ACADEMIC AND PSYCHOLOGICAL ADJUSTMENT IN CHINESE STUDENTS: THE ROLE OF STUDENT RESOURCES

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There is no better place to create a community of caring than in our schools – the heart of our future.
— Patricia Gándara

Dedicated to people who are working on the educational reform in China and the promotion of students' well-being.

Dedicated to the loving memory of my father-in-law, Dietmar Teuber.
1940 – 2019

Dedicated to my parents who have given me unconditional love.

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PREFACE

It was a great honor for me to be invited by a senior high school principal in Shanghai to give a talk to their students in March 2019. He and his team have a strong willingness to promote students' well-being.

I talked about stress and coping to nearly 500 11^{th}-graders. I was touched to experience how proactive most of my audience was. They openly communicated with me about their confusion during their development, and they were very curious about psychological topics. Meanwhile, I felt sorry that a significant number of them had reported dissatisfaction with themselves. Some of them asked me how they could meet their parents' demands and be a better child. Some of them asked me to make suggestions for ways that they could use to more effectively regulate their emotions. Some of them told me that they were depressed because their performance was probably not good enough to progress to higher education.

I was born and raised in Shanghai and have received both basic and higher education there. For me, as part of the first single-child generation, I understand how heavy the pressure of parental expectations can be. Throughout my development, I was exposed to high academic demands and high parental expectations. I went to one of the most demanding key high schools in Shanghai. The ultimate goal of this type of school is not simply the enrollment into any university, but rather achieving a place at elite (international) higher education institutions, such as Fudan University, Massachusetts Institute of Technology, and Harvard University. I cannot remember ever being asleep before 11 p.m. without leaving schoolwork unfinished. I have struggled with the meaning of learning, my life, and my imperfect self.

My educational pathway has inspired me to study stress and coping as well as the promotion of Chinese students' development in my dissertation project. Now, please enjoy reading this dissertation!

ABSTRACT

This dissertation addresses the high level of academic demands in the Chinese education system and the role of student resources in their academic and psychological adjustment. Using three original empirical studies, this dissertation contributes to research (1) by providing Chinese researchers and educators with a valid Chinese-language diagnostic questionnaire (QARCA-C) to measure students' personal and environmental resources (Study I); (2) by extending and transferring usage of the well-established Job Demands-Resources (JD-R) Model to the Chinese school system (Study II & III); and (3) by investigating the relationship between academic demands, students' resources, burnout, engagement, academic achievement, and mental health (Study II & III). Data analyses were based on N = 5,210 Chinese school students and 393 parents. The results warrant good psychometric appropriation of the QARCA-C and measurement invariance across gender and language versions. Relations to external criteria hint at cultural differences. This dissertation highlights the detrimental role of the high level of workload and academic demands as well as the protective role of student resources such as self-efficacy, optimism, positive teacher-student relationships, and grit. Furthermore, the JD-R model appears to be suitable in explaining students' academic and psychological adjustment. Based on the findings, I propose a Student Demands-Resources Model of School Burnout, which considers important socio-demographic factors. In addition to the theoretical significance, the findings provide important political and practical implications of promoting student development. Nevertheless, further cross-cultural comparison and longitudinal studies should be conducted to study cultural equivalences and differences as well as causal relationships.

Keywords: burnout, resilience, student engagement, Asian learners, psychological assessment

PUBLICATIONS

In the context of this cumulative dissertation, the following three articles have been published in or submitted to peer-reviewed journals.

1. Teuber, Z., Wang, Q., Su, Y., Lohaus, A., & Nussbeck, F.W. (2020). Human resources in Chinese youngsters: A Chinese adaptation of the QARCA. *Psychological Test Adaptation and Development, online first article,* 1-8. https://doi.org/10.1027/2698-1866/a000003.

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3. Teuber, Z., Nussbeck, F. W., & Wild, E. (2020). The bright side of grit in burnout-prevention: Exploring grit in the context of demands-resources model among Chinese high school students. *Child Psychiatry and Human Development, online first article*, 1-13. https://doi.org/10.1007/s10578-020-01031-3.

CONTENTS

Part I

SYNOPSIS

1

INTRODUCTION

Since the launch of Programme for International Student Assessment (PISA) in 2000, the value of education has been steadily increasing in all Organisation for Economic Co-operation and Development (OECD) and PISA partner countries. Promoting students' academic achievement has been an important objective in many education systems. This trend can be particularly observed in the Chinese municipality of Shanghai, which has successfully topped the PISA rankings serval times (PISA 2009, 2012, & 2018). Shanghai's outstanding performance 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. Regarding academic performance, the success of China's education system is obvious. However, the dark side of this system should also be highlighted. 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 environment and high academic demands (Hansen, 2018).

heavy workload and high academic demands

A local study in 2015 (Guo et al.) showed that, on average, secondary school students in Shanghai spend 2.39 hours on homework on school days and almost three hours per day at the weekend. OECD reports of 2016b have shown similar results in that 15-year-old Chinese students spent 30.1 hours per week in regular lessons (for comparison: less than 25 hours in Finland, Brazil, and Bulgaria) and 27 hours per week in addition to the required school schedule (for comparison: less than 15 hours are spent in Finland, Germany, Sweden, and Japan). Additionally, due to the one-child policy throughout the last 35 years, school children face high educational expectations on the part of their families (for further reading, see Rasmussen, 2017). Thus, high school students in China experience enormous academic demands from many directions.

The well-established Job Demands-Resources (JD-R) Theory (Bakker et al., 2007) postulates that prolonged or intensive exposure to job demands with the combination of insufficient job or personal resources can lead to burnout and withdrawal behaviors and ultimately to negative occupational outcomes. Although students are not employees, they also attend structured activities, do schoolwork, and study for performance assessment in school. Hence, "school is a place where students work" (Salmela-Aro & Tynkkynen, 2012, p. 929). The concept

of burnout has been extended to educational contexts (for an overview, see Walburg, 2014). Also, the JD-R model has been applied to Finnish (Salmela-Aro & Upadyaya, 2014) and German (Teuber, Möer, et al., 2020) upper secondary school contexts. Similar to job burnout, school burnout detrimentally affects one's well-being and increases the risk of dropping out of school as well as the development of mental disorders, such as affective disorders, eating disorders, and conduct problems (for an overview, see Walburg, 2014).

In contrast to Chinese students' high achievement, the recent PISA report (OECD, 2019c) states that Chinese students' well-being is low in comparison with their PISA-participating peers (China is ranked 61st out of 70; for comparison: Finland is ranked 19th, and Germany is ranked 41st). Compared to students from other PISA-participating countries, Chinese students consistently report more schoolwork-related anxiety and negative emotions (OECD, 2017, 2019b). The high demands of the Chinese education system give grounds for concern, and it is worth examining the relationship between high academic demands and emotional responses in depth. Identifying protective factors that foster students' academic and psychological adjustment may be valuable for researchers and practitioners to derive burnout prevention and intervention strategies.

Using three samples of N = 5,210 Chinese students (aged between 8 and 20 years) and 393 parents, this dissertation contributes to providing Chinese researchers and educators with a valid Chinese diagnostic questionnaire to measure students' resources (Study I) and to gaining a deeper insight into Chinese school students' emotional responses to academic demands (Study II & III). Using the JD-R model as a guiding framework, the relationships between workload, perceived academic demands, personal and environmental resources of Chinese students, and their impact on student academic and psychological adjustment were estimated (Study II & III).

This dissertation will be presented in the following steps: Firstly, the Chinese education system shall be presented in a broader cultural and social context as part of the theoretical background. The cultural and political background in which China is embedded in is essential for understanding the high level of academic demands existent there. Secondly, two core concepts shall be introduced and defined: burnout and engagement, alongside reviewing the consequences associated with these factors. The JD-R model in job and school contexts and associated empirical findings will be presented in the same chapter, and in addition the concept of student resources and their integration into the JD-R model shall be introduced. Following an overview of research objectives and assumptions, the three independent studies regarding these will be briefly presented. Finally, a joint discussion will be presented.

2 THEORETICAL BACKGROUND

2.1 SCHOOLING IN CHINA

hukou-policy

In mainland China, the unique *hukou*-policy has existed for over 2,000 years. It is a domicile registration system that accords rights and obligations to families (OECD, 2016b). It aims to control population movement and mobility and prevent rapid urban migration, as well as to shape developmental priorities and promote collectivist socialism in the People's Republic (T. Cheng & Selden, 1994). In the past 50 years, this system has been additionally implemented as an industrialization strategy: The state siphoned off resources in the countryside to accumulate capital for the industry in urban areas (K. W. Chan, 2009). This uneven resource allocation significantly leads to social inequality and even deteriorates the process of "price scissors" (K. W. Chan, 2009, p. 199). There are two types of *hukou*: urban *hukou* and rural *hukou*. Holding an urban *hukou* is associated with many benefits: for example, access to a better healthcare system, more social welfare entitlements, and schools with higher academic standards (T. Cheng & Selden, 1994). It can be extremely difficult for rural *hukou* holders to convert their *hukou* status. However, organizations such as universities and corporations can help their students or employees to obtain a local *hukou* temporarily. Furthermore, the rules for granting a permanent local urban *hukou* in many big cities are based on a social credit system that favors highly qualified people[1] (Koen et al., 2013). Therefore, enrollment in a prestigious or elite university is a stepping-stone for rural children to stay in big cities. Consequently, good performance in the annual *gaokao* (National College Entrance Examination) increases the chance of socio-economic advancement for rural families.

[1] *so-called rencai yinjin strategy, meaning talent acquisition*

gaokao

In China, students' *gaokao* performance determines their admission into higher education institutions[2]. Hence, *gaokao* is the most important event for Chinese high school students and their parents. As PISA results (OECD, 2016c, 2019a) show, there is a strong relationship between Chinese students' academic achievement and socio-economic status (SES). Although college admission rates are increasing because of the general expansion of higher education, the inequality in college admission in terms of social class and geography is still large (H. Wang, 2011). According to the statistics provided by the Chinese Ministry of Education, the admission rate of Chinese universities in 2018 was only 40% of applicants, and only a further 10% gained a place at an elite Chinese university. Hence, the *gaokao* examination is highly competitive, and the disadvantage of rural children may be thereby

[2] *Some exceptional cases are considered without the scores (e.g., admitted due to recommendations; for an overview, see OECD, 2016a).*

further reinforced. In addition, many students have described the preparation for *gaokao* as a mental "torture" (e.g., S. Wang, 2019, p. 1). An example of this is the final year of high school (i.e., 12th grade), which is usually devoted to preparations where students do practice exams nearly every day. In Shanghai, before students participate in the *gaokao*, they submit a list of college and major choices in order of preference to the Examination Committee[3]. Applicants with higher *gaokao* scores have priority when it comes to the choice of majors and universities. It is not seldom that applicants are assigned to a major that was not among their listed preferences (a so-called *bei tiaoji* phenomenon). If they do not accept it, they must repeat *gaokao* one year later. The low transparency of the *gaokao* system and the limited self-determination in the choice of universities and majors can have long-term negative influences on students' well-being and mental health (H. Zhang & Yu, 2010).

[3] *In the other provinces, examinees fill out their list of preferences after receiving their gaokao results.*

the key school system

The key school system is another system that promotes inequality and raises competition in the Chinese education system (You, 2007). This system appeared in the 1980s due to the scarce educational resources and a lack of qualified teachers. In China, academic upper secondary schools (or senior high schools, i.e., 10-12th grades) are divided into key and ordinary high schools (for an overview, see You, 2007). Key high schools are associated with "elite education" (You, 2007, p. 231) and aim to maximize the enrollment rate to elite higher education institutions. Better educational (e.g., better-qualified teachers, usually with a master degree or higher; native-speaking teachers for foreign languages) and financial resources (e.g., more funds for international exchange programs or better science equipment) are allocated to key high schools through state input and the "intangible assets of the brand" of key high school (You, 2007, p. 232). Similar to the *hukou*-system, the unequal resource allocation increases the social inequity between Chinese schools. This has been reflected in the latest PISA report (OECD, 2019a) showing that whereas some education systems (e.g., in Denmark, Norway, and Bulgaria) succeed in providing resources to all schools including disadvantaged schools, the Chinese education system showed greater disparity between advantaged and disadvantaged students. In Shanghai, 33% of high schools are Shanghai key high schools (receiving the most resources and having the highest academic demands; e.g., high frequency and difficulty of examinations, high quantity and difficulty of schoolwork), 40% are district key high schools, and around 27% ordinary high schools (lowest resources and lowest demands)[4]. Whether one can attend a key high school depends on his or her *zhongkao* (High School Entrance Examination) scores. In Chinese education circles, it is thought that "competition can change everything" (You, 2007, p. 233), whereas the corresponding pressure is not addressed.

[4] *The enrollment rate of universities in a Shanghai key high school can be over 95%, whereas this rate in an ordinary high school can be lower than 15%.*

The last policy I want to introduce is the one-child policy, implemented in 1979, abolished in 2015, and recognized as the largest population control measure of all time (Q. Jiang et al., 2013)[5] . It has strongly impacted not only China's population and women's rights but also parenting habits, learning attitudes, and perceived social pressure. Providing children with many resources and supporting their development has been of paramount importance for many parents. Previous research also yields that the one-child families share high educational aspirations and Chinese parents invest lots of effort and resources in their children's education so that their children have a better start to achieve success in the increasingly competitive society (Kajanus, 2016; Tu, 2016, 2019). Although many researchers (e.g., Fong, 2002) claim that this policy has significantly improved the equality and quality of China's education, from a personal point of view, it should not be neglected that the heavy competition and the boom of commercial extra-curricular support offers (Lohaus & Wild, 2020) may detrimentally affect educational equality as well as the well-being of children and young people (especially for vulnerable subgroups, such as rural children and left-behind children[6]).

To sum up, all of these systems place enormously high demands on school students and exert profound influences on learning behavior and well-being. According to the well-established JD-R model (Bakker & Demerouti, 2014), high levels of demands, heavy workload, and fierce competition are significant risk factors for maladjustments such as burnout. On the opposing side, protective personal and environmental factors (i.e., resources) can contribute to successful adjustments such as student engagement.

[5] *One child per family, exceptions were granted to families whose firstborn was disabled; urban families in which both parents were only-child or worked in high-risk occupations; rural citizens five years after their first-born; and some ethnic minorities (for an overview, see Rasmussen, 2017)*

[6] *Left-behind children are those who stay in rural regions of China while their parents leave to work in urban areas.*

2.2 BURNOUT AND ENGAGEMENT

School provides an important context for children and adolescent development (Eccles & Roeser, 2009). How students adapt to various academic demands and developmental tasks is crucial for their academic and psychological outcomes (Bakker & Demerouti, 2014; Eccles et al., 1993; Lazarus & Folkman, 1984). Whereas school burnout has been seen as maladjustment, student engagement has been regarded as a successful adjustment in school (Salmela-Aro & Vuori, 2015). Research on burnout and research on engagement are traditionally two separate fields. These fields shall be introduced in the following sections, and a framework model shall be presented in which the two constructs are combined.

School Burnout

Burnout is generally defined as a work-related syndrome of emotional exhaustion, cynicism, and reduced personal accomplishment (Maslach

et al., 2001). Increasing numbers of researchers have identified an analogous syndrome in students (e.g., Boyacı & Özhan, 2018; M.-T. Wang et al., 2015). In the school context, emotional exhaustion refers to a lack of energy or feelings of being emotionally overextended during the learning process. Cynicism means a detached attitude towards school (e.g., losing interest in learning and perceiving learning as senseless). Finally, reduced personal accomplishment describes one's negative beliefs in academic competencies and achievement (Lin & Huang, 2014; Salmela-Aro, Savolainen, et al., 2009).

dimensionality

Although burnout is originally conceptualized as being three-dimensional, attempts to replicate this structure have not been consistently successful. Many scholars indeed suggest a two-dimensional structure with exhaustion and cynicism as the core characteristics. There are two main 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). Moreover, several authors (Cordes & Dougherty, 1993; Herrmann et al., 2019; Leiter, 1989; Parker & Salmela-Aro, 2011) suggest that reduced personal accomplishment is a result of high levels of cynicism: Individuals with a cynical attitude tend to withdraw themselves from the job situation (as an avoidant coping strategy). They will perceive a diminished willingness and consequently perceive that they are not able to perform effectively.

Some researchers (Klusmann et al., 2008; Leiter & Maslach, 1988; Maslach et al., 2001) have even posited that emotional exhaustion essentially captures the burnout construct. For example, Maslach et al. (2001, p. 402) suggest emotional exhaustion as "the central quality of burnout" and "the most obvious manifestation" of burnout. Leiter and Maslach (1988) proposed a model suggesting that emotional exhaustion is the first phase of burnout and leads to cynicism (as a maladaptive coping strategy) and reduced personal accomplishment. R. T. Lee and Ashforth (1990) and Taris et al. (2005) provide longitudinal support for the initial and central role of emotional exhaustion in burnout.

burnout phenomena in school-related contexts

The idea that students may also suffer from burnout was first proposed by Pines et al. (1981). Several authors (Ivers, 2019; Pines et al., 1981) were able to show that compared to employees, the burnout level of students was comparable or even higher. Indeed, comparable with employees, students attend structured activities, do schoolwork, and learn for performance assessment in the school. Hence, "school is a place where students work" (Salmela-Aro & Tynkkynen, 2012, p. 929). The phenomenon of school burnout has been observed among students from different cultures and education systems; for instance, from Hong Kong, Australia, Singapore (Lushington & Luscri, 2001), Israel, Hungary, North American (Pines et al., 2002), Finland (Salmela-

Aro, Savolainen, et al., 2009), Germany (Herrmann et al., 2019; Teuber, Möer, et al., 2020), Iran (Pourghaz et al., 2017), South Korean (Kim et al., 2015; Shin et al., 2011), and China (Wu et al., 2010).

In Finland, where students spend significantly less time on learning activities, the burnout prevalence rate (10-15%) in school students is considerable (Salmela-Aro, Kiuru, Pietikäinen, et al., 2008; Salmela-Aro, Savolainen, et al., 2009). Although academic demands in China are high, evidence of school burnout and its etiology are lacking to date.

Consequences of burnout

burnout and depression

A large body of research has linked school burnout to serious physical, affective, and behavioral problems such as cardiovascular diseases (May et al., 2014), depression (e.g., Fiorilli et al., 2017), and drug/media abuse or dependence (e.g., Salmela-Aro et al., 2017; Walburg et al., 2015). The World Health Organization (WHO) has ranked depression as the fourth leading cause of illness and disability worldwide among adolescents aged 15–19 years. According to the statistics from the National Institute of Mental Health[7], the prevalence of a major depressive episode among U.S. adolescents in 2017 was 13.3%. The prevalence rate in Europe ranges from 7.1% to 19.4% (Hungary: 7.1%, Austria: 7.6 %, Romania: 7.6 %, Estonia: 7.9 %, Ireland: 8.5 %, Spain: 8.6 %, Italy: 9.2 %, Slovenia: 11.4 %, Germany: 12.9 %, France: 15.4 %, Israel: 19.4 %; Balazs et al., 2012). A recent report (M. Zhou et al., 2018) found that the prevalence rate of depression among Chinese children and adolescents in 2012 was over 20%.

[7] *Visit https://www.nimh.nih.gov/health/statistics/index.shtml for more statistics.*

The fundamental distinction between burnout and depression is that burnout takes place in job/school-related contexts, whereas depression is context-free (Bakker et al., 2000; Salmela-Aro, Savolainen, et al., 2009). Moreover, several scholars suggest that burnout predicts depression and not vice versa (e.g., Ahola et al., 2005; Bakker et al., 2000). In two longitudinal studies, Salmela-Aro, Savolainen, et al. (2009) investigated the relationship between burnout and depressive symptoms of students aged between 15 and 19 in Finland (a total N = 1,370). Their results showed that burnout predicted subsequent depressive symptoms more strongly than vice versa.

burnout and academic factors

Apart from health-related outcomes, cross-sectional and longitudinal evidence supports that school burnout detrimentally affects educational factors such as motivation, self-regulation, and academic achievement (Asikainen et al., 2019; Bask & Salmela-Aro, 2013; Cadime et al., 2016; Fiorilli et al., 2017; Salmela-Aro, Kiuru, Leskinen, et al., 2009; Tuominen-Soini & Salmela-Aro, 2014). In a longitudinal study, Bask and Salmela-Aro (2013) analyzed data from 878 Finnish adolescents (aged 16–18) and revealed that burnout symptoms grew over time during the period of upper secondary school and that particularly cynicism increased the risk of school dropout: Compared to students

with a low level of cynicism (i.e., the lowest 10th percentile), students with a high level of cynicism (i.e., the highest 10th percentile) were four times more likely to drop out of school.

Student Engagement

On the opposing side of school burnout is student engagement (Bask & Salmela-Aro, 2013). Being actively engaged in school and learning is vital to students' educational success and positive development (Bakker & Demerouti, 2014; Bask & Salmela-Aro, 2013; Salmela-Aro & Upadyaya, 2014). Hence, student engagement has been the focus of a substantial amount of research over the last decades in both Eastern and Western cultures (Cadime et al., 2016; Engels et al., 2016; Fredricks et al., 2004; Tuominen-Soini & Salmela-Aro, 2014; Y. Zhang et al., 2007).

student engagement as a meta construct

Student engagement is generally thought of as a meta construct that consists of affective, cognitive, and behavioral components (Fredricks et al., 2004; Jimerson et al., 2003; Salmela-Aro & Upadaya, 2012; Salmela-Aro & Upadyaya, 2014). Salmela-Aro and colleagues (Salmela-Aro, Savolainen, et al., 2009; Salmela-Aro & Upadyaya, 2014; Salmela-Aro & Vuori, 2015) define student engagement as an overall construct that comprises energy, dedication, and absorption in schoolwork, which are constructs typically found in studies on work engagement (Hakanen et al., 2008; Schaufeli et al., 2006; Schaufeli & Salanova, 2007). According to the authors, energy refers to emotional reactions towards learning and is characterized by high levels of vigor and mental resilience in the learning process and a willingness to invest effort in learning. Dedication is manifested in a positive cognitive attitude towards learning in general, interest in one's schoolwork and the perception that it is meaningful, being intimately involved in one's learning, and experiencing a sense of significance, enthusiasm, inspiration, and challenge. Absorption is defined as having feelings of competence and success, behavioral accomplishment in one's learning and school as a whole, and being fully concentrated on learning, whereby time passes quickly.

measurement issues

Although student engagement has been regarded as multidimensional, scholars have noted that these subtypes overlap and interact with each other (Skinner & Pitzer, 2012). This is also reflected in the assessment of engagement. One of the most widely used questionnaire to assess student engagement is the Utrecht Work Engagement Scale for university students (UWE-S; Schaufeli & Bakker, 2004; Schaufeli, Salanova, et al., 2002), to which the School Student Engagement Inventory by Salmela-Aro and Upadaya (SEI; 2012) adheres. In a cross-national study, Schaufeli, Martinez, et al. (2002) tested the factorial structure of the UWE in three university student samples and revealed that a one-factor structure best fit the data for younger students and gave the best reliability and validity indices. In the validation study of

the SEI, the authors also recommended a one-factor solution yielding excellent reliability and validity. The authors assume that this result is due to the fact that younger students cannot comprehend the subtleties in the engagement concept and suggest that the three dimensions still effectively describe student engagement. Hence, in many studies the overall scale of the SEI has been used (e.g., Salmela-Aro, 2015; Salmela-Aro & Read, 2017; Salmela-Aro, Savolainen, et al., 2009; Teuber, Möer, et al., 2020; Tuominen-Soini & Salmela-Aro, 2014).

Consequences of engagement

In both theoretical and empirical work, student engagement has been regarded as a powerful predictor of academic success and can be seen as an "antidote" (Fredricks et al., 2004, p. 60) to school dropout. In a meta-analysis, Lei et al. (2018) reviewed 69 independent studies (196,473 participants) and revealed that all three components of engagement positively affected academic achievement. In a large Canadian longitudinal study (Archambault et al., 2009) with 13,330 participants (aged 12–16), the authors found that students with low engagement levels from the beginning of high school were more likely to drop out of school. In another longitudinal study (Ladd & Dinella, 2009), 383 American children were followed from ages 5.5 to 13.5. Findings showed that changes and continuity in early student engagement were predictive of children's long-term scholastic growth: Engaged students made greater academic progress than their less-engaged peers.

Apart from the impact on academic outcomes, Appleton et al. (2008) postulate that engagement influences non-academic outcomes: Engagement fosters one's social awareness and relationship skills with peers and adults, as well as leads to better emotional regulation and conflict resolution skills. In a two-wave study, Lewis et al. (2011) investigated the relationship between student engagement subtypes and life satisfaction on a sample of 779 middle school students in the USA from a positive psychology perspective. They found a bi-directional relationship between cognitive engagement and life satisfaction, whereas non-significant relationships were found between behavioral and emotional student engagement and life satisfaction.

Taken together, both school burnout and student engagement influence students' psychological and academic outcomes. In the past, burnout and engagement have been separately studied. In more recent approaches, researchers tend to combine burnout and engagement (see Figure 2.3). In an interesting longitudinal study, Tuominen-Soini and Salmela-Aro (2014) investigated patterns of student engagement and school burnout among $N = 979$ participants (mean age = 18.11 years) in high school. Six years later, 68% of the original participants were involved in the second wave. Using latent profile analyses, four groups of students in high school were identified: engaged, engaged-exhausted, cynical, and burned-out (high scores on all three dimen-

sions of burnout) students. The results demonstrated that both engaged students were successful in school, although engaged-exhausted students were more stressed, whereas cynical and burned-out students were less engaged and had lower academic achievement. Six years later, engaged students were more likely to attend university. Furthermore, results indicated that the patterns were rather stable over time from late adolescence to young adulthood.

2.3 THE JD-R THEORY

a variety of stress and engagement models

Several models have been put forward to explain students' academic and psychological adjustment in stress and engagement research: the Stage-Environment Fit Theory (SEF; Eccles et al., 1993; Eccles & Roeser, 2009), the Self-Concordance Model (SCM; Sheldon & Elliot, 1999), the Effort-Reward Imbalance Model (ERI; Siegrist, 1996), the Demand-Control Model (DCM; Karasek, 1979; Karasek & Theorell, 1999), Tinto's Model of Student Departure (1975), and the Job-Demands Resources Model (JD-R; Bakker & Demerouti, 2014; Salmela-Aro & Upadyaya, 2014). In order not to go beyond the scope of the framework, the central ideas of each model shall simply be presented below.

Previous research on the burnout phenomenon based on the SEF Theory (Salmela-Aro, 2017; Salmela-Aro & Read, 2017; Salmela-Aro et al., 2017) has shown that students' burnout and disengagement may result from the mismatch between the educational environment and students' needs. The SCM, developed based on the SDT (Ryan & Deci, 2000), suggests that individuals are more likely to be committed to and achieve self-concordant goals (intrinsic motivation or identity congruence). In turn this leads to positive academic adjustment (Vasalampi et al., 2009). Following the assumption of ERI, students will expect rewards as they invest efforts in learning. A lack of reciprocity or an imbalance between effort and reward (e.g., the stability of academic grade and appreciation) leads to arousal and stress (Bakker & Demerouti, 2014; Kim et al., 2017; J. Lee et al., 2012; Siegrist, 1996). Findings of limited studies on academic stress in higher education using the DCM indicate that students are most vulnerable to the associated strain if academic demands are high and academic work control is low (Chambel & Curral, 2005; Cotton et al., 2002). At the heart of Tinto's Model of Student Departure (1975) lies the assumption that students' academic and social integration in educational institutions causes changes in commitments, which lead ultimately to persistence in or dropout from educational institutions.

The JD-R model (Figure 2.1; Bakker & Demerouti, 2014) has increased in popularity in educational contexts investigating academic stress in the past decade (Bakker & Demerouti, 2014; Bakker et al., 2007; Demerouti et al., 2001). One reason for the increased usage of this model in explaining students' emotional responses to academic

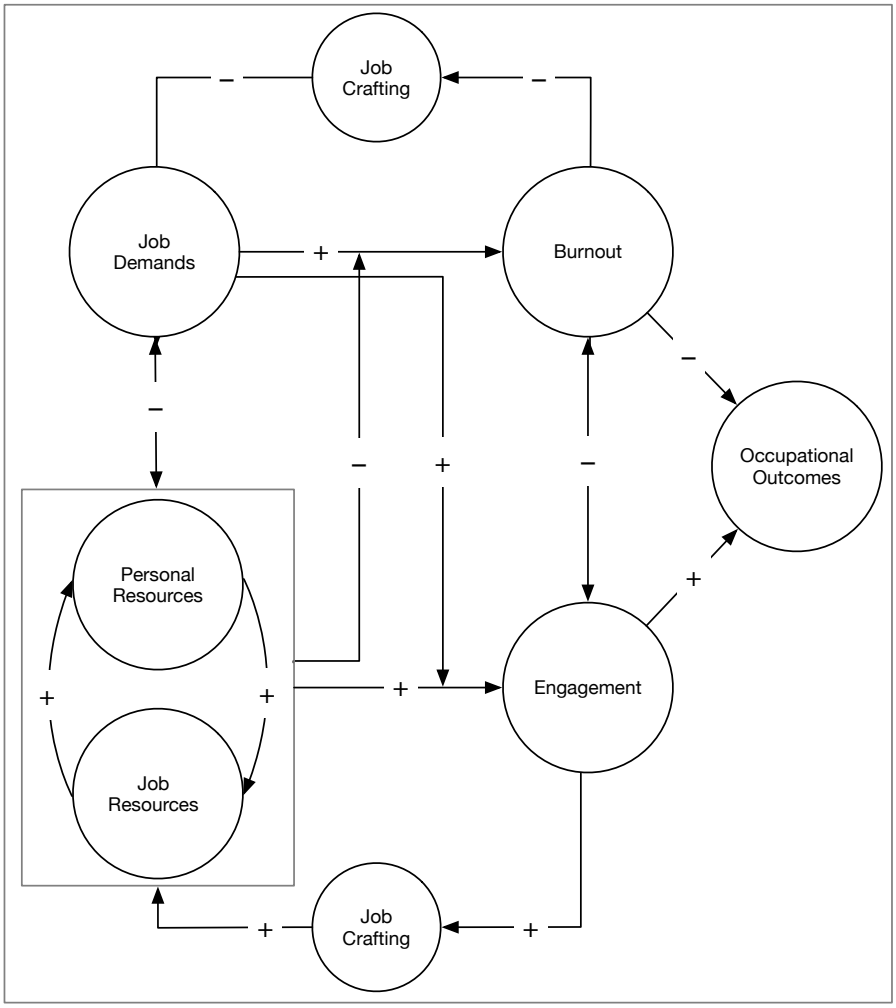

Figure 2.1: The JD-R model (Bakker & Demerouti, 2014)

demands is that it is based on and combines the strengths of other well-established stress models, such as the DCM or ERI models, but extends and advances them through its broadened scope and flexibility (Bakker & Demerouti, 2014, for an overview, see). Furthermore, the JD-R model incorporates two fairly independent research branches: the stress branch and the motivation branch (Demerouti & Bakker, 2011). In the present dissertation, the JD-R model will be used as a guiding framework.

two core assumptions

Based on the physical, psychological, emotional, and organizational aspects of a job, the JD-R model divides the job environment into demands and resources. Job demands (e.g., high work pressure, emotionally demanding interactions with clients or customers) require physical and psychological effort. Job resources on the other hand refer to those which "(a) [are] functional in achieving work goals; (b) reduce job demands and the associated physiological and psychological costs; or (c) stimulate personal growth, learning, and development" (Bakker & Demerouti, 2014, p. 9). These two categories relating to job environments evoke two independent psychological processes: a *health impairment process* and a *motivational process*. In the health impairment

process, job demands determine the strain. In the motivational process, job resources lead to more job engagement.

two interaction effects of demands and resources

In addition to the main effects of job demands and job resources, the JD-R model assumes *two interaction effects*. On the one hand, job resources buffer the detrimental effect of job demands on stress reactions: i.e., the more resources, the weaker the link between demands and strain. Employees who have many job resources can cope better with their daily job demands. On the other hand, the positive effect of resources on engagement can be pronounced if the level of demands is high: the higher the level of demands, the stronger the link between resources and engagement. If an employee is confronted with challenging job demands, job resources become salient and valuable and foster dedication to the task at hand (Bakker & Demerouti, 2014).

Personal Resources

The original JD-R model had been restricted to occupational characteristics and neglected personal resources, which can play an important role during employees' adaption to job demands (Hobfoll, 2002). Thus, some researchers have extended this model to including personal resources (Xanthopoulou et al., 2007). The role of personal resources in the JD-R model is, however, empirically still unclear. Their moderating effects are especially inconsistent. Xanthopoulou et al. (2007) found that personal resources (self-efficacy, organizational-based self-esteem, and optimism) affected the perception of job resources and mediated the relationship between job resources and emotional exhaustion/engagement, whereas personal resources did not moderate the relationship between perceived job demands and exhaustion. On the contrary, some studies (e.g., Tremblay & Messervey, 2011) found not only the main effects but also the interactions between job demands and personal resources on emotional exhaustion and engagement.

Job Crafting

The latest studies on occupational burnout have extended the JD-R model by including job crafting. Job crafting is defined as "the physical and cognitive changes individuals make in their task or relational boundaries" (Bakker & Demerouti, 2014, p. 15). Hence, job crafting refers to one's proactive behavior to make his/her job conditions more favorable. The motivation behind job crafting is to redesign work in such a way that it can fulfill one's needs for personal control and basic needs for social connection, as well as can sustain one's self-esteem (Wrzesniewski & Dutton, 2001). Job crafting is more likely to be initiated if one perceives that opportunities for job crafting exist (Wrzesniewski & Dutton, 2001).

Based on the two categories of job characteristics (i.e., job demands and job resources) in the JD-R model, there are four ways to craft a job, namely (1) increasing structural job resources (an example item, "I decide on my own how I do things"); (2) increasing social job resources (e.g., "I ask my supervisor to coach me"); (3) increasing challenging job demands (e.g., "When an interesting project comes along, I offer myself proactively as project co-worker"); and (4) decreasing hindering job demands (e.g., Bakker & Demerouti, 2014; Tims et al., 2012, 2013, "I make sure that my work is mentally less intense"). Job crafting is assumed to predict future job demands and job resources. In turn, the changes in demands and resources influence burnout and work engagement. In a longitudinal study on N = 288 employees (Tims et al., 2013), the indirect effect of crafting job resources and employee well-being (engagement and job satisfaction) could be found, whereas crafting challenging demands directly led to increases in well-being. The results of a recent meta-analysis (Rudolph et al., 2017) highlight the positive effects of the first three crafting dimensions on job satisfaction, occupational well-being, and work performance, whereas decreasing hindering job demands may be counterproductive because this dimension represents a unique withdrawal or prevention-focused form of crafting. The positive effects of job crafting have strongly stimulated research into its application in burnout prevention and intervention (for an overview, see Bakker et al., 2014).

2.4 THE JD-R MODEL IN SCHOOL CONTEXTS

The JD-R model has been extensively used in occupational contexts. Furthermore, in tertiary educational contexts, increasing numbers of researchers are applying the JD-R to predict university students' burnout and engagement (e.g., Barr et al., 2015; Gusy et al., 2016; Hodge et al., 2019; Lesener et al., 2020; Wolff et al., 2014). Although school burnout has increasingly gained international attention, there has still been little effort made on testing the transferability of the JD-R model into school contexts.

transfer to the Finnish school context

Salmela-Aro and Upadyaya (2014) used the JD-R model to predict students' burnout and engagement. About 1,700 adolescent students (wave 1: 9th-grade) with an average age of 15.5 years participated in their four-year longitudinal self-report study. During the first wave, participants were asked to evaluate academic demands and perceived personal resources (self-efficacy). Burnout and schoolwork engagement were measured during the second and third waves, while depressive symptoms and life satisfaction were assessed during the fourth wave. Their results showed that perceived academic demands at wave 1 turned out to be a significant predictor of school burnout at wave 2, whereas perceived personal resources predicted higher levels of engagement and lower levels of burnout one year later. In the long

term, burnout and engagement at wave 3 positively predicted depressive symptoms and negatively predicted life satisfaction. Finally, school burnout mediated the relationship between academic demands and mental health outcomes. This study was the first longitudinal attempt to transfer the JD-R model to the school context. However, no attempt was made to test the interaction effects between demands and resources.

Although this study provides longitudinal support for the transferability of the JD-R to the school context, several methodological problems should be noted. First, concerning the dimensional problem of burnout (Section 2.2), it may be problematic that the authors used the overall scale of burnout in the JD-R model, in particular, they regarded self-efficacy as a personal resource. Second, the authors used multi-group path analyses and found the equivalence of the JD-R model across gender and school track. Yet, the potential effect such as students' socio-economic background was not considered. Lastly, the sample was collected in school settings, however, the nested data structure was not considered.

transfer to the German school context

Based on the Finnish findings, the JD-R model was also applied to the German school context. Teuber, Möer, et al. (2020) tested all three assumptions of this model on a sample of 395 *Oberstufe* students (i.e., academic track, 10-13th graders). The results of the German study indicated that there were two dependent psychological processes: Perceived academic demands (e.g., overload and negative classroom climate) were positively related to burnout and negatively related to student engagement, whereas personal (e.g., self-efficacy, self-esteem, and optimism) and environmental resources (e.g., parental support, positive relations to peers, and educational integration) were negatively related to burnout and positively related to engagement. Furthermore, high burnout was significantly associated with poor academic performance. However, the authors could not find the postulated buffering and boosting effects of demands and resources. In this German pilot study, burnout was also assessed using the overall burnout score, and SES was not controlled.

Overall, both studies support the possible transferability of the JD-R model to school-related contexts. However, to understand the impact of academic demands and students' resources on their emotional response and engagement, and finally, on their mental health and academic achievement, more empirical studies are necessary. The burnout concepts and the JD-R theory have their origin in the West. Although school burnout has been identified in Asian cultures, it is still unknown if the JD-R model is also feasible there.

2.5 STUDENT RESOURCES

Based on the JD-R model, although high demands are a risk factor for burnout, the successful management of these depends on one's protective factors (i.e., one's resources; e.g., Masten, 2014). Resources are defined as factors that generally foster one's positive development. Broadly, resources fall into one of two categories: personal resources (i.e., individual strengths) and environmental resources (i.e., protective factors in one's surroundings). Contrary to risk factors that increase the likelihood of developing deficits or negative outcomes, protective factors are conceived to buffer the negative outcomes on youth development associated with risk factors. To promote youngsters' development, it is therefore important to be aware of their resources.

Teacher-Student Relationships

In school, teachers are knowledge brokers, coaches, or leaders in the classroom, and role models for their students. Good teacher-student relationships are considered as an essential student resource in the current dissertation.

Research on teacher-student relations is strongly guided by the Attachment Theory (Bowlby, 1969), models of social support (for an overview, see Wentzel, 2016), and Self-Determination Theory (SDT; Ryan & Deci, 2000). Attachment is a system in which a child experiences emotions and different levels of responsiveness to their basic needs from caregivers (Bowlby, 1969). Secure attachment is conceptualized as the ability to connect securely in relationships with significant others and meanwhile to act autonomously and in a manner appropriate to the given situation. School relationship research usually regards teachers as caregivers and students as care seekers (Wentzel, 2016).

Similar to Attachment Theory, social support perspectives on teacher-student relationships (e.g., Person-Environment Fit and Personal Goal Setting; Eccles et al., 1993; Ford, 1992) emphasize that the function of teachers' emotional (i.e., empathy, warmth, and encouragement) and instrumental (i.e., tangible aid to promote learning) support. These can have a positive influence on students' adjustment to school and can serve as a buffer from stress (Wentzel, 2016). According to Wentzel (2016), social support perspectives typically view relationships as personal resources that can range from very familiar and stable to relatively impersonal and volatile, whereas attachment theory focuses on interpersonal relationships that reflect a relatively stable history of interactions.

The central idea of the SDT (Deci & Ryan, 2000) is that the fulfillment of three basic psychological needs (the needs for relatedness, competence, and autonomy) is the fuel of children's motivation and well-being. According to the SDT, a student will perceive a positive

relationship to a teacher if the teacher shows involvement (e.g., caring for and expressing interest in the student), provides structure (e.g., setting clear rules and being consistent), and supports autonomy (e.g., giving students the freedom to make their own choices).

Hence, all of these theories suggest that affectively close and supportive teacher-student relationships are important resources for students. Strong empirical evidence supports this notion. Several meta-analyses (Roorda et al., 2017; Roorda et al., 2011) show that good teacher-student relations foster students' engagement and academic achievement in both Western and Asian cultures. Results of PISA studies (OECD, 2015a, 2019b) indicate that students who perceive a good relationship to their teachers are happier in school, make friends more easily, have a higher sense of belonging, and are more satisfied with their school. These, in turn, significantly contribute to students' academic performance and social and emotional well-being. In particular, in the Chinese collectivistic culture, teacher-student relationships may have a stronger influence on student development; for instance, across all OECD countries and areas, the positive relationship between Chinese students' performance in mathematics and perceived teacher-student relationship is remarkably strong (OECD, 2015a).

Personal Resources

Although most research on burnout has focused on environmental factors, personal factors have been drawing increasing attention over the past 15 years. Studying personal factors and identifying personal resources (i.e., individual strengths) can contribute to a better understanding of individual differences in emotional responses and help derive burnout prevention and intervention approaches.

self-efficacy, self-esteem, and optimism

In health psychology, the most influential Transactional Stress Theory (Lazarus & Folkman, 1984) posits that stress is a product of the transaction (i.e., on-going relationship) between a person and his or her environment. The transaction is mediated by the person's cognitive appraisals and coping processes that determine the outcome of the stress process. Relying on this theory, there has been a great interest in personality traits that may act as personal resources and positively affect appraisal and coping (Vollrath, 2001). A number of constructs (e.g., hardiness, perseverance, self-efficacy, self-esteem, optimism, sense of coherence; for an overview, see Alarcon et al. 2009; Vollrath 2001) have been conceptualized to tap aspects of personality that could operate as predictors of resilience and effective coping. In the present dissertation, three typical personal resources are focused upon, namely, self-efficacy (Bandura, 1977), self-esteem (Rosenberg, 1979), and dispositional optimism (Carver & Scheier, 1998) as fundamental components of individual adaptability recognized by Hobfoll (2002).

Self-efficacy beliefs refer to one's assumptions about his or her capability to organize and execute a course of action to attain goals (Bandura, 1977, 1997). According to Bandura (1977), it can also be conceived as confidence in one's competencies. The self-efficacy belief is supposed to be more important for self- and behavioral regulation than the objective competencies, since action is mainly determined by the expectation of its outcome (Bandura, 1977; Lohaus & Nussbeck, 2016b). Thus, self-efficacy belief determines how much effort a person will invest in tasks and how long he or she will persist with difficult and aversive experiences (Bandura, 1977). For example, a student with a low level of perceived self-efficacy tends to avoid difficult situations because he or she does not anticipate a positive outcome.

Closely related to self-efficacy is self-esteem. Success in coping with developmental tasks can have a positive effect on both self-efficacy and self-esteem (Lohaus & Nussbeck, 2016b). Global self-esteem is defined as one's overall evaluation of the self or personal worth (e.g., Harter, 1983; Rosenberg, 1979). During child development, it can typically be observed that children overestimate their competencies and show high self-esteem at the beginning of their development. After entering school and until adolescence, social comparisons with peers lead to a decline in self-esteem (Robins et al., 2002). According to Harter (1990), its slump is reached around the age of 12 to 13 years.

Dispositional optimism is defined as a generalized, global, and relatively stable personality trait characterized by positive outcome expectations (Carver & Scheier, 1998). These positive expectations increase the propensity to take action and cope with stressful events (Aspinwall & Taylor, 1997). Previous research indicates that dispositional optimism positively influences mental and physical health, well-being, and coping (M. E. Scheier & Carver, 1987; M. F. Scheier et al., 1994; Wieland-Eckelmann & Carver, 1990).

similarities and differences between self-efficacy, self-esteem, and optimism

Self-efficacy, self-esteem, and optimism are strongly interrelated because individuals who perceive themselves as competent and worthy (high self-esteem) will generally expect higher probabilities of task success (high self-efficacy; Gardner & Pierce, 1998) as well as tend to be optimistic about future events (high optimism). However, at the conceptual level, they are considered as distinct constructs. Although both self-efficacy and self-esteem are based on self-evaluation, they differ in terms of their perceptual targets and time perspectives (Gardner & Pierce, 1998). Self-efficacy refers to one's belief in competence to accomplish a given task (focus on the task, future assessment); self-esteem represents a self-perception about one's value (focus on the self, current assessment). In comparison, dispositional optimism is a broader construct including positive expectations of events that are outside personal control (Mäkikangas et al., 2004, p. 557).

There is also empirical evidence supporting their distinction. Using the same questionnaire, two research groups (Lohaus & Nussbeck,

2016b; Teuber, Wang, et al., 2020) examined self-efficacy, self-esteem, and optimism in 2,530 German and 2,600 Chinese students aged between 8–16 years. In both samples, the three constructs were inter-correlated but still different from each other: They showed similar high inter-correlations (in the Chinese sample: *r* between .57 and .64; in the German sample: *r* between .47 and .59); they were statistically different (as three related but distinct latent factors in CFA); each of them uniquely contributed to variance explanation in stress and coping, emotion regulation, behavioral problems, and well-being.

The protective effects of these three constructs on coping with stress are empirically evidential across cultures. For instance, Western (Salmela-Aro & Upadyaya, 2014) and Chinese researchers (e.g., D. W. Chan, 2007) have been able to show that self-efficacy fosters one's competency to cope with academic demands and stress. Self-esteem is positively related to psychological health (e.g., Kernis et al., 2008) as well as academic achievement (for an overview, see Honicke & Broadbent, 2016) and negatively related to depression and anxiety disorders (e.g., Kernis et al., 2008). A study by Virtanen et al. (2016) found a negative association between self-esteem and school burnout. The results of a cross-cultural meta-analysis (including China) on self-esteem (Bleidorn et al., 2016) suggest that this construct is potentially universal across the 48 nations assessed. Previous research indicates that dispositional optimism positively influences physical health, well-being, and coping (e.g., M. E. Scheier & Carver, 1987). Furthermore, there is evidence for the protective effects of optimism on stress coping and job burnout in the Chinese population (X. Jiang & Hui, 2016; C. Liu et al., 2018). In the comprehensive and frequently cited meta-analysis by Alarcon et al. (2009), self-efficacy, self-esteem, and dispositional optimism have all been shown to have protective effects against burnout across age groups as well as within Eastern and Western cultures.

Grit

consistency of interests and perseverance of effort

Another construct of interest while investigating Chinese students' academic and psychological adjustment is that of *grit*. It was proposed by American researchers (Duckworth et al., 2007, p. 1087) and defined as "perseverance and passion for long-term goals". Grit consists of two dimensions: *consistency of interests* and *perseverance of effort* (Duckworth et al., 2007). Consistency of interests refers to the tendency not to frequently change interests and goals. Perseverance of effort refers to the tendency to work hard even in difficult situations. According to the authors, individuals with high levels of grit show an enduring commitment to their ambitions, work strenuously towards challenges, and sustain interest and effort for a long time period despite adversity. Serval studies provide evidence for the power of grit

in predicting retention in the military, workplace, school, and even marriage (Duckworth et al., 2007; Eskreis-Winkler et al., 2014; Maddi et al., 2012).

Both cultural and theoretical reasons can rationalize the choice of this construct. First, the central idea of grit is close to the learning value of Chinese students that is strongly influenced by the Confucian tradition. Chinese learners view learning as a process of moral striving (J. Li, 2002) and regard perseverance of effort in pursuing goals as the key to success (Lau & Lee, 2008; Tan, 2017), which is also reflected in the old Chinese saying "zhi yao gong fu shen, tie chu mo cheng zhen" ("If you work at it hard enough, you can grind an iron rod into a needle." Hui, 2005, p. 28). Second, Duckworth et al. (2007) regard grit as a trait-like factor that positively affects one's behavior in the face of difficult and stressful events.

Grit is predominantly operationalized as a higher-order construct (i.e., the overall grit scale; Credé et al., 2017). Several scholars have criticized this approach, and a recent meta-analysis by Credé et al. (2017) showed that using the overall grit score might impair the predictive power of this concept with respect to performance. Furthermore, the results of a large cross-cultural study by Disabato et al. (2019) suggested that the use of grit overall scale was more appropriate in individualistic cultures than in collectivistic cultures. Therefore, in the present dissertation, grit is operationalized as two correlated first-order factors instead of one higher-ordered factor.

"Old wine in new bottles"?

Aside from discussions on how to measure grit, Credé et al. (2017) pointed out that grit overlapped with other established constructs such as persistence, proactivity, industriousness, need for achievement, and (some facets of) conscientiousness (e.g., self-control, order). In particular, the relationship between grit and conscientiousness has been intensely debated. Schmidt et al. (2018) analyzed the connection between grit and conscientiousness while accounting for the complex structure of conscientiousness and the two-dimensional conceptualization of grit. The results of their study suggested that grit could be completely integrated into the hierarchical structure of conscientiousness. Similarly, Rimfeld et al. (2016) found in their twin study that the etiology of grit was highly similar to conscientiousness. Opposing this, Duckworth et al. (2007, p. 1089) argued, "Grit overlaps with achievement aspects of conscientiousness but differs in its emphasis on long-term stamina rather than short-term intensity." This argument can be supported by Abuhassàn and Bates (2015): Conscientiousness was positively related to school grades, whereas perseverate grit was associated with higher life-course accomplishment. Moreover, Duckworth et al. (2007) found in their study series grit's incremental predictive validity of success beyond IQ and conscientiousness. The incremental validity of grit for predicting academic performance beyond Big-Five personality traits (i.e., extroversion, agreeableness, conscien-

tiousness, openness, and neuroticism), self-control, and intelligence could be supported in a Chinese sample (J. Li, 2002).

the dark side of grit

In addition to these conceptual debates, it has been questioned whether grit is always beneficial. In daily life, it is sometimes more adaptive to be situational. Perseverance may also be detrimental if one strives for goals that challenge their individual or environmental resources. Schechtman et al. (2013, p. 42) highlight the essential role of goals and point out, "promoting perseverance for goals inappropriate for the students can induce stress and have detrimental long-term effects." As previously mentioned, however, the rationale of grit is in line with Chinese culture. Effort and high academic goals are highly valued in Chinese culture. The present dissertation, therefore, focuses on the assumed positive function of grit for students' academic and psychological adjustment.

2.6 LOCATING STUDENT RESOURCES IN THE JD-R MODEL

In the present dissertation, academic workload is defined as the time spent on learning activities including learning in school, doing homework, and attending extra-curricular support offers (e.g., private lessons and hands-on training). Academic demands are seen as the perceived difficulty and quantity of academic tasks, while teacher-student relationships, self-efficacy, self-esteem, optimism, and grit are regarded as personal or interpersonal resources that are functional in dealing with these tasks.

Teacher-student Relationships, Self-Efficacy, Self-Esteem, Optimism, and Burnout

In the job context, a high-quality relationship with one's supervisor has been regarded as one of the most powerful job resources (Bakker & Demerouti, 2007). As such a high-quality teacher-student relationship is regarded as an analogous resource in the school context, as part of this dissertation.

The guiding theories of teacher-student relationships suggest that affectively close and supportive teacher-student relationships are important resources for students' academic and psychological development in the school (Section 2.5). In the literature, an abundance of cross-sectional and longitudinal evidence supports the idea that the quality of teacher-student relationships predicts changes in students' social-emotional well-being in school, engagement, academic motivation, and learning (Burchinal et al., 2008; Deci & Ryan, 2000; Y. Liu et al., 2015; Roeser et al., 2000; Roorda et al., 2017; Wentzel, 2016; Wentzel & Wigfield, 2007).

High-quality relationships with teachers may also alleviate the impact of academic demands on burnout symptoms. Results of a study by

Liew et al. (2010) suggest that a positive teacher-student relationship serves as a compensatory factor particularly for first-grade children with low effortful control on school tasks that require accuracy, fine motor skills, and attention-related skills. Overall, social support from teachers may complement or can even compensate for lacking personal resources.

Based on the assumptions of the JD-R model and empirical findings, it is assumed that teachers' support can help students to deal with demanding schoolwork, and may, therefore, buffer the impact of academic demands on burnout (i.e., emotional exhaustion and cynicism, see Section 2.2).

Self-efficacy, self-esteem, and optimism have been shown to contribute to students' psychological adjustment and positive development (Section 2.5). Various studies hint at their protective effects against school burnout (self-efficacy: Salmela-Aro and Upadyaya, 2014; self-esteem: Luo et al., 2016; Xiang et al., 2019; optimism: Vizoso et al., 2019). It is therefore assumed that students with many personal resources (i.e., self-efficacy, self-esteem, and dispositional optimism) trust their own capabilities to master academic demands and expect positive academic outcomes. They are more likely to persist in demanding learning contexts. Hence, personal resources may buffer the detrimental effect of academic demands.

As mentioned before, high-quality teacher-student relationships have positive effects on student development. Students' self-efficacy, self-esteem, and optimism might benefit from a supportive relationship with teachers. Hence, these personal and interpersonal resources may be linked to each other. However, most studies on the effects of resources on burnout concentrate on one single resource. The present dissertation concerns itself with the incremental contribution of these factors in explaining the variance of burnout symptoms (i.e., emotional exhaustion and cynicism; see Section 2.2).

Integrating Grit into the JD-R Model

Various studies (for more details, see Credé et al., 2017) indicate that the two grit facets play different roles in predicting success. Therefore, both facets shall be estimated instead of considering grit as a higher-ordered factor.

Gritty people pursue their long-term goals with passion; passion for long-term goals fuels achievement because gritty people tend to utilize self-control to sustain their focus on goals in the face of challenging or stressful conditions (Duckworth & Gross, 2014). Bowman et al. (2015) revealed that gritty American college students engaged more in college activities and were less likely to change majors than their less gritty peers. Further, Datu and colleagues found that grit (overall scale) positively predicted positive emotions and well-being among

Filipino high school students (Datu, Yuen, et al., 2018) and Chinese primary school students (Datu & Fong, 2018). Hence, it is reasonable to assume that gritty students tend to engage more in schoolwork and feel less emotionally exhausted. A high level of academic demands is expected to be related to a higher level of school burnout, whereas burnout and schoolwork engagement are expected to be negatively associated.

The JD-R model suggests that burnout increases the likelihood of mental disorders, for instance, depression (Salmela-Aro & Upadyaya, 2014). This assumption has been supported not only by Western researchers (Salmela-Aro, Savolainen, et al., 2009) but also by Asian researchers (Datu, King, et al., 2018; Musumari et al., 2018). I envisage that school burnout mediates the relationship between academic demands and depressive symptoms. According to the JD-R model, engagement predicts well-being and higher academic achievement. Life satisfaction is defined as a cognitive-judgmental aspect of subjective well-being (Diener et al., 1985). These relations have also been found previously within the context of school (Salmela-Aro & Upadyaya, 2014). Bowman et al. (2015) found that American college students' higher commitment and engagement predicted their college satisfaction and greater academic achievement. An Australian study (Hodge et al., 2018) also highlights the mediatory role of engagement between grit and academic achievement. This finding could be replicated in Filipino (Datu et al., 2016) and Chinese school students (Zhao et al., 2018). Thus, gritty students are expected to engage more in school and in turn, show higher academic performance and be more satisfied with their lives.

Another assumption of the JD-R model is that there are interactions between job demands and job resources on emotional exhaustion as well as on work engagement. Grit is therefore assumed to become more salient and have a stronger impact on student engagement when perceived academic demands are high. Gritty students cope better with their academic demands, and thus grit buffers the negative effect of high academic demands.

Including Socio-Demographic Factors

The original JD-R model does not include socio-demographic factors. In the school context, however, empirical findings have highlighted associations between academic demands, burnout, student engagement, resources, and socio-demographic factors, such as school tracks, gender, and SES. In the present dissertation, socio-demographic factors are considered as covariates.

In several longitudinal studies, researchers have been able to reveal that school burnout is particularly pronounced in higher and more challenging educational tracks that have primarily been linked to

higher academic pressure and competitiveness (Salmela-Aro, Kiuru, & Nurmi, 2008; Salmela-Aro, Kiuru, Pietikäinen, et al., 2008). As introduced in Section 2.1, the Chinese educational system is characterized by high demands and high levels of competitiveness. Due to the key school system (e.g., in Shanghai: Shanghai key high schools, district key high schools, and ordinary high schools), levels of competition, academic demands, and workload may vary between different school types.

In terms of gender-specific differences, females are regarded to have a higher risk of being burned-out. However, scholars have found fine-grained differences in burnout symptoms. In a large meta-analysis, Purvanova and Muros (2010) analyzed the relationship between gender and burnout using 409 effect sizes from 183 studies. Results showed that females were slightly more emotionally exhausted than males, whereas males were somewhat more cynical than females. Similar patterns in the school context have been found: Girls are more vulnerable to internalized problems (e.g., emotional exhaustion, Herrmann et al., 2019; Salmela-Aro and Tynkkynen, 2012; Teuber, Möer, et al., 2020; depression, reduced self-efficacy, Salmela-Aro, Kiuru, and Nurmi, 2008; reduced self-esteem and optimism, Lohaus and Nussbeck, 2016b), whereas boys typically show more externalized symptoms (e.g., cynicism and disengagement, Salmela-Aro and Tynkkynen, 2012). Furthermore, there are gender-specific differences in students' academic adjustment. For instance, girls are more likely to be successful in school because they engage more in academic work than boys (Lei et al., 2018).

From my point of view, the influence of SES should also be considered. A low SES, associated with low financial, social, and cultural resources (Bourdieu & Russer, 1987), has been shown to significantly contribute to students' stress vulnerability and negative emotional responses (e.g., E. Goodman et al., 2003). Furthermore, the high level of Chinese students' workload may be compounded by the participation in commercial extra-curricular support offers (Chapter 1) that are linked to the SES (Lohaus & Wild, 2020).

3

RESEARCH OBJECTIVES

As previously mentioned (Section 2.1), Chinese school students are confronted with heavy workloads and immense academic demands, which may prove to be risky for their development. Using the JD-R model as a guiding framework, this dissertation shall focus particularly on the role of student resources.

Research on youth development has mainly been carried out in Western cultures. Several Western measures have been translated into Chinese and are commonly used for the assessment of resources in Chinese adult populations. Among others, Schwarzer's General Self-Efficacy Scale has been adapted and has been widely used for studies involving Chinese university students (J. X. Zhang & Schwarzer, 1995); Rosenberg's Self-Esteem Scale has also been translated and validated in Chinese adult samples (S.-T. Cheng & Hamid, 1995); the Chinese Optimism and Pessimism Scale (Xia et al., 2016) is an adaptation of the Optimism and Pessimism Scale for adults (Dember et al., 1989). A substantial number of studies (e.g., Chang et al., 2018; H. C. W. Li et al., 2010; Shi et al., 2017) have adapted these measures for use with Chinese children and adolescents without knowing if these constructs are interpreted in Chinese culture in the same way as in Western cultures and whether these constructs can be measured in the same way (e.g., lack of measurement invariance evidence across cultures, lack of construct validity evidence). This may lead to biased or unreliable results (van de Vijver & Tanzer, 2004).

The *first main research objective* of the present dissertation is to adapt and develop a Chinese measure of resources in children and adolescents that fulfills high psychometric standards, including (1) translation and back-translation processes; (2) a pilot study with a relatively small sample to ensure the validity of the translation; (3) a validation study with a large representative sample in which the test-retest reliability, internal factorial structure, the construct validity (combining with several validated measures), and the congruence between self- and parent reports are analyzed; (4) testing of measurement equivalence across gender and language versions.

I decided to adapt the German Questionnaire to Assess Resources for Children and Adolescents by Lohaus and Nussbeck (QARCA, in German: *Fragebogen zu Ressourcen in Kindes- und Jugendalter*; 2016a). There are two main reasons for doing this: (1) the QARCA is a measure which simultaneously assesses personal and environment resources (including self-efficacy, self-esteem, and optimism) and its development has already met high psychometric standards; (2) the

development process and psychometric parameters of the QARCA are well-documented allowing us to test its measurement equivalence across cultures.

The JD-R model was initially designed for occupational contexts. School as such can be seen as a workplace for students. However, work and learning characteristics are also different from each other, for instance, in terms of freedom of choice and crafting options. Although previous research supports the transferability of the JD-R model to educational contexts, the evidence is limited to Western (especially Finnish) findings. Therefore, the *second main research objective* of this dissertation is to test if the JD-R is feasible in the context of Chinese schooling and whether this model needs to be revised. This would, on the one hand, provide a valuable theoretical foundation to better understand the etiology of burnout and to derive prevention and intervention approaches. On the other hand, this would give us a first clue of the universality of the JD-R model across contexts.

In short, alongside the two characteristics (demands and resources) of the job environment, the JD-R model posits two parallel psychological processes: On the one hand, demands predict strain, and on the other hand, job and personal resources foster engagement. The JD-R model assumes additionally two interaction effects between demands and resources: Namely, that resources can buffer the detrimental effect of demands and that demands can boost the motivational effect of resources.

Previous researchers have revealed several resources that are protective against burnout and in the enhancement of student engagement. However, the majority of this research has come from Finland. Against this background, the *third main research objective* is to identify Chinese students' resources and to investigate whether findings from Western cultures are generalizable to Chinese culture.

In prior studies, single resource measures such as positive teacher-student relationships, self-efficacy, self-esteem, optimism have been linked to burnout. Because self-efficacy, self-esteem, and optimism are interrelated and students' relationships with their teachers can influence students' personal resources and vice versa, it is worthwhile investigating the incremental contribution in the explanation of variance in burnout symptoms. Regarding the debates on burnout dimensions, emotional exhaustion and cynicism shall be the focus in Study II.

The relatively young and controversial construct of *grit* has inspired researchers to examine its impact on success. In academic contexts, grit has been found to promote student engagement and psychological adjustment. The central idea of grit is similar to Chinese mindset that effort is the key to success. Recent empirical findings have also linked grit to well-being. However, the large majority of the existent literature on grit also originates from Western societies. It is unknown

to what extent these findings would hold when applied to research on Chinese society. Another research objective of this dissertation is to examine whether grit contributes to Chinese students' well-being besides academic success. All assumptions of the JD-R model, including the main effects of resources and demands, the interactions between demands and resources, and the mediating role of emotional exhaustion and student engagement shall be tested in Study III.

While conducting survey studies on student samples, it is common to collect data in school settings which leads to a nested data structure. Yet, this has been frequently ignored in prior research studies (in both cross-sectional and longitudinal studies, e.g., Gusy et al., 2016; Salmela-Aro & Upadyaya, 2014). Furthermore, the potential influence of socio-demographic factors such as gender, SES, and school type have yet to be addressed. The *fourth main research objective* of this dissertation is to apply the JD-R model and through using rigorous statistical approaches to investigate the effects of such aspects.

Figure 3.1 gives an overview of the studies in the framework model. In the next chapter, three empirical studies on relationships between student personal and interpersonal resources, psychological as well as academic outcomes shall be briefly presented.

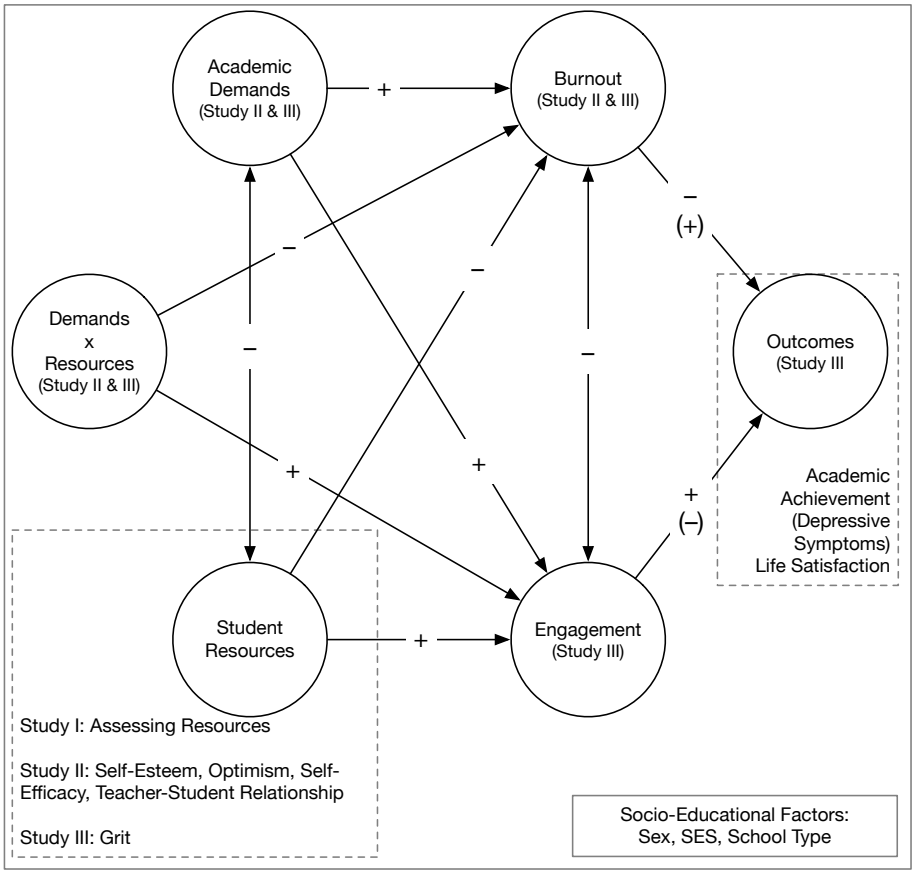

Figure 3.1: An overview of the examined variables in the respective studies within the framework model

4

EMPIRICAL STUDIES

4.1 STUDY I: HUMAN RESOURCES IN CHINESE YOUNGSTERS – A CHINESE ADAPTION OF THE QARCA

Aims and Assumptions

Following the outline of this dissertation project, Study I (Teuber, Wang, et al. 2020) aims to provide Chinese researchers and educators with a valid Chinese diagnostic measure of students' personal and environmental resources (QARCA-C) and to demonstrate a high-quality psychological test adaptation and development, particularly for cross-cultural research purposes.

The original German QARCA (Lohaus & Nussbeck, 2016a) consists of 60 items, with a four-point rating scale from 1 (*never*) to 4 (*always*). It estimates six personal (Nr. 1-6) and four environmental resources (Nr. 7-10): (1) empathy and perspective-taking, (2) self-efficacy, (3) self-esteem, (4) self-control, (5) sense of coherence, (6) optimism, (7) parental social and emotional support, (8) authoritative parenting, (9) integration into peer groups, and (10) educational integration. Based on the German study, we expected positive associations to emotion regulation, well-being, prosocial behavior, coping, and parental warmth as well as negative associations to behavioral problems and stress.

Method

After a translation and back-translation procedure as well as a pilot study, we conducted a validation study on a sample of 2,600 students (M_{age} = 12.51 years, SD = 1.84) and 393 parents from Baoding, China. Additionally, 114 participants filled in the QARCA-C after two weeks to evaluate the test-retest reliability. We used ERQ-CCA (W. Liu et al., 2017), KIDSCREEN-10 (The KIDSCREEN Group, 2006), SDQ-C (A. Goodman & Goodman, 2009), SSKJ (Lohaus et al., 2006), s-EMBU (J. Jiang et al., 2010) to measure children's emotion regulation, well-being, conduct problems, stress and coping, and parenting behaviors from the child perspective, respectively. We also investigated children's resources from the parental perspective using QARCA-C parent reports. For testing the factorial structure, we performed Confirmatory Factor Analyses (CFA) using the weighted least square mean and variance adjusted (WLSMV) estimator in Mplus (Muthén & Muthén, 1998-2020). We tested for measurement invariance across gender and language versions (Chinese and German) using Multi-Group CFA.

Results and Discussion

The results of unidimensional CFA models suggested that each measurement model of the subscales fitted the data well (all RMSEA < .08; all CFI > .98). The 10-factor CFA model showed an adequate model fit. The results of the equivalence testing across gender showed that for all subscales, full metric or full scalar invariance held. Measurement invariance models across Chinese and German language versions showed that all subscales corroborated at least partial metric invariance. The inter-subscale correlations corresponded to those of the German study regarding the direction. Furthermore, test-retest correlations over two weeks for the subscales were high (r = .72 to .93).

Compared to German children and adolescents, Chinese children and adolescents showed lower levels of all resource types except for optimism. Influenced by Confucian-based collectivism, that encourages modesty and conformity (Heine & Lehman, 1995; Markus & Kitayama, 1991), Chinese people generally tend to be moderate in their expression of opinions and understate their own positive traits and abilities (Chen et al., 1995; Vieluf et al., 2013). This means that the difference in resources may be affected by cross-national differences in self-presentational norms and expression tendencies. To evaluate this assumption, cross-cultural comparisons including dimensions such as collectivism-individualism should be conducted in the future. Results of meta-analyses (e.g., Fischer & Chalmers, 2008) show that greater individualism is associated with greater optimism. That said, the finding in Study I shows the opposing association, however, the effect size was small.

Surprisingly, we were unable to find *any* significant correlation between QARCA-C self-reports and parent reports. Hence, the two reports reflect completely different views. The zero correlations between parent and child reports may be explained through the suboptimal design of the parent version. For the parent version, items were taken from the child version and simply reworded, which may not work as well in the Chinese as in Western cultures. Further, it could be interesting in future studies to test the correlation between self-report and teacher/friend report in order to investigate whether low rates of agreement between self- and other ratings are specific to the Chinese parent-child relation, or generalizable.

Taken together, the Chinese version of the QARCA was found to be soundly adapted and displayed its postulated factorial structure. Reliability estimates for the subscale scores were good and expected correlations within the QARCA, as well as with external criteria could be found. It is the first Chinese measure that simultaneously assesses personal and environmental resources for youngsters. Furthermore, it enables a valid and reliable assessment of the three personal resources (i.e., self-efficacy, self-esteem, and optimism) investigated in Study II.

4.2 STUDY II – SCHOOL BURNOUT AMONG CHINESE HIGH SCHOOL STUDENTS: THE ROLE OF TEACHER-STUDENT RELATIONSHIPS AND PERSONAL RESOURCES

Aims and Assumptions

Study II (for full text, see **??**) aims to investigate the relationship between students' workload, academic demands, students' resources and furthermore, to examine whether findings originating predominantly using Western samples could be replicated within a Chinese sample. Relying on strong theoretical and empirical works on the positive effect of good teacher-student relationships and personal resources (self-efficacy, self-esteem, and optimism) on students' coping, we hypothesized that 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. We also hypothesized that these resources could act to buffer the detrimental relationship between academic demands and burnout.

According to empirical findings, students' self-efficacy, self-esteem, and optimism are intercorrelated, and teacher-student relationships interact with these students' personal resources. The results of Study I provided additional evidence of the distinctive effects of self-efficacy, self-esteem, and optimism. Hence, we are interested in the incremental influence of each presumed protective factor on burnout symptoms.

Method

To evaluate our assumptions, we conducted a self-report study on N = 1,083 high school students in Shanghai (M_{age} = 16.33 years, SD = 1.56). Students' workload was measured using a self-developed 24-hour clock approach. School burnout was measured using the Chinese version of the MBI-SS for adolescent students (Wu et al., 2010). Academic demands were assessed with four items covering the perceived workload and difficulty of learning materials. Self-efficacy, self-esteem, and optimism were measured using the QARCA-C (Teuber, Wang, et al., 2020). We used the teacher-student relationship scale from the PISA student questionnaire to assess teacher-student relationships (OECD, 2012). Home literacy resources (measured by the number of books in the home) were used as an indicator of SES. Gender was entered dummy-coded. To control for the school type, we used two dummy-coded items. To test the hypotheses, we specified structural equation models (SEM) in Mplus using ESTIMATOR = MLR, TYPE = COMPLEX to reflect the nested structure of the data.

Results and Discussion

The results of the SEM and model comparisons showed that there were no significant interactions between demands and student resources and that the SEM without interaction terms fitted the data well. Altogether, 20% of the variance in emotional exhaustion and 28% of the variance in cynicism was able to be explained by the presumed risk factors and resources. Respondents who reported higher levels of workload also reported higher levels of exhaustion, whereas workload was not related to cynicism. Academic demands however were significantly related to exhaustion and cynicism. No significant path coefficients between teacher-student relationships and both burnout symptoms could be found. Regarding personal resources, we found a negative correlation between self-efficacy and cynicism. Only optimism was significantly negatively associated with both burnout symptoms. However, after controlling for optimism and self-efficacy, higher self-esteem was related to higher cynicism.

Concerning the research question regarding the incremental variance contribution in two core burnout symptoms (i.e., emotional exhaustion and cynicism) explained by workloads, academic demands, and personal (i.e., self-efficacy, self-esteem, and optimism) and interpersonal resources (i.e., teacher-student relationship), the findings support previous studies which suggest that workloads and demands are the most important predictors of emotional exhaustion, whereas the lack of resources is a more important predictor of disengagement and cynicism (Bakker & Demerouti, 2014; Salmela-Aro & Vuori, 2015).

Several limitations of the current study should be addressed in future studies. The most important limitation is its cross-sectional design. Although findings from longitudinal studies (Salmela-Aro & Upadyaya, 2014) support the notion that demands and resources impact burnout, future research should investigate the presumed causal relationships longitudinally, ideally through manipulating academic demands. For an economical investigation of students' time schedules, only two 24-hour clocks, that is time periods were recorded. We hence cannot ascertain whether the two recorded time periods 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, ambulatory assessments or day-specific 24-hour time activity recording could allow for a much more fine-grained assessment of students' activities. Lastly, we were surprised to find a detrimental effect of self-esteem on cynicism within the structural model. We strongly encourage researchers to replicate this finding in future studies.

4.3 STUDY III – THE BRIGHT SIDE OF GRIT IN BURNOUT-PREVENTION: EXPLORING GRIT IN THE CONTEXT OF A DEMANDS-RESOURCES MODEL AMONG CHINESE HIGH SCHOOL STUDENTS

Aims and Assumptions

Study III (Teuber, Nussbeck, et al. 2020) aims to extend the JD-R theory and the grit theory by integrating grit into the JD-R model. The concept of grit can be seen as similar to the learning ethos of Chinese students which is strongly influenced by Confucian traditions. Chinese learners view learning as a process of moral striving (J. Li, 2002) and regard perseverance of effort in the pursuit of goals as the key to success (Lau & Lee, 2008; Tan, 2017). Hence, both effort and high academic goals are highly valued in Chinese culture. A large body of research on grit has focused on its positive effect on success. Recent empirical works show that grit can also foster well-being (Datu, Yuen, et al., 2018). Due to the high cultural consensus about effort and success, one may question the significance of individual differences in grit in predicting success within Chinese populations. A relevant method of investigating this phenomenon is to test whether these results (mainly from Western societies) hold in Chinese high school students.

Based on the JD-R model's assumptions and longitudinal evidence, we tested whether academic demands were positively related to emotional exhaustion and negatively related to student engagement, as well as whether whereas grit was negatively related to exhaustion and positively associated with engagement (two crossed psychological processes). Furthermore, we investigated if grit could buffer the detrimental effect of demands and boost engagement (i.e., interaction effects). Finally, we explored the hypothesis that burnout and engagement could have a mediating role in the JD-R model framework and influence students' academic achievement, well-being, and depressive symptoms.

Method

Participants were N = 1,527 high school students (M_{age} = 16.38 years, SD = 1.04) from Shanghai, China. To assess grit, we used the Chinese Grit-S (Duckworth et al., 2007). Emotional exhaustion was measured using the subscale developed by Wu et al. (MBI-SS; 2010). Student engagement was measured using the SEI (Salmela-Aro & Upadaya, 2012). Depressive symptoms were measured with the Chinese version of the Center for Epidemiologic Studies Depression Scale (Radloff, 1977). Life satisfaction was measured using the validated Chinese version of the Satisfaction with Life Scale (Diener et al., 1985). Academic achievement was measured using two items. Students were

asked about their sum scores of Chinese, Mathematics, and English in their exams from the previous school term. To compare the scores, we standardized the exam scores into percentages. We used home literacy resources (measured by the number of books in the home) as an indicator of SES. Gender was entered dummy-coded. To control school type, we used two dummy-coded items. To test the hypotheses, we specified structural equation models (SEM) in Mplus using ESTIMATOR = MLR, TYPE = COMPLEX to reflect the clustered structure of the data. All the analyses were controlled for gender, SES, and school types.

Results and Discussion

Like in Study II, we could not find any significant interactions between academic demands and student resources (i.e., grit in this study). Furthermore, model comparisons suggested that the model without any interaction fitted the data well.

Overall, 32% of the variance in emotional exhaustion, 48.2% of the variance in schoolwork engagement, and 27.9% of the variance in life satisfaction could be explained. Most results are in line with the assumptions and previous findings. Academic demands were negatively related to engagement and positively related to exhaustion. We found that exhaustion was positively related to depression and negatively related to satisfaction with life, whereas schoolwork engagement positively linked to life satisfaction. This supports recent findings in work and school contexts with Western samples (Hakanen et al., 2008; Salmela-Aro & Upadyaya, 2014).

Both grit facets (consistency of interest, perseverance of effort) showed the expected negative relationships to emotional exhaustion. However, we did not find any significant relationship between consistency of interest and engagement. This result is consistent with prior studies (for an overview, see Credé et al. 2017) that show that consistency of interest has weaker effects on engagement than the other dimension of grit. From a cross-cultural perspective, we speculate that the role of consistency of interests for academic adjustment of Chinese students may be minimized because of the social and cultural consensus about the high value of effort and achievement in Chinese culture. To achieve their academic goals, Chinese students may be willing and used to suppressing their interests. However, this dimension may also be relevant in individualistic cultures in which personal needs and interests are more important.

The most unexpected result is that after controlling for gender, SES, and school types, academic achievement was no longer related to all other variables. This may be due to the way in which we assessed achievement: First, participants were asked to report on their exam

scores and may have intentionally over-inflated them. Second, the retrospective report may have also led to inaccuracy.

As expected, it was found that gritty students experience less exhaustion and engage more in schoolwork. However, higher school demands are associated with higher levels of emotional exhaustion irrespective of the degree of grit which a student has. One explanation for this observation is that students with greater levels of grit are more likely to persist on demanding learning tasks (Duckworth et al., 2007) but are not necessarily the most intelligent ones. Further, due to the proactive nature, students with greater levels of grit are more likely to receive positive responses from their teachers because they are likely to be viewed as hard-working and self-disciplined. Thus, gritty students may have more environmental resources that influence the coping process. This could also explain the failed interactions between demands and grit. Thus, grit may interact with other factors such as coping strategies. Students with more grit who seek social support may cope with demands more successfully than those who choose avoidant coping strategies.

The presumed mediatory role of emotional exhaustion and engagement was partially supported: Students who perceived high demands also experienced more burnout, which in turn was related to more depressive symptoms and less life satisfaction. Insofar perseverance of effort, as well as consistency of interest may protect against being burned-out (Salmela-Aro, Savolainen, et al., 2009) and positively affect mental health (Datu, King, et al., 2018; Musumari et al., 2018). Perseverant students engaged more in schoolwork, which in turn was positively related to life satisfaction. We assume that perseverant students are more motivated and believe more in their ability to control their lives than their peers. Thus, their satisfaction with life is likely to be greater. Yet, the mediatory role of exhaustion and engagement requires longitudinal investigation in future studies.

Taken together, grit may be considered as a personal resource. The findings suggest that both facets of grit may be protective against school burnout. However, only perseverate grit (rather than consistency of interest) contributes to students' involvement. A critical review of the research on grit can be found in Section 2.5. The pattern of present findings advocates for the criticism that using a single global indicator (overall scale) of grit might disguise the effects of the distinct facets (Rimfeld et al., 2016). Regarding the generalization of the core JD-R assumptions, much like in Study II, we found again two crossed psychological processes. In the job context, the interactions of demands and personal resources are inconsistent. We were not able to reveal any interactions. This study is based on Western theories and findings, cross-cultural comparison studies should therefore be conducted as part of future research.

5 DISCUSSION

The overarching research objective of this dissertation was to contribute to a deeper understanding of Chinese students' emotional responses to academic stressors by examining the role of student resources within the context of the JD-R model. This chapter serves to conclude and discuss the main findings of all three empirical studies. Based on previous and current findings in addition to the initial JD-R theory, a Student Demands-Resources Model of School Burnout will be proposed. Strengths and limitations of this dissertation shall be discussed, alongside political and practical implications and finally challenges for future research shall be addressed.

5.1 MAIN FINDINGS

Measuring Student Resources

the QARCA-C

Valid and reliable psychological measures largely determine whether the results of (cross-cultural) studies are valid and interpretable. A main research objective of this dissertation was to develop a Chinese version of the QARCA using a comprehensive statistical analysis, including testing factorial structure, internal consistency, test-retest reliability, construct validity, correspondence between self- and parent reports, and measurement invariance across gender and language versions. This way, the development of the QARCA-C may serve as a model of test adaptation in future research.

The Chinese version of the QARCA showed high internal consistency and test stability. Its factorial structure is invariant across gender and language versions. In line with assumptions and previous Western findings (e.g., Lohaus & Nussbeck, 2016b), Chinese students with high levels of personal and environmental resources (a) are more likely to stay resilient on challenging developmental tasks and cope better with stressful events; (b) show less behavioral problems and greater levels of prosocial behavior; and (c) report higher levels of well-being and parental warmth. These findings indicate that although psychological constructs of adolescent development are largely rooted in Western research, overall, they can also be applied to research involving Chinese culture. Hence, the QARCA-C displays sound psychometric properties and can be regarded as a valid measure to assess Chinese students' personal and environmental resources.

measuring grit

During the last decade, grit has received intensive attention from within and outside of the scientific community. International organiza-

tions such as OECD have started to include grit in their assessments of students' learning in schools (OECD, 2015b), and policymakers have suggested that grit as a concept should be promoted in school settings (Gutman & Schoon, 2014; Schechtman et al., 2013; K. Zhou, 2016). As described in Section 2.5, grit has been operationalized as a higher-order construct in most studies (Credé et al., 2017): Both grit facets—*consistency of interests* and *perseverance of effort*—are typically summed to yield a total grit score. As in several other collectivistic countries (r = .03 to .27; Abuhassàn & Bates, 2015; Datu et al., 2016), the correlation between both grit facets in this dissertation was found to be weak (r = .19). In line with a recent large cross-cultural study (Disabato et al., 2019), the operationalization of grit into two correlated first-order factors was found to be more reliable than the overall grit score. Furthermore, both grit facets showed a significant association with burnout, whereas only perseverant grit was found to contribute to student engagement. Thus, the current findings advocate the criticism that a single global indicator of grit may disguise the distinct effects of the individual facets (Credé et al., 2017; Disabato et al., 2019).

Risks and Protective Factors in Students' Academic and Psychological Adjustment

Using the JD-R model as a heuristic framework, this dissertation aims to identify risk and protective factors for students in their academic and psychological adjustment. Academic demands were operationalized as workload (time spent on learning activities), perceived difficulty and quantity of schoolwork, whereas teacher-student relationships, self-efficacy, self-esteem, optimism, and grit were seen as student resources which are functional in dealing with academic demands. The relationships between these constructs were examined in connection with school burnout, student engagement, students' health and well-being, and academic achievement.

The results suggest that high levels of academic workload and perceived academic demands are significant risk factors for the development of a school burnout syndrome. Furthermore, higher levels of academic demands are negatively related to student engagement. Hence, academic demands may have not only a health impairing effect, but also a demotivating effect. Demanding schoolwork requires effort from the student, and high academic demands in high schools may lead to poor adjustment and an increase in burnout symptoms. This is in line with longitudinal findings (Salmela-Aro & Upadyaya, 2014). However, future studies should include a variety of academic demands such as academic overload and school-related emotional demands in addition to simply the quantity and difficulty of schoolwork.

Psychological traits such as self-efficacy, self-esteem, and dispositional optimism have been found to positively affect one's psychologi-

cal adjustment (D. W. Chan, 2007; X. Jiang & Hui, 2016; C. Liu et al., 2018; Salmela-Aro & Upadyaya, 2014). In this dissertation, each of these resources uniquely explained the variance of burnout symptoms. An unexpected positive relationship was found between self-esteem and cynicism. Although high self-esteem is generally regarded to be desirable and adaptive in child development, several scholars have been able to reveal its dark side. In an interesting study by Favara (2013), self-esteem is described as being a "double-edged sword": A certain amount of self-esteem is effective in protecting the adolescent against potentially risky behaviors, whereas a very high level of self-esteem may enhance the probability of engaging in risky behaviors. Further, there is longitudinal evidence supporting the dark side of high self-esteem in adolescents (Hoffman, 2003). The reason proposed for these negative effects is that individuals with high self-esteem usually have high aspirations and tend to overestimate their accomplishments. This overconfidence increases vulnerability to self-regulation failure. Yet, effective self-regulation, a key competence to deal with stressors (Neuenschwander & Oberlander, 2017; L. Zhou et al., 2017), requires an accurate assessment of self (Baumeister et al., 1993). Hence, (overly) high self-esteem may have negative influences on psychological adaption (leading to cynical reactions). However, further studies are needed to investigate whether this finding can be replicated and disentangle the positive from the negative side of self-esteem and the associated effects on relevant psychological constructs such as well-being, burnout, motivation, and achievement.

A positive teacher-student relationship has been shown to positively affect students' emotional development, academic accomplishment, and engagement in school. However, in this dissertation, this construct was no longer found to be a significant protective factor after controlling for students' personal resources. In the job context, Xanthopoulou et al. (2007) found that personal resources partly mediated the relationship between job resources and work engagement. However, the mechanism between job resources and personal resources in the context of the JD-R model is still unknown. It is possible that teacher-student relationships indirectly influence students' adjustment through personal resources. The relationship between school-related resources and personal resources should be investigated in future longitudinal studies.

Grit as a concept has been questioned on its predictive power of success. Similar to findings from several American (Muenks et al., 2017; Usher et al., 2018) and German researchers (Steinmayr et al., 2018), no effect of grit on academic achievement could be found after controlling for school type, SES, and gender in the current dissertation. A Finnish research group (Tang et al., 2019) investigated the relationship between grit and academic achievement in Finnish school students. The authors found a small effect of the grit facet *perseverance of effort* on students'

academic achievement in their longitudinal study. Furthermore, grit's impact on engagement was greater than achievement. They concluded that engagement was a more proximal outcome of grit than achievement. In this dissertation, a positive association between perseverance of effort and engagement in Chinese high school students was also found. Hence, the results of this dissertation support current Western findings.

Both grit facets were negatively related to burnout and depression. Perseverance of effort was additionally associated with higher life satisfaction. Hence, besides the motivational effect, grit can be said to have a health-enhancing quality. The protective effect of grit against psychological distress was also found in a study conducted on Filipino high school students (e.g., Datu, Yuen, et al., 2018).

In Study II and Study III, interaction effects of academic demands and student resources were investigated within the framework model. However, it must be concluded that there is no evidence to support a buffering role for students' resources or a boosting role of academic demands. Students' resources may interact with other factors. It is important however to note that the lack of findings regarding interaction effects could be the result of the operationalization of student resources. Interaction effects may have been more likely if domain-specific resources had been used, such as study self-efficacy.

In summary, the results suggest that high academic demands are risk factors, whereas students' personal resources (self-efficacy, adequate self-esteem, optimism, and grit) are protective factors when it comes to Chinese student's adjustment. The two psychological processes—the *health impairment process* and the *motivational process*—proposed by the JD-R framework are not independent from each other in school-related contexts. The interaction effects between demands and resources, however, require further investigation. Moreover, there are context-specific aspects that should be taken into account (for more detail, see Section 5.2).

5.2 STUDENT DEMANDS-RESOURCES MODEL

Based on the findings of this dissertation along with previous research findings, it is necessary to revise the assumptions of the JD-R model when applying it to school-related contexts. Although school can be seen as a workplace for students, school contexts significantly differ from job contexts in several aspects; for instance, physical and financial demands are of greater relevance in the job context. The Student Demands-Resources (SD-R) Model of school burnout is therefore proposed, which includes context-specific factors.

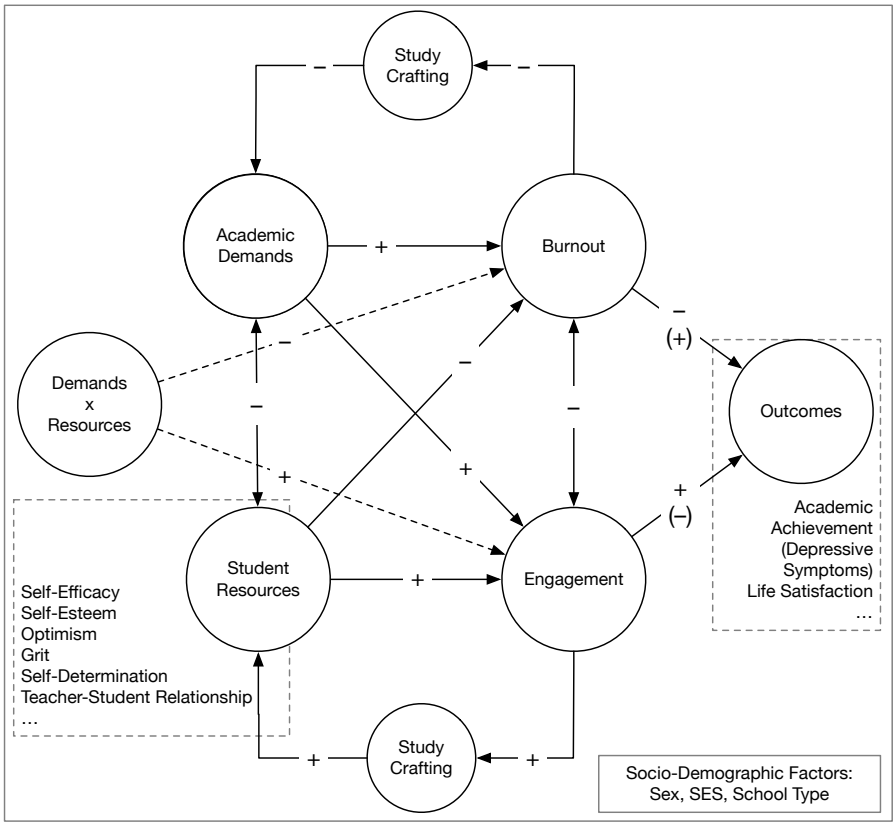

Figure 5.1: The Student Demands-Resources (SD-R) Model of School Burnout

Characteristics of Learning Environment

In the JD-R model, in terms of the physical, emotional, psychological, and social aspects of a job, job characteristics are distinguished between job demands and job resources. In the school context, academic demands refer to the cognitive, emotional, psychological, and social aspects of the learning environment. Demanding learning tasks, frequent examinations, academic overload, and negative relationships with peers and teachers require sustained psychological effort and are therefore associated with psychological costs. However, academic demands are not per se negative (Lazarus & Folkman, 1984, will be discussed in Section 5.6). Student resources such as support from teachers, integration into peer groups, personal strengths (e.g., high cognitive ability, general self-efficacy, optimism, and grit) are functional in dealing with academic tasks, achieving study goals, reducing psychological costs, and stimulating learning and development in educational settings.

Two Crossed Psychological Processes

The initial JD-R model postulates two parallel psychological processes: a *health impairment process* as well as a *motivational process*. As can be seen in Figure 2.1, no crossed paths between demands and engage-

ment and between resources and burnout are assumed. Yet, these relationships have been found, not only in the current dissertation but also in further empirical work (e.g., Gusy et al., 2016; Herrmann et al., 2019; Teuber, Möer, et al., 2020). Although empirical evidence indicates that demands are more important predictors of burnout and in contrast, resources are more important predictors of engagement (Bakker & Demerouti, 2007; Bakker et al., 2010), the possibility of crossed paths should not be ignored. In the SD-R model (Figure 5.1) model, high academic demands are not only a risk factor for school burnout but can also be detrimental for students' engagement and further, high resource levels have not only a motivational effect but also a positive effect on stress reactions. Academic demands however cost effort, deplete students' resources, and reduce students' commitment, whereas student resources fulfill basic psychological needs and diminish negative emotional responses.

In the long term, burnout increases the risk of physical and mental health problems (e.g., depressive episodes) as well as decreasing well-being outcomes (e.g., life satisfaction). On the opposing side, students who are dedicated to and engage in academic work to a greater extent are more likely to achieve higher academic performance.

Demands × Resources

In addition to the main effects of demands and resources, two joint or interaction effects of job demands and job resources are posited in the JD-R model which predict employees' adjustment. In the proposed SD-R model, the joint effects are depicted with dotted lines. Students' resources may buffer the detrimental effect of demands. Theoretically, it is reasonable and plausible to assume that students who have many resources in their learning environment are more likely to successfully cope with academic demands. Students with high cognitive ability, high self-efficacy, and high optimism, are more likely to perceive high academic demands as challenges. In this case, high levels of demands may even promote student engagement. That said, the joint effects could not be found using the SD-R model. The mechanism of learning environment may not be the same as the job environment. Students' resources may interact with further variables other than academic demands.

Study Crafting

The latest extension to the JD-R model was the inclusion of job crafting. In the higher education context, study crafting refers to students' proactive behaviors that change their academic demands and resources to make their study environment more favorable (Dormann & Guthier, 2019; Grützmacher et al., 2018). Relying on Wrzesniewski and Dutton's

assumption (2001), if and to what extent students craft their study depends on their perception of opportunities for study crafting. Crafting resources in the school context can be seen for example as trying to learn new things in school and asking for feedback from teachers. Crafting demands can be participating in challenging learning activities and avoiding difficult academic tasks that may be counterproductive. Crafting resources may foster a student's resources: for instance, proactively asking teachers for feedback can meet the basic psychological need for competence, which in turn facilitates his/her well-being and learning commitment (Demerouti et al., 2015). On the contrary, avoiding difficult learning tasks can also reduce one's self-efficacy, which in turn has negative effects on his/her emotional exhaustion and engagement (Salmela-Aro & Upadyaya, 2014). In future research, it would be worthwhile to investigate whether the concept of study crafting can be adapted to school settings.

Socio-Demographic Factors

Based on previous findings and the results of this dissertation, important socio-demographic factors (gender, SES, and school type) were included as control variables in the SD-R model. Particularly since Chinese schools are characterized by high aggregation according to students' academic abilities (see Section 2.1), these factors significantly impact students' academic and psychological outcomes as well as their development.

The current dissertation provides important evidence of the applicability of the SD-R model in the context of Chinese schooling. The SD-R model can be used as a framework to understand students' emotional responses to academic demands and to reveal resources that may prevent students from experiencing burnout. The psychological processes proposed by the SD-R model imply causality: Academic demands and student resources affect burnout and engagement, which in turn influences students' academic and psychological outcomes over time. With this dissertation, it was not possible to validate these causal assumptions completely. Yet, these causal relationships have been validated in both occupational and school contexts in previous research (Bakker & Demerouti, 2014; Salmela-Aro & Upadyaya, 2014). It can therefore be assumed that these causal links will hold in the long run as well.

5.3 POLITICAL IMPLICATIONS

As defined by the OECD (2019a), a world-class education system is characterized not only by high achievement, but also by high equity and students' well-being. The latest OECD reports (OECD, 2019b, 2019c) have shown that all these three criteria are simultaneously

achievable, for example, in Estonia and Finland. In comparison, it remains necessary for some countries such as China and Germany to promote equity and well-being with much greater urgency.

features of the Finnish education system

In the past 20 years, the Finnish education system has gained worldwide attention. Not only European (including Estonian; for further reading, see Toots, 2009) but also Chinese educators, researchers, and policymakers (for an overview, see Cai & Zuo, 2019) are interested in learning from the Finnish system for their own educational reform. Many characteristics have been assumed to be contributors to Finland's success (for detail, see Kikas & Lerkkanen, 2011; Kupiainen et al., 2009). To name several examples: (1) In Finland, compulsory formal education consists of nine years of comprehensive school. All children, regardless of their economic or social standing, have access to the same high quality of education from preschool onwards; (2) The Finnish curriculum emphasizes the promotion of students' comprehensive development including all aspects of individual growth and learning. This means that literacy and numeracy, students' self-concept, and emotional development are equally valued; (3) Teachers are highly qualified and are given full autonomy, and there is a culture of trust in teachers' professionalism for judging what is best for students and in their reporting of progress.

China

China also has a 9-year compulsory formal education, and the educational transition into upper secondary education is in the 9th grade[1]. However, to maximize children's competitiveness in the *gaokao* examinations, the selection begins as early as preschool. The boom of private and international or bilingual preschools that "promise" a better preparation for key primary schools leads to a differing level of educational quality and with that parental preference toward certain schools. The current key school system undermines students' mental health, puts students' development at a disadvantage, and serves to amplify social disparity (You, 2007). Under such high-performance pressure, the *jianfu* rule (alleviating academic burden in elementary and middle school) proposed by China's Ministry of Education 30 years ago has failed. Many parents worry that when public schools reduce homework and test difficulty as well as downgrade the importance of scores, it is the parents who have to step into the vacuum to provide their children with enough extracurricular learning support to help them stand out from their peers and eventually gain admission to a (key) higher educational institution. There are several ways to reduce the heavy competition and inequity in education: (1) improving the quality of vocational schools and thus making their candidates more attractive on the labor market; (2) allocating equal resources to schools; (3) abolishing the key school system, or at least reflecting and redefining its educational objectives; and (4) reducing the gap between advantaged and disadvantaged schools. Shanghai as an example has adopted several strategies that are similar to those found in Finland,

[1] *The compulsory formal education consists of 6 years of elementary school and 3 years of middle school. Afterward, depending on their zhongkao scores, students can be enrolled either into a vocational school or a high school.*

for example: teacher exchange programs between urban and rural areas and supporting disadvantaged schools in school management and teaching methods through using the expertise of experienced school leaders from successful schools. This approach should also be implemented in further Chinese areas.

Germany

In Germany, school is generally compulsory for ten years. After the 4th grade, students are separated and attend secondary schools according to their teacher's recommendation based on their academic performance and/or the wishes of their families[2]. This educational transition is however strongly affected by the socio-economic status of the family (Maaz et al., 2010). Children from low parental education backgrounds, rural region, or those of foreign origin are disadvantaged (Heineck & Riphahn, 2009). Although there are many support offers in the German educational system to help disadvantaged families and children's academic and psychological adjustment, evaluation of available data indicates a fundamental discrepancy in terms of participation (Bauer, 2005; Lohaus & Wild, 2020). Furthermore, many parents are unhappy about poor school equipment, overburdening of the teachers, rigid structures, and the lack of innovative concepts (Henry-Huthmacher, 2008). Furthermore, the early educational transition, increasing educational aspirations, and the lack of trust in public schools put many students and parents under pressure. Several recommendations can be made to address these points: (1) As many disadvantaged (e.g., low-income or immigrant) parents have limited ability to support their children, limited German language skills, and/or are often segregated in closed communities, policymakers should systematically promote access to local resources in order to further support such children's school experiences and enhance family functioning; (2) improving teacher education in terms of dealing with diversity, both at a cultural as well as an ability level; and finally (3) investing more resources in the basic education in terms of equipment quality and the improvement of the quality and access to all-day schooling (since schooling in Germany is traditionally only until midday) which can take the form of including homework supervision and other extracurricular activities.

[2] *With the exception of Berlin, where the transition takes place after the 6th grade.*

5.4 PRACTICAL IMPLICATIONS

Identifying Students at Risk

In line with previous findings, students with low self-efficacy, low optimism, low grit, but exaggeratedly high self-esteem are more likely to experience burnout symptoms and withdraw themselves from school-related activities. This academic and psychological maladjustment detrimentally affects their mental health and well-being (Bakker et al., 2014; Salmela-Aro & Upadyaya, 2014; Walburg, 2014).

The assessment of personal resources may be helpful to identify students at greater risk of burnout and motivational withdrawal. Students with few personal resources may profit the most from programs that impart learning and coping strategies, improve time management, and enable sensible goal setting.

Promoting Resources through Accessible Coping Trainings

The findings indicate that promoting students' personal resources and reducing school-related stress may foster students' psychological adjustment. It would, therefore, be conceivable to offer training in coping with academic stressors in Chinese high schools. Adaptive coping strategies can demonstrably mediate positive feelings or emotions and strengthen one's personal resources (Lazarus & Folkman, 1984; W. H. Li et al., 2012). Thus, with appropriate coping training, resources can be facilitated, which in turn have a positive effect on students' well-being. Yet, such training should be adapted to meet the needs and lifestyles of the students with the aim of being used in everyday life and in the long term (Beyer, 2005; Seidl et al., 2016). In particular, regarding the current situation in China, it is important to minimize the time cost of such training. A development in recent years is the combination of exercise and sport and the teaching of specific coping skills (Berger, 1994; Milchrahm, 2017). Sport and physical activity have a fundamentally positive influence on the psychological well-being of young people (Holder et al., 2009). School physical education is a good means of regulating emotions and reducing stress (Fuchs & Gerber, 2018; Schmid et al., 2016). If school physical education is supplemented with strategies for stress management, for example with relaxation techniques or mindfulness-based concepts, this could be an effective stress management training for Chinese high school students' adjustment to daily school life.

For instance, the stress management program EPHECT (Effects of a Physical Education-based Coping Training) is an example of a potential training concept. In this training program, six basic modules (each lasting 20 minutes) are incorporated into physical education lessons and can be conducted by teachers. The modules focus on movement and stress management skills and are carried out in a weekly rhythm. They consist of a) experiencing and understanding stress, b) successful time management, c) developing mental strength - dealing with negative thoughts and emotions, d) relaxing and taking it easy - e.g., progressive muscle relaxation, breathing technique, and yoga, e) eliminating sources of stress - problem-solving strategies, and f) managing stress together - social support. Module d) is a good example of how relaxation techniques and physiological reactions can be linked. First of all, the students are encouraged to measure their resting pulse rate and its change through various movement exercises.

Finally, the influence of certain relaxation exercises on pulse rate and emerging emotions in self-awareness is assessed and discussed. This coping training program has been established in Germany and has shown positive effects on students' coping abilities (Lang, 2015). If it fits the Chinese school setting, then it should be implemented and evaluated.

What Can Educators Do?

The findings of the current dissertation suggest that 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. 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.

experiencing self-determination

Meeting students' basic psychological needs (i.e., needs for competence, relatedness, and autonomy) may strengthen students' resilience and contribute to their successful stress management (Deci & Ryan, 2000). Autonomy in learning can be facilitated if students have the opportunity to choose tasks that they perceive as consistent with their interests and goals. Traditional Chinese culture strongly emphasizes harmony and conformity. Through this, Chinese students have more respect for their teachers and tend to suppress their own opinions. Allowing criticism and encouraging independent thinking can be an effective way for students to experience competence and autonomy (Assor et al., 2002). Many high school students complain about the monotonous, repetitive, and excessive school tasks during their *gaokao*-preparation (see section Section 2.1). Classrooms in Chinese schools are characterized by large size, with an average class containing 50 students. Lessons have a mostly frontal format. Western research on instruction quality shows that collaboration between students fosters students' engagement and the instructional quality of lessons (Helmke, 2001). However, typical Western pair and group work is not feasible in Chinese classroom settings. Nevertheless, teachers can encourage students to study together or discuss learning topics after lessons instead of completing monotonous exam excises.

What Can Parents Do?

showing empathy, acceptance, and emotional warmth

In the Chinese system, parents have high educational aspirations and expectations. Children and adolescents are seen as carriers of hope. Many parents believe that the academic failure of the child is their fault. This leads not only to children's stress but also parental stress. As the results of the dissertation (Study I) show, parental warmth is linked to lower stress vulnerability and stress symptoms of youngsters. In the Chinese culture, although emotional suppression may not be

necessarily maladaptive, some scholars have shown that problematic parent-child communications are particularly risky for children's emotional responses and well-being (Su & Liu, 2013; Tang et al., 2020). An early study (Chau & Landreth, 1997) had shown that the parent-child communication and relationship can be improved if Chinese parents show more empathic behavior towards their children, display greater acceptance of their children, and perceive less stress related to their parenting. It can therefore be argued that giving children emotional warmth and talking about the child's needs, feelings, and emotions instead of focusing solely on academic success may be useful.

5.5 STRENGTHS AND LIMITATIONS

One of the most significant contributions of this dissertation is the successful adaptation of the QARCA to the Chinese population. Its test adaptation and development fulfilled high psychometric standards. It enables a valid and reliable assessment of Chinese children's and adolescents' resources as well as cross-cultural comparisons of students' resources between Chinese and German youngsters. Through the application of the Chinese QARCA, clues were found regarding cultural differences in emotion regulation and parenting that may have important implications for test adaptations in future research.

Most theoretical and empirical research work on students' academic and psychological adjustment originates in Western countries. In the current dissertation, the assumptions proposed by the JD-R model were investigated in Chinese high school students. The findings suggest that the JD-R model should be revised when applying it to school-related contexts. Based on the findings, I proposed the SD-R model. Hence, this dissertation has been able to fill the research gap, and the SD-R model may prove to be appropriate for school burnout research and the derivation of burnout prevention and intervention approaches.

The findings of this dissertation on the effect of student resources on students' academic and psychological adjustment correspond to Western and longitudinal findings. Beyond these, it was possible to identify and investigate the dark side of self-esteem in students' psychological adjustment. With the integration of grit into the JD-R model, I could not only extend research on the flexibility of the JD-R but also research on the topic of grit.

Another strength that cannot be overlooked is the rigorous statistical analyses used and the large sample size in all three empirical studies ($N > 1{,}000$). In all studies, samples included participants from different school types and socio-economic backgrounds. The rate of participation was around 90% in all studies. Further, I was able to achieve largely gender-balanced samples.

Despite these strengths, several limitations should also be noted. In Study I, participants were from the Beijing and Hebei provinces (northern China), in contrast to Study II and III, where participants were from Shanghai (eastern China). These three provinces are far from representative of China as a whole. I chose these areas because Beijing and Shanghai are two Chinese municipalities where educational reforms begin. Hebei province is one of the largest provinces in China and consists of rural and urban areas. Unlike many municipalities in China, its education system is monitored directly by the central government. Hence, the samples consist of students from both mundane and innovative Chinese educational systems.

A further limitation is the cross-sectional design of all three studies. Although the assumed relationships were theoretically founded and empirically supported, longitudinal studies should be conducted to further support these findings. That said, a longitudinal study on a random high school student sample with the consideration of (pseudo-)anonymity would be extremely challenging. The reason for this is that students change their class in the second year of high school and that 12th-graders leave school after *gaokao*. Therefore, such studies require more complex international administration and significantly more support and engagement from teachers. Further, I tested a typical pseudonymization code system often applied in Western research (e.g., the combination of numbers and letters based on some individual facts such as the second letter of the participant's birthplace) to enable data-matching between different waves. However, this method did not seem to be suitable for Chinese students. This may be due to the fact that the Chinese language is not based on alphabet in the same way as is the English language[3].

Studies II and III were based on self-report data. Most of the variables of interest were intra-psychological constructs. In similar situations, self-report has been regarded as the best way to measure such constructs (Howard, 1994; Parker & Salmela-Aro, 2011). Although parental reports were included in Study I, the results warrant that the view that parents' reports do not appear to be overly informative. Further, self-report methods are often the most practical and are easier to administer in classroom settings. They can be given to large and diverse samples of students at a relatively low monetary as well as time cost. For these two studies, the limited resources and time required relatively rapid on-site data collection in China.

Lastly, the theoretical reasoning and hypotheses are based on Western burnout theory and empirical findings. 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 comparisons between Chinese samples and samples from Western countries should be conducted.

[3] *I tested the code system using pinyin without tones. Pinyin is the official romanization system for Mandarin. It consists of alphabet and diacritics denoting tones.*

5.6 CHALLENGES FOR FUTURE RESEARCH

Overall, this dissertation provides new information about Chinese students' resources and emotional responses to academic demands in addition to giving insights into cross-cultural similarities and differences in terms of student resources. That said, there is still much research work to be done in order to further understand these topics.

Measurement and Cross-Cultural Issues

The high degree of flexibility of the JD-R and SD-R models allow for the extension of various demands and resources. To test the universality of the SD-R model, cross-cultural comparison studies are necessary. However, up until now, the literature has lacked a standardized burnout measure with cut-off scores and norm samples. This is a reason why there are relatively few studies on burnout prevalence. The development of such measures could help educators, psychologists, and practitioners to assess burnout level and allow an indication as to at which risk level action should be taken.

To assess workload, I developed a 24-hour clock method, whereas many studies operationalize workload as the sum time spent on academic work. Both measures are suboptimal. For a reliable assessment of time spent on learning activities, experience sampling (ES) could prove to be a good alternative, in which individuals carry electronic pagers for a set time period. In response to ES signals, students fill out self-report questionnaires with a series of questions about their activities, locations, cognitive, and affective responses (see Hektner et al., 2007, for more description). This method also has limitations, in that it requires a considerable time investment from respondents, and the success depends largely on participants' willingness to comply to instructions.

Due to the dynamic and interactive nature of students' environment, a recommendation for future research is the use of multiple perspectives to assess students' environmental resources. It may be helpful also to include multiple perspectives for some constructs: for example, teacher-student relationship from the perspective of the teacher and peer integration from the peers' perspective.

Academic Demands as Challenge and Hindrance Stressors

In the SD-R model, academic demands are defined as aspects of learning that require effort and are associated with psychological costs. Although academic demands play a largely negative role in this model, as previously mentioned, individuals can also positively respond to demands (Lazarus & Folkman, 1984; Lepine et al., 2005; LePine et al., 2004; Podsakoff et al., 2007). The Transactional Stress Theory (Lazarus

& Folkman, 1984) postulates two stages of appraisal in stress processes. In the primary appraisal, an individual evaluates whether a stressor is relevant (either positive or dangerous) or irrelevant. In the secondary appraisal, an individual evaluates his or her resources or coping strategies for addressing perceived relevant stressors. Based on this theory, LePine and colleagues (Lepine et al., 2005; LePine et al., 2004; Podsakoff et al., 2007) postulate a two-dimension model of stressors yielding a distinction between challenge stressors and hindrance stressors. LePine et al. (2004) provide some examples for challenge and hindrance demands in educational contexts: Challenging academic demands are, for example, high workload, difficult learning content, and time pressure; whereas hindering academic stressors can be, for example, ambiguous expectations in the learning environment and inability to clearly understand the learning materials.

Based on these definitions, academic demands in the current dissertation can be seen as challenge demands. However, no motivation-enhancing effects of these could be found. On the contrary, Flinchbaugh et al. (2015) and LePine et al. (2004) found a positive effect of challenging academic stressors and a negative effect of hindering academic demands on students' motivation. In the German higher educational context, Gusy and colleagues (Gusy et al., 2016; Lesener et al., 2020) operationalized academic demands as a higher-ordered factor (time pressure, overtaxing, and work-life imbalance as three first-ordered factors). They found null associations between demands and engagement. This approach appears suboptimal since the effects of the various stressors may be hidden. A recommendation for future research is to include a variety of demand measurements to clarify the role of specific demands in the context of the SD-R model.

Behavioral Outcomes

Several authors have found that school burnout and engagement may influence individuals' observable behaviors. There is some indication that students' burnout and disengagement in school increase alcohol (Jackson et al., 2016) and cannabis (Walburg et al., 2015) abuse/dependence. Furthermore, in the work context, research has shown that burnout and engagement may be "transmitted by to or imitated by other individuals in the surrounding environment through a contagion process" (Bakker et al., 2014, p. 405). Previous studies show that adolescents can be easily affected by their peers' behavior and thinking; for instance, association with deviant peers confers particular risk for conduct problems in adolescence (for an overview, see Price et al., 2019). Besides peers, students' behaviors can also influence their teachers and parents. As Bakker et al. (2014) in a review suggested, it is necessary to gain insight into the behavioral outcomes of burnout

and engagement and the mechanism through which they influence others.

5.7 CONCLUSION

The present dissertation addresses current critical topics in the context of Chinese education. Using three original empirical studies, a focus was placed on the role of student resources in Chinese students' academic and psychological adjustment. The findings indicate that the development process of the QARCA-C may serve as a model for future psychological test adaptation and development. Moreover, the QARCA-C enables further cross-cultural comparisons of resources in Chinese and German youngsters. Another important contribution of this dissertation to research is the application, extension, and modification of the well-established JD-R model to the Chinese school context. The proposed SD-R model may be appropriate for studying school burnout and student engagement in future research. The results highlight the detrimental effect of high academic workload and demands as well as the protective nature of student resources such as a positive teacher-student relationship, students' self-efficacy, adequate self-esteem, optimism, and grit. The findings have the potential to stimulate Chinese researchers and educators to take students' individual differences in stress and coping more into consideration.

In China, psychology is still a noticeably young research field. Chinese culture and its education system largely differ from Western countries. While applying Western theories to the Chinese system, cultural-specific aspects regarding the local school system and cultural values should be taken into consideration. Which is not uncommon, that theories require contextual modifications. The trend of globalization stimulates the growing interest in cross-cultural research on educational topics. However, high-quality cross-cultural studies require not only rigorous research methods but also the awareness of the influence of culture on human behavior and development. From personal experience, to really understand a foreign culture and to reflect about cultural differences are time-consuming processes. It is hoped that this dissertation will inspire and encourage researchers who have intensive experience with multiple cultures to share their experience and to expand their research horizon in the conducting of cross-cultural studies.

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Part II

APPENDICES

CONTRIBUTION STATEMENT

STUDY I: "HUMAN RESOURCES IN CHINESE YOUNGSTERS – A CHINESE ADAPTION OF THE QARCA"

Ziwen Teuber designed and conducted the data analysis of this study. Qichen Wang and Yanjie Su supported the data collection in China. Ziwen Teuber wrote the first draft of the manuscript. Arnold Lohaus and Fridtjof Nussbeck critically revised and approved the final manuscript. All co-authors agree to the submission of the publication as part of this cumulative dissertation "Academic and Psychological Adjustment in Chinese Students: The Role of Student Resources".

STUDY II: "SCHOOL BURNOUT AMONG CHINESE HIGH SCHOOL STUDENTS: THE ROLE OF TEACHER-STUDENT RELATIONSHIPS AND PERSONAL RESOURCES"

Ziwen Teuber designed the study, collected the data, conducted the data analysis, and wrote the first draft of the manuscript. Fridtjof Nussbeck and Elke Wild critically revised and approved the final manuscript. All co-authors agree to the submission of the publication as part of this cumulative dissertation "Academic and Psychological Adjustment in Chinese Students: The Role of Student Resources".

STUDY III: "THE BRIGHT SIDE OF GRIT IN BURNOUT-PREVENTION: EXPLORING GRIT IN THE CONTEXT OF DEMANDS-RESOURCES MODEL AMONG CHINESE HIGH SCHOOL STUDENTS"

Ziwen Teuber designed the study, collected the data, conducted the statistical analysis, and wrote the first draft of the manuscript. Fridtjof Nussbeck and Elke Wild critically revised and approved the final manuscript. Fridtjof Nussbeck and Elke Wild agree to the submission of the publication as part of this cumulative dissertation "Academic and Psychological Adjustment in Chinese Students: The Role of Student Resources".

A

STUDY I

"HUMAN RESOURCES IN CHINESE YOUNGSTERS – A CHINESE ADAPTATION OF THE QARCA"

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Original Article

Human Resources in Chinese Youngsters – A Chinese Adaptation of the QARCA

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Abstract. *Background:* The German Questionnaire to Assess Resources for Children and Adolescents (QARCA; Lohaus & Nussbeck, 2016) is a diagnostic questionnaire that estimates six personal resources and four environmental resources. This study aimed to develop a Chinese version of the QARCA. Due to the important cultural differences between China and Western countries, we focused on whether these resources in a Chinese sample could be similarly assessed with Western samples and whether the association between the subscales of the QARCA was comparable across cultures. *Methods:* The validation sample consisted of 2,600 Chinese students and 393 parents. *Results and Discussion:* The results indicated that the Chinese version was soundly adapted with its postulated factorial structure. Reliability estimates for the subscale scores were good and expected correlations within the QARCA, as well as with external criteria. It is the first Chinese measure that simultaneously assesses personal and environmental resources for youngsters.

Keywords: protective factors, resilience, youth development, psychological measurement, cross-cultural comparison

During the development from childhood to adolescence, youngsters are exposed to many developmental tasks that represent risks and opportunities. According to the risk and protective factor models (e.g., Masten, 2014), the successful management of these depends on one's protective factors (i.e., resources). Resources are defined as factors that generally foster one's positive development. Broadly, resources fall into one of two categories: personal resources (i.e., individual strengths) and environmental resources (i.e., protective factors in one's surrounding). Contrary to risk factors that increase the likelihood of developing deficits or negative outcomes, protective factors are conceived to buffer the repercussions of risk factors on youth development. To promote youngsters' development, it is therefore important to be aware of their resources.

In China, youngsters have been the most important members of a family since the one-child policy was introduced in the 1980s. Creating an optimal environment for them is of paramount importance for most Chinese parents (Rasmussen, 2017). However, little is known about the actual resources of Chinese youngsters because there is no validated Chinese measure. To remedy this limitation, we adapted and validated a Chinese version of the theoretically based and empirically validated German diagnostic Questionnaire to Assess Resources for Children and Adolescents (QARCA; Lohaus & Nussbeck, 2016).

The QARCA Questionnaire

The QARCA consists of 60 items (for sample items, see ESM 1), with a 4-point rating scale from 1 (*never*) to 4 (*always*). It can be used in research as well as in therapeutic and educational contexts for diagnostics in 8–16-year-olds in individual or group test settings. It measures six personal and four environmental resources.

Personal Resources

Empathy and Perspective-Taking (EPT)

Empathy is defined as the capacity to understand, experience, and respond to emotions or feelings of another person, whereas perspective-taking refers to the ability to perceive or understand a particular situation from another's point of view (Galinsky, Maddux, Gilin, & White, 2008). These two aspects are negatively correlated with conduct behavior, but positively correlated with prosocial behavior (Eisenberg & Fabes, 1990).

Self-Efficacy

Self-efficacy (SEFF) refers to personal assumptions about the capability to accomplish a task. It can also be conceived of as confidence in one's competencies and is supposed to

have a direct impact on behavior (Bandura, 1977). Moreover, SEFF determines how long an individual will bear adversities and enhances children's well-being and academic performance (Galla et al., 2014).

Self-Esteem

Self-esteem (SEST) encompasses one's subjective emotional evaluation of the self (Rosenberg, 1979). It is positively related to psychological health and negatively related to psychological disorders, such as anxiety and depression (Sowislo & Orth, 2013).

Sense of Coherence

Sense of coherence (SOC) is defined as "a global orientation that expresses the extent to which one has a pervasive, enduring, though dynamic feeling of confidence that one's internal and external environments are predictable and that there is a high probability that things will work out as well as can reasonably be expected" (Antonovsky, 1979, p. 132). SOC is mandatory for understanding and controlling the world around oneself so that it prevents the development of emotional problems (Eriksson & Lindström, 2006).

Optimism

The subscale optimism (OPT) focuses on dispositional OPT, which is defined as a generalized and stable positive outcome expectation (Carver & Scheier, 2014). Previous research has indicated that dispositional OPT positively influences physical health, well-being, and coping (Mäkikangas, Kinnunen, & Feldt, 2004).

Self-Control

Self-control (SCON) is embedded in the concept of self-regulation (Carver & Scheier, 1998), which is the ability to regulate one's own emotions and behavior. SCON is positively related to goal achievement and delay of gratification (Rosenbaum, 1980). Being able to stand a delay of gratification in childhood has positive effects on social and cognitive competence, stress resistance, and frustration tolerance in adulthood (Shoda, Mischel, & Peake, 1990).

Environmental Resources

Parental Social and Emotional Support

The family is one of the most important support systems for youngsters. Both instrumental support (e.g., help with problem-solving) and emotional support (e.g., attachment and consolation) are integrated into parental social and emotional support (PSUP) in the QARCA. Perceived parental support is positively linked to the well-being of youngsters (Deci & Ryan, 2000).

Authoritative Parenting

Authoritative parenting (AUP) is characterized by high responsiveness and high demands (Baumrind, 1971). Authoritative parents react promptly to their children's needs, set clear standards and rules, monitor the child's behavior, and meanwhile enable their children to develop autonomy. Furthermore, AUP fosters positive youth development (Deci & Ryan, 2000).

Integration Into Peer Groups

During youth development, the importance of relationships with peers increases with age. Integration into peer groups (IPG) positively impacts problem-solving, conflict management, and the development of a self-concept (Erikson, 1968).

Educational Integration

Besides peers, classroom climate and academic performance can be regarded as other crucial factors for youth development. A positive classroom climate, which is a hallmark of high-quality instruction, positively affects students' social competence, SEST, and academic performance. In turn, high academic performance positively influences students' development (Helmke, 2001).

On the conceptual level, these resources have been regarded as distinct, yet partly overlapping constructs. For instance, individuals who perceive themselves as competent and worthy will generally expect higher probabilities of success and tend to be optimistic about future events (Gardner & Pierce, 1998). Parents' emotional support and responsiveness, as well as IPG, are related to basic psychological needs (Deci & Ryan, 2000). Moreover, environmental resources affect personal resources, and vice versa. These relations are reflected by the correlations of the 10 subscales (Lohaus & Nussbeck, 2016). Additionally, the authors report positive associations with prosocial behavior, adaptive emotion regulation, and well-being, as well as negative associations with vulnerability, stress, conduct problems, and parents' psychological pressure.

The Present Study

This study aimed to develop and validate a Chinese version (QARCA-C) of the QARCA. This would enable Chinese psychologists and educators to diagnose a child's and adolescent's resources and enable researchers to gain further insight into youth development in China. Moreover, this study will deepen our understanding of cultural differences and similarities by examining whether resources found in Western cultures can also be found in Chinese culture and whether the relations between the resources and external criteria are the same across cultures.

After a translation and back-translation procedure (see ESM 2.1) and a pilot study (see ESM 2.2), we evaluated psychometric properties of the QARCA-C in a large sample of Chinese 8–16-year-olds. Based on the German study, we expected positive relations with emotion regulation, well-being, prosocial behavior, coping, and parenting, as well as negative relations with conduct problems and stress.

Method

Participants and Study Design

Participants were 2,716 students and 393 parents from Baoding, China. After removing 116 invalid cases (due to the extremely short response time), we considered data from 1,350 boys and 1,250 girls (M_{age} = 12.51; SD = 1.84; age range: 8–16 years; 5.11% 3rd graders, 6.73% 4th graders, 8.15% 5th graders, and 7.11% 6th graders, 35.81% 7th graders, 21.42% 8th graders, and 8.89% 9th graders, and 7% 10th graders). All participants were Mandarin speaking. For comparison, the German sample consisted of 2,513 students (1,229 girls; M_{age} = 12.20; SD = 2.21; age range: 8–16 years) and 314 parents (Lohaus & Nussbeck, 2016).

Participants filled in one out of six sets of questionnaires as part of a school assignment during school holidays or weekends. The six different sets of questionnaires (see ESM 3.1) consisted of the QARCA-C, and one, or a combination, of the following measures described in the next section. Additionally, 114 participants (64 girls) filled in the QARCA-C after 2 weeks.

Participants and their parents or guardians were informed about the nature of this study and their right to withdraw from participation without any negative consequence. The ethics review committees of Bielefeld University approved this study.

Measures

Emotion Regulation Questionnaire for Children and Adolescents

We used the Chinese Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CCA; Liu, Chen, & Tu, 2017) to assess emotion regulation: cognitive reappraisal (six items) and expressive suppression (four items) using 7-point answer formats.

Quality of Life Questionnaire for Children and Adolescents

The self-report KIDSCREEN-10 (The KIDSCREEN Group, 2006) is a standardized screening instrument for children's subjective health and well-being. The Chinese version was provided by the KIDSCREEN organization. Answers were scored on a 5-point rating scale.

Strength and Difficulties Questionnaire

The Strength and Difficulties Questionnaire (SDQ; Goodman & Goodman, 2009) is a behavioral screening questionnaire for children and adolescents. The Chinese 3-point self-report (available under http://www.sdqinfo.com) includes 25 items measuring (a) emotional problems, (b) conduct problems, (c) hyperactivity, (d) peer relationship, and (e) prosocial behavior. The four difficulty subscales (a–d) can be summed up to generate a total difficulties score.

German Questionnaire for the Measurement of Stress and Coping in Children and Adolescents

The Questionnaire for the Measurement of Stress and Coping in Children and Adolescents (SSKJ; Lohaus, Eschenbeck, Kohlmann, & Klein-Heßling, 2006) is a self-report questionnaire covering (a) stress vulnerability (7 items); (b) five coping strategies (seeking social support, problem solving, avoidant coping, palliative emotion regulation, and anger-related emotion regulation; 30 items in all); and (c) stress symptoms (physical and psychological symptoms; 18 items). In a preliminary study (in preparation), we back-translated and validated the Chinese version using a large sample.

Egna Minnen Barndoms Uppfostran

To measure parenting behaviors from the child perspective, we used the validated Chinese Egna Minnen Barndoms Uppfostran (s-EMBU; Jiang, Lu, Jiang, & Xu, 2010). It consists of 21 four-point scale items covering rejection, emotional warmth, and overprotection. Participants were asked to respond twice to each item (i.e., separately for their mothers and fathers).

QARCA-C Parent Report

The QARCA-C parent report measures the same 10 dimensions as the self-report, except for the use of "my child" instead of "I" in the item wordings.

Internal consistencies of all subscales are presented in ESM 3.7 and 3.8.

Results

Descriptives

Table 1 shows descriptive statistics and mean comparisons between the language versions. ESM 3.2 presents the results of mean comparisons between boys and girls.

Table 1. Sample descriptives and comparison of means between the language versions

	China (*N* = 2,600)		Germany (*N* = 2,513)			
	M	*SD*	*M*	*SD*	*t* test	Cohen's *d*
EPT	3.00	0.60	3.09	0.53	−5.68***	.16
SEFF	2.79	0.54	3.00	0.48	−14.70***	.41
SEST	2.61	0.67	3.19	0.52	−34.50***	.97
SOC	3.00	0.55	3.16	0.48	−11.07***	.31
OPT	3.07	0.59	2.97	0.50	6.53***	−.18
SCON	2.93	0.56	2.98	0.56	−3.19**	.09
PSUP	3.02	0.74	3.69	0.47	−38.50***	1.08
AUP	2.90	0.70	3.45	0.52	−31.81***	.89
IPG	3.20	0.65	3.52	0.45	−20.40***	.59
EDUI	3.24	0.68	3.35	0.60	−6.13***	.18
Total score	2.98	0.46	3.24	0.32	−23.39***	.65

Note. *p < .05. **p < .01. ***p < .001. AUP = authoritative parenting; EDUI = educational integration; EPT = empathy and perspective-taking; IPG = integration into peer groups; *M* = mean; OPT = optimism; PSUP = parental social and emotional support; SCON = self-control; *SD* = standard deviation; SEFF = self-efficacy; SEST = self-esteem; SOC = sense of coherence. The degree of freedom of all subscales was 5,111.

Scale Analyses

Before performing scale analyses, we particularly inspected the reverse-worded items. Various studies show that reverse-worded items are problematic in Chinese samples and can cause measurement bias (e.g., Zhong, Wang, Li, & Liu, 2009). We decided to exclude those items that were only weakly related (r < .20) to their corresponding scale (Item 17 from the QARCA-C; Item 7 and Item 23 from the SDQ-C).

Item metric analyses (Table 2) for the QARCA-C revealed expectable corrected item-total correlations (r_{it} = .34 to .76) and standardized factor loadings of items on the respective subscales. All subscales show good internal consistencies.

Factor Structure

Confirmatory factor analyses (CFA) were estimated to examine the factor structure of the QARCA-C using the weighted least square mean and variance adjusted (WLSMV) estimator implemented in *Mplus* 8.2 (Muthén & Muthén, 1998–2019). The results of unidimensional CFAs (Table 3) suggested that each of the 10 measurement models for the subscales fit the data acceptably well (all RMSEA < .08; all CFI > .98). All items loaded significantly on their latent factors (all λ_{stand} > .46, all ps < .001). For the unidimensional CFAs, specific residual correlations were allowed based on model modification indices. Similar to the original study, we allowed for 15 residual correlations (see ESM 3.3 and 3.4). Although this points to a facet structure of the subscales, we did not differentiate between these facets to be in line with the German version. Finally, the 10-factor CFA model showed an adequate model fit, with χ^2 = 8,847.444, df = 1,592, p < .001, CFI = .931, RMSEA = .042, 90% CI = [.041, .043].

The results of the equivalence testing (using multi-group CFAs) across gender showed that for all subscales, full metric or full scalar invariance holds (see ESM 3.5). ESM 3.6 displays fits for measurement invariance models across two language versions. For four subscales, full metric/partial scalar invariance was supported; the remaining six subscales corroborated partial metric invariance by setting free one to four loadings.

The correlations between the subscales are principally moderate to strong and vary considerably (Table 4; smallest r = .27 for EPT with PSUP, largest r = .72 for IPG

Table 2. Item analyses for the Chinese study and German study (in parentheses)

			r_{it}		λ_{stand}	
	McDonald's ω	Cronbach's α	Min	Max	Min	Max
EPT	.82	.82 (.78)	.52 (.42)	.62 (.60)	.60 (.48)	.77 (.71)
SEFF	.72	.72 (.81)	.37 (.56)	.53 (.64)	.46 (.60)	.76 (.74)
SEST*	.80*	.71* (.82)	.51* (.41)	.65* (.63)	.64* (.50)	.75* (.75)
SOC	.70	.70 (.69)	.34 (.37)	.51 (.48)	.47 (.45)	.71 (.60)
OPT	.79	.78 (.72)	.46 (.37)	.61 (.50)	.61 (.43)	.81 (.63)
SCON	.71	.70 (.68)	.36 (.26)	.50 (.44)	.48 (.34)	.69 (.60)
PSUP	.84	.86 (.89)	.53 (.64)	.76 (.74)	.66 (.70)	.90 (.79)
AUP	.80	.80 (.77)	.44 (.42)	.65 (.54)	.44 (.46)	.82 (.67)
IPG	.85	.84 (.79)	.54 (.42)	.70 (.61)	.63 (.40)	.83 (.76)
EDUI	.89	.89 (.87)	.62 (.52)	.76 (.66)	.69 (.52)	.92 (.79)

Note. AUP = authoritative parenting; EDUI = educational integration; EPT = empathy and perspective-taking; OPT = optimism; PSUP = parental social and emotional support; SCON = self-control; SEFF = self-efficacy; SEST = self-esteem; SOC = sense of coherence; IPG = integration into peer groups; r_{it} = adjusted item-total correlation; λ_{stand} = standardized factor loading; * = without Item 17.

Table 3. Goodness-of-fit indices of the unidimensional confirmatory factor analyses for the subscales (WLSMV estimates)

					90% CI		
	χ^2	*df*	*p*	RMSEA	Lower	Upper	CFI
EPT	69.16	8	<.001	.05	.04	.07	.99
SEFF	19.09	7	<.001	.03	.01	.04	.99
SEST	3.91	3	.27	.01	.00	.04	1.00
SOC	81.42	8	<.001	.06	.05	.07	.99
OPT	82.87	7	<.001	.07	.06	.08	.99
SCON	83.54	9	<.001	.06	.05	.07	.98
PSUP	159.50	9	<.001	.08	.07	.09	.99
AUP	120.03	7	<.001	.08	.07	.09	.99
IPG	97.63	7	<.001	.07	.06	.08	.99
EDUI	87.68	6	<.001	.07	.06	.08	.99

Note: N = 2,600. AUP = authoritative parenting; CFI = comparative fit index; CI = confidence interval; EDUI = educational integration; EPT = empathy and perspective-taking; IPG = integration into peer groups; OPT = optimism; PSUP = parental social and emotional support; RMSEA = root-mean-square error of approximation; SCON = self-control; SEFF = self-efficacy; SEST = self-esteem; SOC = sense of coherence.

and EDUI). All correlations correspond to those of the German study regarding the direction of the association, albeit they are generally more elevated.

Relations to External Criteria

ESM 3.7 and ESM 3.8 present all correlations between QARCA-C resources and external criteria. As expected, all resources positively related to cognitive reappraisal. However, 6 of 10 resources were positively associated with expressive suppression. As assumed, resources and well-being were also positively related.

Concerning the relations between resources and the SDQ subscales (ESM 3.8), the overall results were in line with our assumption. All resources positively related to prosocial behavior and negatively related to hyperactivity and peer relationship problems. Most resources negatively related to emotional and behavior problems.

We expected negative relations between resources and stress, as well as positive relations between resources and coping. Most resources were negatively related to stress vulnerability and stress symptoms (ESM 3.7). Except for SEST, we found negative associations between resources and anger-related emotion regulation. Avoidant coping was positively related to SEFF, SEST, SOC, OPT, and SCON. Participants who reported higher levels of resources also reported higher levels of seeking social support, problem-solving, and palliative emotion regulation.

We found the expected positive correlations between emotional warmth from both parents and resources. Parents' rejections were negatively related to PSUP, AUP, and EDUI. Overprotection had less influence on resources: Mothers' overprotection was negatively related to SOC and PSUP, whereas no relation between fathers' over-protection and resources was found.

Agreement Between Self- and Parent Reports

Surprisingly, and contrary to the German study, we could not find *any* significant correlation between QARCA-C self-reports and parent reports.

Test–Retest Reliability

Test–retest correlation over 2 weeks for each subscale score varied between r = .72 and .93, all ps < .001 (in the German study: r = .53 to .86, all ps < .05).

Table 4. Intercorrelations between the subscales in the Chinese study and the German study (in parentheses)

	EPT	SEFF	SEST	SOC	OPT	SCON	PSUP	AUP	IPG
SEFF	.47 (.30)								
SEST	.36 (.14)	.58 (.47)							
SOC	.52 (.33)	.66 (.56)	.54 (.49)						
OPT	.51 (.35)	.64 (.53)	.57 (.59)	.68 (.58)					
SCON	.55 (.34)	.60 (.39)	.48 (.39)	.62 (.40)	.62 (.50)				
PSUP	.27 (.23)	.37 (.28)	.41 (.40)	.37 (.32)	.44 (.39)	.38 (.30)			
AUP	.33 (.29)	.41 (.28)	.42 (.30)	.40 (.34)	.46 (.33)	.43 (.34)	.69 (.62)		
IPG	.39 (.26)	.41 (.35)	.43 (.36)	.40 (.35)	.47 (.39)	.42 (.39)	.41 (.31)	.43 (.29)	
EDUI	.38 (.26)	.43 (.33)	.44 (.43)	.44 (.35)	.53 (.45)	.45 (.45)	.46 (.38)	.48 (.34)	.72 (.58)

Note. All correlations are significant with p < .001. AUP = authoritative parenting; EDUI = educational integration; EPT = empathy and perspective-taking; IPG = integration into peer groups; OPT = optimism; PSUP = parental social and emotional support; SCON = self-control; SEFF = self-efficacy; SEST = self-esteem; SOC = sense of coherence.

Discussion

The purpose of this study was to develop a Chinese version of the QARCA questionnaire. Overall, the results show that the QARCA-C is a sound translation of the German original version: (a) all items show appropriate item-total correlations, (b) the scores of the QARCA-C subscales display acceptable to high internal consistencies, (c) the scores display high temporal stability, (d) the internal structure is similar to the original scale with (partial) scalar or (partial) metric invariance across gender and language versions for all subscales, and (e) all subscales are positively associated.

As for the German version, we had to allow for several residual correlations, which may (in parts) point to a facet structure of the subscales. At this point, we can only speculate about the genesis of these residual correlations. It seems that some of the residual correlations are due to wording effects (e.g., Items 55 and 60 include *comfortable*, and Items 42, 45, and 47 *rules*), whereas others more clearly reflect facets of the subscale (e.g., Items 6 and 32 cover more cognitive aspects of EPT than the remaining four items that cover the more emotional/feeling-oriented side; Items 13 and 24 of SOC cover *control* aspects rather than *understandability*). Whether the residual correlations actually cover psychologically meaningful facets of the subscales cannot be answered with the present research. Future studies should explore the potential facet structure by linking the potential facets to external criteria and investigating the differential associations.

Overall, most associations between QARCA-C resources and external criteria correspond to previous findings. However, the results also indicate some differences. Regarding emotion regulation, studies in Western cultures (e.g., Goldstein, Tamir, & Winner, 2013) have underlined the adaptive role of cognitive reappraisal and the maladaptive role of expressive suppression. In this study, resources positively related to cognitive reappraisal. Yet, we also found positive associations between expressive suppression and some of the resources. From a cross-cultural perspective, expressive suppression may be dysfunctional for Western youngsters, but not so for Chinese. This notion is in line with the study by Soto, Perez, Kim, Lee, and Minnick (2011), who found that expressive suppression negatively related to psychological outcomes in an American sample, but not in a Chinese sample. The authors argue that the use of suppression is more normative in China, whereas expressiveness is more normative in the West. Similarly, a binational study showed that, compared to Americans, Chinese are more reluctant to express their feelings and wishes (Eid, Langeheine, & Diener, 2003).

Concerning the relationships between parenting style and children's resources, the Chinese and the German samples show only slightly comparable results. Comparable to the German findings, we found that parents' emotional warmth was positively related to youngsters' resources. Furthermore, rejection from Chinese fathers seems to have negative effects only on children's environmental resources, whereas rejection from Chinese mothers also negatively affects children's personal resources. The German study shows that both parents' emotional pressure is a risk factor during the development of resources. In our study, Chinese parents' overprotection has almost no association with children's resources. We have to emphasize that participants' evaluation strongly depends on their perception and definition of *too much control and warmth*. Moreover, in the rapidly changing Chinese culture, which is progressing toward capitalism, Western ideals are being incorporated into child-rearing habits of Chinese parents (Way et al., 2013). Both could explain that the participants reported, on average, a rather low level of overprotection ($M = 2.23$, $SD = .54$). Additionally, the differences between the German and our study may also be due to the fact that we could not use the Zurich Brief Questionnaire for the Assessment of Parental Behaviors (Reitzle, Winkler Metzke, & Steinhausen, 2001), which was used in the German study, because there is no validated Chinese translation.

Most strikingly, and in contrast to the German QARCA study, there was *no* significant correlation between the self-reports and parent reports. Hence, the two reports reflect completely different views. Cultural differences in parent–child communication may explain this result. Su and Liu (2013) reviewed cross-cultural studies on parent–child communications and found that Western parents and children talk more about personal topics (e.g., wishes, emotions, and psychological needs), whereas in Eastern families, parents and children talk about actions and their consequences. In a meta-analysis, Tang, Tang, Ren, and Wong (2020) concluded that low-quality parent–child communication is one of the most important factors for the high depression prevalence rate in Chinese adolescents. Nevertheless, there are validation studies with respect to Chinese youngsters' self-reports on intra-psychological constructs showing evidence of validity. Therefore, we assume that youngsters' self-reports may be more useful than parent reports in China. However, this assumption has to be evaluated with external (not self-reported) criteria in future research.

Several limitations of this study should be taken into consideration. First, in the QARCA-C, the reverse-worded Item 17 was problematic and consequently excluded from the final version. An alternative item should be formulated and evaluated. Second, it may be that the zero correlations between parent and child reports are due to the fact that the parent version was not optimally designed. For the parent version, items of the child version were simply

reworded, which may not work as well in the Chinese as in Western cultures. Further, it could be interesting to test the correlation between self-report and teacher/friend report to investigate if low rates of agreement between self- and other ratings are specific to the Chinese parent–child relation or generalize. Presuming that the parent version of the QARCA-C provides valid measures of the parent perception of the child's resources, the striking finding that there is no association between self- and parent reports in China is worth a deeper examination: It would be interesting to investigate whether this disagreement originates in parenting styles, a lack of time that parents and their children spend together, or other reasons, such as communication within the family.

Electronic Supplementary Material

The electronic supplementary material is available with the online version of the article at https://doi.org/10.1027/2698-1866/a000003

ESM 1. Example items of the QARCA
ESM 2. Translation and the pilot study
ESM 3. Results of the validation study

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Electronic Supplementary Material

ESM 1: Example Items of the QARCA

Scales	Example Items
EPT	I try hard to understand others.
SEFF	I can reach a lot with my ability.
SEST	I am proud of myself.
SOC	I think my life makes sense.
OPT	Even if I have problems, I see the positive side.
SCON	I can concentrate well on my tasks.
PSUP	My parents can comfort me well.
AUP	My parents are warmhearted, but they also set limits for me.
IPG	I think others of my age like me.
EDUI	My classmates are nice to me.

Note: The English translation has not been validated. EPT = empathy and perspective-taking. SEFF = self-efficacy. SEST = self-esteem. SOC = sense of coherence. OPT = optimism. SCON = self-control. PSUP = parental social and emotional support. AUP = authoritative parenting. IPG = integration into peer groups. EDUI = educational integration.

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ESM 2: Translation and the Pilot Study

ESM 2.1 *Translation*

To accomplish a valid translation, we applied the translation and back-translation approach[1]. This approach requires two translators who are competent in both Chinese and German language, and who both have experiences in the two different cultures. The first translator, who is also the investigator, was born and raised in China and has been living in Germany for more than ten years. She studied psychology in Germany and is aware of the cultural differences between the two countries. The back translator is German who had been staying in China for almost two years and is fluent in Chinese. In addition, he studied Chinese Culture and International Relations in Germany, China, and South Korea. At first, the original questionnaire was translated into Chinese by the investigator and then back-translated into the original language by the second translator, who was unaware of the original German item wording. In the next step, we compared the back-translated German version with the original version to validate that the meaning of each item was maintained. Then, we revised inaccurate items and compared these with the original ones again. We repeated this process until there was no incongruence between the two language versions.

[1] Brislin, R. W. (1980). Translation and content analysis of oral and written material. *Handbook of Cross-Cultural Psychology: Methodology*, *2*, 389–444.

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ESM 2.2 *The Pilot Study*

Participants and Procedure

In all, 302 students from Beijing (171 boys and 131 girls) with a mean age of 11.94 years (*SD* = 2.39; age range = 8 to 16; 13.95% 3rd-graders, 10.63% 4th-graders, 16.61% 5th-graders, 10.30% 6th-graders, 5.98% 7th-graders, 13.29% 8th-graders, and 29.24% 9th-graders) participated in the pilot study. All participants were Mandarin native speakers. Data were collected during regular school lessons.

Psychometric Properties

Goodness of Fit of the Unidimensional Confirmatory Factor Analyses for the Ten Resources in the Pilot Study (WLSMV-Estimates)

					90% CI		
	χ^2	*df*	*p*	*RMSEA*	lower	upper	*CFI*
EPT	14.49	9	.11	.05	.00	.09	1.00
SEFF*	14.00	7	.05	.06	.00	.10	.98
SEST	30.13	5	<.001	.13	.08	.18	.96
SOC	32.61	9	<.001	.08	.06	.13	.95
OPT	28.99	9	<.001	.08	.05	.12	.95
SCON	14.68	9	.101	.05	.00	.08	.98
PSUP	27.46	9	<.001	.08	.05	.12	.98
AUP*	16.64	8	<.05	.06	.02	.10	.98
IPG*	14.29	7	.05	.06	.01	.10	.99
EDUI*	23.50	8	<.05	.08	.04	.12	.99

Note. N = 302. * = Residual correlations between the items inside of each subscale score were allowed. 90% C.I. = 90% confidence interval of the *RMSEA*. EPT = empathy and perspective-taking. SEFF = self-efficacy. SEST = self-esteem. SOC = sense of coherence. OPT = optimism. SCON = self-control. PSUP = parental social and emotional support. AUP = authoritative parenting. IPG = integration into peer groups. EDUI = educational integration.

The subscale score SEFF showed a relatively low internal consistency (α = .59), whereas internal consistency of all other resources was acceptable or high (α = .61 to .81). Item-total correlations ranged from .25 to .64 for all subscale scores. However, in contrast to the original German validation study, the only reverse-worded Item 17 (“I wish I were another

person") still showed a negative item-total correlation after recoding. One possible reason for this is that participants might have misunderstood it. Compared to the results of the German study, internal consistencies were generally lower in the Chinese pilot sample (9 out of ten cases).

Internal Consistency and Item-Total Correlations for the Pilot Study and the German Study

		Cronbach's alpha		r_{it}	
	McDonald's Omega	CN	GE	min	max
EPT	.81	.81	.78	.49	.64
SEFF	.60	.59	.81	.25	.43
SEST	.71 (.75)	.61 (.75)	.82	-.08 (.44)	.51 (.56)
SOC	.68	.67	.69	.28	.50
OPT	.69	.69	.72	.34	.49
SCON	.64	.63	.68	.26	.44
PSUP	.79	.79	.89	.49	.60
AUP	.64	.64	.77	.31	.48
IPG	.77	.76	.79	.39	.55
EDUI	.80	.79	.87	.46	.62

Note. CN = Chinese sample. GE = German sample. r_{it} = corrected item-total correlation. Values in parentheses for SEST depict the estimates without Item 17. EPT = empathy and perspective-taking. SEFF = self-efficacy. SEST = self-esteem. SOC = sense of coherence. OPT = optimism. SCON = self-control. PSUP = parental social and emotional support. AUP = authoritative parenting. IPG = integration into peer groups. EDUI = educational integration.

To sum up, these findings provide initial support for the sound translation of the QARC-C, as well as for a comparable internal structure and a valid and reliable assessment of the ten resources. However, the reverse-worded Item 17 reveals cultural differences. To keep the two versions of the QARCA as comparable as possible, and due to the relatively small sample size of the Chinese pilot study, we decided to keep Item 17 in its original wording in the validation study.

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ESM 3: Results of the Validation Study

ESM 3.1 *Description of Subsamples and the Corresponding Sets of Questionnaires*

Subsample	QARCA-C combined with					*n*
	SDQ	KIDSCREEN	ERQ	s-EMBU	SSKJ	
1	X		X		X	577
2	X	X				742
3				X		497*
4		X			X	188
5			X			539
6	X					173

Note. *n* = size of the subsample. QARCA-C = Questionnaire to Assess Resources for Children and Adolescents - Chinese. SDQ = Strength and Difficulties Questionnaire. KIDSCREEN = Quality of Life Questionnaire for Children and Adolescents. s-EMBU = Egna Minnen Barndoms Uppfostran. ERQ = Emotion Regulation Questionnaire. SSKJ = German Stress and Coping Questionnaire for Children and Adolescents. *: 393 parents filled in parent reports.

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ESM 3.2 *Gender-Specific Mean Comparisons Using t-Tests*

	Boys (*n* = 1,350)		*Girls* (*n* = 1,250)			
	M	*SD*	*M*	*SD*	*t*-test	*Cohen's d*
EPT	2.98	0.60	3.02	0.59	-1.67	0.07
SEFF	2.80	0.53	2.78	0.54	0.92	-0.04
SEST	2.62	0.66	2.60	0.68	0.75	-0.03
SOC	3.01	0.55	2.99	0.56	0.92	-0.04
OPT	3.10	0.57	3.04	0.62	2.59**	-0.10
SCON	2.92	0.56	2.93	0.56	-0.29	0.01
PSUP	2.97	0.68	2.95	0.73	0.80	-0.03
AUP	2.93	0.68	2.86	0.72	2.67**	-0.11
IPG	3.21	0.64	3.20	0.66	0.54	-0.02
EDUI	3.25	0.66	3.23	0.70	0.58	-0.02
Total Score	2.99	0.45	2.97	0.47	1.11	-0.04

Note. *M* = mean. *SD* = standard deviation. *$p < .05$. **$p < .01$. ***$p < .001$. EPT = empathy and perspective-taking. SEFF = self-efficacy. SEST = self-esteem. SOC = sense of coherence. OPT = optimism. SCON = self-control. PSUP = parental social and emotional support. AUP = authoritative parenting. IPG = integration into peer groups. EDUI = educational integration.

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ESM 3.3 *The 15 residual correlations that were allowed*

EPT: Item 6 with Item 32
- Item 6: I try hard to understand others.
- Item 32: I know how other people feel.

SEFF: Item 3 with Item 5, Item 15 with Item 21
- Item 3: I can reach what I really want to achieve.
- Item 5: When I set a goal, I also achieve it.
- Item 15: I can reach a lot with my ability.
- Item 21: With my abilities, I can achieve everything.

SEST: Item 25 with Item 29, Item 31 with Item 34
- Item 25: I like myself.
- Item 29: I can be proud of myself.
- Item 31: I feel comfortable thinking about myself.
- Item 34: I have many good feelings when I think about myself.

SOC: Item 13 with Item 24
- Item 13: I can influence my life.
- Item 24: I can control what happens in my life.

OPT: Item 4 with Item 8, Item 11 with Item 26
- Item 4: Even though I have problems, I see the positive side.
- Item 8: If I don't feel so good, I know that I will feel better soon.
- Item 11: I believe that somehow everything will turn out for the best.
- Item 26: I look to my future with confidence.

AUP: Item 42 with Item 47, Item 45 with Item
- Item 42: There are rules at home that I have to follow.
- Item 47: My parents explain the rules that apply in our home.
- Item 45: We have rules here, but I have a say in it.

IPG: Item 52 with Item 53, Item 53 with Item 54
- Item 52: My friends like me for who I am
- Item 53: I think others of my age like me.
- Item 54: I have a lot of contact with people of my age.

EDUI: Item 55 with Item 60, Item 56 with Item 59, and Item 57 with Item 60
- Item 55: I feel comfortable at school.
- Item 60: I feel comfortable in my class.
- Item 56: I come along well with my classmates.
- Item 59: My classmates are nice to me.
- Item 57: The climate in my school is really good.

Authors' Note: We ad hoc translated these items from German into English. There is no validated English version.

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ESM 3.4 *Goodness-of-Fit of the Unidimensional Confirmatory Factor Analyses for the Subscales without Residual Correlations (WLSMV-estimates)*

	χ^2	*df*	*p*	*RMSEA*	90% CI		*CFI*
					lower	upper	
EPT	375.39	9	<.001	.13	.11	.14	.97
SEFF	456.54	9	<.001	.14	.13	.15	.92
SEST	461.10	5	<.001	.19	.17	.20	.96
SOC	277.99	9	<.001	.11	.10	.12	.94
OPT	198.23	9	<.001	.09	.08	.10	.98
AUP	769.91	9	<.001	.18	.17	.19	.93
IPG	609.07	9	<.001	.16	.15	.17	.96
EDUI	803.04	9	<.001	.18	.17	.20	.97
total	10850.261	1607	<.001	.047	.046	.048	.912

Note: N = 2,600. EPT = empathy and perspective-taking. SEFF = self-efficacy. SEST = self-esteem. SOC = sense of coherence. OPT = optimism. SCON = self-control. PSUP = parental social and emotional support. AUP = authoritative parenting. IPG = integration into peer groups. EDUI = educational integration.

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ESM 3. 5 *Estimating Measurement Invariance across Gender Using Multi-Group CFAs in Mplus (WLSMV-Estimates)*

					90% CI			
	Model	χ^2	*df*	*RMSEA*	lower	upper	*CFI*	$\Delta\chi^2$
EPT	1	78.18***	16	.06	.04	.07	.99	–
	2	73.69***	21	.04	.03	.06	.99	2-1 = 10.27
	3	117.39***	38	.04	.03	.05	.99	3-2 = 47.08***
	4	90.05***	32	.04	.03	.05	.99	4-2 = 19.20 (6)
SEFF	1	28.20*	14	.03	.01	.04	.99	–
	2	30.71*	19	.02	.00	.04	.99	2-1 = 5.42
	3	102.65***	36	.04	.03	.05	.99	3-2 = 69.33***
	4	34.11*	21	.02	.01	.04	.99	4-2 = 3.44
SEST	1	8.53	6	.02	.00	.04	1.00	–
	2	9.78	10	.00	.00	.03	1.00	2-1 = 2.77
	3	69.00***	24	.04	.03	.05	.99	3-2 = 56.41***
	4	20.57***	15	.02	.00	.03	.99	4-2 = 10.75
SOC	1	90.41***	16	.06	.05	.07	.99	–
	2	80.09***	21	.05	.04	.06	.99	2-1 = 9.55
	3	121.82***	38	.04	.03	.05	.98	3-2 = 44.05***
	4	94.50***	32	.04	.03	.05	.99	4-2 = 16.75
OPT	1	77.98***	14	.07	.06	.08	.99	–
	2	79.12***	19	.05	.04	.06	.99	2-1 = 4.3
	3	150.27***	36	.05	.04	.06	.99	3-2 = 73.33***
SCON	1	103.60***	18	.06	.05	.07	.98	–
	2	89.49***	23	.05	.04	.06	.98	2-1 = 4.92
	3	110.30***	40	.04	.03	.05	.98	3-2 = 24.86
PSUP	1	187.20***	18	.08	.07	.10	.99	–
	2	137.64***	23	.06	.05	.07	.99	2-1 = 7.16
	3	211.74***	40	.06	.05	.07	.99	3-2 = 80.40***
AUP	1	127.03***	14	.08	.07	.09	.99	–
	2	93.96***	19	.06	.04	.07	.99	2-1 = 3.59
	3	173.02***	36	.08	.07	.08	.98	3-2 = 82.80***
	4	99.45***	21	.05	.04	.06	.99	4-2 = 5.26
IPG	1	150.77***	14	.07	.06	.08	.99	–
	2	85.89***	19	.05	.04	.06	.99	2-1 = 9.2
	3	167.40***	36	.05	.05	.06	.99	3-2 = 84.15***
	4	89.88***	21	.05	.04	.06	.99	4-2 = 4.19
EDUI	1	90.56***	12	.07	.06	.09	.99	–
	2	66.54***	17	.05	.04	.06	.99	2-1 = 9.67
	3	110.18***	34	.04	.03	.05	.99	3-2 = 48.22***
	4	73.88***	22	.04	.03	.05	.99	4-2 = 8.68

Note: $N = 2600$. *$p < .05$. ***$p < .001$. Model 1 = configural invariance; 2 = full metric invariance: factor loadings were set the same across gender. Model 3 = full scalar invariance: factor loadings and thresholds of the manifest variables were set the same across gender. Model 4 = partial scalar invariance by setting free one to several thresholds.

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ESM 3.6 *Equivalence Testing between the Chinese Scale and the Original German Scale with Mplus using Multi-Group CFAs (WLSMV-Estimates)*

						90% CI		
	Model	χ^2	*df*	*p*	*RMSEA*	lower	upper	*CFI*
EPT	1	499.81	13	<.001	.12	.11	.13	.96
	2	887.84	31	<.001	.10	.10	.11	.93
	3	101.05	11	<.001	.06	.05	.07	.99[2]
SEFF	1	209.85	12	<.001	.08	.07	.09	.96
	2	2513.21	30	<.001	.18	.17	.18	.53
	4	252.81	14	<.001	.08	.07	.09	.96[16]
SEST	1	67.17	7	<.001	.06	.05	.07	.99
	2	5480.11	22	<.001	.31	.30	.32	.49
	4	170.41	11	<.001	.08	.07	.09	.99[11]
SOC	1	322.75	13	<.001	.09	.09	.11	.94
	2	1288.14	31	<.001	.13	.12	.13	.74
	3	135.96	11	<.001	.07	.06	.08	.97[2]
OPT	1	184.38	12	<.001	.07	.07	.08	.98
	2	2126.65	30	<.001	.16	.16	.17	.72
	4	366.36	19	<.001	.08	.08	.09	.95[11]
SCON	1	332.56	14	<.001	.09	.09	.10	.92
	2	959.95	32	<.001	.11	.10	.11	.78
	3	245.29	13	<.001	.08	.07	.09	.94[1]
PSUP	1	815.16	14	<.001	.15	.14	.16	.96
	2	9246.73	32	<.001	.33	.33	.34	.54
	3	159.50	9	<.001	.08	.07	.09	.99
AUP	1	189.08	12	<.001	.08	.07	.09	.98
	2	6354.36	30	<.001	.29	.28	.29	.39
	4	238.82	15	<.001	.08	.07	.08	.98[15]
IPG	1	468.94	12	<.001	.12	.11	.13	.97
	2	2463.80	30	<.001	.18	.17	.18	.83
	3	145.47	9	<.001	.08	.07	.09	.99[3]
EDUI	1	758.74	11	<.001	.16	.15	.17	.98
	2	1816.74	29	<.001	.15	.15	.16	.94
	3	114.82	7	<.001	.08	.07	.09	1.00[4]
total		10815.43	1640	<.001	.05	.05	.05	.91

Note: N = 2600. Model 1 = full metric invariance: the factor loadings in the Chinese study were set the same as in the original study. Model 2 = scalar invariance: factor loadings and thresholds of the manifest variables in the Chinese study were set the same as in the original study. Model 3 = partial metric invariance by setting free one to four loadings (superscripts = numbers of the freed loadings). Model 4 = partial scalar invariance by setting free 11 or more thresholds of the manifest variables (superscripts = numbers of freed thresholds; note: each manifest variable has three thresholds).

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ESM 3.7 *Correlations between Resources and External Criteria: Emotion Regulation, Stress and Coping, Parenting, Well-Being, and Parent Report*

QAR CA-C	Emotion regulation		Stress and coping								Rejection		Emotional warmth		Overprotection		Well-being	QA RC A-P
	CR	ES	VUL	SOC	PRO	AVO	PAL	ANG	PHY	PSY	Father	Mother	Father	Mother	Father	Mother		
EPT	.38***	.16***	-.04	.22***	.46***	.03	.19***	-.21***	.05	-.05	-.02	-.01	.22***	.22***	.07	.01	.28***	.01
SEFF	.38***	.12***	-.14***	.23***	.37***	.14***	.31***	-.09*	-.03	-.11**	.00	-.11*	.25***	.27***	.03	-.08	.44***	.04
SEST	.34***	.06	-.18***	.27***	.23***	.15***	.32***	-.03	-.16***	-.22***	.01	-.01	.20***	.20***	.02	.01	.49***	-.03
SOC	.36***	.15***	-.14***	.16***	.38***	.07*	.27***	-.13***	-.03	-.14***	-.04	-.12**	.29***	.26***	-.01	-.10*	.47***	.03
OPT	.47***	.12***	-.18***	.24***	.49***	.13***	.34***	-.22***	-.12**	-.24***	-.08	-.16***	.38***	.42***	.02	-.07	.61***	-.02
SCON	.40***	.21***	-.09**	.19***	.41***	.15***	.32***	-.12***	.00	-.09*	-.06	-.11*	.25***	.28***	.00	-.02	.43***	.03
PSUP	.29***	.01	-.08*	.31***	.29***	-.09*	.17***	-.11**	-.24***	-.26***	-.29***	-.39***	.62***	.67***	-.04	-.15**	.58***	-.04
AUP	.37***	.10***	-.08*	.23***	.30***	.04	.22***	-.09*	-.21***	-.23***	-.23***	-.26***	.59***	.55***	-.03	-.04	.55***	.04
IPG	.28***	.04	-.07	.25***	.36***	.05	.22***	-.11***	-.12***	-.16***	-.03	-.07	.29***	.30***	.10*	.02	.52***	.06
EDUI	.37***	.04	-.10**	.20***	.42**	.00	.19***	-.22***	-.25***	-.27***	-.12**	-.13**	.33***	.36***	.01	-.02	.67***	.02
total	.51***	.14***	-.15***	.33**	.52***	.08*	.35***	-.19***	-.17***	-.25***	-.14**	-.21**	.51***	.53***	-.03	-.07	.72***	.02
McDonald's Omega	.82	.71	.70	.88	.91	.78	.84	.88	.79	.91	.79	.80	.86	.82	.65	.65	.86	.69–.88

Note: **p* < .05. ***p* < .01. ****p* <.001. EPT = empathy and perspective-taking. SEFF = self-efficacy. SEST = self-esteem. SOC = sense of coherence. OPT = optimism. SCON = self-control. PSUP = parental social and emotional support. AUP = authoritative parenting. IPG = integration into peer groups. EDUI = educational integration. CR = cognitive reappraisal. ES = expressive suppression. VUL = vulnerability. SOC = seeking social support. PRO = problem solving. AVO = avoidant coping. PAL = palliative emotion regulation. ANG = anger-related emotion regulation. PHY = physical symptoms. PSY = psychological symptoms. QARCA-P = QARCA parent report.

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ESM 3.8 *Correlations Between Resources and Strengths and Difficulties*

	SDQ					
QARCA-C	Emotional problems	Conduct problems	hyperactivity	Peer relationship problems	Prosocial behavior	Total difficulties score
EPT	-.02	.00	-.18***	-.17***	.44***	-.02
SEFF	-.09	.03	-.25***	-.17***	.40***	-.09**
SEST	-.16***	.05	-.16***	-.19***	.31***	-.16***
SOC	-.15***	-.07*	-.23***	-.25***	.42***	-.15***
OPT	-.25***	-.09***	-.29***	-.28***	.47***	-.25***
SCON	-.06*	.01	-.22***	-.16*	.46***	-.06*
PSUP	-.19***	-.08**	-.20***	-.23***	.37***	-.19***
AUP	-.14***	-.03	-.20***	-.19**	.40***	-.14***
IPG	-.14***	-.03	-.17***	-.49***	.49***	-.14***
EDUI	-.27***	-.11***	-.24**	-.47***	.51***	-.27***
total	-.20***	-.05	-.29***	-.36***	.58***	-.20***
McDonald's Omega	.81	.70	.64	.53	.79	.86

Note: *$p < .05$. **$p < .01$. ***$p < .001$. EPT = empathy and perspective-taking. SEFF = self-efficacy. SEST = self-esteem. SOC = sense of coherence. OPT = optimism. SCON = self-control. PSUP = parental social and emotional support. AUP = authoritative parenting. IPG = integration into peer groups. EDUI = educational integration.

B

STUDY II

"SCHOOL BURNOUT AMONG CHINESE HIGH SCHOOL STUDENTS: THE ROLE OF TEACHER-STUDENT RELATIONSHIPS AND PERSONAL RESOURCES"

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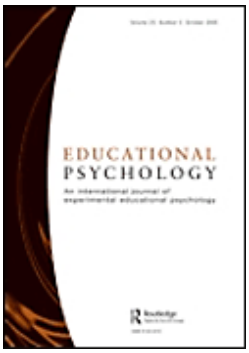


School Burnout among Chinese High School Students: The Role of Teacher-Student Relationships and Personal Resources

Journal:	*Educational Psychology*
Manuscript ID	CEDP-2020-0326.R1
Manuscript Type:	Original Article
Keywords:	resilience, protective factors, Self-efficacy, self-esteem < Self-efficacy, optimism

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 modeling 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.

Keywords: resilience, protective factors, self-efficacy, self-esteem, optimism.

School Burnout among Chinese High School Students:

The Role of Teacher-Student Relationships and Personal Resources

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 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 organizations 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, access to higher education is determined by the annual *gaokao* (National College Entrance Examination). Although admission rates are increasing because of the general

expansion of higher education, the college admission still largely depends on one's social class and geography (Wang, 2011). According to the statistics provided by the Ministry of Education of China, the admission rate by Chinese universities in 2018 was only 40%. To improve academic performance and ultimately maximize the odds of university enrollment, many high school students (i.e., academic track, 10–12th graders) participate in extracurricular activities. Ten years ago, Lai, Liu, and Liu (2007) had already reported that Chinese students were overloaded with homework and extracurricular activities. Additionally, due to the one-child policy in the last 35 years, school children face high educational expectations from their families (for further reading, see Rasmussen, 2017). It can be said that Chinese high school students experience high academic demands from different directions.

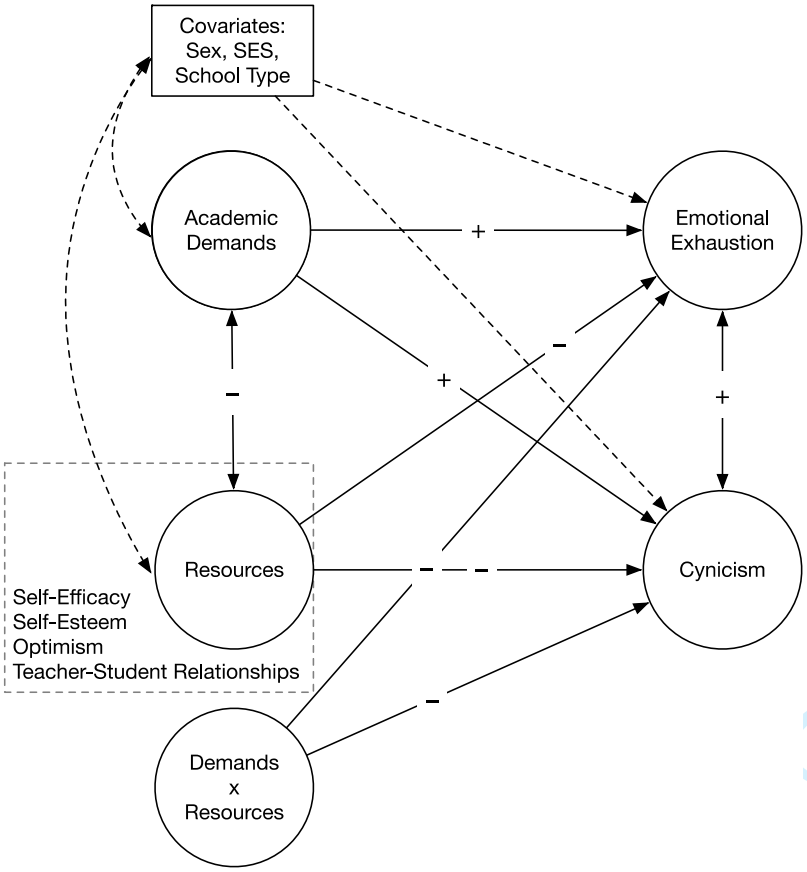
In school contexts, high academic demands are shown to be a significant predictor of burnout, which leads to negative academic and psychological outcomes such as school dropout and depression (for an overview, see Walburg, 2014). According to the well-established Job Demands-Resources (JD-R) model (Bakker & 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 hypothesized 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 hypothesized that such resources buffer the detrimental effect of demands. To test the hypothesized models, we performed structural equation modeling.

Figure 1

The Hypothesized Model Relying on the JD-R Model (Bakker & Demerouti, 2014)



Note. Dotted paths = not included in the original JD-R. SES = socio-economic status.

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 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 conceptualized 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 & Luscri, 2001; Pines et al., 2002; Salmela-Aro et al., 2009; Teuber et al., 2020).

Like job burnout, school burnout can lead to serious mental and academic problems. Among others, burnout is considered 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. In a longitudinal study, Bask & Salmela-Aro (2013) revealed that burnout symptoms grew over time in secondary school and that particularly *cynicism* increased the risk of school dropout. Compared to students with low levels of cynicism (i.e., the lowest 10th percentile), students with high levels of cynicism (i.e., the highest 10th percentile) were four times more likely to drop out of school.

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 behavior. Ultimately, the two components constitute burnout and lead to negative organizational 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 preschool 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 operationalize 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 has been restricted to occupational characteristics and neglected personal resources that can play an important role during employees' adaption to job demands (Hobfoll, 2002). Thus, some researchers have extended this model by including personal resources (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 & Upadyaya, 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 as distinct constructs at the conceptual level. *Self-efficacy* refers to personal assumptions about the capability to accomplish a task (Bandura, 1977). *Self-esteem* is conceptualized 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 and colleagues (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 enrollment 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 categorized 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 X University [blind for review]. 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 (χ^2 = 58.70, df = 13, p < .001, CFI = .97, SRMR = .04, RMSEA = .06, 90% CI for RMESA [.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 α = .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-hour 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 totaling more than 24 hours 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 RMESA [.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 RMESA [.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.

To create two homogeneous metric indicators (test halves) for the latent variables representing perceived academic demands, teacher-student relationships, self-efficacy, self-esteem, optimism, exhaustion, and cynicism , we applied the commonly used item-to-construct balance technique according to factor loadings (Little et al., 2002; for more detail, see ESM 3). Since there were only three items measuring emotional exhaustion, we used these three items 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: In the first step, we tested the more general Hypothesis Hb by estimating SEMs with latent interactions using the LMS-approach (Klein & Moosbrugger, 2000) based XWITH option in *Mplus* (demands × teacher-student relations; demands × personal resources). Four different models (including one interaction effect at a time) were specified due to estimation problems in the complete model. In the next step, we performed an SEM including all main effects and the significant interaction effects of step 1, resulting in the final model including all presumed main effects (Ha) and the significant interaction effects (Hb). In all analyses, we considered gender, SES, and school type as covariates.

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 Standardized 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 (Schermelleh-Engel et al., 2003).

Results

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

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***

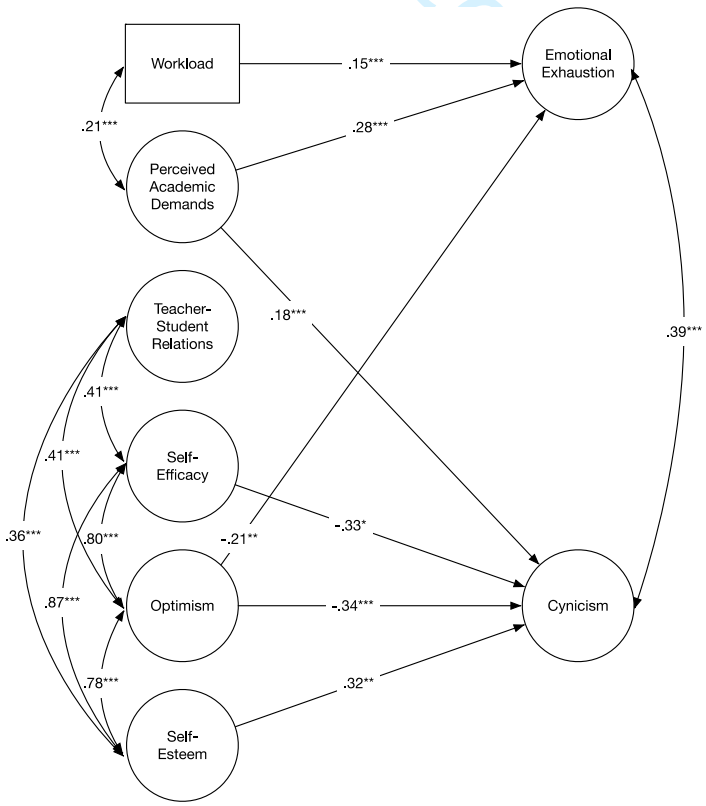
Note. *p < .05. **p < .01. ***p < .001. WL = workload. DE = perceived academic demands. TSR = teacher-student relationships. EFF = self-efficacy. OPT = optimism. EST = self-esteem. EE = emotional exhaustion. CY = cynicism.

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 × teacher-student relations on exhaustion (β = -.02, p = .54) and cynicism (β = .02, p = .75), demands ×

personal resources on exhaustion (β = .01 to .06, p = .20 to .80) and cynicism (β = -.03 to .01, p = .64 to .90). Model comparisons between the models including interaction terms (AIC = 32681.75 to 32684.18, BIC = 33145.50 to 33147.93) and the model without any interaction (χ^2 = 327.51, df = 130, p < .001, CFI = .97, SRMR = .04, RMSEA = .04, 90% CI for RMESA [.03, .04]; AIC = 32680.86, BIC = 33134.63) 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.

Figure 2

The Final SEM after Controlling for SES, Gender, and School Type



Note. *p < .05. **p < .01. ***p < .001. For sake of simplicity, non-significant path coefficients are not depicted but estimated in this model. Technically, the workload is modeled as a latent variable in *Mplus* which perfectly corresponds to the observed variable. For sake of simplicity, control variables and their path coefficients as well as non-significant path coefficients are not depicted but estimated in the model

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 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 ($r = .39$, $p < .001$).

The correlations between self-efficacy, self-esteem, and optimism were particularly high, we thus removed self-efficacy and optimism from the SEM 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.

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* = unstandardized regression coefficient. SE_B = standard error of the regression coefficient *B*. *β* = standardized regression coefficient. R^2 = variance explanation in total. ΔR^2 = incremental variance explanation.

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 focused 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. 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 β = .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 explains 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

Several limitations of the current study must be noted. The most important limitation is its cross-sectional design. Although the direction of the relationships is theoretically founded and supported by previous studies, future research should longitudinally investigate the presumed causal relationships. Second, we focused on high school students most probably experiencing the highest academic demands of all students. These results cannot readily be generalized to other groups (e.g., middle school students and vocational school students). Third, our theoretical reasoning and hypotheses are based on Western burnout theory and empirical findings. 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 comparisons between Chinese samples and samples from Western countries should be conducted. 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-hour 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-hour 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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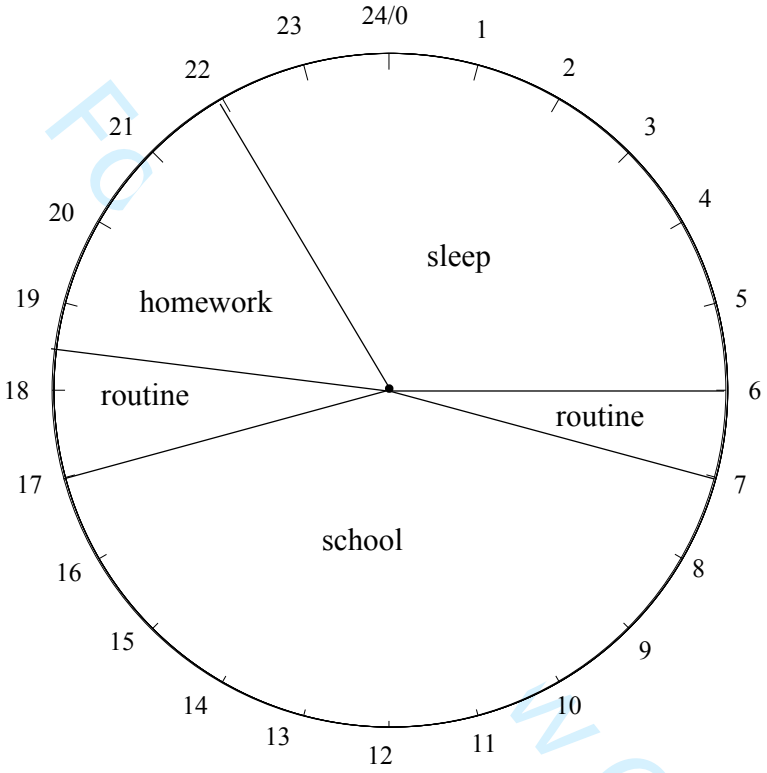
Electronic Supplementary Material

EMS 1: Example of the 24-hour clock approach. For instance, the time between 22 o'clock and 6 o'clock is filled with "sleep".



ESM 2: Confirmatory factor analyses for self-efficacy, self-esteem, and optimism (parcels as indicators) in the present study (using MRL estimator, TYPE = COMPLEX in Mplus)

model	χ^2	*df*	*p*	*CFI*	*SRMR*	*RMSEA*	90% C.I	Scaling correction factor	cd	TRd
1-factor	455.91	9	<.001	.83	.05	.221	[.20, .24]	1.86		
3-factor	14.62	6	<.05	.99	.01	.04	[.01, .06]	1.70	5.58	136.25***

Note: *** = $p < .001$. *df* = Degrees of Freedom. *CFI* = Comparative Fit Index. *SRMR* = Standardized Root Mean Square Residual. *RMSEA* = Root Mean Square Error of Approximation. cd = difference test scaling correction. TRd = Satorra-Bentler scaled χ^2 difference test[1].

[1] Satorra, A., & Bentler, P. M. (2010). Ensuring Positiveness of the Scaled Difference Chi-square Test Statistic. *Psychometrika*, *75*(2), 243–248. https://doi.org/10.1007/s11336-009-9135-y

ESM 3: item-to-construct balance technique

Item parceling refers to as a procedure for computing average or sum scores across multiple items. These parcel scores are then used as indicators of latent factors in the SEM analysis. Use of item parceling reduces model complexity and reduces influences of individual items' systematic errors on the model estimation[2].

Item-to-construct balance technique is one way to build balanced parcels. Parcels are created based on the magnitude of factor loadings. The highest loaded item is matched with the lowest loaded item. This procedure continues by placing lower loaded items with higher loaded items.

[2] Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To parcel or not to parcel: Exploring the question, weighing the merits. *Structural Equation Modeling*, *9*(2), 151–173.

ESM 4: Mplus input example

```
TITLE: SEM with one interaction term – demands x optimism
DATA: FILE = "data.dat";
VARIABLE:
NAMES =
        EE_2 EE_3 EE_4
        Books
        DE1 DE2 CY1 CY2
        EFF1 EFF2 OPT1 OPT2 EST1 EST2
        TSR1 TSR2
        workload
        Dkey Skey
        Gender;

MISSING=.;

ANALYSIS:
        process=2;
        ESTIMATOR = MLR;
        TYPE=random;
        ALGORITHM=INTEGRATION;

MODEL: ! Note: covariance between all dependent factors are estimated by default

! for the following variables: the factor loading was fixed to Unity and its residual was fixed to Zero
        ! socio-economic status
        SES by books@1;
        books@0;

        ! workload
        load by workload@1;
        workload@0;

! measurement models

        ! CFA – academic demands
        DE by DE1 DE2;

        ! CFA – emotional exhaustion
        EE by EmEr_2 EmEr_3 EmEr_4;

        ! CFA – cynicism
        CY by CY1 CY2;

        ! CFA – self-efficacy
        EFF by EFF1 EFF2;

        ! CFA – optimism
        OPT by OPT1 OPT2;

        ! CFA – self-esteem
        EST by EST1 EST2;
```

```
        ! CFA – teacher-student relations
        TSR by TSR1 TSR2;

        ! covariance between dependent factors
        EE with CY;

! structural models
        ! effects of school types, gender, SES, workload, teacher-student relationship,
        ! self-efficacy, optimism, self-esteem on emotional exhaustion
        EE on DE Dkey Skey Gender SES load TSR EFF OPT EST;

        ! effects of school types, gender, SES, workload, teacher-student relationship,
        ! self-efficacy, optimism, self-esteem on cynicism
        CY on DE Dkey Skey Gender SES load TSR EFF OPT EST;

        ! interaction term demands*optimism
        inter |DE XWITH OPT;

        ! effect of the interaction on emotional exhaustion
        EE on inter;

        ! effect of the interaction on emotional cynicism
        CY on inter;

OUTPUT: STDYX TECH1 TECH4;
```

ESM 5:

ESM 5.1: Gender-specific differences

	Boys n = 568		Girls n = 514			
	M	*SD*	*M*	*SD*	*t*	*d*
WL	13.67	2.13	13.93	1.91	-1.99*	.13
DE	2.73	0.56	2.71	0.45	0.79	.01
EE	3.25	1.04	3.29	0.97	-0.68	.04
CY	2.24	0.95	2.02	0.79	3.94***	.25
TSR	2.98	0.57	3.00	0.45	-0.48	.03
EFF	2.60	0.65	2.46	0.58	3.54***	.22
EST	2.50	0.75	2.46	0.72	0.75	.05
OPT	2.82	0.75	2.60	0.68	0.54	.03

Note. *M* = mean. *SD* = standard deviation. *d* = effect size: Cohen's *d*. WL = workload. DE = perceived academic demands. TSR = teacher-student relationship. EFF = self-efficacy. OPT = optimism. EST = self-esteem. EE = emotional exhaustion. CY = cynicism. *$p < .05$. ***$p < .001$.

ESM 5.2: Pearson's correlations between SES, workload, demands, and resources

Correlation between SES and	*df*	*r*	*p*
WL	933	.09	<.01
DE	898	.19	<.001
EE	882	.18	<.001
CY	873	.02	.48
TSR	915	.04	.18
EFF	881	.00	.95
EST	883	.02	.52
OPT	884	-.03	.44

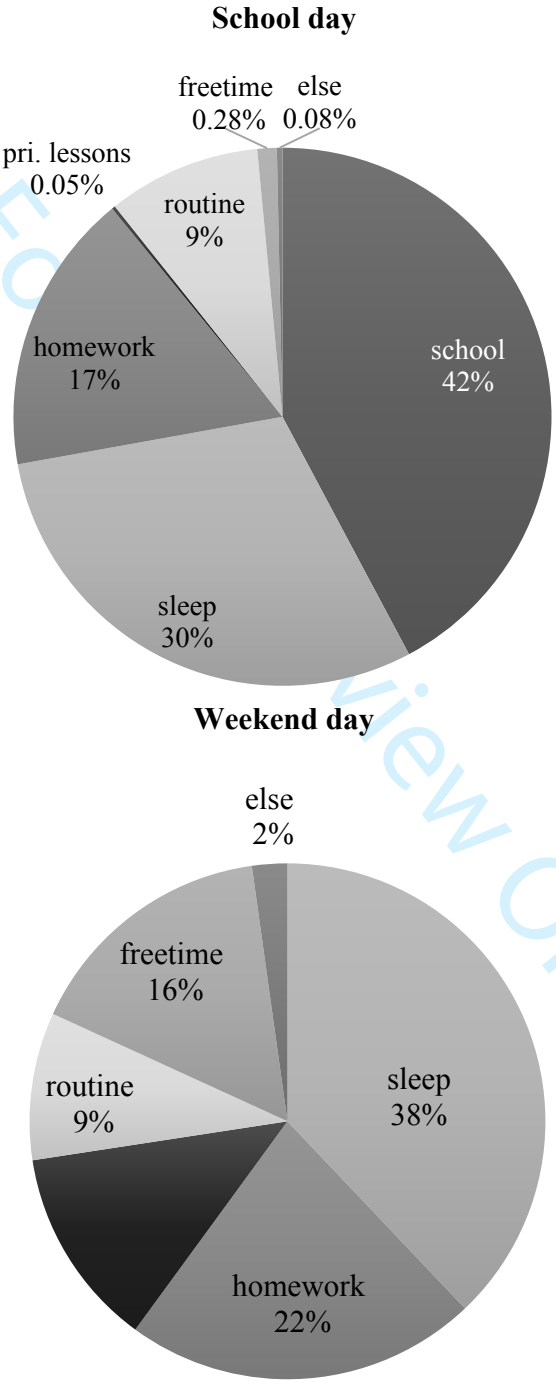
Note. SES = socio-economic status. *df* = degree of freedom. WL = workload. DE = perceived academic demands. TSR = teacher-student relationship. EFF = self-efficacy. OPT = optimism. EST = self-esteem. EE = emotional exhaustion. CY = cynicism.

ESM 5.3: Differences in school type

				Tukey's HSD Comparisons	
	School type	*M*	*SD*	1	2
WL	1	13.40	2.24		
	2	13.67	1.74	.18	
	3	14.64	1.92	<.001	<.001
DE	1	2.68	0.52		
	2	2.65	0.46	.69	
	3	2.90	0.53	<.001	<.001
EE	1	3.41	0.90		
	2	3.16	1.05	<.01	
	3	3.21	1.07	.05	.78
CY	1	2.29	0.88		
	2	1.92	0.80	<.001	
	3	2.24	0.93	.72	<.001
TSR	1	2.94	0.51		
	2	3.01	0.50	.10	
	3	3.05	0.53	<.05	.66
EFF	1	2.49	0.61		
	2	2.55	0.63	.38	
	3	2.57	0.63	.24	.89
EST	1	2.46	0.74		
	2	2.45	0.75	.99	
	3	2.56	0.72	.27	.22
OPT	1	2.72	0.70		
	2	2.87	0.73	<.01	
	3	2.86	0.71	<.05	.96

Note. 1 = ordinary high school. 2 = district key high school. 3 = Shanghai key high school.

ESM 6: The averaged activities across all participants for a school and a weekend day. Note: Routine contains activities like washing, meals, and the way to school. pri. Lessons=private lessons



Students who spent much time on learning activities during the week also spent more time on learning activities on weekends (r = .48, p < .001). During the analysis, we noticed the following peculiarities: About 25% of the students from the private high school participated in hands-on art training. They spent on average 9.42 hours on training on a weekend day. The school principal reported in an interview that hands-on training aimed to help students with a special talent to improve their skills and to increase their performance in art *gaokao* (art *gaokao* has been regarded as an alternative to achieve higher education for students with poor academic performance). More than 75% of the total sample reported that they participated in private lessons for at least one subject (M = 5.35 hours; SD = 2.71). In addition, on weekends, perceived academic demands were positively related to time spent on learning activities (r = .20, p < .001) and negatively related to time spent on recreational activities (r = -.15, p < .001).

C

STUDY III

"THE BRIGHT SIDE OF GRIT IN BURNOUT-PREVENTION: EXPLORING GRIT IN THE CONTEXT OF DEMANDS-RESOURCES MODEL AMONG CHINESE HIGH SCHOOL STUDENTS"

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DECLARATION

I hereby declare that I have not submitted the dissertation entitled "Academic and Psychological Adjustment in Chinese Students: The Role of Student Resources" either in terms of this current version or another version to any other faculty.

I have written this submitted dissertation by myself and in this process, I have used no other sources than those expressly indicated.

Bielefeld, February 8, 2021

Ziwen Teuber

BIOGRAPHICAL NOTE

The author was born on 20th, February 1988 in Shanghai, China, the daughter of Yiliang Feng and Jingmei Wang. She began learning painting at the age of three. After graduating from Xingzhi Senior High School in Shanghai, she attended East China University of Science and Technology (ECUST) in Shanghai in 2006 to study Industrial Design. In ECUST, she earned scholarship for academic excellence several times. She emigrated to Germany in 2010 and has since settled there with her German husband and daughter. After a year of parental leave, she began studying psychology at Bielefeld University in 2011. After she graduated from Bielefeld University with a M.Sc. in psychology in 2016, she began working at the University of Duisburg-Essen in the lab of Professor Detlev Leutner (Instructional Psychology, Project "BilWiss – Broad Pedagogical Knowledge and the Development of Professional Competence in Teacher Education"). During her time at the University of Duisburg-Essen she focused on large-scale-assessment and the diagnostic competencies of teachers in Germany. One year later, she returned to Bielefeld University and joined the lab of Professor Fridtjof Nussbeck (Psychological Methods and Evaluation) and Professor Elke Wild (Educational Psychology, Project "Fabi – Special Needs Education and Leisure Time Activities: Bielefeld Study"). Between 2017 and 2019, she additionally worked as a project manager for the Bertelsmann Foundation in a team lead by Frank Frick (Program: Learning for Life, Project "MYSKILLS – Identifying Professional Competencies"). Besides stress and coping issues in China, she is focused on research in the field of higher education and parental engagement. She is strongly interested in inequity in education systems.

COLOPHON

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