR relatedness OR involvement) AND AB=(student engagement OR student involvement OR student participation OR cognitive engagement OR behavioural engagement OR emotional engagement OR effort OR persistence OR school identification OR school belonging OR motivation OR self-regulation OR learning strategies) AND AB=(academic achievement OR academic performance OR learning outcome*)). Overall, these procedures generated 9,295 relevant documents, which were then analysed comprehensively based on the following inclusion and exclusion criteria.

Eligibility criteria

To find articles that met the requirements for the current study, we screened the articles using the following criteria:

a. the research had to be published in peer-reviewed journals in English;
b. the research had to be an empirical study, so reviews were not included;
c. the research had to cover three variables simultaneously, namely teacher support, student engagement, and academic achievement;
d. the research had to involve elementary, junior or senior high school students without special disabilities;
e. the research had to report sample sizes and correlation coefficients between teacher support, student engagement, and achievement;
f. if the same sample was used by the authors to report identical results in multiple published studies, we only included one study that measured multiple dimensions of teacher support or student engagement.

The first-round review totally yielded 149 studies.

In addition to the above requirements, eligible articles were further assessed based on three research variables:

a. teacher support must be measured by students' perceptions rather than teachers' reports, otherwise the research was excluded;
b. the research utilising the above-mentioned concepts and types of student engagement in the review was included, while excluding research that investigated student participation in extracurricular activities;
c. as for academic achievement, studies measuring students' actual achievement were included, which could be self-reported by students, rated by teachers, or officially provided by schools, thus excluding those that employed students' self-concept or anticipated grades as indicators of academic achievement. Besides, academic achievement could not be a control variable;
d. regarding research procedure, teacher support ought to be measured before or at the same time as student engagement and achievement, since it is more appropriate to regard it as a predictor. Moreover, given the possibility of teachers' occupational mobility due to their departures or class placement, etc., these three

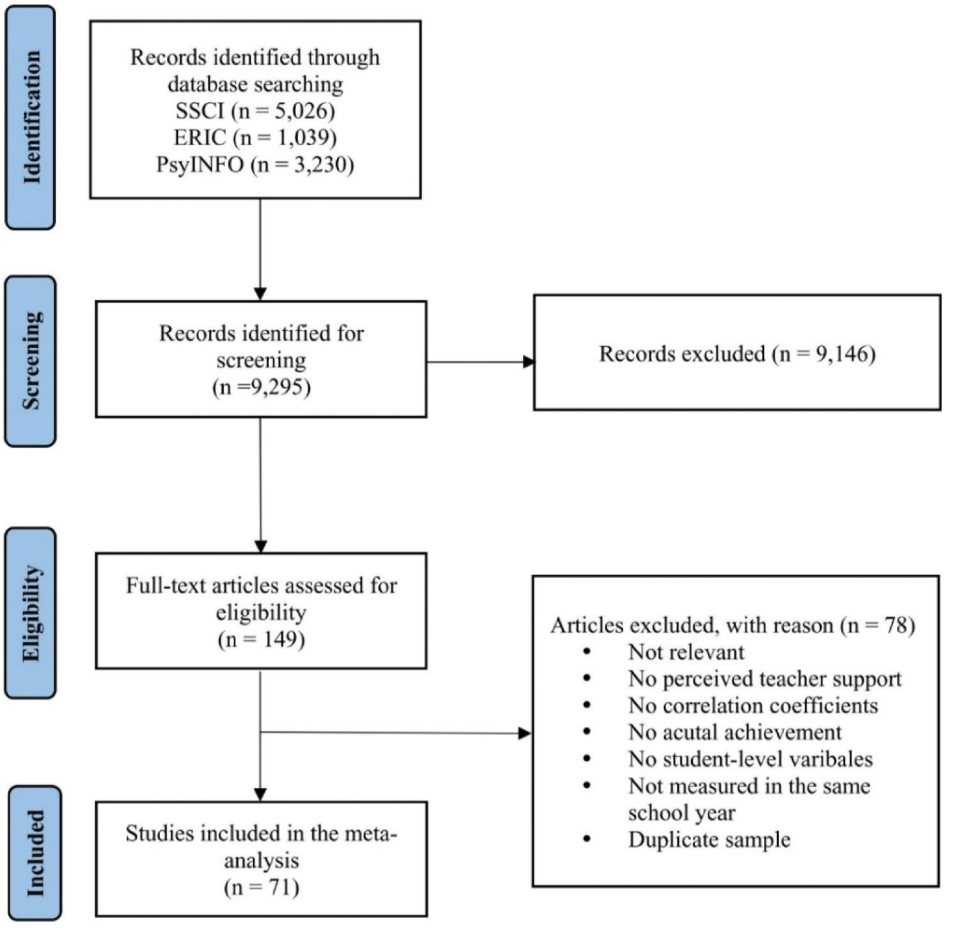

Figure 1. PRISMA flow diagram.

variables should be measured within the same school year to minimise the impact of inconsistent teacher support;

e. the research measuring variables at the class-level rather than student-level was not included.

After scrutinising the full texts of the 149 studies identified, 71 articles that met all the criteria were retained. Figure 1 shows the complete screening procedure.

Coding scheme

The first two authors conducted the coding process in three phases. First, the first author developed a preliminary coding scheme: (a) grades were coded as elementary, lower-secondary, upper-secondary, elementary & lower-secondary, lower- & upper-secondary, and mixed; (b) cultural circles were coded as eastern (e.g. China, Korea, Singapore), western (e.g. Australia, Finland, UK, US), other (e.g. Turkey), and mixed culture; (c) dimensions of teacher support were coded as academic, autonomy, emotional,

and mixed support. When a study measured at least two of these dimensions of support which were integrated into a single variable, we coded it as "mixed"; (d) types of student engagement were coded as behavioural, cognitive, emotional, and mixed engagement; and (e) indicators of academic achievement were coded as course grades, standardised test scores, and task performance.

Along with coding basic information from each study, a more detailed coding scheme on effect size was as follows:

a. if studies reported correlation coefficients for each dimension of teacher support or student engagement, these effect sizes were separately entered;
b. if studies provided correlation coefficients for different types of academic achievement (e.g. standardised test scores or course grades), we coded them separately;
c. if multiple disciplines in the same category of academic achievement were reported, the mean value was taken as the effect size;
d. if correlation coefficients for different samples or groups were reported, all effect sizes were coded accordingly;
e. if longitudinal studies provided multiple effect sizes for more than one time point, each effect size had to be entered after taking into account the weight of its corresponding sample size.

Second, the two researchers independently coded the same 20 articles. Discussions of the coding scheme as well as clarification of the concepts and subordinations of research variables led to a consensus on the inconsistencies encountered during the coding process.

Finally, the two researchers coded the remaining articles, resulting in a consistency of 0.95. In the Supplementary Appendix, we show the coding results for 71 studies included in the current meta-analysis.

Analytic strategy

The purpose of data analyses is to calculate the main effect of teacher support on academic achievement, explore the moderating effect of potential variables and the mediating effect of student engagement using meta-analysis and MASEM. A meta-analysis integrates findings of multiple studies while reducing measurement and sampling errors present in a single study, thereby increasing the external interpretation validity of the research conclusions (Schmidt & Hunter, 2014). Prior to this, publication bias and homogeneity analysis are required.

Publication bias

By utilising the funnel plot, Egger's regression, and trim-and-fill method, we examined the publication bias, which is caused by the fact that statistically significant results are more likely to be published than statistically non-significant ones. A funnel plot is a scatter plot of all included effect sizes relative to their standard errors (Card, 2011). In the absence of publication bias, effect sizes are symmetrically distributed around the average effect size in the funnel plot and *p*-value in Egger's regression is non-

significant. Moreover, the trim-and-fill method provides an unbiased effect size based on the funnel plot. The publication bias is considered negligible when there is little shift from the original observed effect size to the filled effect size, (Borenstein et al., 2009; Card, 2011).

Homogeneity analysis

Q, I^2, and T^2 tests were employed to test whether the variance in each subgroup exceeded that expected by sampling error (Cooper, 2009). Q test follows a χ^2 distribution with a degree of freedom of k-1, where k represents the number of studies (Borenstein et al., 2009; Card, 2011). The value of I^2 reflects the proportion of variance in the total variance due to heterogeneity across all studies. T^2 is an estimate of the variance of the true effect size (Borenstein et al., 2009). The results of I^2 and T^2 also inform the model selection in the subsequent analysis.

Average effect size

Following Borenstein et al. (2009), the correlation coefficients from each study were converted to Fisher's Z ($Z = 0.5 \times \ln\left(\frac{1+r}{1-r}\right)$, $V_z = \frac{1}{n-3}$, $SE_z = \sqrt{V_z}$). All Fisher's z-transformed values were then used as effect sizes for calculating the comprehensive effect size which finally was be transformed back into correlation ($r = \frac{e^{2z}-1}{e^{2z}+1}$).

Moderating analysis

Based on the results of homogeneity analysis, the moderating analysis was conducted with either a fixed-effects or a random-effects model to explore which variables contributed to inconsistent results. Possible moderators included grade level, cultural circle, dimensions of teacher support, and indicators of achievement in the present study.

All of the analyses as mentioned above, including calculating the average weighted effect size, were conducted using Comprehensive Meta-Analysis software (CMA Version 2.0).

Mediating effect analysis

MASEM was used to carry out mediating effect analysis, which involved a two-stage structural equation model (TSSEM) to synthesise the correlation matrix and fit the hypothesised model (Cheung & Chan, 2005). First, all correlation matrices across studies were synthesised into a pooled correlation matrix. In the second stage, the mediating analysis was tested by applying the pooled correlation matrix to fit structural equation modelling. For the current study, correlation-based MASEM was implemented with the metaSEM package in R statistical platform (Cheung, 2014; Cheung & Cheung, 2016).

Results

Characteristics of included studies

In the main effect and moderator analyses, there were 93 effect sizes from 71 journal articles, with sample sizes ranging from 41 to 14,796. The vast majority of articles

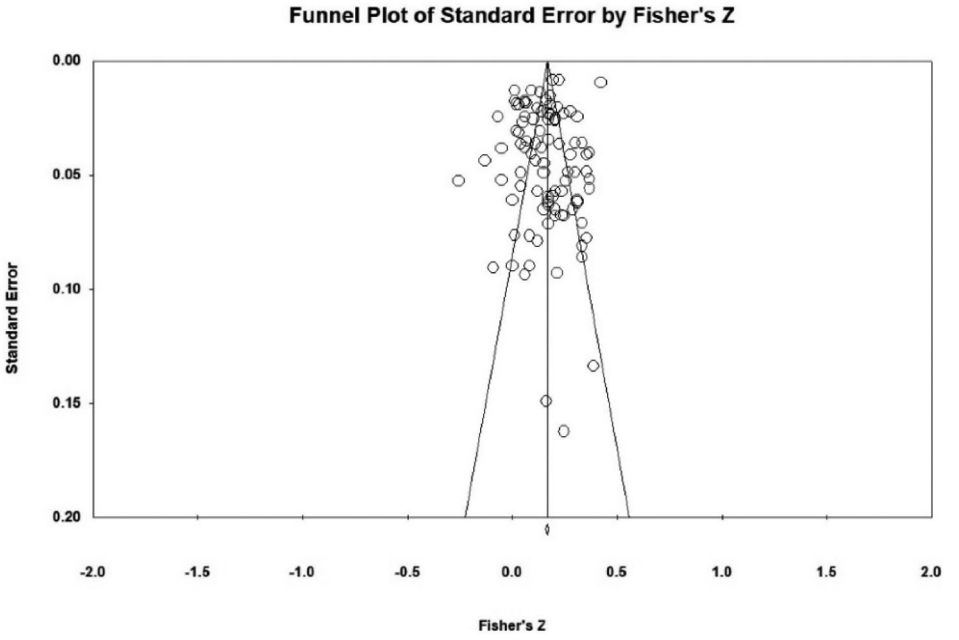

Figure 2. Funnel plot of effect sizes.

included in the meta-analysis were conducted in Western cultural contexts (75%), followed by those from China, Korea, Malaysia, Philippines, and Singapore (20%). In the mediating effect analysis, we merged the dimensions of teacher support and indicators of achievement, yielding 119 effect sizes.

Publication bias

The funnel plot (see Fig. 2) presented a symmetrical distribution of the majority of effect sizes. Egger's regression showed that no statistically significant bias was detected ($p = .25 > .05$). In addition, the result of trill-and-fill method revealed that the shift in over effect size was small (from .16 to .13). In short, we concluded that publication bias in our research was negligible.

Heterogeneity test and effect size

As shown in Table 1, the Q test for heterogeneity among all studies was statistically significant ($Q = 1965.22$, $p < .001$), with less than 5% of the variance resulting from sampling error ($I^2 = 95.32$). The variance of true effect sizes was .01 ($T^2 = 0.01$), indicating considerable heterogeneity among effect sizes.

Based on the results of the heterogeneity test, as well as the fact that the included studies spanned a considerable number of countries (e.g. Australia, China, Finland, Singapore, UK, USA) and different cultural circles, the random-effects model was more appropriate (Card, 2011).

The average weighted effect size of teacher support with academic achievement was 0.16, suggesting that the effect of teacher support on student achievement was

Table 1. Heterogeneity test and the average effect based on the random-effects model.

k	*r*	95% CI		*Z*	*Q*	I^2	T^2
93	0.16	0.13	0.18	11.75***	1965.22***	95.32	0.01

Notes. K: number of effect sizes; CI: confidence interval; ***$p<.001$.

positive and significant, albeit somewhat weak according to Cohen's (1992) threshold (small effect: $r = 0.10$, medium effect: $r = 0.30$, and large effect: $r = 0.50$).

Moderator analysis

In view of the considerable heterogeneity among the effect sizes, we further conducted the sub-group analyses to test the extent to which the association between teacher support and academic achievement varied by the potential moderators that might explain the inconsistencies.

As displayed in Table 2, grade level influenced the link between teacher support and achievement ($Q_{between} = 11.87$, $p < .05$). The effect size was the largest in upper-secondary students ($r = 0.20$, $p < .001$), followed by lower-secondary ($r = 0.15$, $p < .001$) and elementary school students ($r = 0.11$, $p < .001$). The dimensions of teacher support significantly moderated the association of teacher support with academic achievement ($Q_{between} = 8.63$, $p < .05$). Student achievement was impacted more by emotional support ($r = 0.18$, $p < .001$) than autonomy support ($r = 0.13$, $p < .001$) and academic support ($r = 0.09$, $p < .001$). Also, the relation between teacher support and achievement was influenced by the indicators of achievement ($Q_{between} = 7.74$, $p < .05$). Specifically, teacher support was more strongly related to course grades ($r = 0.18$, $p < .001$) than standardised test scores ($r = 0.10$, $p < .05$), whereas the correlation with task performance was not statistically significant ($r = 0.01$, $p > .05$). In addition, the link between teacher support and achievement did not differ by cultural circle ($Q_{between} = 0.24$, $p > .05$).

Analysis of mediating effect

In accordance with Cheung and Cheung (2016), this study examined the mediating effects of student engagement and its three sub-types separately based on correlation-based MASEM, using the random-effects model (Table 3).

The fitted mediation model of student engagement was saturated, meaning that it perfectly fitted the data (χ^2 ($df = 0$, $N = 188990$) $= .00$, $p = 0$, CFI $= 1.00$, SRMR $= .00$, RMSEA $= .00$). Students' perceived teacher support positively predicted their engagement ($\beta = 0.36$), which, in turn, influenced academic achievement ($\beta = 0.23$). As such, the indirect effect of teacher support on achievement was $\beta = 0.08$. The total effect of teacher support on academic achievement was $\beta = 0.17$, with a statistically significant direct effect of $\beta = 0.09$. These results indicated that the positive relationship between students' perceptions of teacher support and achievement was partially mediated by student engagement.

Similarly, perceived teacher support significantly contributed to behavioural ($\beta = 0.30$), cognitive ($\beta = 0.35$), and emotional engagement ($\beta = 0.42$). The three sub-types of student engagement were positively associated with academic achievement

Table 2. Moderator analysis of the relationship between perceived teacher support and academic achievement.

		Analyses results				
Moderators	*k*	$Q_{between}$	Effect size	95% CI	*Z*-value	*p*
Grade level		11.87*				
Elementary	19		0.11	0.05 0.17	3.60	.000
Lower-secondary	35		0.15	0.10 0.20	5.55	.000
Upper-secondary	26		0.20	0.16 0.23	11.44	.000
Elementary & lower-secondary	3		0.18	0.09 0.27	3.90	.000
Lower- & upper-secondary	9		0.15	0.08 0.21	4.25	.000
Mixed	1		0.12	0.08 0.16	5.85	.000
Cultural circle		0.24				
Eastern culture	18		0.15	0.07 0.23	3.58	.000
Western culture	71		0.15	0.13 0.18	12.13	.000
Other	3		0.19	0.01 0.36	2.11	.035
Mixed	1		0.16	0.13 0.19	9.39	.000
Teacher support		8.63*				
Academic support	15		0.09	0.04 0.15	3.55	.000
Autonomy support	19		0.13	0.07 0.18	4.63	.000
Emotional support	49		0.18	0.14 0.21	9.91	.000
Mixed	10		0.21	0.11 0.29	4.29	.000
Academic achievement		7.74*				
Course grades	65		0.18	0.16 0.20	15.62	.000
Standardised test scores	26		0.10	0.04 0.16	3.41	.001
Task performance	2		0.01	−0.23 0.24	0.06	.950

Notes. K: number of effect sizes; CI: confidence interval; $^*p<.05$.

Table 3. Analysis of mediating effects.

Mediation models	*k*	*a*	CI_a	*b*	CI_b	*ab*	CI_{ab}	*c′*	$CI_{c'}$	*c*
TS-ENG-AC	119	0.36	0.33, 0.39	0.23	0.20, 0.27	0.08	0.07, 0.10	0.09	0.06, 0.11	0.17
TS-BENG-AC	35	0.30	0.25, 0.34	0.34	0.27, 0.41	0.10	0.08, 0.13	0.05	0.00, 0.10	0.15
TS-CENG-AC	50	0.35	0.31, 0.38	0.21	0.16, 0.25	0.07	0.06, 0.09	0.10	0.06, 0.14	0.17
TS-EENG-AC	26	0.42	0.36, 0.48	0.12	0.04, 0.20	0.05	0.02, 0.08	0.12	0.07, 0.17	0.17

Notes. k: number of effect sizes; CI: confidence interval; TS: teacher support; ENG: engagement; BENG: behavioural engagement; CENG: cognitive engagement; EENG: emotional engagement; AC: academic achievement.

($\beta = 0.34$, $\beta = 0.21$, and $\beta = 0.12$, respectively). Consequently, the indirect effect of teacher support on achievement through behavioural engagement was $\beta = 0.10$, through cognitive engagement was $\beta = 0.07$, and through emotional engagement was $\beta = 0.05$. In other words, behavioural, cognitive, and emotional engagement were all served as mediators. Besides, there were positive predictive paths from perceived teacher support to achievement in the mediation model of behavioural engagement ($\beta = 0.05$), of cognitive engagement ($\beta = 0.10$), and of emotional engagement ($\beta = 0.12$). These results confirmed that behavioural, cognitive, and emotional engagement partially mediated the relationship between students' perceived support and their academic achievement.

Discussion

This section begins by describing the major findings related to the average effect size, moderator analysis, and mediating effect analysis. Next, we outline some implications for researchers and practitioners. In the final part, we discuss some limitations and future research directions.

Average effect size

The present study manifested that there was a statistically significant and positive correlation between student perceived teacher support and achievement, which resonates the conclusions of previous empirical studies (e.g. Chen, 2005; Ganotice & King, 2014; Lam et al., 2012). It is also in line with the findings of previous meta-analytic studies and further confirms a small to medium effect size ($r = 0.16$, Roorda et al., 2011; $r = 0.17$, Roorda et al., 2017). Notwithstanding, an effect size of 0.16 in our study indicated that perceived teacher support could facilitate students' academic progress, according to Rosenthal's (1984) binominal effect size display (BESD). Put it another way, students could benefit from teachers' academic help, autonomous motivation, and affective interpersonal relationships with teachers (Deci & Ryan, 2000; Ryan & Deci, 2000). A possible justification for a small to moderate correlation between teacher support and academic achievement is that the weak association could be attributed to other possible mediators aside from the direct influencing path, such as student engagement as substantiated by this study.

Moderator analysis

We also tested several potential factors that may affect the link between perceived teacher support and academic achievement. Intriguingly, no evidence about the moderating role of the cultural circle was found. This implies that support from teachers is available to Western and Eastern students alike. This result further reinforces the cross-cultural attributes of teachers' facilitation of student learning outcomes in microsystems (Bronfenbrenner, 1977, 1986). Another argument is that autonomy support is only relevant for students in countries that value independence and individualism, rather than those in collectivistic cultures that emphasise obedience and strict discipline (e.g. Iyengar & Lepper, 1999 ; Oishi & Diener, 2001). SDT advocates, however, maintain that all people have a psychological need for autonomy and that autonomy support is universally beneficial for enhancing learning motivation and outcomes (e.g. Diseth et al., 2012; Jang et al., 2012; Ryan & Deci, 2000).

Secondly, our results showed that achievement indicators moderated the association of perceived teacher support with achievement, with the effect size of teacher support being higher for course grades than for standardised test scores. The varying associations could be explained by the relevance of the content examined by the test and the teachers' daily teaching. Course exams at school are closely related to subject knowledge and regarded as the priority for daily instruction by teachers, whereas standardised tests tend to detach from specific knowledge to assess students' higher-order skills, so they might not be as critical to teachers' classroom instruction. Scholars may investigate this explanation further.

As anticipated, grade level moderated the relation between students' perceived teacher support and their achievement. Teacher support had stronger impact on upper-secondary students than on lower-upper and elementary students. Our results concur well with Roorda et al. (2011) who found that secondary students were more sensitive to teacher support and caring and affective teacher-student relationships, reflecting teachers' growing importance during the middle school years (Ryan et al.,

1994). Furthermore, high-stakes testing and accountabilities in upper-secondary schools put additional stress on teachers, making them more keenly engaged in supporting senior high students' learning.

Finally, the effects of teacher support and its three dimensions on student achievement were significant, again in agreement with previous studies (e.g. Diseth et al., 2012; Leon et al., 2017; Ryan & Deci, 2000). This means that when exposed to a supportive classroom environment, perceived emotional solicitude, academic assistance, and autonomy support could amplify the benefits of teachers' influences on student learning. However, contrary to our expectation, the remarkable finding is that academic achievement was more affected by perceived emotional support than autonomy and academic support. This makes us even more convinced that daily caring and encouragement are equally effective in promoting academic progress in youth. Nonetheless, teachers' tendency to assist academically disadvantaged students may be a possible explanation for the smaller effect size of academic support (e.g. Guill et al., 2020; Kikas et al., 2015).

Mediating effects analysis

As hypothesised, our research evidence demonstrated that both general student engagement and its three sub-types (behavioural, cognitive, and emotional engagement) could build a mediated link between students' perceptions of teacher support and academic achievement. These results provide further evidence that Connell's self-system process model has external interpretation (Connell & Wellborn, 1991; Klem & Connell, 2004). Besides, the current findings are consistent with previous research conclusions (e.g. Jelas et al., 2016; Wang & Holcombe, 2010). For example, Klem and Connell (2004) found that elementary and middle school students who perceived a teacher-provided positive and caring learning environment were more likely to be engaged in school. Furthermore, high levels of school engagement were associated with higher academic scores.

The conclusions regarding the partial mediation of student engagement confirm Roorda et al.'s (2017) meta-analysis but seems to contradict Hughes et al.'s (2008) full mediation. The differences might occur due to different study designs. In Hughes et al.'s (2008) longitudinal study, student participation in Year 2 completely mediated the association of teacher support in Year 1 with achievement in Year 3. In this meta-analysis study, however, we did not compare bivariate and cross-lagged associations. Future perspectives are needed on this issue.

Implications

Several implications inferred from the discussion above contribute to our understanding of support from teachers. In light of the positive and significant mean correlation between students' perceived teacher support and academic achievement, together with the results of moderating analyses of achievement measure and grade level, we are confident that teacher support benefits students' learning outcomes, particularly in a high-stakes testing and accountability context. Thus, in practice, teachers could be

more assertive in the efforts they make for students and build a strong sense of fulfilment. Moreover, in parallel to being useful for students' course-based knowledge, the moderator analysis implicates that support provided by teachers is also relevant for higher-order skills examined in international tests, for example. As such, teachers would appropriately broaden their students' horizons beyond the textbook. In terms of dimensions of teacher support, the present study suggests that a psychologically safe environment created by teacher emotional support enables adolescents to achieve higher levels of academic success. Students experience emotional support at school when their teachers treat them with respect and parity, when they perceive warmth and unconditional regard from their teachers, and when their teachers are willing to listen to their ideas. Finally, the partial mediation of student engagement further implies that a suitable classroom environment created by teachers facilitates students' academic success by promoting their levels of engagement. On the other hand, it also demonstrates that there might be other factors that mediate the association between teacher support and student achievement other than student engagement, which could enlighten researchers to engage in further insight into other possible mediators.

Limitations and future research directions

We aware that our research may have some limitations. Firstly, negative dimensions were left out during defining and coding research variables. For example, when both positive and negative teacher-student relationships occurred in a study, we only retained the positive aspect, and similarly left out disaffection in student engagement. Secondly, we searched academic support using generic terms (e.g. academic support, instructional support), which somewhat omitted specific supportive teaching behaviours (e.g. teacher questioning, positive feedback). Thirdly, despite having included both cross-sectional and longitudinal studies, the current study did not consider research design as a potential moderator. Thus, future researchers can take cross-lagged correlations into account. Finally, only studies that investigated three variables simultaneously (that is teacher support, student engagement, and academic achievement) were considered in the current research due to our consideration of examining the mediating effects of student engagement, which excluded studies involving only two of the three variables. There is a possibility that this may have affected the external validity of this study. These aspects worth further investigation and explanation.

Conclusions

We conducted a meta-analysis of 93 effect sizes from 71 articles examining the relationship between students' perceived teacher support and academic achievement among elementary and secondary students. The conditions under which and how perceived teacher support affected achievement were also explored. Based on the random-effects model, we found a positive and significant relation dependent on grade level, dimensions of teacher support, and measures of achievement. Furthermore, general student engagement, behavioural, cognitive, and emotional engagement partially

mediated the association between students' perceptions of teacher support and academic achievement, respectively.

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References

Appleton, J. J., Christenson, S. L., Kim, D., & Reschly, A. L. (2006). Measuring cognitive and psychological engagement: Validation of the student engagement instrument. *Journal of School Psychology*, *44*(5), 427–445. https://doi.org/10.1016/j.jsp.2006.04.002

Bond, M. H. (1991). *Beyond the Chinese face: Insights from psychology*. Oxford University Press.

Borenstein, M., Hedges, L. V., Higgins, J. P., & Rothstein, H. R. (2009). *Introduction to meta-analysis*. Wiley.

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

Bronfenbrenner, U. (1986). Ecology of the family as a context for human development: Research perspectives. *Developmental Psychology*, *22*(6), 723–742. https://doi.org/10.1037/0012-1649.22.6.723

Card, N. A. (2011). *Applied meta-analysis for social science research*. Guilford Press.

Chen, J. J. L. (2005). Relation of academic support from parents, teachers, and peers to Hong Kong adolescents' academic achievement: The mediating role of academic engagement. *Genetic, Social, and General Psychology Monographs*, *131*(2), 77–127. https://doi.org/10.3200/MONO.131.2.77-127

Chen, J. J. L. (2008). Grade-level differences: Relations of parental, teacher and peer support to academic engagement and achievement among Hong Kong students. *School Psychology International*, *29*(2), 183–198. https://doi.org/10.1177/0143034308090059

Cheung, M. W. L. (2014). metaSEM: An R package for meta-analysis using structural equation modeling. *Frontiers in Psychology*, *5*, 1521. https://doi.org/10.3389/fpsyg.2014.01521.

Cheung, M. W. L., & Chan, W. (2005). Meta-analytic structural equation modeling: A two-stage approach. *Psychological Methods*, *10*(1), 40–64.

Cheung, M. W. L., & Cheung, S. F. (2016). Random-effects models for meta-analytic structural equation modeling: Review, issues, and illustrations. *Research Synthesis Methods*, *7*(2), 140–155.

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*(1), 155–159. https://doi.org/10.1037/0033-2909.112.1.155

Connell, J. P., & Wellborn, J. G. (1991). Competence, autonomy, and relatedness: A motivational analysis of self-system processes. In M. R. Gunnar & L. A. Sroufe (Eds.), *Self processes and development* (pp. 43–77). Erlbaum.

Cooper, H. (2009). *Research synthesis and meta-analysis: A step-by-step approach*. SAGE publications.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01

Diseth, Å., & Samdal, O. (2014). Autonomy support and achievement goals as predictors of perceived school performance and life satisfaction in the transition between lower and upper secondary school. *Social Psychology of Education*, *17*(2), 269–291. https://doi.org/10.1007/s11218-013-9244-4

Diseth, Å., Danielsen, A. G., & Samdal, O. (2012). A path analysis of basic need support, self-efficacy, achievement goals, life satisfaction and academic achievement level among secondary school students. *Educational Psychology*, *32*(3), 335–354. https://doi.org/10.1080/01443410.2012.657159

Fall, A. M., & Roberts, G. (2012). High school dropouts: Interactions between social context, self-perceptions, school engagement, and student dropout. *Journal of Adolescence*, *35*(4), 787–798.

Federici, R. A., & Skaalvik, E. M. (2014). Students' perceptions of emotional and instrumental teacher support: Relations with motivational and emotional responses. *International Education Studies*, *7*(1), 21–36.

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, *74*(1), 59–109. https://doi.org/10.3102/00346543074001059

Ganotice, F. A., & King, R. B. (2014). Social influences on students' academic engagement and science achievement. *Psychological Studies*, *59*(1), 30–35. https://doi.org/10.1007/s12646-013-0215-9

González, A., & Verónica-Paoloni, P. (2014). Engagement and performance in physics: The role of class instructional strategies, and student's personal and situational interest. *Revista de Psicodidactica* [Journal of Psychodidactics], *20*(1), 25–45. https://doi.org/10.1387/RevPsicodidact.11370

Guill, K., Lüdtke, O., & Schwanenberg, J. (2020). A two-level study of predictors of private tutoring attendance at the beginning of secondary schooling in Germany: The role of individual learning support in the classroom. *British Educational Research Journal*, *46*(2), 437–457. https://doi.org/10.1002/berj.3586

Hughes, J. N., Luo, W., Kwok, O. M., & Loyd, L. K. (2008). Teacher-student support, effortful engagement, and achievement: A 3-year longitudinal study. *Journal of Educational Psychology*, *100*(1), 1–12.

Iyengar, S. S., & Lepper, M. R. (1999). Rethinking the value of choice: A cultural perspective on intrinsic motivation. *Journal of Personality and Social Psychology*, *76*(3), 349–366.

Jang, H., Kim, E. J., & Reeve, J. (2012). Longitudinal test of self-determination theory's motivation mediation model in a naturally occurring classroom context. *Journal of Educational Psychology*, *104*(4), 1175–1188. https://doi.org/10.1037/a0028089

Jelas, Z. M., Azman, N., Zulnaidi, H., & Ahmad, N. A. (2016). Learning support and academic achievement among Malaysian adolescents: The mediating role of student engagement. *Learning Environments Research*, *19*(2), 221–240. https://doi.org/10.1007/s10984-015-9202-5

Jia, Y., Way, N., Ling, G., Yoshikawa, H., Chen, X., Hughes, D., Ke, X., & Lu, Z. (2009). The influence of student perceptions of school climate on socioemotional and academic adjustment: A comparison of Chinese and American adolescents. *Child Development*, *80*(5), 1514–1530.

Jin, L., & Cortazzi, M. (1998). Dimensions of dialogue: Large classes in China. *International Journal of Educational Research*, *29*(8), 739–761. https://doi.org/10.1016/S0883-0355(98)00061-5

Johnson, D. W., Johnson, R., & Anderson, D. (1983). Social interdependence and classroom climate. *The Journal of Psychology*, *114*(1), 135–142. https://doi.org/10.1080/00223980.1983.9915406

Kikas, E., Silinskas, G., & Soodla, P. (2015). The effects of children's reading skills and interest on teacher perceptions of children's skills and individualized support. *International Journal of Behavioral Development*, *39*(5), 402–412. https://doi.org/10.1177/0165025415573641

King, R. B., & Ganotice, F. A. (2014). The social underpinnings of motivation and achievement: Investigating the role of parents, teachers, and peers on academic outcomes. *The Asia-Pacific Education Researcher*, *23*(3), 745–756. https://doi.org/10.1007/s40299-013-0148-z

Klem, A. M., & Connell, J. P. (2004). Relationships matter: Linking teacher support to student engagement and achievement. *The Journal of School Health*, *74*(7), 262–273.

Lam, S. F., Jimerson, S., Kikas, E., Cefai, C., Veiga, F. H., Nelson, B., Hatzichristou, C., Polychroni, F., Basnett, J., Duck, R., Farrell, P., Liu, Y., Negovan, V., Shin, H., Stanculescu, E., Wong, B. P., Yang, H., & Zollneritsch, J. (2012). Do girls and boys perceive themselves as equally engaged in school? The results of an international study from 12 countries. *Journal of School Psychology*, *50*(1), 77–94. https://doi.org/10.1016/j.jsp.2011.07.004

Lei, H., Cui, Y., & Zhou, W. (2018). Relationships between student engagement and academic achievement: A meta-analysis. *Social Behavior and Personality: An International Journal*, *46*(3), 517–528. https://doi.org/10.2224/sbp.7054

Leon, J., Medina-Garrido, E., & Núñez, J. L. (2017). Teaching quality in math class: The development of a scale and the analysis of its relationship with engagement and achievement. *Frontiers in Psychology*, *8*, 895.

Madjar, N., Nave, A., & Hen, S. (2013). Are teachers' psychological control, autonomy support and autonomy suppression associated with students' goals? *Educational Studies*, *39*(1), 43–55. https://doi.org/10.1080/03055698.2012.667871

Mih, V., & Mih, C. (2013). Perceived autonomy-supportive teaching, academic self-perceptions and engagement in learning: Toward a process model of academic achievement. *Cognition, Brain, Behavior*, *17*(4), 289–313.

Oishi, S., & Diener, E. (2001). Goals, culture, and subjective well-being. *Personality and Social Psychology Bulletin*, *27*(12), 1674–1682. https://doi.org/10.1177/01461672012712010

Patall, E. A., Cooper, H., & Wynn, S. R. (2010). The effectiveness and relative importance of choice in the classroom. *Journal of Educational Psychology*, *102*(4), 896–915. https://doi.org/10.1037/a0019545

Patrick, H., Ryan, A. M., & Kaplan, A. (2007). Early adolescents' perceptions of the classroom social environment, motivational beliefs, and engagement. *Journal of Educational Psychology*, *99*(1), 83–98. https://doi.org/10.1037/0022-0663.99.1.83

Reeve, J. (2009). Why teachers adopt a controlling motivating style toward students and how they can become more autonomy supportive. *Educational Psychologist*, *44*(3), 159–175. https://doi.org/10.1080/00461520903028990

Reeve, J., & Jang, H. (2006). What teachers say and do to support students' autonomy during a learning activity. *Journal of Educational Psychology*, *98*(1), 209–218. https://doi.org/10.1037/0022-0663.98.1.209

Reeve, J., Nix, G., & Hamm, D. (2003). Testing models of the experience of self-determination in intrinsic motivation and the conundrum of choice. *Journal of Educational Psychology*, *95*(2), 375–392. https://doi.org/10.1037/0022-0663.95.2.375

Roorda, D. L., Jak, S., Zee, M., Oort, F. J., & Koomen, H. M. (2017). Affective teacher–student relationships and students' engagement and achievement: A meta-analytic update and test of the mediating role of engagement. *School Psychology Review*, *46*(3), 239–261. https://doi.org/10.17105/SPR-2017-0035.V46-3

Roorda, D. L., Koomen, H. M., Spilt, J. L., & Oort, F. J. (2011). The influence of affective teacher–-student relationships on students' school engagement and achievement: A meta-analytic approach. *Review of Educational Research*, *81*(4), 493–529. https://doi.org/10.3102/0034654311421793

Rosenthal, R. (1984). *Meta-analytic procedures for social research*. Sage Publications.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

Ryan, R. M., Stiller, J. D., & Lynch, J. H. (1994). Representations of relationships to teachers, parents, and friends as predictors of academic motivation and self-esteem. *The Journal of Early Adolescence*, *14*(2), 226–249. https://doi.org/10.1177/027243169401400207

Schmidt, F., & Hunter, J. (2014). *Methods of meta-analysis: Correcting error and bias in research findings* (3rd ed.). Sage Publications.

Skinner, E. A., & Belmont, M. J. (1993). Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year. *Journal of Educational Psychology*, *85*(4), 571–581. https://doi.org/10.1037/0022-0663.85.4.571

Skinner, E. A., Kindermann, T. A., & Furrer, C. J. (2009). A motivational perspective on engagement and disaffection: Conceptualization and assessment of children's behavioral and emotional participation in academic activities in the classroom. *Educational and Psychological Measurement*, *69*(3), 493–525. https://doi.org/10.1177/0013164408323233

Soenens, B., Sierens, E., Vansteenkiste, M., Dochy, F., & Goossens, L. (2012). Psychologically controlling teaching: Examining outcomes, antecedents, and mediators. *Journal of Educational Psychology*, *104*(1), 108–120. https://doi.org/10.1037/a0025742

Song, J., Bong, M., Lee, K., & Kim, S. I. (2015). Longitudinal investigation into the role of perceived social support in adolescents' academic motivation and achievement. *Journal of Educational Psychology*, *107*(3), 821–841. https://doi.org/10.1037/edu0000016

Stroet, K., Opdenakker, M. C., & Minnaert, A. (2013). Effects of need supportive teaching on early adolescents' motivation and engagement: A review of the literature. *Educational Research Review*, *9*, 65–87. https://doi.org/10.1016/j.edurev.2012.11.003

Su, Y. L., & Reeve, J. (2011). A meta-analysis of the effectiveness of intervention programs designed to support autonomy. *Educational Psychology Review*, *23*(1), 159–188. https://doi.org/10.1007/s10648-010-9142-7

Tardy, C. H. (1985). Social support measurement. *American Journal of Community Psychology*, *13*(2), 187–202. https://doi.org/10.1007/BF00905728

Van Ryzin, M. J. (2011). Protective factors at school: Reciprocal effects among adolescents' perceptions of the school environment, engagement in learning, and hope. *Journal of Youth and Adolescence*, *40*(12), 1568–1580. https://doi.org/10.1007/s10964-011-9637-7

Virtanen, T. E., Vasalampi, K., Kiuru, N., Lerkkanen, M. K., & Poikkeus, A. M. (2020). The role of perceived social support as a contributor to the successful transition from primary to lower secondary school. *Scandinavian Journal of Educational Research*, *64*(7), 967–983. https://doi.org/10.1080/00313831.2019.1639816

Walker, C. O., Greene, B. A., & Mansell, R. A. (2006). Identification with academics, intrinsic/extrinsic motivation, and self-efficacy as predictors of cognitive engagement. *Learning and Individual Differences*, *16*(1), 1–12. https://doi.org/10.1016/j.lindif.2005.06.004

Wang, M. T., & Holcombe, R. (2010). Adolescents' perceptions of school environment, engagement, and academic achievement in middle school. *American Educational Research Journal*, *47*(3), 633–662. https://doi.org/10.3102/0002831209361209

Wang, M., & Eccles, J. S. (2013). School context, achievement motivation, and academic engagement: A longitudinal study of school engagement using a multidimensional perspective. *Learning and Instruction*, *28*, 12–23. https://doi.org/10.1016/j.learninstruc.2013.04.002

Wentzel, K. R. (1998). Social relationships and motivation in middle school: The role of parents, teachers, and peers. *Journal of Educational Psychology*, *90*(2), 202–209. https://doi.org/10.1037/0022-0663.90.2.202

Wu, J. Y., Hughes, J. N., & Kwok, O. M. (2010). Teacher–student relationship quality type in elementary grades: Effects on trajectories for achievement and engagement. *Journal of School Psychology*, *48*(5), 357–387.

Zysberg, L., & Schwabsky, N. (2021). School climate, academic self-efficacy and student achievement. *Educational Psychology*, *41*(4), 467–482. https://doi.org/10.1080/01443410.2020.1813690