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School burnout among Chinese high school students: the role of teacher-student relationships and personal resources

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ABSTRACT

This study addresses the high level of academic demands and workload in Chinese high schools and aims to identify protective factors against students' negative emotional responses. Using the well-established Job Demands-Resources Model as a guiding framework, we investigated the relationship between workload, perceived academic demands, teacher-student relationships, personal resources (self-efficacy, self-esteem, and optimism), and school burnout symptoms (emotional exhaustion and cynicism). Data analyses were based on self-reports from 1,083 Chinese students. The results of structural equation modelling showed that workload and academic demands were positively related to burnout. Among the resources, optimism was negatively related to emotional exhaustion and cynicism, whereas self-efficacy was only negatively related to cynicism. Surprisingly, self-esteem was positively related to cynicism after controlling for the other two personal resources. Our findings underline the potentially protective effect of students' self-efficacy, dispositional optimism, and self-esteem (at least at the bivariate level) against school burnout.

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Resilience; protective factors; self-efficacy; self-esteem; optimism

Shanghai's outstanding performance at its first participation in PISA 2009 (Programme for International Student Assessment) has produced a global 'PISA-shock' that shifted the gaze of educational reform from Finland to the East and has strongly impacted educational policymaking in OECD countries (Sellar & Lingard, 2013). Sellar and Lingard (2013, p. 464) even describe China's education system as a 'reference' system. However, alongside the pursuit of high educational quality and academic excellence, China is paying a high price by putting their children under enormous strain through the highly competitive and selective social and academic environment.

The unique *hukou*-policy has existed for over 2000 years in China. This is a system of household registration that is used to control population movement and mobility, to prevent rapid urban migration, as well as to shape China's developmental priorities

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and collectivist socialism (Cheng & Selden, 1994). In short, this system restricts where an individual is allowed to live. If one is born into a rural *hukou*, it can be extremely difficult to move to an urban *hukou*. In general, holding an urban *hukou* is associated with many benefits; for instance, access to a better healthcare system, more social welfare entitlements, and schools with higher academic standards (Cheng & Selden, 1994). Although the quota of an urban *hukou* is limited, and the application process is competitive, state-owned organisations such as universities and corporations can sponsor their enrolled students or employees a local *hukou* temporarily. Therefore, admission to a prestigious university is a stepping-stone for rural children to stay in big cities.

In China, whether a student can be enrolled by a higher education institution is determined by his or her *gaokao* (National College Entrance Examination) scores. Due to the general expansion of higher education, admission rates are increasing. However, college admission still largely depends on one's socioeconomic status and family background (Wang, 2011). As reported by the Ministry of Education of China, the admission rate by Chinese universities in 2018 was only 40%. To improve academic performance and ultimately maximise the chances of university enrolment, many high school students (i.e. academic track, 10–12th graders) participate in extracurricular activities. Ten years ago, Lai et al. (2007) had already reported that Chinese students were overwhelmed with the quantity of homework and extracurricular activities. In addition, parents of school children have high educational expectations under the one-child policy in the past 35 years (for further reading, see Rasmussen, 2017). It can be said that Chinese high school students are confronted with high academic demands.

In school contexts, high academic demands are shown to be a significant predictor of burnout, which leads to negative academic and psychological outcomes such as school dropout and depression (for an overview, see Walburg, 2014). According to the well-established Job Demands-Resources (JD-R) model (Bakker & Demerouti, 2014), the availability of resources (i.e. protective factors) is vital to successful stress management. Recently, the JD-R model has been applied to Finnish (Salmela-Aro & Upadyaya, 2014), German (Teuber, Möer, et al., 2020), and Chinese (Teuber, Nussbeck, et al., 2020) upper secondary school contexts. To understand Chinese students' emotional responses to academic demands, more research works are needed.

Using the JD-R model as a guiding framework, we examined the relationship between workload, academic demands, teacher-student relationships, personal resources, and burnout symptoms in Chinese high school students (see Figure 1). We hypothesised that academic demands and workload are two significant risk factors of burnout, whereas high school students' resources (e.g. a positive teacher-student relationship, students' self-efficacy, self-esteem, optimism) are protective against burnout. Furthermore, we hypothesised that such resources buffer the detrimental effect of demands. To test the hypothesised models, we performed structural equation modelling.

School burnout

Burnout is generally defined as a work-related syndrome that consists of emotional exhaustion, cynicism, and reduced personal accomplishment (Maslach et al., 2001). In

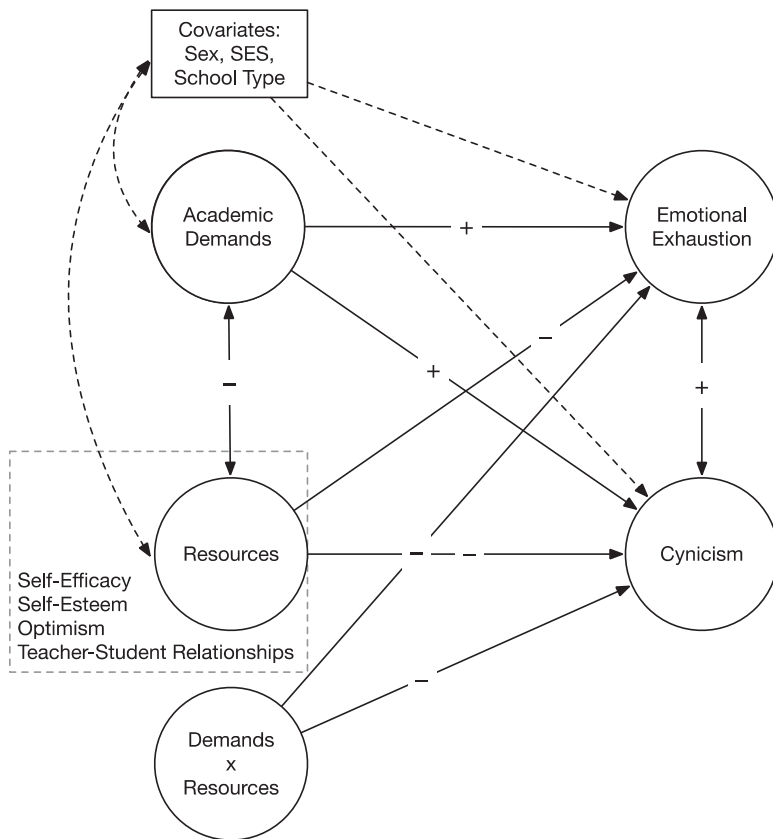


Figure 1. The hypothesised model relying on the JD-R model (Bakker & Demerouti, 2014). *Note.* Dotted paths: not included in the original JD-R model; SES: socio-economic status.

school contexts, emotional exhaustion refers to feelings of being emotionally overextended in the learning process. Cynicism means a cynical and distant attitude towards school. Finally, reduced personal accomplishment describes negative beliefs in one's own academic competencies (Salmela-Aro, Kiuru, et al., 2009).

Although burnout is originally conceptualised as being three-dimensional, attempts to replicate this structure have not consistently been successful. Many scholars (e.g. Purvanova & Muros, 2010) indeed suggest a two-dimensional structure with emotional exhaustion and cynicism as the core characteristics. There are two substantial arguments to suppose this: First, reduced personal accomplishment is akin to personality variables, such as self- or professional efficacy. Second, it correlates weakly with the other two dimensions and other known burnout or work-related variables (Kalliath et al., 2000). Thus, we focus on emotional exhaustion and cynicism as proximal outcomes in this study.

Since students attend structured activities, do schoolwork, and learn for performance assessment in school, school can be understood as a place where students work (Salmela-Aro & Tynkkynen, 2012). Having adopted this view and transferred burnout from the work to the school context, several researchers (e.g. Ivers, 2019; Pines et al., 1981) found that the burnout level of students was comparable to or even higher

than the burnout level of employees. Indeed, burnout among students has been identified as being a serious issue in a variety of cultures (e.g. in China, Singapore, North America, Finland, Germany, and Australia; Herrmann et al., 2019; Lushington & Luscari, 2001; Pines et al., 2002; Salmela-Aro, Kiuru, et al., 2009; Teuber, Nussbeck, et al., 2020).

Similar to job burnout, burnout in school-related contexts can lead to various mental and academic problems. Among others, burnout is regarded as an antecedent of depression (Bakker et al., 2000; Salmela-Aro, Savolainen, et al., 2009). The fundamental distinction between burnout and depression is that burnout takes place in job or school contexts, whereas depression is context-free (Bakker et al., 2000; Salmela-Aro, Savolainen, et al., 2009). In the school context, burnout has been shown to predict depression (Salmela-Aro, Savolainen, et al., 2009). In addition to depression, burnout has been linked to school dropout. For instance, the result of a longitudinal study conducted by Bask & Salmela-Aro (2013) indicated that burnout symptoms grew over time in secondary school. Their findings particularly underlined the detrimental effect of *cynicism*. Namely, students with high cynicism (i.e. the highest 10th percentile) were four times more likely to drop out of school than those with low cynicism (i.e. the lowest 10th percentile).

The JD-R model

In the past two decades, the JD-R model (Bakker & Demerouti, 2014) has become a popular heuristic model to predict job burnout. Strong cross-sectional and longitudinal evidence supports its applicability and flexibility across a wide variety of occupational settings (for an overview, see Bakker & Demerouti, 2014). Within this model, working characteristics broadly fall into one of two categories: job demands and job resources. Job demands are primarily linked to exhaustion, whereas job resources are primarily (and inversely) linked to disengagement or cynicism (Demerouti et al., 2001). According to the JD-R model, there are two psychological processes underlying the development of burnout: In the *health impairment process*, job demands lead to emotional exhaustion; in the *motivational process*, a lack of job resources leads to cynicism or withdrawal behaviour. Ultimately, the two components constitute burnout and lead to negative organisational outcomes. In addition to the main effects of job demands and job resources, the JD-R model posits two interaction effects. On the one hand, job resources buffer the detrimental effect of job demands on stress reactions. On the other hand, the positive effect of resources on engagement can be pronounced if demands are high.

The transferability of the JD-R model to the school context has been supported in both cross-sectional (Teuber, Möer, et al., 2020; Teuber, Nussbeck, et al., 2020) and longitudinal (Salmela-Aro & Upadyaya, 2014) studies. In a longitudinal study, Salmela-Aro and Upadyaya (2014) found that perceived academic demands predicted school burnout (as an overall score), whereas students' self-efficacy predicted schoolwork engagement. In the long term, burnout led to more depressive symptoms, whereas engagement fostered well-being.

The role of resources in the JD-R model

Teacher-student relationships

In the job context, a high-quality relationship with one's supervisor has been seen as one of the most powerful job resources (Bakker & Demerouti, 2007). In this study, we regard a good teacher-student relationship as an essential school-related resource.

Research on teacher-student relationships is strongly guided by models of social support (for an overview, see Wentzel, 2016) and self-determination theory (Ryan & Deci, 2000). Relying on these theories, students evaluate their relationship to teachers as positive if they perceive equality and receive emotional (i.e. empathy, warmth, and encouragement) and instrumental (i.e. tangible aid to promote learning) support from their teachers. Affectively close and supportive teacher-student relationships positively influence students' academic and psychological outcomes. There is a large body of support for these positive effects. In a meta-analysis, Roorda et al. (2017) revealed that good teacher-student relationships fostered the academic achievement of students from pre-school to 12th grade in Western countries and China. Also, PISA studies have consistently reported that a positive teacher-student relationship positively affects students' well-being and academic performance across countries (OECD, 2015). In the Chinese collectivistic culture, teacher-student relationships may have stronger influences on student development; for instance, across all PISA participating countries, the positive relationship between Chinese students' performance in mathematics and perceived teacher-student relationship is remarkably strong (OECD, 2015). We assume that teachers' support and fairness can help students to cope with demanding school tasks and may, therefore, buffer the detrimental effect of academic demands on students' emotional response. In this study, we operationalise the teacher-student relationship as an overall scale, including teachers' support and fairness based on the PISA study (OECD, 2015). This way, we consider it as a comprehensive higher-order factor.

Personal resources

The original JD-R model was limited to occupational characteristics and neglected personal resources that are crucial for one's occupational and psychological adjustment (Hobfoll, 2002). In the past 15 years, the JD-R model has been extended by several scholars by incorporating personal resources (e.g. Xanthopoulou et al., 2007). In the school context, personal resources such as self-efficacy, self-esteem, and optimism have been found to be protective during students' adjustment process. For instance, Western (Salmela-Aro & Upadaya, 2014) and Chinese researchers (Chan, 2007) have shown that self-efficacy fosters students' competency to cope with academic demands. Self-esteem is positively related to psychological health and academic achievement (Honicke & Broadbent, 2016) and negatively related to depression and anxiety (e.g. Kernis et al., 2008) as well as burnout (Virtanen et al., 2016). The protective effect of dispositional optimism against burnout has also been revealed (Liu et al., 2018).

Although self-efficacy, self-esteem, and optimism are strongly interrelated, they are considered distinct constructs at the conceptual level. *Self-efficacy* refers to personal assumptions about the capability to accomplish a task (Bandura, 1977). *Self-esteem* is conceptualised as one's emotional evaluation of the self (Rosenberg, 1979), whereas

self-efficacy is more task-specific compared to self-esteem. Finally, *dispositional optimism* (Carver & Scheier, 2014) is a broader construct and refers to a positive outcome expectation in general. There is also empirical evidence supporting their distinction. Lohaus and Nussbeck (2016) and Teuber, Wang, et al. (2020) examined self-efficacy, self-esteem, and optimism in German and Chinese students aged between 8 and 16 years, with the same questionnaire used in both studies. In both samples, the three constructs were associated with each other showing comparable correlations; yet, the three constructs could be separated from each other by confirmatory factor analysis (CFA); and each of the constructs explained unique variance in stress and coping, emotion regulation, well-being, and conduct problems.

According to the JD-R model, job resources buffer the detrimental effects of demands. However, findings on the buffering effects of personal resources are inconsistent in the literature. Xanthopoulou et al. (2007) examined the role of self-efficacy, self-esteem, and optimism in predicting job burnout. Instead of buffering effects, the authors found a mediatory role of personal resources between job resources and burnout. On the contrary, several scholars found evidence for the interaction between job demands and personal resources such as self-efficacy and optimism (Grau et al., 2000; Salanova et al., 2002). Although the literature is not entirely consistent, we expect that students with many personal resources are more likely to persist in demanding learning contexts. Hence, we assume that personal resources may buffer the detrimental effect of academic demands.

As previously mentioned, high-quality teacher-student relationships positively affect students' psychological adjustment. A large number of studies show that teacher-student relationships are related to students' self-efficacy, self-esteem, and optimism (Hughes & Chen, 2011; Martin et al., 2007). However, most studies on the effects of resources on burnout concentrate on one single resource (i.e. either self-efficacy or optimism, etc.). We are not only interested in the associations between these resources but also in their incremental variance explanation in predicting burnout symptoms.

Hypotheses

Based on the framework delineated above, we formulate the following hypotheses (Figure 1):

- Ha: Workload and perceived academic demands are positively related to burnout symptoms (emotional exhaustion and cynicism), whereas personal resources (self-efficacy, self-esteem, and optimism) and perceived teacher-student relations are negatively related to burnout symptoms.
- Hb: Expanding on Ha, personal resources and positive teacher-student relationships buffer the detrimental relationship between academic demands and burnout.

Method

Participants and procedure

As previously mentioned, students in Shanghai show high academic performance, and the enrolment of an elite university in big cities is associated with socio-economic

advancement for rural families. Hence, high school students in Shanghai face 'double pressure' (heavy competition within and outside of Shanghai). We, thus, focus on high school students in Shanghai in the present study.

In Shanghai, like elsewhere in China, high schools are categorised into key and ordinary schools. In comparison to ordinary schools, key schools refer to higher academic demands and are usually allocated more resources (You, 2007). To achieve a heterogenic sample and to reflect the specification of the Chinese school system, we contacted five high schools in Shanghai: a private ordinary high school (lowest academic demands and lowest resources), an ordinary high school, a campus district high school, a district key high school, and a Shanghai key high school (highest resources and highest demands).

Before collecting the data in March 2018, ethical permission for this study was obtained from the ethical committee of Bielefeld University. All participants were informed about the nature of this study and the possibility of the withdrawal of their participation at any time without consequences. To be eligible, participants and their parents or guardians had to provide informed consent. The participation was anonymous and voluntary.

Our sample included 1,083 students (47.5% female, $M_{age} = 16.33$ years, $SD = 1.56$) from 28 randomly selected classes (18% from the private ordinary high school, 22% from the ordinary high school, 23% from the district campus key high school, 15% from the district key high school, and 22% from the Shanghai key high school). The participation rate was 89.50%. All participants were Mandarin speakers.

Measures

School burnout

The two core symptoms—*emotional exhaustion* and *cynicism*—were measured with the two subscales of a validated Chinese version of the Maslach Burnout Inventory-Student Survey (MBI-SS; Maslach et al., 2006) for adolescent students (Wu et al., 2010). Preliminary analyses found one item of each subscale with cross-loading. We thus excluded them from further analyses. After the elimination of both items, the two-factor CFA model fitted the data well ($\chi^2 = 58.70$, $df = 13$, $p < .001$, $CFI = .97$, $SRMR = .04$, $RMSEA = .06$, 90% CI for RMSEA [.04, .08]). In this study, three items measured emotional exhaustion (e.g. 'I feel emotionally drained by learning') and four items measured cynicism (e.g. 'I doubt the significance of my learning'). All items were rated on a 5-point scale (1 = *never happens*, 5 = *always happens*). The subscales showed good internal consistency (both $\alpha = .83$).

Workload

For the assessment of students' workload, we asked participants to evaluate their average time spent on learning activities (Jacobs & Dodd, 2003). We developed a graphical representation of a 24-h clock so that it had a half-open answer format (see electronic supplementary material, ESM 1). This way, some commonly reported problems of assessing time spent on learning activities could be prevented (e.g. participants reporting activities totalling more than 24 h per day). Participants were asked to fill in two

clocks (one for a school day and the other one for a day on the weekend) with their activities. We ran an unpublished pilot study with 65 students. Participants had no difficulties understanding the instructions and filling in the two clocks. Moreover, they reported that their school days were highly comparable so their 'school day' clock could be considered representative of their weekdays generally. In this study, learning activities included attending lessons in school, doing homework, preparing and revising for lessons, and attending private lessons and hands-on training. The average hours per day spent on learning activities represent one's workload.

Academic demands

Academic demands were measured with four items using 4-point rating scales (Teuber, Nussbeck, et al., 2020). Two items covered perceived workloads: 'How do you evaluate the amount of homework?' and 'How do you evaluate the frequency of exams?' (1 = *little* to 4 = *very much*); and two items covered the perceived difficulty of the learning: 'How difficult is the schoolwork for you usually?' and 'How difficult are the exams for you usually?' (1 = *very easy*, 4 = *very difficult*). The one-factor CFA model fitted the data well ($\chi^2 = 16.84$, $df = 1$, $p < .001$, CFI = .97, SRMR = .01, RMSEA = .10, 90% CI for RMSEA [.07, .17]). Cronbach's alpha of the overall scale was .74.

Personal resources

We used the validated Chinese Questionnaire to Assess Resources for Children and Adolescents (QARCA-C; Teuber, Wang, et al., 2020) for all three personal resources. Six items measured *self-efficacy* (e.g. 'I can achieve everything with my ability'). Five items measured *self-esteem* (e.g. 'I like myself'). Six items measured *dispositional optimism* (e.g. 'Even if I have problems, I can see the positive side'). All items were rated on a 4-point scale (1 = *never*, 4 = *always*). Three related (factor correlations between $r = .78$ and $.87$, see Table 2) but distinct factors were identified in the present study (see ESM 2). Internal consistencies of the three subscales were .84 (self-efficacy), .89 (self-esteem), and .91 (dispositional optimism).

Teacher-student relationships

Teacher-student relationships were measured with the corresponding 5-item scale used in the Chinese student questionnaire of the PISA study (OECD, 2012). This scale covered teachers' emotional and instrumental support, teachers' fairness, and the perceived quality of the teacher-student relationship in general (e.g. 'If I need extra help, I will receive it from my teachers'). All items were coded on a 4-point scale (1 = *totally disagree*, 4 = *totally agree*). The result of CFA supported its unidimensional structure ($\chi^2 = 50.29$, $df = 5$, $p < .001$, CFI = .96, SRMR = .03, RMSEA = .09, 90% CI for RMSEA [.07, .12]). Cronbach's alpha of the overall scale was $\alpha = .89$.

Demographics

Demographic variables included: sex (0 = *male*, 1 = *female*) and school types (two dummy-coded variables: 0 = *not district key high schools*, 1 = *district key high schools*; 0 = *not Shanghai key high schools*, 1 = *Shanghai key high school*). To assess socio-economic status (SES), we asked for the number of books in the home using the same

item as in the Chinese PISA study (1 = *less than 20 books*, 5 = *more than 200 books*; OECD, 2013). A huge number of studies (OECD, 2013) show that this item is strongly correlated with parents' income and educational level and can, thus, be seen as a powerful indicator of SES.

Data analysis

Data analyses were conducted in *Mplus* 8 (Muthén & Muthén, 1998–2020). We used the TYPE = COMPLEX (CLUSTER = class) option to reflect the clustering of the data. Missing value analysis indicated that around 10% of the participants did not fill out the clocks and that data was missing between 1.50 and 10% for all variables. Little's test did not reach significance ($\chi^2=2135.56$, $df=2078$, $p=.19$), pointing to a Missing Completely at Random (MCAR) mechanism, which allowed us to use the full-information maximum likelihood robust (MLR) estimator.

We applied the widely used item-to-construct balance technique based on factor loadings (Little et al., 2002; for more detail, see ESM 3) to create two homogeneous metric indicators (i.e. test halves) for the latent variables representing perceived academic demands, teacher-student relationships, self-efficacy, self-esteem, optimism, exhaustion, and cynicism. There were only three items for the measurement of emotional exhaustion. These three items were used as indicators. For workload, only one score was calculated so that we incorporated the manifest variable into the SEM (by defining a latent variable for workload with only one indicator. The factor loading was fixed to Unity and the residual variance of the item was fixed to Zero, see ESM 4 for the MPLUS-Syntax). Before testing the hypotheses, we performed a global CFA with all indicators to test the presumed measurement structure. The CFA showed that the measurement structure fit the data well. To test our hypotheses (see Figure 1), we followed a stepwise analysis plan: First, we tested the more general Hypothesis Hb by estimating SEM models with latent interactions using the LMS-approach (Klein & Moosbrugger, 2000) based XWITH option in *Mplus* (demands \times teacher-student relationships; demands \times personal resources). Four different models (including one interaction effect at a time) were specified due to estimation problems in the complete model. Next, we ran an SEM model that included all presumed main effects (Ha) and the significant interaction effects from step 1 (Hb). We considered gender, SES, and school type as covariates (i.e. control variables) in all models.

To evaluate the model fit, we relied on the recommendations by Hu and Bentler (1999) with a non-significant χ^2 -value, a Comparative Fit Index (CFI) $\geq .95$, Root Means Square Error of Approximation (RMSEA) $\leq .05$, and Standardised Root Mean Square Residual (SRMR) $\leq .05$ indicating good model fit and CFI $\geq .90$, RMSEA $\leq .08$, and SRMR $\leq .08$ indicating acceptable fit. For model comparisons, we used Akaike information criterion (AIC) and Bayesian information criterion (BIC): the lower AIC and BIC, the higher the quality of the model (Schermele-Engel et al., 2003).

Results

Table 1 presents the means and standard deviations of the observed variables and Table 2 the latent correlations (correlations of factor scores in a global CFA model

Table 1. Means and standard deviations (in parentheses) for the total sample and the five high schools.

	WL	DE	TSR	EFF	OPT	EST	EE	CY
Total sample	13.79 (2.03)	2.63 (0.50)	2.99 (0.51)	2.53 (0.62)	2.80 (0.71)	2.47 (0.64)	3.27 (1.00)	2.14 (0.88)
Private ordinary high school	13.67 (2.48)	2.66 (0.58)	2.85 (0.53)	2.45 (0.63)	2.64 (0.71)	2.40 (0.63)	3.41 (0.95)	2.50 (0.94)
Ordinary high school	13.18 (2.01)	2.59 (0.49)	3.01 (0.48)	2.52 (0.59)	2.77 (0.68)	2.49 (0.64)	3.41 (0.86)	2.14 (0.81)
District campus key high school	13.73 (1.64)	2.61 (0.39)	2.97 (0.48)	2.53 (0.60)	2.91 (0.71)	2.40 (0.63)	3.16 (1.01)	1.80 (0.70)
District key high school	13.53 (1.91)	2.53 (0.52)	3.07 (0.53)	2.58 (0.66)	2.79 (0.76)	2.58 (0.68)	3.15 (1.12)	2.14 (0.93)
Shanghai key high school	14.64 (1.92)	2.78 (0.52)	3.05 (0.53)	2.57 (0.63)	2.86 (0.71)	2.52 (0.64)	3.21 (1.07)	2.24 (0.93)

Note. WL: workload; DE: perceived academic demands; TSR: teacher-student relationships; EFF: self-efficacy; OPT: optimism; EST: self-esteem; EE: emotional exhaustion; CY: cynicism.

Table 2. Correlations of factor scores in a global CFA with all items and scales.

	WL	DE	TSR	EFF	OPT	EST	EE
DE	.22***						
TSR	.06	-.06					
EFF	.01	-.07	.41***				
OPT	-.02	-.04	.41***	.80***			
EST	.04	.00	.36***	.87***	.78***		
EE	.19***	.31***	-.11**	-.22***	-.25***	-.15***	
CY	.08	.24***	-.24***	-.36***	-.40***	-.25***	.50***

Note. * $p < .05$; ** $p < .01$; *** $p < .001$; WL: workload; DE: perceived academic demands; TSR: teacher-student relationships; EFF: self-efficacy; OPT: optimism; EST: self-esteem; EE: emotional exhaustion; CY: cynicism.

with all items and scales). The global CFA model showed good model fit ($\chi^2=128.81$, $df=77$, $p<.001$, CFI=.99, SRMR=.02, RMSEA=.03, 90% CI for RMSEA [.02, .03]). ESM 5 shows the results of differences in gender, SES, and school types. ESM 6 presents the averaged activities across all participants for a school and a weekend day.

Following the data analysis plan, we first specified SEM including bivariate latent interactions of demands with teacher-student relation and personal resources respectively. It turned out that none of the latent interaction terms reached significance: demands \times teacher-student relations on exhaustion ($\beta = -.02$, $p=.54$) and cynicism ($\beta = .02$, $p=.75$), demands \times personal resources on exhaustion ($\beta = .01$ to $.06$, $p = .20$ to $.80$) and cynicism ($\beta = -.03$ to $.01$, $p = .64$ to $.90$). Model comparisons between the models including interaction terms (AIC = 32,681.75 to 32,684.18, BIC = 33,145.50 to 33,147.93) and the model without any interaction ($\chi^2 = 327.51$, $df=130$, $p<.001$, CFI=.97, SRMR=.04, RMSEA=.04, 90% CI for RMSEA [.03, .04]; AIC= 32,680.86, BIC= 33,134.63) indicated that models with and without interactions fitted the data equally well. Hence, we interpret the more parsimonious model (i.e. without interaction) as depicted in Figure 2.

Table 3 presents the path and determination coefficients of the final model (without interactions). Altogether, 20% of the variance in emotional exhaustion and 28% of the variance in cynicism (the two burnout symptoms) could be explained by the presumed risk factors and resources. Respondents who reported higher levels of workload also reported higher levels of exhaustion ($\beta=.15$, $p<.01$, $\Delta R^2 = .03$), whereas workload was not related to cynicism ($\beta=.05$, $p= .25$). Academic demands were significantly

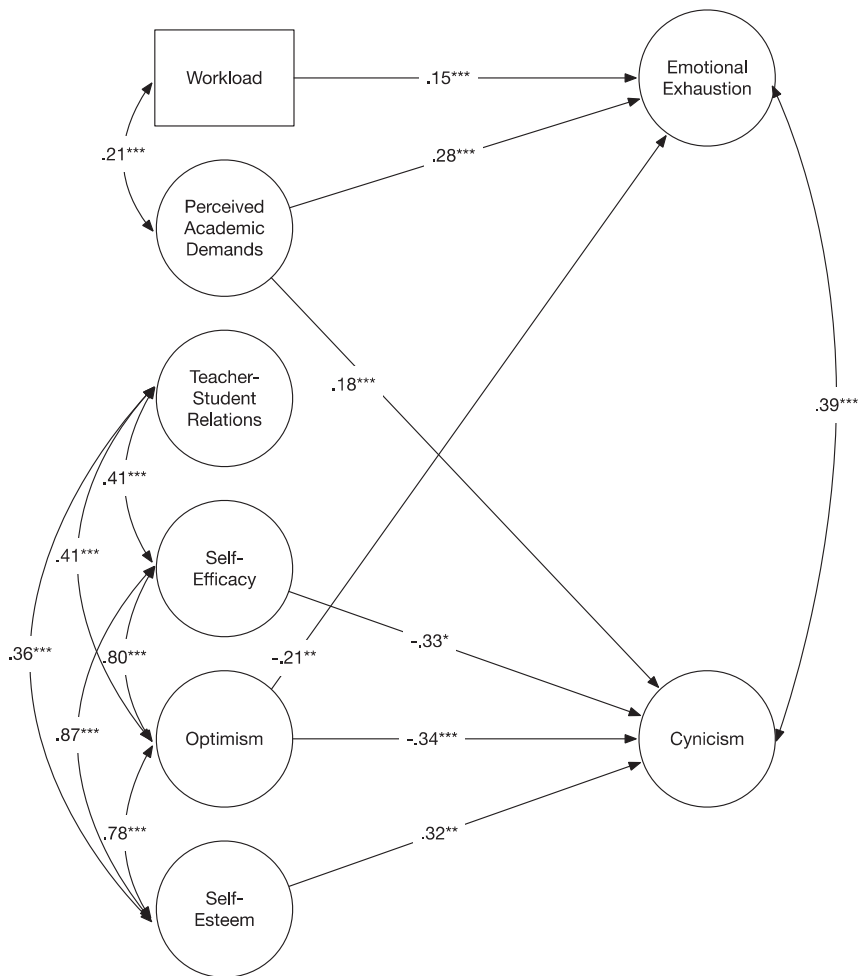


Figure 2. The final SEM model after controlling for SES, gender, and school type. *Note.* * $p < .05$. ** $p < .01$. *** $p < .001$. For sake of simplicity, control variables and their path coefficients as well as non-significant path coefficients are not depicted but estimated in this model. Technically, the workload is modelled as a latent variable in *Mplus* which perfectly corresponds to the observed variable.

related to exhaustion ($\beta = .28$, $p < .001$, $\Delta R^2 = .08$) and cynicism ($\beta = .18$, $p < .001$, $\Delta R^2 = .03$). No significant path coefficients between teacher-student relationships and both burnout symptoms were found. Regarding personal resources, we found a negative path coefficient running from self-efficacy to cynicism ($\beta = -.33$, $p < .05$, $\Delta R^2 = .02$). Only optimism was significantly negatively associated with both burnout symptoms (exhaustion: $\beta = -.21$, $p < .01$, $\Delta R^2 = .01$; cynicism: $\beta = -.34$, $p < .001$, $\Delta R^2 = .04$). However, there was an unexpected significant positive path coefficient between self-esteem and cynicism ($\beta = .32$, $p < .01$, $\Delta R^2 = .02$) indicating that, controlling for optimism and self-efficacy, higher self-esteem was related to higher cynicism. Both burnout symptoms were positively related to each other ($r = .39$, $p < .001$).

Table 3. Results of the latent multiple regression.

	B	SE _B	β	p	R ²	ΔR ²
EE					.20	
Sex	.02	.06	.01	.74		.00
SES	−.01	.03	−.02	.67		.00
Dkey	−.19	.07	−.11	<.05		.01
Skey	−.28	.07	−.14	<.01		.03
WL	.07	.02	.15	<.001		.03
DE	.49	.08	.28	<.001		.08
TSR	.01	.08	.00	.96		.00
OPT	−.25	.08	−.21	<.01		.01
EFF	−.19	.14	−.14	.15		.00
EST	.16	.11	.14	.14		.00
CY					.28	
Sex	−.16	.05	−.10	<.01		.02
SES	−.01	.03	−.02	.67		.00
Dkey	−.29	.09	−.18	<.01		.01
Skey	−.11	.09	−.06	.23		.00
WL	.02	.02	.05	.25		.00
DE	.29	.08	.18	<.001		.03
TSR	−.12	.08	−.07	.16		.00
OPT	−.37	.10	−.34	<.001		.04
EFF	−.44	.22	−.33	<.05		.02
EST	.35	.13	.32	<.01		.02

Note. EE: emotional exhaustion; CY: cynicism; SES: socio-economic status; Dkey: district key high school; Skey: Shanghai key high school; WL: workload; DE: perceived academic demands; TSR: teacher-student relationships; EFF: self-efficacy; OPT: optimism; EST: self-esteem; *B*: unstandardised regression coefficient; *SE_B*: standard error of the regression coefficient *B*; *β*: standardised regression coefficient; *R*²: variance explanation in total; *ΔR*²: incremental variance explanation.

The correlations between self-efficacy, self-esteem, and optimism were particularly high, we thus removed self-efficacy and optimism from the SEM model to see if the positive effect of self-esteem on cynicism remained stable. After removing self-efficacy, the path coefficient was still positive and significant ($\beta = .14, p < .05$). After removing optimism, the path coefficient was no longer significant ($\beta = .20, p = .10$). However, self-esteem turned to be negatively associated with both burnout symptoms (with exhaustion: $\beta = -.15, p < .001$, with cynicism: $\beta = -.20, p < .001$) after removing both self-efficacy and optimism from the model.

Discussion

In this study, we consider a positive teacher-student relationship, students' self-efficacy, self-esteem, and optimism as students' resources and integrate them into the JD-R model. Based on a Chinese high school student sample, we tested whether workload and academic demands were positively related to burnout symptoms and whether students' resources were negatively associated with burnout. Further, we investigated whether students' resources could buffer the detrimental effect of demands. Due to the close relationship between the resources, we focussed on the incremental contribution of each resource in the explanation of variance in burnout symptoms. All analyses were controlled for sex, SES, and school type.

As expected, academic demands were positively associated with both burnout symptoms, whereas workload was positively associated with emotional exhaustion but not significantly associated with cynicism. This result is in line with previous findings

indicating that demands are primarily linked to exhaustion, whereas resources are primarily linked to cynicism (e.g. Maslach et al., 2001).

There was no association between academic demands and teacher-student relationships (Table 2). Effort is viewed as the most important factor for academic success in China (Lau & Lee, 2008). In Chinese culture, good teachers are regarded as being demanding and strict. Due to the highly valued effort and the high academic aspiration in general, Chinese high school students may perceive the level of academic demands as independent of the perceived teacher-student relationship.

The perceived quality of teacher-student relationships was negatively associated with burnout symptoms (based on bivariate associations). However, this relationship was no longer significant after controlling for personal resources in the SEM model. Yet, it does not mean that teacher-student relationships are not important in students' adjustment. As expected, teacher-student relationships were positively linked to students' personal resources. Teacher-student relationships may influence students' emotional responses indirectly through personal resources. However, this assumption will need to be evaluated in future longitudinal studies.

Regarding the relationship between personal resources and burnout, we found expected bivariate associations (Table 2). In the SEM, however, only (higher) optimism was related to (less) exhaustion; for cynicism, we found that high self-efficacy and being optimistic related to lower scores in cynicism. Yet, contrary to our assumption and empirical findings (Vasalampi et al., 2010; Virtanen et al., 2016), self-esteem was positively related to cynicism after controlling for all other presumed protective factors (partial latent regression weight/path coefficient $\beta = .32$). That is, students with the identical workload and academic demands, the same teacher-student relation, the same self-efficacy, and the same optimism react more cynically if they show higher scores in self-esteem. This additional factor uniquely explained 2% of the variation in cynicism compared to 6.25% of the shared variance in the bivariate relationship (squared correlation in Table 2; uncorrected association). In previous work, self-esteem was found to be linked to impaired self-regulation (Neuenschwander & Oberlander, 2017; Zhou et al., 2017) and had thus also a dark side (e.g. Baumeister et al., 1993). Yet, due to the high correlations of the three personal resources in our study, we cannot rule out that this negative association is a statistical artefact. Further studies are needed to investigate the association between self-esteem and students' psychological adjustment in depth (e.g. by including constructs like the stability of self-esteem or contingent self-esteem).

Regarding the presumed buffering effect of resources, none of the presumed interaction effects proved to be significant. Hence, we have to reject Hb. This may be due to the fact that we assessed general self-efficacy, optimism, and self-esteem. For future research, the assessment of more specific personal resources associated with the school context may be helpful to reveal the postulated buffering effects.

Overall, 20% of the (error-free) variance in exhaustion and 28% of the variation in cynicism could be explained by the latent regressions. The total incremental variance explanations of the presumed resources were 5% for exhaustion and 18% for cynicism. Hence, future studies should consider further potentially protective factors such as

teachers' feedback and relations to peers, coping strategies, self-compassion, or growth mindset to better understand the genesis of burnout.

Conclusions, limitations, and future research

The present study is subject to several limitations. First, given the cross-sectional design of this study, we were not allowed to draw causal conclusions. Although our hypotheses were derived from well-established theories and empirical findings, longitudinal studies are needed in the future to examine the presumed causal relationships. Second, our sample consisted of high school students who are most likely exposed to the highest academic demands of all students. These results cannot readily be generalised to other groups such as middle school students and vocational high school students. Third, our theoretical reasoning and hypotheses are based on Western burnout theory, and most empirical studies were conducted in Western societies. China differs greatly from Western countries not only in terms of its education system but also in terms of its culture. In the future, cross-cultural comparison studies may be helpful to test cultural similarities and differences in the development of burnout. Fourth, this study relied on students' self-reporting, and we cannot rule out that results may be biased due to method effects. Fifth, for an economic investigation of students' time schedules, only two 24-h clocks were used. We, hence, cannot ascertain that the two clocks reliably depict the average workload on weekdays and weekends (although students of the pilot study reported that their activities on school days are rather stable during the week). In future studies, experience sampling or day-specific 24-h clocks could allow for a much more fine-grained assessment of students' activities. Last, the positive association between self-esteem and cynicism may be due to statistical artefact. It can be helpful to measure the three personal resources using different scales instead of using subscales of the same questionnaire and include additional construct such as self-esteem stability.

Apart from these limitations, the present study may have important implications for educators and practitioners who are interested in the enhancement of Chinese students' well-being and school engagement. Our findings suggest that Chinese educators should pay more attention to an adequate workload and be aware of students' individual differences in their perception of stressors as well as in their resources. Identifying students at risk (e.g. low self-efficacy and low optimism) could be an important step for burnout prevention and intervention. Furthermore, teachers should give their students emotional and instrumental support as well as focus on helping their students in seeing the positive side of the effortful learning process.

This study was the first attempt to test the influences of teacher-student relationships and students' personal resources on school burnout in Chinese students. As in Western countries, evidence for the potential protective effects of students' self-efficacy, dispositional optimism, and (not exaggerated) self-esteem could be found.

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