

A network approach to language learning burnout, negative emotions, and maladaptive emotion regulation strategies

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Abstract

Despite the growing recognition of the impact of affective factors on second/foreign language (L2) learning, there remains a paucity of knowledge regarding academic burnout in L2 learning. Moreover, the intricate interplay between L2 burnout, maladaptive emotion regulation strategies, and negative L2 emotions remains inadequately explored. Given the increasing acknowledgment of network analysis as an advanced and appropriate method for unraveling the complex relationships among psychological constructs in applied linguistics, the current study aimed to investigate the network structure of burnout, maladaptive emotion regulation strategies, and negative

emotions among 841 Chinese undergraduates who were learning English as a foreign language (EFL). The results of the network analysis revealed that shame, emotional exhaustion, and avoidance emerged as the most central nodes within negative emotions, burnout, and maladaptive emotion regulation strategies, respectively; shame, emotional exhaustion, and avoidance were also the most powerful bridging nodes linking the aforementioned three constructs. Notably, the robust bridging association between emotional exhaustion and anxiety was observed. Overall, Chinese EFL students may experience high levels of burnout and negative emotions and apply counter-productive regulation strategies in English learning, but these reactions are intertwined rather than independent of each other. Students who are overwhelmed by anxiety and shame are more prone to burnout symptoms, while those dominated by anger are more likely to vent it out. Theoretical and pedagogical implications are discussed.

Keywords: network approach; L2 burnout; negative emotions; maladaptive emotion regulation strategies

1. Introduction

The roles of cognition and emotion have long been recognized in understanding one's learning process (Snow et al., 1996), yet they were historically separated (Meyer & Turner, 2002). Recent research exhibits a growing inclination toward exploring their synergistic and integrated relations. The transformative power of positive emotions is evident, as without them, the conversion of self-beliefs (e.g., self-efficacy) or learning motivation into tangible learning efforts becomes challenging (Putwain et al., 2013). Likewise, within the field of English-as-a-foreign-language (EFL) learning, alongside the enduring focus on learners' cognitive processes (Bai et al., 2020), there is a rising emphasis on learners' academic emotions (e.g., anxiety, enjoyment) (Dewaele & Li, 2020; Wang et al., 2021).

In the context of Chinese EFL learning, the English subject has been compulsory and integral since primary school. English exams have always been considered high-stakes tests, with English test scores significantly influencing enrollment in high schools and universities. Even at the university level, English remains a mandatory subject embedded in the curriculum. Moreover, passing the College English Test Band 4 or 6 (CET-4/6) has been stipulated as a part of graduation requirements in some universities or a recruitment selection criterion in the job market (Chen & Klenowski, 2009). Given such a context, English learning has become an obligatory task (Wu et al., 2023). As a result, students, especially those with little interest in English, may perceive it as burdensome and become susceptible to burnout, characterized by a low level of vigor and engagement in

English learning. Negative emotions such as anxiety, anger, and shame are also more likely to be induced and intensified by the elevated academic pressure experienced by Chinese EFL learners (Shao et al., 2013). Therefore, the issue of Chinese university students' language learning burnout and its relations with other negative academic emotions and emotion regulation strategies warrants particular investigation. The investigation of negative emotions aligns with the "emotional turn" in applied linguistics (White, 2018). The integration of anger and shame in the network contributes to broadening the spectrum of emotion types in second language acquisition (SLA), which has been dominated by enjoyment, anxiety, and boredom (Boudreau et al., 2018; Derakhshan et al., 2022). Without adaptive emotion regulation strategies, negative emotions could accumulate, reaching a threshold and contributing to students' feelings of burnout in the realm of language learning. Therefore, the inclusion of negative emotions, emotion regulation strategies, and burnout has the potential to inspire researchers to explore the path from negative emotions to emotional drain.

However, the following issues have barely been addressed. Firstly, although there is an increasing number of studies on complex constructs involving both emotional and cognitive dimensions, such as academic burnout and emotion regulation strategies (ERS) in the EFL context (e.g., Li et al., 2021; Solhi et al., 2023), they are still underexplored compared to the broader field of education or educational psychology. This is somewhat counterintuitive considering that language learners are prone to burnout due to the psychologically unsettling nature of the language learning process in an unnatural language environment (Liu et al., 2021) and the impact of evaluations from teachers (Jahedizadeh et al., 2016). Although several studies have reported a medium level of L2 burnout (Jahedizadeh et al., 2015; Jahedizadeh et al., 2016), very few attempts have been made among Chinese EFL undergraduates who face significant stress from familial and cultural expectations, as well as demands for academic excellence (Shih, 2015).

Secondly, the existing limited EFL literature on ERS has predominately adopted either a qualitative approach with interview and observation data (Bielak & Mystkowska-Wiertelak, 2020) or treated it as a concept subsumed under the umbrella term of emotional intelligence (Li & Xu, 2019; Shao et al., 2013). Until now, there has been almost no quantitative study examining L2 learners' utilization of ERS and their corresponding learning outcomes. Lastly, current EFL quantitative studies on ERS have often employed a latent construct approach, treating burnout and emotions as separate dimensions rather than delving into the intricate network among these dimensions. For instance, most studies have treated anxiety, enjoyment and boredom as distinct emotion types without modeling their complex interactions in a network, despite their coexistence and occasional joint investigation (Dewaele & Li, 2020; Li, 2021).

To address the above limitations, this study aimed to pioneer the exploration of a fine-grained dimension-level network among L2 burnout, negative emotions and maladaptive ERS. As opposed to the traditional structural equation modeling investigating latent variables, network analysis holds the potential to reveal more complex systems of language development. Recognized recently by pioneering researchers in applied linguistics (Freeborn et al., 2022), this novel and sophisticated method has been acknowledged by SLA researchers for studying complex relationships. However, empirical studies analyzing these relationships between psychological constructs are scarce, with Freeborn et al. (2022) being an exception as they modeled the network of language learning motivation and achievement. Acknowledging the increasing complexity and interwoven nature of language learning (Hiver & Al-Hoorie, 2020; Hiver et al., 2022), components within the system should be nonlinear, where changes in one could trigger changes in another. Network analysis, unlike other relationship-intensive methods, is advantageous. For instance, compared with factor-based analytic methods like structural equation modeling, which viewed psychological constructs as latent constructs measured through observed variables with unidirectional relationship from latent variables to the observed variables, network analysis proposes that constructs “exist as systems” (Guyon et al., 2017, p. 2), where components are intercorrelated, and the interrelationships are estimated in an exploratory manner rather than being determined *a priori* by researchers (Freeborn et al., 2022). Such exploratory analysis is in alignment with the complexity of variable relations (Hilpert & Marchand, 2018). Taken together, the study aims to address the following two research questions:

RQ1: What are the most central nodes within L2 burnout, negative emotions and maladaptive ERS?

RQ2: What are the bridging edges across dimensions of L2 burnout, negative emotions and maladaptive ERS?

2. Literature review

2.1. Academic burnout

Burnout was originally noted in human professionals (e.g., doctors, nurses, teachers) due to gradual work-induced stress (Freudenberger, 1974). Although defined variously, it has been most widely recognized as an overarching syndrome comprising three dimensions (Maslach et al., 1997): (1) *emotional exhaustion*, referring to feelings of emotional drain due to overloaded demands

and depleted resources and characterized by feelings of low energy, listlessness, drain and frustration (Lee et al., 2020); (2) *depersonalization* (elsewhere *cynicism*), known as a cognitive indifference toward the environment and people around; (3) *reduced personal accomplishment* (also known as *inefficacy*), related to a lack of personal efficiency and sense of achievement.

Although burnout is often treated as a standalone construct, distinguishing the three dimensions is crucial, as they do not necessarily co-occur or carry similar weights. Many researchers (Bakker et al., 2002; Schaufeli et al., 2002; Seidler et al., 2014) view emotional exhaustion and depersonalization as the fundamental dimensions of burnout, with reduced personal accomplishment seen as the opposite end of efficacy. Consequently, certain studies (e.g., Lee et al., 2020) have exclusively considered the first two dimensions as manifestations of burnout. Notably, emotional exhaustion is often considered as the starting point of burnout with depersonalization viewed as a dysfunctional coping strategy aimed at mentally distancing oneself from exhausting demands (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001; Leiter & Maslach, 1988).

Over decades, the research on burnout has expanded beyond professionals to include students, leading to the concept of academic (or school) burnout. This extension is likely due to the resemblance of the school tasks (e.g., assignments, projects) and academic demands (e.g., assessment from professors, fear of academic failure) to those encountered in the professional realm (Hu & Schaufeli, 2009; Pala, 2012). Even though academic burnout has not been as intensively investigated as job burnout, there is a growing recognition of its existence, significance and potential harm (Stoeber et al., 2011). It can permeate other personal-related contexts, with students experiencing burnout reporting academic, physical and psychological problems, such as dropout, academic underachievement, headache, depression and anxiety (e.g., Bask & Salmela-Aro, 2013; Madigan & Curran, 2021; Wang et al., 2015).

Consistent with the theoretical conceptualization of job burnout, academic burnout is also considered a tripartite construct resulting from chronic academic stressors (Campos et al., 2011; Lee et al., 2020). While environmental factors (e.g., study burden) of burnout have been acknowledged, a growing body of research has delved into individual difference (ID) factors, especially affective and cognitive ones, to identify students at greater risk of burnout. According to the job demands-resources model (Demerouti, Bakker, De Jonge, et al., 2001), burnout originates from overburdened demands and a lack of resources. Adaptive coping strategies (e.g., reappraisal) are considered personal resources associated with a reduced level of burnout, while maladaptive coping strategies (e.g., avoidance) are seen as demands linked to a deteriorated level of burnout (Shin et al., 2014; Vizoso et al., 2019).

Up to now, however, most studies on academic burnout have been focusing on medical or nursery students (Azar et al., 2020; Dunn et al., 2008), with comparatively less attention paid to EFL learning. Within this limited literature, researchers have explored various individual (e.g., intrinsic motivation, shame, gender) and environmental (e.g., teacher support) predictors (Alavi & Abbasnia, 2014; Jahedizadeh et al., 2015; Karimi & Fallah, 2021) and outcomes (e.g., language achievement; Ghanizadeh & Jahedizadeh, 2015) of EFL learners' burnout. To date, only two studies have specifically targeted Chinese EFL undergraduates (Liu et al., 2021; Yu et al., 2022). Liu et al. (2021) found that anxiety and grit mediated the relation between perfectionism and burnout, while Yu et al. (2022) explored the moderation of maladaptive ERS on the relation between motivation and burnout.

2.2. Negative academic emotions

The realm of academic emotions, encapsulating a spectrum of subjective states directly tied to learning (Pekrun et al., 2002), holds significant sway over the learning experience. According to the broaden-and-build theory (Fredrickson, 2001), positive academic emotions such as enjoyment have the power to expand learners' scope of activities, facilitate academic engagement and resilience. Conversely, negative academic emotions exemplified by anxiety possess the potential to impede engagement (Fredrickson & Joiner, 2018; Zhang, 2019). The field of EFL learning has witnessed increased recognition of emotion in recent decades (Dewaele & Li, 2020), spurred by the positive psychology movement and a humanistic approach. Beyond anxiety, a plethora of L2 classroom emotions have been explored, including enjoyment, boredom, and shame (Boudreau et al., 2018; Derakhshan et al., 2021; Derakhshan et al., 2022; Dewaele & MacIntyre, 2014; Li, 2021; Pawlak et al., 2020; Saito et al., 2018).

Negative academic emotions weave intricately with and are inseparable from academic burnout for two primary reasons. Firstly, drawing from the attentional control theory (Eysenck et al., 2007), negative emotions such as anxiety could constrain individuals' cognitive ability to process information, hinder the functioning of the attentional system, and amplify attention to potential "threats." Thus, those experiencing negative emotions are more susceptible to burnout in the face of stress. The broaden-and-build theory (Fredrickson, 2001) offers an alternative perspective, framing negative emotions as forms of personal demands that set in motion a loss cycle and downward spiral, depleting individuals' emotional and cognitive resources and engendering emotional exhaustion. Secondly, when learners are emotionally drained in the learning process, an array of negative emotions may be aroused, including contempt, anger,

hatred, and shame (Abraham, 2000). The accumulation of these emotions can become unbearable, activating defense mechanisms and promoting emotional detachment from learning (Lee et al., 2020). Studies among medical students have shown that negative academic emotions, such as shame and anxiety, are both related to burnout and its dimensions (Burr & Beck Dallaghan, 2019). In a longitudinal study, Lee et al. (2020) found that academic hatred mediated the prediction of emotional exhaustion on cynicism. The association between shame and burnout was also evident among Iranian EFL undergraduates, with shame and burnout measured cross-sectionally using the Internalized Shame Scale and the Academic Burnout Scale (Karimi & Fallah, 2021). However, Karimi and Fallah's (2021) study primarily focused on illustrating how teacher affective support's influence on burnout was mediated by shame in a structural equation model, without delving into individuals' emotional coping with academic demands or treating the variables within a network.

2.3. Maladaptive academic emotion regulation strategies

Academic emotion regulation strategies denote learners' deliberate or subconscious manipulation of emotional occurrence, types and expressions (Gross, 1998). Based on the conservation of resources model (Hobfoll, 1989), individuals inherently strive to conserve resources and seek new ones for effective adaptation. This resource framework involves four categories: objects, conditions, personal characteristics and energies. When individuals face resource depletion, the application of maladaptive coping strategies, leading to fewer resources and burnout, depression and physiological outcomes (Halbesleben et al., 2014), sets in motion a detrimental cycle.

Inspired by this model, this study specifically scrutinizes individual characteristics as resource depletion (maladaptive ERS and negative emotions). Maladaptive ERS, such as suppression, deplete resources because they require more mental effort to monitor and change emotional expressions, and thereby result in negative emotions and burnout (Guan & Jepsen, 2020; Vinter et al., 2020). Empirical evidence supports the mediating role of academic burnout in the relationship between maladaptive ERS and academic underachievement (Seibert et al., 2017). It is plausible that ERS influence the association between negative emotions and burnout. Firstly, ERS are considered as coping strategies capable of either mitigating or exacerbating negative emotional experiences (Burić et al., 2016). It has been shown that certain ERS (e.g., suppression, respiration) exhibit a dual nature, predicting both positive and negative emotions. Secondly, according to the emotional awareness hypothesis (Boden & Berenbaum, 2011; Boden

et al., 2015), when individuals become aware of emotion arousal, they tend to regulate it. However, maladaptive regulation shifts people's emotional system inwards and eventually leads to distress syndrome (burnout in this case).

Taken together, the conservation of resources model supports the negative relationship between maladaptive ERS and academic burnout, while broaden-and-build theory holds that negative emotions triggered by maladaptive ERS could contribute to academic burnout. The above two theories have laid foundations for the bivariate correlations or mediational paths among the three latent variables. The emerging network approach in the field of sociology and psychology has provided new directions for approaching the complex relationships among them (Freeborn et al., 2022). Since cognition and emotion are inseparable and could mutually influence each other, it is necessary to look into the key components and their network connections.

2.4. The network approach

So far, investigations into the relationship between burnout, emotions and ERS have predominantly adopted two approaches: (1) comparing the influence of different ERS on burnout and emotions across diverse samples, or (2) exploring the interplay of the three constructs using mediation or moderation models. While the two approaches have significantly contributed to our understanding of their connections, they have overlooked the intricate, dimension-level interplay underlying these constructs. In other words, dimensions have been treated as distinct indicators rather than intertwined reflections of a complex system.

To overcome these limitations, network analysis emerges as a compelling alternative. Originating from sociology and subsequently gaining attention in anthropology, finance, management, education, and psychopathology, network analysis has remained underutilized in EFL learning. The basic tenet behind network analysis is that constructs are generated by a complex constellation of components (Borsboom & Cramer, 2013). This approach enables the identification of central components and discerns which component-level connections serve as "bridges" in the network (Afzali et al., 2017). For example, emotional exhaustion may trigger cynicism and reduced personal accomplishment. The presence of emotional exhaustion may heighten the likelihood of a connection between cynicism and shame, while its absence may result in their disconnection.

Although network studies delineating the structure of job burnout exist (Verkuilen et al., 2020; von Känel et al., 2020), only a scant few have explored the network structure of L2 burnout and emotion-related variables. Noteworthy examples include Verkuilen et al. (2020), who highlighted the centrality of emotional

exhaustion and the stronger association with depression compared to the other two dimensions (cynicism and personal inefficacy). Meanwhile, von Känel et al. (2020) uncovered significant associations between emotional exhaustion and somatic diseases such as high blood pressure as well as associations between personal inefficacy and chronic lung diseases. However, a comprehensive network study depicting the network of L2 burnout and emotion-related variables is notably absent. Adopting a network approach to L2 burnout becomes imperative as it offers a clear visualization of burnout's interactions with various language learning variables, thus holding methodological implications for future L2 research (Freeborn et al., 2022). Additionally, this approach can provide insights for developing fine-grained prevention and intervention programs targeting central burnout symptoms (Blanchard & Heeren, 2020). The current study aims to bridge these significant research gaps.

3. Method

3.1. Participants

Convenience sampling was employed to recruit participants from two universities, resulting in a total of 890 voluntary participants. After excluding incomplete (missing data < 20%) and arbitrary (responses following a certain expected pattern such as 1, 2, 2, 1) surveys, a total of 841 (male = 245; female = 596) valid participations (valid rate: 94.5%) were retained. The sample comprised 427 freshmen, 393 sophomores, and 21 juniors, with a mean age of 19.57 ($SD = 1.28$). The participants, representing diverse majors such as foreign languages, engineering, and arts, were all obligated to attend the College English course. This course, conducted weekly, aims at enhancing students' overall English competence through diverse activities during the class, including translation, speech, reading and writing. Participants, on the whole, have demonstrated a moderate level of English proficiency. Notably, 333 participants reported their scores on the College English Test-Band 4, a national standardized English test whose score ranges between 0-710, revealing a mean of 487.64 and a standard deviation of 64.59.

3.2. Procedure

Undergraduates from two universities in southern China were approached and invited for participation if they met the following criteria: (1) Chinese nationality; (2) no dyslexia; and (3) enrolled in English class(es). After being informed of

the topic, background, anonymity and voluntariness of the research, participants endorsed formal consent and completed questionnaires on an online platform *wenjuanxing* during their English classes. Participants were thanked and given access to a summary of the results but were not financially compensated. All the questionnaires went through an English-to-Chinese translation and a back Chinese-to-English translation procedure.

3.3. Measures

3.3.1. Maslach Burnout Inventory-Student Survey

The Maslach Burnout Inventory-Student Survey was developed by Schaufeli et al. (2002). The scale contains 15 items on a 7-point scale (0 representing “never” to 6 representing “always”) with three subscales: emotional exhaustion (feelings of emotional fatigue), cynicism (cognitive indifference toward the learning environment and people around) and reduced personal accomplishment (lack of self-efficacy). The tri-factorial structure was also supported by a study on Chinese middle school students (Li et al., 2021). The reliability and validity of this scale in college students has been reported in both paper-and-pencil and online survey (Campos et al., 2011). Original items were modified to fit the Chinese EFL context. For example, the item “I have become less enthusiastic about my studies” was changed into “I have become less enthusiastic about my English studies.” The item “In my opinion, I am a good student” was changed into “In my opinion, I am a good student at English learning.” In this study, the scale demonstrated good internal reliability with Cronbach’s alpha values of .87, .95, .85 and .70 for the total scale and three subscales, respectively.

3.3.2. The Academic Emotion Regulation Strategies Questionnaire

The Academic Emotion Regulation Strategies Questionnaire, developed by Burić et al. (2016), was modified to measure language learning ERS in this study. The original questionnaire includes 37 items, clustered into eight subscales, on a 5-point Likert scale (from 1 representing “strongly disagree” to 5 representing “strongly agree”), covering strategies such as avoiding situations, developing competence, reappraisal, suppression, redirecting attention, venting, respiration and seeking social support. The current study focused on maladaptive types of ERS (expressive suppression, situation avoiding, and venting), with some items reworded to match the Chinese EFL context. For example, “When I am afraid of an oral exam,

“I stay at home” was revised into “When I am afraid of an English oral exam, I stay in my dormitory.” Internal reliability was excellent, with Cronbach’s alpha values of .91 for overall ERS, .97 for situation avoidance, .86 for expressive suppression, and .97 for venting, respectively.

3.3.3. The Academic Emotions Questionnaire

The Academic Emotions Questionnaire, developed and validated by Pekrun et al. (2011), was revised to assess students’ L2 emotions in English learning. The scale taps into five emotion types, that is, enjoyment, pride, anxiety, anger, and shame, using a five-point Likert scale. This scale has demonstrated good psychometric property among Chinese samples (Zhen et al., 2017). The current study utilized the scales measuring three negative emotions (anxiety, anger, and shame). Cronbach’s alpha values were .90, .89, .73, and .84 for total negative emotions, anxiety, anger and shame, respectively.

3.4. Data analysis

Descriptive analyses were conducted using SPSS 25 and network analyses were implemented using R. A network structure comprises two parts: nodes and edges. Nodes usually refer to specific symptoms or clustered domains, while edges denote standardized partial correlations among the nodes (Jones et al., 2017). For parsimony and accuracy of power analysis, domains of the three constructs (i.e., emotional exhaustion, cynicism, reduced personal efficacy, anger, anxiety, shame, avoiding, suppression and venting) were used as nodes in this study instead of individual items. This aligns with common practices in network literature (Verkuilen et al., 2020). Central nodes are those highly connected with others. The thickness of edges, both within domains of the same constructs and between domains of different constructs, visualizes the strength of connections, with thicker and more saturated edges representing stronger connections. Network analysis was based on bootstrapped 95% confidence intervals with the original samples resampled for 1000 times to ensure robustness against differences of questionnaire design. This practice is consistent with previous network analysis studies (Verkuilen et al., 2020). Three series of analyses were conducted to obtain the above information: network estimation with R-package *qgraph*, centrality measures with *networktools*, and stability with *bootnet*. The following sections will illustrate how the three sets of information were obtained.

3.4.1. Network estimation

Following the guidelines (Epskamp et al., 2012), the network pattern was estimated using the Gaussian Graphical Model (Lauritzen, 1996). Edges in the network represent partial correlation coefficients between nodes (i.e., three dimensions of burnout; three types of ERS and negative emotions), controlling for statistical dependencies with other nodes. The gLASSO (graphical least absolute shrinkage and selection operator) procedure was employed to avoid spurious and inflated edge estimation (Friedman et al., 2008).

3.4.2. Centrality estimation

The centrality of each node was represented by (1) one-step expected influence (EI, estimating the strength of connection within the same construct such as emotional exhaustion and cynicism). It was implemented because some of the edges were negative. It was also represented by (2) one-step bridge expected influence (BEI, estimating bridges connecting nodes across constructs such as emotional exhaustion and anxiety). Higher EI and BEI values suggest a higher level of centrality for the target node.

3.4.3. Accuracy and stability estimation

Following the existing guidelines (Epskamp et al., 2012), the accuracy of edge estimation was assessed through bootstrapped 95% confidence intervals (CI) of edge weights. Less overlap among lower-level and upper-level CIs represents greater accuracy. The edge-weight difference test was supplemented to identify the variation across edge strengths. Subsequently, the stability of centrality (EI and BEI) was estimated via case-drop bootstrap. The correlation stability (CS) coefficient was estimated to examine centrality stability with scores larger than .25 preferred and .50 ideal.

4. Results

The majority of participants were freshmen ($N = 427$) and sophomores ($N = 393$), with an average age of 19.57 ($SD = 1.28$). Their majors encompassed diverse fields, including finance, marketing, and foreign languages other than English. Table 1 provides a summary of the node names, means, standard deviations, EI and BEI of L2 burnout, ERS, and negative emotion domains. Table 2 presents the

Table 1 Summary of descriptive information, expected influences, and bridge expected influences for domains of burnout, negative emotions and maladaptive ERS

Construct	Node labels	M	SD	EI	BEI
Burnout	B1: emotional exhaustion	20.13	6.44	0.98	0.47
	B2: cynicism	15.61	5.23	0.71	0.21
	B3: reduced personal efficacy	20.55	5.96	0.07	0.07
Negative emotions	E1: anger	21.18	4.2	0.77	0.23
	E2: anxiety	18.97	3.77	0.54	0.1
	E3: shame	20.74	5.06	1.5	0.51
Maladaptive ERS	R1: situation avoiding	8.62	3.79	0.69	0.18
	R2: suppression	15.48	3.67	0.08	0.08
	R3: venting	10.97	4.73	0.6	0.08

Table 2 Correlational matrix of the domains of burnout, negative emotions and maladaptive ERS

	1	2	3	4	5	6	7	8	9
1 EE	1								
2 CY	.68***	1							
3 PE	.23***	.21***	1						
4 Anger	.55***	.45***	.13***	1					
5 Anxiety	.60***	.45***	.22***	.49***	1				
6 Shame	.63***	.52***	.28***	.77***	.69***	1			
7 Suppression	.23***	.14***	-.04	.27***	.24***	.28***	1		
8 Venting	.17***	.21***	.08*	.38***	.06	.33***	.20***	1	
9 Avoiding	.25***	.31***	.10**	.39***	.10**	.36***	.19***	.62***	1

Note. EE: emotional exhaustion; CY: cynicism; PE: reduced personal efficacy; *** $p < .001$; ** $p < .01$; * $p < .05$

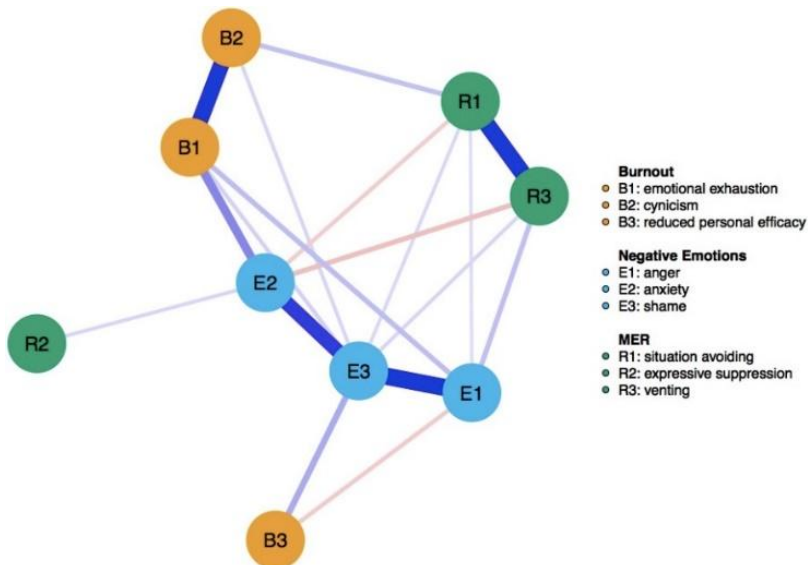


Figure 1 Networks containing the domains of negative emotions, maladaptive emotion regulation and burnout in the EFL context ($N = 841$). Blue lines represent positive links and red lines negative ones. The thickness of the edges indicates the association magnitude. MER = maladaptive emotion regulation.

correlational results among the domains. Except for the relationship between reduced efficacy and suppression, and between anxiety and venting, all the correlations were significant at different levels. Given that language proficiency and gender were identified as correlates of the variables in the study (Li et al., 2021; Wu et al., 2023), we conducted a retest of the above network with language proficiency and gender controlled for as covariates. Results remained unchanged regarding the network structure of study variables, the most central nodes within constructs (EI) and between constructs (BEI), and the relative strengths of bridging edges. For the sake of parsimony, covariates of language proficiency and gender were not plotted in the figures of the present study. Figure 1 visualizes the network structure with colors set to be distinguishable by color-blind readers. The network density was 50%, indicating 18 out of 36 potential edges were present.

4.1. Central nodes

Based on the network structure, central nodes were examined to see which domains are in the central place. Standardized estimates of EI and BEI are presented in Figure 2 (see Supplementary Material Figure S1 for scores of EI and Figure S2 for BEI). The most central nodes (highest EI) within the specific constructs and the most influential bridging nodes (highest BEI) linking the constructs were shame (E3) for negative emotions, emotional exhaustion (B1) for burnout and avoidance (R1) for maladaptive ERS.

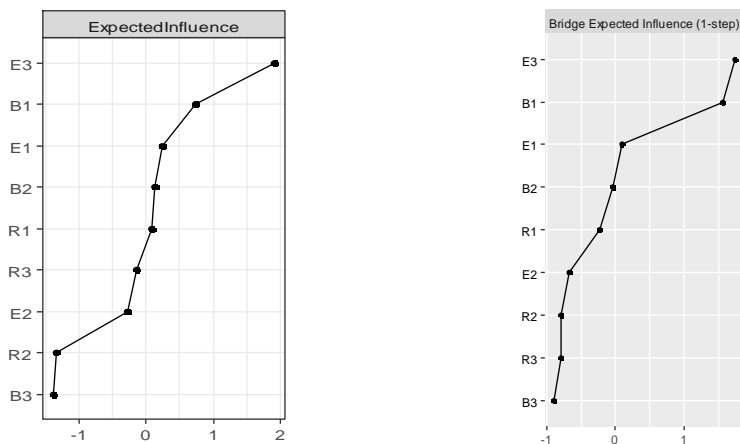


Figure 2 Standardized expected influence centrality indicators (on the left) and standardized bridge expected influence indicators (on the right) for domains of negative emotions, maladaptive emotion regulation and burnout in the EFL context ($N = 841$) (Table 1 presents the corresponding node labels)

4.2. Strong bridging edges

The edge-weights bootstrap (see Appendix, Figure S3) demonstrated that the network of burnout, negative emotions, and emotion regulation strategies was moderately accurately estimated. Most edges were positive (except for the association between anxiety and avoiding [E2-R1], reduced personal efficacy and anger [B3-E1], anxiety and venting [E2-R3]; see Figure 3). Fourteen bridging edges emerged with six across burnout and negative emotions, seven across negative emotions and ERS, and one across burnout and ERS. Among the bridging edges, the association between emotional exhaustion and anxiety (B1-E2) was the strongest. Case-drop bootstrap revealed CS coefficients for the order of EI and BEI being 0.52 and 0.75, respectively, indicating that the aforementioned results were stable enough for interpretation (see Appendix, Figure S4).

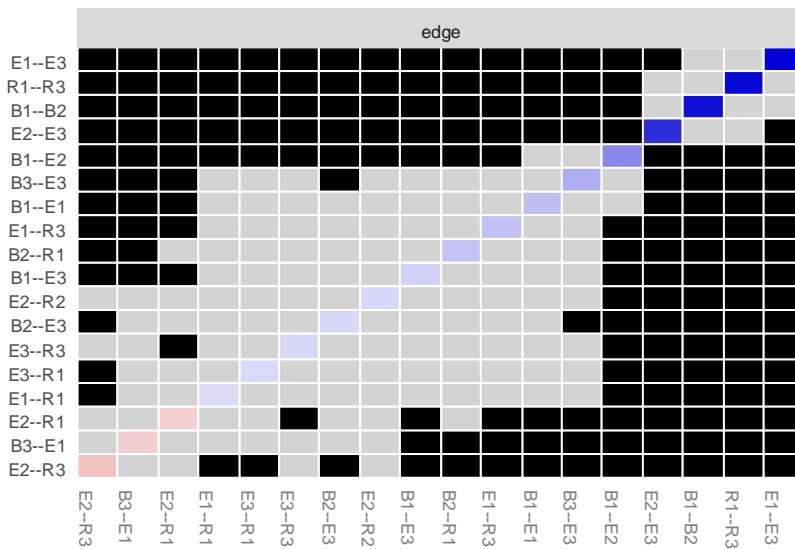


Figure 3 Bootstrapped difference test ($\alpha = 0.05$) results between edge weights that were not zero in the network of negative emotions, MER and burnout in the EFL context ($N = 841$). Gray boxes denote edges that have no difference from one-another and black boxes indicate edges that have significance difference from one another (Table 1 presents the description of corresponding node labels)

5. Discussion

The current study represents the initial attempt in the network analysis concerning language learning burnout, negative emotions, and maladaptive ERS. Results

underscored the centrality of emotional exhaustion for burnout, shame for negative emotions, and avoidance for maladaptive ERS as the most central and pivotal bridging nodes across constructs. Notably, the association between emotional exhaustion and anxiety turned out to be the most influential bridging edges. While most of the edges were positive, the association between venting and anxiety, avoiding and anxiety, as well as reduced personal efficacy and anger were negative. The following sections are devoted to interpreting the most central nodes within the above concepts and the key bridging edges linking these concepts.

5.1. The centrality of emotional exhaustion, shame and avoidance

Addressing the first research question, the high centrality of emotional exhaustion echoed the results of previous studies emphasizing its core role in burnout (Lee et al., 2020; Schaufeli et al., 2002). The current study provides scientific and empirical evidence, reinforcing the pivotal position of emotional exhaustion in the EFL context. Despite its conceptual parallelism with other burnout dimensions, emotional exhaustion serves as a fundamental element, potentially triggering socially distant attitudes towards and feelings of incompetence (Kim et al., 2015; Schaufeli et al., 2002). If these negative effects accumulate beyond learners' tolerance, EFL learners may become emotionally drained.

Regarding the other two burnout dimensions, cynicism (depersonalization) and reduced personal efficacy (lack of accomplishment) were both positively associated with shame. The study suggests that students experiencing shame may doubt their English learning abilities, adopting a detached attitude as a defense mechanism (Maslach et al., 1997). Negative emotions accumulating and leading to burnout align with previous research (Andreychik & Differences, 2019; Szczygiel & Mikolajczak, 2018). The negative association between reduced personal efficacy and anger, though counterintuitive, suggests that angry feelings during English learning may lead individuals to blame external (e.g., lack of teacher support) or internal non-cognitive (e.g., not hardworking enough) hindrance rather than reduced efficacy in completing English learning activities.

It should be noted that shame, rather than anxiety, emerged as the most central node for the negative emotion community. Shame was associated with all the three dimensions of burnout and two types of ERS (avoiding and venting). Anxiety is the most frequently reported and extensively investigated emotion in the EFL context (Dewaele & Li, 2020; Dewaele & MacIntyre, 2014; Wang et al., 2021) because foreign language learning is believed to be an emotion-laden process, which is replete with apprehension, restlessness, and nervousness (Saito et al., 2018). The prevalence of shame could be attributed to the English teaching

method and learning mindset in China. Traditionally, the Chinese EFL classroom emphasizes the grammar-translation method characterized by rote memory and grammar explanation (Clark-Gareca & Gui, 2019; Wang, 2009), often neglecting spoken English (Chen & Goh, 2011). This, coupled with a lack of authentic language environment and limited resources (e.g., staff, material) outside the class, could arouse students' feeling of inferiority (Xu & Wang, 2024). Additionally, shame's importance in Chinese culture, emphasizing face, criticism, humiliation, embarrassment, and evaluation from others, might contribute to its prevalence (Fung, 1999; Ho, 1976).

5.2. The bridging edges across constructs

Related to the second research question, while shame emerged as the dominant emotion, the most robust bridging edge was identified between anxiety and emotional exhaustion. This indicates that anxious students were more likely to experience emotional exhaustion compared to other negative emotions. This is not hard to understand given the precedence of anxiety among Chinese EFL learners (Li et al., 2021; Liu et al., 2021; Shao et al., 2013). Since previous studies in EFL learning have usually explored the predictive effect of anxiety on overall burnout rather than its specific dimensions, the inseparable link between anxiety and emotional exhaustion sheds light on potential avenues for future pedagogical research and interventions.

Concerning maladaptive ERS, the positive association between avoidance and cynicism aligns with the trade-off effect of situation selections. Avoidance of certain situations may provide short-term relief but result in long-term harm (Gross, 2002; Lazarus & Folkman, 1984). This association also relates to the avoiding nature of cynicism as a defense mechanism (Lee et al., 2020) and situation avoiding as avoidant-oriented coping (Lazarus & Folkman, 1984). In the face of academic stress, learners may choose to retreat from a learning-related environment in order to avoid further harm, even though these behaviors usually backfire. For instance, students choosing to skip class as a means of reducing English learning anxiety were found to be more susceptible to long-term burnout in the current study.

Regarding the association between maladaptive ERS and negative emotions, it is worth mentioning that avoiding and venting were associated with all the three types of negative emotions, whereas suppression was associated only with anxiety. The negative outcomes of avoidant-oriented coping are evident (Lazarus & Folkman, 1984) as avoiding stress-arousing situations does not alleviate stress, but instead, leads to unpleasant feelings. The detrimental effect of venting on shame and anger is also unsurprising given the existing evidence classifying venting anger as a maladaptive coping strategy (Bushman, 2002; Dalebroux et al., 2008). Experimental studies

have found that venting anger generates more anger (Bushman, 2002). The negative association between avoiding, venting and anxiety is also in line with the activation of anxiety under “moderate control” because students who tended to skip class or kick things around demonstrated a lack of control in language learning. The overall associations between domains of the three constructs are in line with the broaden-and-build theory (Fredrickson, 2001) and attentional control theory (Eysenck et al., 2007). Specifically, the relative strengths of the associations provide a nuanced picture of the two theories in SLA. The findings suggest that maladaptive ERS may not be universally associated with all types of negative emotions, triggering specific dimensions of burnout.

Linking the three constructs together, the network findings suggest a mediation path wherein negative emotions could transmit the influence of maladaptive ERS onto burnout. In other words, individuals who prefer maladaptive ERS in dealing with English learning stress are likely to experience negative feelings, subsequently depleting their emotional energy. As indicated by the bridging edges in this study, avoiding English learning tasks could induce a simultaneous onset of multiple negative feelings (anxiety, shame, and anger). These overwhelming feelings may then transfer into an indifferent and detached attitude (i.e., cynicism) as an additional coping mechanism to safeguard individuals psychologically. While previous studies have reported the downregulating effect of different ERS on negative emotions (Davis et al., 2010; Ng & Diener, 2009; Olatunji et al., 2007) and the influence of negative emotions on burnout (Rose et al., 2004; Szczygiel & Mikolajczak, 2018), this study integrates these aspects by unveiling a nuanced and intricate network.

The network findings provide a foundation for practical implications for EFL teachers and policy makers. Firstly, it is important for teachers to empower students’ social emotional learning ability, especially adaptive emotion regulation strategies. Understanding how to upregulate positive emotions and downregulate negative emotions is vital for students to optimize language learning outcomes, such as grammar assimilation and willingness to produce output. The initial step in assisting students in this regard should involve reinforcing teachers’ emotion regulation literacy and competence. Secondly, teachers should pay increased attention to the emotional tone of the classroom by making language learning more enjoyable and less anger- or anxiety-seducing. High levels of negative emotions pose students a risk of burnout. Provision of more scaffolding, inclusion of familiar topics, and group interaction might be effective ways of creating a more leisurely classroom atmosphere. In order to alleviate EFL students’ language learning burnout, teachers should provide a relaxing and friendly atmosphere to help students reduce anxiety. Future intervention programs combating burnout should be tailored based on students’ preferred use of maladaptive ERS and dominance of negative emotions.

6. Limitations and future directions

Limitations of the study should also be acknowledged. Firstly, this study estimated networks based on only two universities with most participants in the first or second year, which restricts the generalizability of the findings. It is possible that students at higher grades adopt a more negative view toward learning English in a compulsory course. The strength of connection between dimensions of burnout and shame may be lower in western countries wherein shame culture was not existent. Researchers are encouraged to carry out network analysis among western samples to test the replicability of this finding. It would also be interesting to compare the influence of shame for Chinese and other Eastern Asian samples. Future studies could conduct the network comparison with the inclusion of other sample types. Secondly, the assessment of emotions relied on retrospective self-report which may be biased due to the transient state of emotions. Though negative emotions measured were situated in genuine English learning scenarios (classroom, activities, exams), they were not “real-time” subjective experience. Thirdly, the data were collected only once, which prevented us from looking at the overtime stability of the network. Future studies could repeat measures with time intervals in order to examine the changing trajectory.

7. Conclusion

To conclude, this study represents a pioneering exploration of network analysis in the field of EFL learning. It stands as the inaugural investigation into the network structure of language learning burnout, negative emotions and maladaptive ERS. The network approach enhances our understanding of the complex interactions among domains of the three constructs. It also furnishes empirical evidence underscoring the central place of emotional exhaustion as a core element of burnout, shame as the prevailing negative emotion, as well as the robust association between emotional exhaustion and anxiety among Chinese EFL undergraduates. These findings suggest potential intervention targets, focusing on mitigating emotional exhaustion and shame in language learning, along with addressing avoidance as a maladaptive emotion regulation strategy.

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APPENDIX

Detailed information for network analysis

Network estimation

We estimated the entire sample network using the present state-of-the-art methodology, that is, the Gaussian Graphical Model (GGM; Lauritzen, 1996), a network characterizing the edges (relationships) between nodes (three negative emotions, three MER strategies, and three burnout domains). In the GGM, edges can be interpreted as partial correlation coefficients, a correlation between two nodes after controlling for all other nodes in the network. No edge emerging between two nodes means that the two nodes are conditionally independent of each other, given all other nodes in the network.

To avoid estimating spurious edges and minimize the risk for false positives (e.g., a nonzero association is estimated, although it does not actually exist), GGMs are estimated with a regularization technique called the graphical least absolute shrinkage and selection operator (LASSO) (Friedman et al., 2008). LASSO maximizes a penalized log-likelihood considering network density (the number and the strength of edges), which is regulated by a tuning parameter lambda (λ), with larger λ values resulting in sparser networks and lower values in denser networks. The optimal model is identified by using the extended Bayesian information criterion (BIC), which results in a sparse conservative and parsimonious network (Epskamp & Fried, 2018). This technique has been utilized in many recent articles. A tutorial paper on how to estimate GGMs with regularization techniques in R is available elsewhere (Epskamp & Fried, 2018). The `cor_auto` function in `qgraph` was used to automatically compute appropriate correlations between domains of negative emotions, MER and burnout.

Centrality measures

To identify the most central nodes within constructs, we computed one-step expected influence (EI), as opposed to the commonly used centrality measures (e.g., strength, betweenness, and closeness) which are typical of networks with exclusively positive edges and not able to distinguish between positive and negative edges (Robinaugh et al., 2016). EI evaluates a node's influences on other nodes in the network while taking into account negative edges, thus being the preferred centrality measure when a network includes negative edges (Robinaugh et al., 2016). One-step EI is the summed weight of all edges a node shares with its immediate neighbors while retaining the positive or negative weight values. Higher one-step EI implies being more central in the network. To examine bridging nodes across constructs, we calculated the corresponding one-step bridge expected influence (BEI) which evaluates the extent to which a given node influences its exclusively cross-construct neighbors (Jones et al., 2017). For instance, the one-step BEI of a certain negative emotion assesses the degree to which that emotion affects MER and burnout. Higher one-step BEI indicates a larger bridging effect.

Accuracy and stability

The accuracy and stability analyses for the entire sample network were conducted under the guidance of Epskamp et al. (2018). First, we estimated the accuracy of network edges

through bootstrapping 95% confidence intervals (CIs) of the edge weights. Large overlap among bootstrap 95% CIs implies that most edges are not significantly different from one another and the order of the edge weights should thus be interpreted with care. The less overlap among 95% CIs, the more accurate the edge estimation. A subsequent test for edge-weights difference identified which edges significantly differ from others. Second, we examined the stability of centrality measures (i.e., one-step EI and one-step BEI) through case-drop bootstrapping (i.e., randomly dropping certain proportions of participants from the original sample and re-estimating the network) and estimated the correlation stability coefficients (CS-coefficient) to quantify the centrality stability. The CS-coefficient should be at least 0.25 for the order of the centrality to be considered stable, and a value above 0.5 is preferred. A tutorial paper on the accuracy and stability of psychological networks using the R-package bootnet is available elsewhere (Epskamp et al., 2018).

Supplementary figures

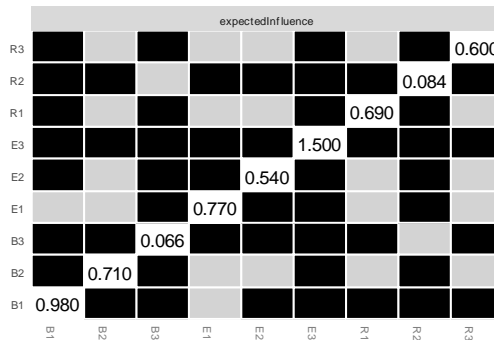


Figure S1 Bootstrapped difference tests ($\alpha = 0.05$) between expected influence of negative emotions, MER and burnout domains in the EFL context ($N = 841$). Gray boxes indicate nodes that do not differ significantly from one another and black boxes represent nodes that do differ significantly from one another. White boxes show the value of node strength (see Table 1 for the description of node labels)

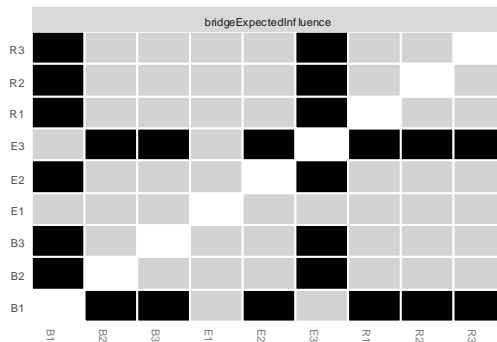


Figure S2 Bootstrapped difference tests ($\alpha = 0.05$) between bridge expected influence of negative emotions, MER and burnout domains in the EFL context ($N = 841$). Gray boxes indicate nodes that do not differ significantly from one another and black boxes represent nodes that do differ significantly from one another (see Table 1 for the description of node labels)

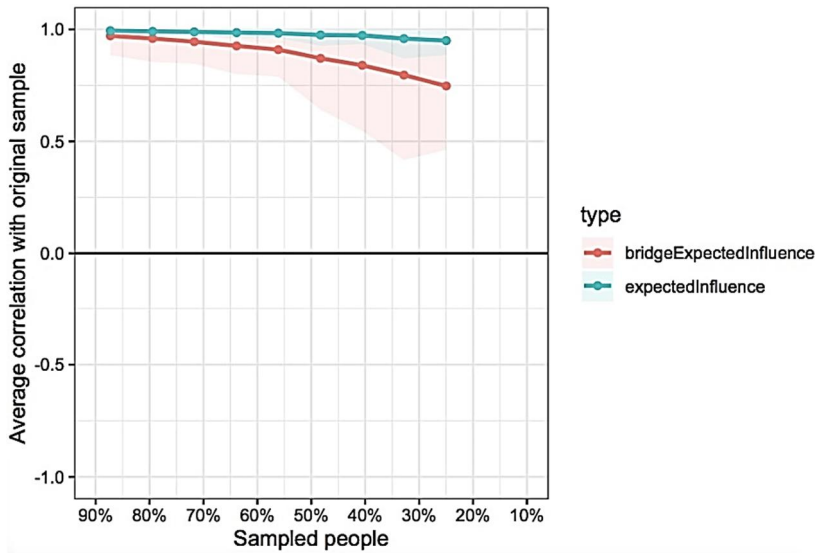


Figure S3 Average correlations between centrality indices of the domain-level network of negative emotions, MER and burnout sampled with persons dropped and the original sample ($N = 841$); lines indicate the means and areas indicate the range from the 2.5th quantile to the 97.5th quantile (see Table 1 for the description of node labels)

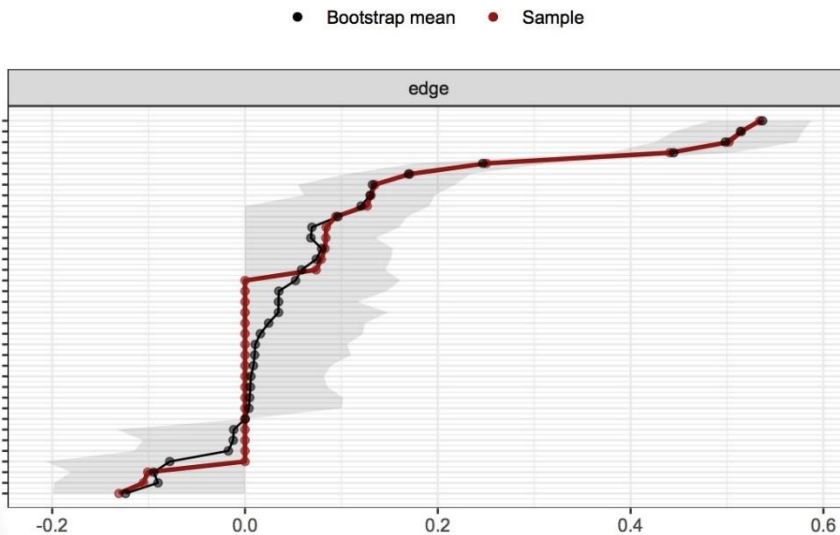


Figure S4 Bootstrapped confidence intervals of estimated edge weights for the estimated domain-level network of negative emotions, MER and burnout in EFL context ($N = 841$); the red line indicates the sample values and the gray area the bootstrapped CIs; each horizontal line represents one edge of the network, ordered from the edge with the highest edge weight to the edge with the lowest edge weight