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# Exploring occupational well-being profiles, outcomes, and predictors among Chinese teachers: A mixed-methods approach using latent profile and decision tree analysis

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## Abstract

Understanding the varied profiles of occupational well-being, their outcomes, and predictors is key to formulating effective strategies for enhancing teachers' occupational health and well-being. This study employed latent profile analysis (LPA) to identify distinct occupational well-being profiles and their outcomes among 366 Chinese teachers, and decision tree analysis to explore the factors predicting each profile. The results showed three occupational well-being profiles: burnout, engaged, and burnout-engaged. The "engaged" group exhibited normal ranges for depression and stress, along with mild anxiety. The "burnout" group demonstrated moderate depression and stress, coupled with severe anxiety. The "burnout-engaged" group was near the threshold of mild depression and moderate anxiety. The result of the decision tree model revealed that marital status, teaching experience, income, role as a class teacher, school type, and working hours significantly influenced these occupational well-being profiles. Specific combinations of variables were associated with each occupational well-being profile, offering a nuanced understanding of the risky and protective factors for teacher occupational well-being. By identifying distinct occupational well-being profiles among

Chinese teachers and their outcomes, and elucidating the key predictors and their interrelations, this study provides insights into how to quickly screen for teachers in need of help at work, and how to design targeted interventions for different teachers.

**KEYWORDS**

Chinese teachers, decision tree approach, latent profile analysis, occupational well-being profiles

# INTRODUCTION

Teachers' occupational well-being is essential for their career development and mental health, as well as for students' overall development (Braun et al., 2020; Jogi et al., 2023). Teachers usually encounter a combination of supportive factors and challenges, resulting in a spectrum of occupational well-being outcomes, ranging from high engagement to burnout, with the mixed condition of engagement and burnout lying between the two. However, prior work has largely focused on burnout and work engagement in isolation (Hakanen et al., 2006; Hascher & Waber, 2021). Few studies have covered diverse states on the occupational well-being spectrum, especially the concurrence of work engagement and burnout, which might be fostered by Chinese cultural expectations for teachers. Moreover, the complicated interrelations between multi-predictors of occupational well-being could be hardly captured by traditional statistical methods (e.g., linear regression, structural equation modeling) in prior studies (Casely-Hayford et al., 2022; Skaalvik & Skaalvik, 2011). The present study was designed to extend prior work by identifying distinct profiles of occupational well-being, by latent profile analysis, and their predictors, using decision tree analysis, among Chinese teachers. Three questions have guided this study: (1) What occupational well-being profiles can be identified among Chinese teachers? (2) What are the outcomes of these profiles? (3) What are the predictive factors of these profiles, and how do the predictors interact with each other?

## The potential occupational well-being profiles: a focus on teacher burnout and work engagement

Burnout and work engagement are two salient and well-studied constructs of occupational well-being (Hakanen et al., 2006). Burnout, characterized by emotional exhaustion, depersonalization, and a sense of reduced personal accomplishment, describes a negative state of occupational well-being (Maslach et al., 2001). Conversely, work engagement refers to an optimal state, marked by high levels of vigor, dedication, and absorption (Schaufeli et al., 2008). Early literature predominantly employed a variable-centered approach, using either work engagement or burnout independently to measure the extent of occupational well-being (Hascher et al., 2021; Hascher & Waber, 2021).

However, Schaufeli et al. (2008) challenged the view that work engagement and burnout are polar constructs, and suggested that individuals may experience both simultaneously. In other words, to gain a complete description of teachers' various occupational well-being states, it is

necessary to adopt a person-centered approach and consider both positive and negative indicators. This viewpoint is preliminarily supported by a few empirical studies, whose profile descriptions of teachers' occupational well-being were limited by relying on overall scores or selected dimensions of burnout and engagement (Salmela-Aro et al., 2019; Timms et al., 2012). The present study, therefore, aimed to identify the finer-grained states of teachers' occupational well-being, by examining all dimensions of burnout (i.e., emotional exhaustion, depersonalization, and diminished personal accomplishment) and engagement (i.e., energy, dedication, and absorption).

Moreover, most of these studies were conducted in Western cultures, leaving questions about their applicability to Chinese participants. Therefore, we have positioned our study as one more contribution to countering the Western bias in psychological science as represented by the analysis of Henrich et al. (2010) that our studies are overly represented by studies of samples from Western Educated, Industrialized Rich Democracies (WEIRD).

Notably, Chinese culture may foster the coexistence of work engagement and burnout among teachers. Valuing characteristics such as diligence and responsibility, "Hui Ren Bu Juan" (teaching others tirelessly) is viewed as an ideal property of a good teacher (J. Chen & Brown, 2013). This high extent of engagement could in turn bring increased work pressures and conflicts between work and family life, ultimately leading to teacher burnout (Chakravorty & Singh, 2020). Sustained high levels of arousal can also trigger persistent activation accompanied by negative consequences such as psychological distress (Shimazu et al., 2018).

## The outcomes of occupational well-being profiles among Chinese teachers

Occupational well-being can spill over into other life domains and affect overall mental health (Hakanen & Schaufeli, 2012). According to the conservation of resources theory (COR), the gain spiral emphasizes that the accumulation of resources can promote work engagement, leading to further resource acquisition and better mental health status (Hobfoll & Shirom, 2001; Shimazu et al., 2018). Conversely, the loss spiral illustrates how the lack of resources combined with high job demands can trigger job burnout, further resulting in the depletion of resources and deterioration of mental health, forming a negative cycle (Halbesleben et al., 2014; Hobfoll et al., 2018). Existing literature also has demonstrated that high work engagement alleviated symptoms of psychological distress (Bakker, 2010; Unda-López et al., 2023); while burnout initiated or intensified symptoms of anxiety and depression (Bianchi et al., 2015; De Francisco et al., 2016).

In line with the gain and loss spirals (Armon et al., 2014; Papathanasiou, 2015), we predicted that individuals experiencing burnout display poorer mental health status, including higher levels of depression, anxiety, and stress, while those with high work engagement exhibit better mental health status. If burnout and engagement do coexist in some individuals, these people suffer from the detrimental effects of burnout, yet they also benefit from the protective effects of engagement and thus may exhibit moderate levels of mental health. In sum, we proposed that there may be several profiles of occupational well-being, which are associated with the corresponding mental health outcomes. These different mental health outcomes can in turn provide validity of the different profiles of teacher occupational well-being (Morin et al., 2018).

## Individual and environmental predictors of occupational well-being profiles

The ecosystem theory (Bronfenbrenner & Morris, 2006) emphasizes the interactions between individuals and their multilayered environments, illustrating how these interactions shape human development. Accordingly, it is important to take a transactional view and consider both personal characteristics and external environmental factors when examining teachers' occupational well-being (Kokkinos, 2007).

Regarding individual factors, with mixed results, most studies examined socio-demographic variables such as teaching experience, income, and marital status as predictors of occupational well-being (Durak & Saritepeci, 2019). These factors encapsulate critical aspects of teachers' lives: career progression, economic stability, and familial support (Kelchtermans, 1993), and are central to administrative measures on promoting teacher welfare through professional development, salary adjustments, and work-life balance (Gao et al., 2023). Specifically, varied teaching experiences are linked to occupational well-being in different ways: novice teachers struggled with role adaptation, while experienced teachers suffered from prolonged emotional labor (Kamtsios, 2018; Podolsky et al., 2019; Zysberg & Ditza, 2017). Financial stress affects well-being, with lower incomes contributing to stress and burnout (Sabokrouh et al., 2020; S. Li et al., 2020). Marital status also plays a critical role: married teachers are more vulnerable due to family-work conflicts, whereas unmarried teachers have higher burnout risks due to heavier workloads and limited social support (Chakravorty & Singh, 2020; Jia et al., 2017).

As for environmental factors relating to teachers' well-being, existing studies mainly paid attention to variables in micro-, meso-, and exo-systemic environments (Gao et al., 2023). Within teachers' micro-systems, working time is the key factor. The risk of job stress and burnout increases with the number of hours worked per week (Bannai et al., 2015). In the meso-system, the role of the class teacher, serving as a communication bridge between different micro-systems including the school, students, and parents, is a critical factor. Compared to the subject teachers, the class teachers not only handle teaching tasks but also class management, parent communication, and students' psychological well-being, bringing significant demands and stress (Shi, 2023). The type of school is an influencing factor in the exo-systems, with key schools having better resources and higher-achieving students, while ordinary schools face economic constraints and higher burnout rates (Ke et al., 2013; Sohail et al., 2023).

Regardless of consistent or mixed findings, previous research has selected potential individual and environmental determinants of teachers' occupational well-being, which are compatible with the ecosystem theory. However, the computational constraints and analytical complexity of traditional statistical methods (e.g., linear regression, structural equation modeling) employed in the prior studies limited our understanding of how multiple predictors interacted and led to different teacher occupational well-being profiles (Rothenberg et al., 2023). Hence, the present study employed the decision tree prediction model to analyze a wide range of predictors simultaneously.

Decision tree methodology (one of the key machine learning algorithms) can create non-parametric models that handle categorical and continuous variables, accurately representing non-linear relationships (Rokach, 2016). This method is particularly useful at revealing complex interactions among a wide range of variables without the need for distributional assumptions (Cai et al., 2022). Focused on prediction, it aims to identify key predictors and how they interact

to influence profiles of occupational well-being. Additionally, decision trees are inherently visual, making them easier to interpret. This enhances our understanding of how different factors interact and their potential effects.

# METHODS

## Participants and procedure

Data for this study were collected via an online survey distributed through WeChat to teachers at primary and secondary schools across China. Participants received a 5 RMB compensation for completing the survey. Out of 410 distributed questionnaires, 366 were valid after excluding brief and duplicate responses. The sample consisted of 71.04% primary school teachers (n = 260), 18.58% secondary school teachers (n = 68), and 10.38% high school teachers (n = 38). Female teachers made up 74.04% (n = 271) of the sample, while male teachers constituted 25.96% (n = 95). Age distribution was as follows: 54.64% under 30 years old (n = 200), 21.86% aged 31–40 (n = 80), 17.49% aged 41–50 (n = 64), and 6.01% over 50 years old (n = 22). The study received approval from the Ethics Committee of XXX University (for blinded review), with all participants providing informed consent and their data being processed anonymously.

## Measurement

### Demographic information

The present study examined teacher characteristics at both the individual and environmental levels. Individual predictors included marital status (unmarried, married without children, married with children), teaching experience (≤5 years, 6–10 years, 11–15 years, 16–20 years, >20 years), and income level (≤4,000 RMB, 4,001–5,000 RMB, 5,001–6,000 RMB, 6,001–7,000 RMB, 7,001–8,000 RMB, >8,000 RMB). Regarding environmental factors, the study focused on work-related aspects: the role of being a class teacher (yes/no), type of school (key schools with abundant resources and academic rigor vs. ordinary schools with limited funding), and work hours (≤8 hours, >8 hours).

### The burnout inventory

Li and Shi (2003) revised the International Burnout Scale to align with China's social and cultural context. This scale, demonstrating good reliability and validity among the Chinese population, assesses three dimensions of burnout: emotional exhaustion (e.g., "I feel emotionally drained from my work"), cynicism (e.g., "I doubt the significance of my work"), and reduced accomplishment (e.g., "In my opinion, I am good at my job"). Responses are on a 5-point Likert scale (1 = never or very rarely true, 5 = very often or always true). Internal consistency coefficients for the dimensions were .90, .90, and .89, respectively, for the current sample.

### The work engagement scale (UWES)

The revised Utrecht Work Engagement Scale (UWES-revised), adapted by Zhang and Gan (2005) using middle school teachers, shows good reliability and validity among the Chinese population. It includes seven Likert-style statements assessing three components of engagement: vigor, dedication, and absorption. Vigor is assessed with statements like, "When I get up in the morning, I feel like going to class." Dedication is evaluated through statements like, "I feel my job inspires me." Absorption is measured with items like, "When I am working, I forget everything else around me." Internal consistencies for vigor, dedication, and absorption were .90, .85, and .90, respectively.

### Mental health status

This study focused on general mental health issues—including depression, anxiety, and stress—due to their significant impact on other health dimensions (Jun et al., 2018). The Depression, Anxiety, and Stress Scale (DASS-21), a short-form version developed by Lovibond and Lovibond (1995), was used in its Simplified Chinese version, revised by Gong et al. (2010), showing good reliability and validity. The DASS-21 consists of 21 items divided into three subscales: Depression, Anxiety, and Stress, each with 7 items scored on a 4-point Likert scale (0 = "Does not apply" to 3 = "Always applies"). Scores for each sub-scale were doubled for the final score. Thresholds for mild, moderate, and severe levels are: Depression (10, 14, 21), Anxiety (8, 10, 15), and Stress (15, 19, 26) (Gong et al., 2010). Cronbach's alpha coefficients were .89, .85, and .91, respectively.

## Data analysis

Descriptive statistics and zero-order correlation analyses were executed using SPSS 25.0 to establish a preliminary understanding of the data's structure and initial relationships. Latent Profile Analysis (LPA) in Mplus 7.0 identified unique occupational well-being profiles, defined by dimensions of burnout and engagement. Following Yang's (2006) guideline of a minimum average sample size of 50 per profile, the sample size of 366 in this study ensures adequate statistical power.

The LPA model selection process started with a single-class model, incrementally adding classes to determine the optimal number. Criteria included lower Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and sample-size-adjusted BIC (aBIC) values; significant p-values from the Lo–Mendell–Rubin likelihood ratio test (LMRT) and bootstrap likelihood ratio test (BLRT); higher entropy for classification precision; and model interpretability (Vrieze, 2012). Subsequent analysis employed a multivariate analysis of variance (MANOVA) to validate the distinctiveness of identified occupational well-being profiles, with further insights gleaned through post hoc tests. To examine differences in depression, stress, and anxiety across the derived profiles, the BCH procedure in Mplus 7.0 facilitated comparisons of these continuous outcomes. A decision tree model was constructed using Python's scikit-learn "DecisionTreeClassifier", with LPA-derived occupational well-being profiles as outcomes and a range of predictors. Despite the challenges of small datasets in social sciences, the model's predictive accuracy and generalization were ensured through strategic

sampling, hyperparameter tuning, and evaluation metrics (Goodfellow et al., 2016; Gutiérrez et al., 2023).

Given the low proportion of individuals with a negative occupational well-being profile, various data sampling strategies from the "imblearn" library were explored to address the class imbalance, including the Synthetic Minority Over-sampling Technique (SMOTE), Adaptive Synthetic Sampling Approach (ADASYN), RandomOverSampler, and ClusterCentroids (S. Abokadr et al., 2023; Xu et al., 2021). The dataset was then randomly split into training and testing sets using the "train_test_split" function. Hyperparameters such as the maximum depth of the tree, the minimum number of samples to split an internal node, and the minimum number of samples in a leaf node were optimized using a parameter grid. Split quality was assessed using the Gini impurity function, with lower values indicating better splits (Radaelli, 2010).

After parameter optimization, the model's classification performance was evaluated primarily using the Area Under the Receiver Operating Characteristic Curve (AUC). An AUC value closer to 1 indicates superior model discriminative ability; a threshold of .60 or above is considered effective in practical applications (Šimundić, 2009; Wang et al., 2022; Yong et al., 2020).

# RESULTS

## Descriptive statistics

Table 1 presents the descriptive characteristics of the participants. The correlations between variables can be found in Appendix 1, which indicated that there was a negative correlation between the various dimensions of burnout and those of work engagement. In addition, depression, anxiety, and stress were positively correlated with various dimensions of burnout, while negatively correlated with these dimensions of work engagement.

## Identification of occupational well-being profiles

The LPA results indicated the presence of multiple distinct teacher well-being profiles, with the three-profile model identified as optimal. This conclusion was reached based on the decreasing AIC, BIC, and aBIC values as the number of profiles increased, with the three-profile solution marking the point of diminishing returns in overall model fit improvement. The LMR-LRT value also favored the three-profile model over the two-profile model, while additional profiles did not enhance qualitative outcomes. The entropy value for the three-profile solution was above .80, suggesting a reliable classification. Detailed statistical information on model fit for one to four profiles is provided in Appendix 2.

Figure 1 graphically presents the final LPA results. The MANOVA results showed significant differences in the seven occupational well-being indicators across the three profiles (Table 2). In the first profile group, participants reported high burnout and low work engagement, thus classified as the "burnout" profile (N = 30, 8.20%). The second profile group had high work engagement and low burnout, classified as the "engaged" profile (N = 88, 24.04%). The third profile group demonstrated average levels of both work engagement and burnout, labeled as the "burnout-engaged" profile (N = 248, 67.76%).

**TABLE 1** Demographic information of the respondents.

| | | Frequency | Percentage (%) |
|---|---|---|---|
| Married status | Unmarried | 179 | 48.91 |
| | Married (nochild) | 23 | 6.28 |
| | Married (child) | 164 | 44.81 |
| Teaching experience | ≤5 years | 216 | 59.02 |
| | 6-10 years | 34 | 9.29 |
| | 11-15 years | 15 | 4.10 |
| | 16-20yeras | 28 | 7.65 |
| | >20 years | 73 | 19.95 |
| Teacher role | Not being a class teacher | 203 | 55.46 |
| | Being a class teacher | 163 | 44.54 |
| School type | Ordinary | 267 | 72.95 |
| | Key | 99 | 27.05 |
| Income | ≤4,000 RMB | 81 | 22.13 |
| | 4,001–5,000 RMB | 87 | 23.77 |
| | 5,001–6,000 RMB | 81 | 22.13 |
| | 6,001–7,000 RMB | 49 | 13.39 |
| | 7,001–8,000 RMB | 28 | 7.65 |
| | >8,000 | 40 | 10.93 |
| Working time at school | ≤8 hours | 107 | 29.23 |
| | 8 < time≤10 hours | 187 | 51.09 |
| | >10 hours | 72 | 19.67 |

## Outcomes of occupational well-being profiles

Differences in mental health indicators (depression, stress, and anxiety) were also observed among the three profiles (Table 3). All profile comparisons revealed statistically significant differences in the depression level, but no significant differences were found between the "burnout-engaged" and "engaged" groups in terms of anxiety and stress levels. According to the DASS-21 criteria, the average scores for depression, anxiety, and stress in the "burnout" group aligned with the criteria for moderate depression, severe anxiety, and moderate stress, respectively. The "burnout-engaged" profile's mean scores for depression and anxiety approximated the thresholds for mild depression and moderate anxiety. Meanwhile, the "engaged" group's anxiety score met the criteria for mild anxiety.

## Predictors of occupational well-being profiles

According to the results of Latent Profile Analysis (LPA), 8.20% of the sample were categorized as burnout teachers, indicating a significant imbalance in the sample distribution. To address this, Random Over Sampling was used to increase the number of samples in minority categories, enhancing the model's ability to recognize the "burnout" profile. The dataset was divided

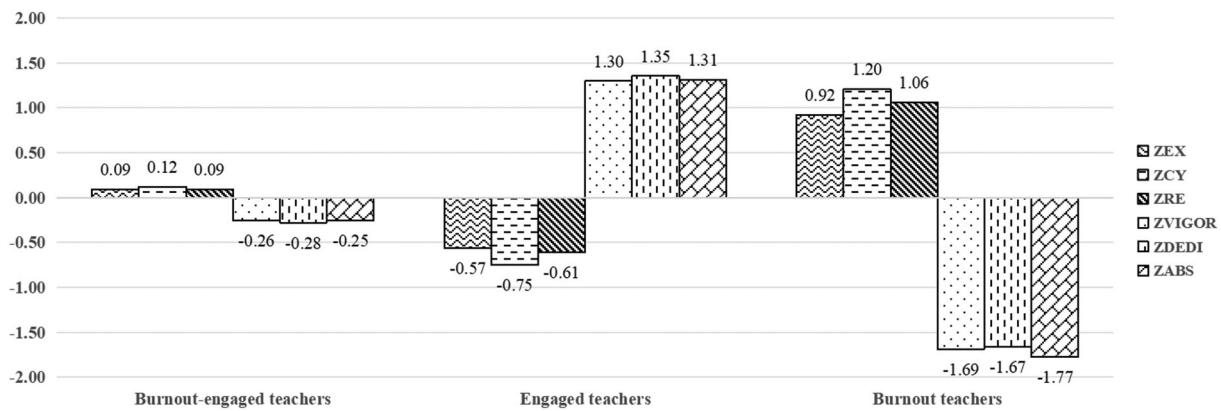


**FIGURE 1** Latent profiles in selected three-profile solution based on standardized scores. Note. ZEX = emotional exhaustion; ZCY = cynicism; ZRE = reduced accomplishment; ZVIGOR = vigor; ZDEDI = dedication; ZABS = absorption.

**TABLE 2** Differences in profile indicators of three groups.

| | | Group 1 | Group2 | Group3 | | |
|---|---|---|---|---|---|---|
| | | Burnout | Engaged teachers | Burnout-engaged teachers | | |
| N of profile groups (%) | | 30 (8.20%) | 88 (24.04%) | 248 (67.76%) | Post hoc# | F (df: 2,363) |
| Profile indicators | Exhaustion | .92 | −.57 | .09 | 1 > 3 > 2 | 31.88*** |
| | Cynicism | 1.20 | −.75 | .12 | 1 > 3 > 2 | 63.40*** |
| | Personal accomplishment | 1.06 | −.61 | .09 | 1 > 3 > 2 | 41.67*** |
| | Vigor | −1.69 | 1.30 | −.26 | 1 < 3 < 2 | 416.93*** |
| | Dedication | −1.67 | 1.35 | −.28 | 1 < 3 < 2 | 485.43*** |
| | Absorption | −1.77 | 1.31 | −.25 | 1 < 3 < 2 | 480.14*** |

*Note*: #, The specific approach of POST HOC for profile indicators of career development is Tamhane T2 (when data violates the homogeneity of variance assumption).
*$p < .05$,**$p < .01$.

**TABLE 3** Differences of mental health between occupational health profiles (N = 366).

| | Mean | | | |
|---|---|---|---|---|
| Mental health | Burnout teachers(a) | Engaged teachers(b) | Burnout-engaged teachers(c) | Overall $\chi^2$ |
| Stress | 21.46 $_{b,c}$ | 8.62 $_{a}$ | 10.72 $_{a}$ | 28.19** |
| Depression | 17.70 $_{b,c}$ | 4.25 $_{a,c}$ | 7.37 $_{a,b}$ | 37.94** |
| Anxiety | 17.04 $_{b,c}$ | 8.08 $_{a}$ | 9.42 $_{a}$ | 16.33** |

*Note*: $N = 366$, Overall $\chi^2$ test was performed with two degrees of freedom. Subscript letters indicate profiles that differ significantly at $p < .05$. For example, subscripts b and c indicate that group a's mean score differs significantly from the b and c groups.
*$p < .05$,**$p < .01$.

into training (86%) and testing (24%) subsets. A grid search optimized parameters, achieving an Area Under the Curve (AUC) of .74, with a tree depth of four, requiring at least four teachers for node splits, and a minimum of four teachers for leaf nodes.

From the analysis, Figure 2 reveals essential rules for identifying teachers with a high risk of burnout or those likely to fall into burnout-engaged and engaged profiles. The "burnout" profile was defined by three criteria: (1) A class teacher, unmarried or married without children, working 8 hours or less with an income of 5,000 yuan or less; (2) Unmarried or married without children, serving as a class teacher but working more than 8 hours; (3) Married with children, over 20 years of experience, earning 6,000 yuan or less.

The "burnout-engaged" category included teachers who were: (1) Not a class teacher, unmarried or married without children, with 5 years of teaching experience or less; (2) Married with children, teaching for 10–20 years in key schools; (3) Married with children and serving as a class teacher, with 10 years of teaching experience or less.

The "engaged" profile was described for teachers who met any of the following conditions: (1) Not a class teacher, unmarried or married without children, with over 5 years of experience;

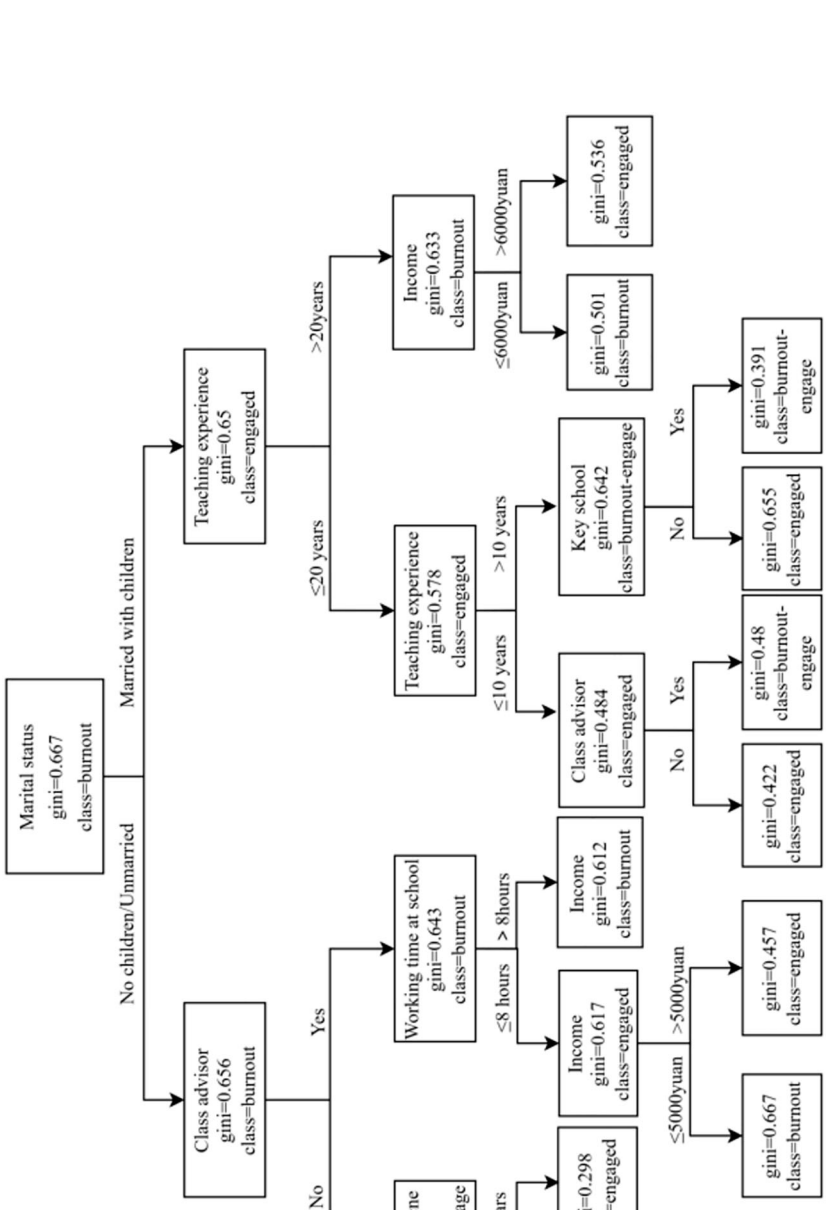


**FIGURE 2** CART model of predicting the occupational mental health profiles. Note. Class = burnout, class = burnout teachers; class = engaged, class = engaged teachers; class = burn-engage, class = burnout-engaged teachers.

(2) A class teacher, unmarried or married without children, working 8 hours or less, with an income above 5,000 yuan; (3) Married with children, not a class teacher, with 10 years of experience or less; (4) Married with children, having 10–20 years of experience in ordinary schools; (5) Married with children, teaching for over 20 years, with an income exceeding 6,000 yuan.

# DISCUSSIONS

This study employed latent profile analysis to identify three underlying profiles of teachers' well-being at work: burnout, engaged, and burnout-engaged. These groups demonstrated significant differences in mental health among teachers. Moreover, utilizing decision tree analysis, the research findings suggested that different profiles were associated with specific combinations of personal and environmental factors.

## Three profiles of teachers' occupational well-being

In addition to the two profiles of burnout and engaged, this study identified a burnout-engaged profile, in line with previous research (Salmela-Aro et al., 2019; Timms et al., 2012), offered further support to the idea that burnout and engagement can coexist as a specific form of occupational well-being (Schaufeli et al., 2008). However, different from studies of Western teachers (Timms et al., 2012), which suggested the burnout profile was the most prevalent among teachers, this study found that the burnout-engagement profile was the most common among Chinese teachers. This may be attributed to Confucian work ethics, which advocate for selfless dedication (Shun, 2015). Despite burnout, the high expectations from parents and students often compel these teachers to maintain their commitment, thus preventing complete disengagement. However, prolonged engagement can be counterproductive, transforming into a source of burnout as individuals struggle to disconnect from their work (Muhamad Nasharudin et al., 2020; Sonnentag, 2012), leading to a state where burnout and engagement coexist. This may also be attributed to the universal virtue and core Chinese values in Chinese culture, such as bearing hardship, persistence, and patience. As Hong (2001) succinctly put it, "the exertion of effort is a cultural norm" in China. Consequently, individuals in China are likely to possess greater willpower and a lower belief in the Depletion of Mental Resources (the belief that mental resources become depleted after engaging in cognitive tasks for a period of time; Sun et al., 2019). This enables them to maintain focus on a specific task for extended periods, even if the task is difficult or boring, and to continue working hard when facing difficulties, rather than attributing challenges to the limited nature of resources (Job et al., 2010). As a result, Chinese teachers, even when experiencing job burnout, tend to remain engaged in their work, pushing through challenges and monotony.

## The associations between occupational well-being profiles and mental health

The "engaged" group, characterized by high engagement, reported superior mental health. The DASS-21 scores of the "engaged" group indicated normal ranges for depression and stress, alongside mild anxiety. Conversely, the "burnout" group exhibited the most adverse mental

health, marked by moderate depression and stress, coupled with severe anxiety. These findings are aligned with the gain spiral and loss spiral of Conservation of Resources Theory (Hobfoll & Shirom, 2001), as well as the existing empirical literature: burnout is positively correlated with negative mental health, whereas work engagement is associated with positive mental health (Koutsimani et al., 2019; Upadyaya et al., 2016).

The coexistence of burnout and work engagement poses a threat to teachers. The "burnout-engaged" teachers showed higher levels of depression compared to their fully engaged counterparts. According to the DASS-21 criteria (Antony et al., 1998), this group approximated mild depression and moderate anxiety levels. This is similar to previous research indicating that "burnout-engaged" individuals, such as students, may initially be motivated but are susceptible to burnout and depressive symptoms due to psychological pressures and performance expectations (Tuominen-Soini & Salmela-Aro, 2014). This interplay highlights the need for strategies that balance engagement with the capacity for disengagement to prevent chronic adverse effects on teachers' occupational well-being.

## Effects of individual-environmental interplay on teachers' occupational well-being at work

The decision tree model from this study offered a systematic analysis of factors impacting teachers' occupational well-being. Each pathway to occupational well-being profiles contains a blend of personal and contextual factors. This finding suggests that occupational well-being arises from the interplay between these environmental and individual influences, supporting the principle of person-environment interaction outlined in the ecosystem theory (Bronfenbrenner & Morris, 2006). Marital status was identified as a key predictor of occupational well-being profiles. This aligns with existing literature, where marital status significantly influences the levels of burnout and work engagement. Married teachers with children tend to show greater engagement, possibly due to a heightened sense of mission and the supportive networks that parenthood can bring (Jia et al., 2017; Lau et al., 2017). However, the dual pressures of work and family responsibilities can lead to burnout, especially when compounded by additional stressors such as serving as a class teacher or working at a key school (X. Li et al., 2021). Interestingly, while prior research viewed employment at key schools as advantageous (Ke et al., 2013), this study suggests it may instead be a risk factor for teacher occupational well-being. The demanding academic standards and rigorous performance evaluations at these schools might account for this increased risk.

Teaching experience also serves as a significant predictor but is nuanced by interactions with other individual and environmental variables. The decision tree suggests that less experienced teachers are more susceptible to burnout, while more experienced teachers tend to be associated with higher engagement, potentially due to increased professional competence and recognition (Kamtsios, 2018; Watts & Robertson, 2011). However, this relationship is not linear; experienced teachers earning lower incomes or those working under more demanding conditions—such as serving as the class teacher or teaching at key schools—may face a higher burnout level, suggesting that professional experience does not uniformly shield from the negative impacts of stressors (Agyapong et al., 2022).

Individual income plays a crucial role, directly impacting teachers' occupational well-being and interacting with external work-related factors like working hours and the role of being a class teacher. A higher income can provide resources for stress relief, promoting engagement,

and reducing burnout (Ptacek et al., 2019). Yet, this protective effect has its limits; high-income teachers facing excessive workloads also experience elevated burnout risk. This is consistent with the previous finding that excessive working hours, defined as more than 40–60 hours per week, are a major risk factor for burnout (Hu et al., 2016; Lin et al., 2021).

## PRACTICAL IMPLICATIONS

Our findings have several practical implications. First, using latent profile analysis, we identified three groups of Chinese teachers: the well-adjusted group characterized by high levels of engagement, the sub-optimal group with concurrent engagement and burnout, and the burnout group. The three groups are located at different points of the occupational well-being spectrum, accompanied by varied mental health statuses, and ask for varied intervention packages: the burnout group in urgent need of career intervention and mental health counseling from psychologists, fewer work demands and more resources from school administrators or principals, and more support from families; the sub-optimal group, i.e., the burnout-engaged group, in need of preventive measures from principles and psychologists, including methods to increase individual or work resources, and strategies to fight with stress; the engaged teachers can be further empowered by schools.

Second, based on our decision tree outputs, utilizing easily accessible demographic and background information, the present study provides educational administrators with an efficient method to select burnout or burnout-engaged teachers. For example, a married teacher, without children, and having five years or less of experience, might belong to the burnout-engaged group. Further examination could be manipulated and tailored prevention measures could be provided. In a word, this method can serve as the first step of fast screening for teachers in need.

Not only does this study help in screening teachers, but it is also helpful in designing specific intervention measures. The decision tree revealed how different variables interact and bring about stress or burnout. For instance, in our decision tree, income level was a critical determinant of occupational well-being for married teachers with extensive teaching experience, while job stress was more influential for married teachers with limited teaching experience. This suggests that offering fair compensation is a good strategy for experienced married teachers, whereas providing work support and reducing job stress are key for less experienced married teachers.

## LIMITATIONS AND FUTURE RESEARCH

This study has several limitations that suggest avenues for future research. Firstly, while it explored the link between occupational well-being profiles and mental health indicators including depression, anxiety, and stress through the conservation of resources theory, it did not address "context-free" well-being measures like life satisfaction and happiness. Future studies should incorporate these to provide a more holistic understanding of well-being. Another fruitful area for future exploration is examining the antecedents of these three profiles in relation to various job stress models. For example, the Job Demand-Control-Support Theory suggests that high job demands need not lead to excessive stress (and Burnout) if there is sufficient control and autonomy afforded the worker with appropriate organizational support (Karasek & Theorell, 1990; van der Doef & Maes, 1999). Additionally, factors such as personal agency, and

elements within the macro-system of the ecosystem theory such as cultural values, could also be incorporated to expand the analytical framework for understanding teachers' occupational well-being. Lastly, the reliance on decision tree algorithms in this study presents an opportunity for methodological expansion. Future research could benefit from employing diverse analytical techniques, including Random Forests and Support Vector Machines, to validate and expand upon the current study's findings.

## CONCLUSION

The study utilized latent profile and decision tree analyses to delineate unique occupational well-being profiles among Chinese educators, integrating both extrinsic and intrinsic factors. By assessing burnout (emotional exhaustion, cynicism, reduced efficacy) and engagement (vigor, dedication, absorption), three distinct profiles emerged: high burnout, high engagement, and a dual profile of burnout and engagement. The research also uncovered significant disparities in stress, anxiety, and depression across these profiles. The decision tree analysis pinpointed marital status as the key determinant, with variables such as class teacher role, experience, school hours, income, and school type interplaying to shape these profiles. These findings underscore the intricate, non-linear dynamics between these variables and well-being, offering a sophisticated perspective on the factors that define the occupational well-being profiles of teachers. Finally, our current study adds to the growing non-Western studies aimed at countering the Western bias in psychological science (Henrich et al., 2010).

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### CONFLICT OF INTEREST STATEMENT
The authors declare no conflict of interest.

### DATA AVAILABILITY STATEMENT
The data that support the findings of this study is openly available at https://doi.org/10.6084/m9.figshare.27241167.v1

### ETHICS STATEMENT
The study received ethical approval from the Ethical Review Committee of Shanghai Normal University (SHNU Ethics [2024] no. 76).

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## APPENDIX: DESCRIPTIVE STATISTICS AND ZERO-ORDER CORRELATIONS AMONG RESEARCH VARIABLES(N = 366)

| | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Exhaustion | 3.01 | 1.00 | 1 | | | | | | | | |
| Cynicism | 2.36 | 1.04 | .70** | 1 | | | | | | | |
| Personal accomplishment | 2.15 | .75 | .18** | .34** | 1 | | | | | | |
| Vigor | 3.52 | 1.05 | −.39** | −.50** | −.44** | 1 | | | | | |
| Dedication | 3.75 | 1.09 | −.40** | −.54** | −.47** | .85** | 1 | | | | |
| Absorption | 3.54 | 1.17 | −.36** | −.50** | −.45** | .91** | .87** | 1 | | | |
| Stress | 11.09 | 9.44 | .53** | .54** | .18** | −.23** | −.24** | −.21** | 1 | | |
| Anxiety | 9.72 | 8.18 | .49** | .48** | .15** | −.17** | −.19** | −.15** | .87** | 1 | |
| Depression | 7.46 | 8.72 | .53** | .58** | .22** | −.27** | −.32** | −.26** | .86** | .84** | 1 |

*Note*: 1, Exhaustion; 2, Cynicism; 3, Personal accomplishment; 4, Vigor; 5, Dedication; 6, Absorption; 7, Stress; 8, Anxiety; 9. Depression.

## APPENDIX: FIT INDICES FOR OCCUPATIONAL MENTAL HEALTH PROFILES

| | AIC | BIC | aBIC | Entropy | LMR-LRT | BLRT | Class size per profile |
|---|---|---|---|---|---|---|---|
| 1-Profile | 6249.97 | 6296.80 | 6258.73 | | | | |
| 2-Profile | 5562.61 | 5636.76 | 5576.48 | .86 | .03 | .00 | 248/118 |
| 3-Profile | 5222.83 | 5324.30 | 5241.81 | .95 | .00 | .00 | 248/88/30 |
| 4-Profile | 4947.83 | 5076.62 | 4971.93 | .91 | .10 | .00 | 130/65/18/153 |

*Note*: AIC, Akaike Information Criterion; BIC, Bayesian information criterion; aBIC, sample-size adjusted Bayesian information criterion; LMR-LRT, Lo–Mendell–Rubin adjusted likelihood ratio test; BLRT, Bootstrap Likelihood Ratio Test.