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An Investigation into the Variables Affecting School Principals' Burnout through XGBoost Method

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ABSTRACT

The present study aims to investigate the impact of organizational psychological capital, organizational citizenship behavior, individual performance, and various demographic variables on school principals' burnout in public schools. The opinions of principals working in Diyarbakır province and districts between the years of 2016- 2017 were considered. This research employed a survey model, which falls under the quantitative research paradigm. Data were collected from 254 principals through the administration of the Organizational Psychological Capital Scale, Organizational Citizenship Behavior Scale, Individual Performance Scale, and School Principal Burnout Scale. The collected data were analyzed using the Extreme Gradient Boosting (XGBoost) mining method. The findings revealed several key predictors of principals' burnout, including altruism, resilience, professional seniority, individual performance, civic virtue, type of school, hope, sportsmanship, school principal's length of service, marital status, optimism and the district of the school. Based on these results, it is recommended to alleviate principals' burnout by reducing their responsibilities and creating conducive environments that foster their leadership roles.

Okul Müdürlerinin Tükenmişliğini Etkileyen Değişkenlerin XGBoost Yöntemi ile İncelenmesi

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ÖZ

Bu araştırmanın amacı, kamu okullarında görev yapan okul müdürlerinin görüşleri doğrultusunda örgütsel psikolojik sermayenin, örgütsel vatandaşlığın, bireysel performansın ve çeşitli demografik değişkenlerin okul müdürlerinin tükenmişliğini ne düzeyde etkilediğini tespit etmektir. Diyarbakır merkez ve ilçelerde görev yapan toplamda 254 okul müdürü ile gerçekleştirilen araştırmada veri toplama aracı olarak Psikolojik Sermaye Ölçeği, Örgütsel Vatandaşlık Davranış Ölçeği, Bireysel Performans Ölçeği ve Okul Müdürleri Tükenmişlik Ölçeği kullanılmıştır. Araştırma nicel araştırma yöntemlerinden betimsel yönde tarama araştırmaları modelinde tasarlanmıştır. Verilerin analizi *Extreme Gradient Boosting (XGBoost) veri madenciliği yöntemi* kullanılarak gerçekleştirilmiştir. Analiz sonucunda okul müdürlerinin tükenmişliklerinin en önemli yordayıcılarının sırasıyla; yardımlaşma, psikolojik dayanıklılık, mesleki kıdem, bireysel performans, sivil erdem, okul türü, umut, centilmenlik, okul müdürünün hizmet süresi, medeni durum, iyimserlik, okulun bulunduğu yerleşim yeri olduğu tespit edilmiştir. Bu kapsamda okul müdürlerinin tükenmişliklerinin önüne geçmek için okul müdürlerinin sorumluluklarının azaltılarak liderlik rolünü gerçekleştirecekleri ortamların yaratılması önerilmektedir.

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INTRODUCTION

The determination of variables influencing organizational efficiency has been considered as a key factor for the sustainability. Initially, although such financial capital resources that cannot be easily copied by competitors as business, equipment, technology or patent has been thought to be of importance for organization's sustainability and competitive advantage, it has been seen that vision, long-term approaches to planning and decision-making , employee-oriented leadership or harmony within the organization play a pivotal role instead of financial components when the financial situation of individual businesses achieve the same level. Thus, people are acknowledged to be the organization's most crucial asset (Bozek, 2015), thereby forming a basis for achieving the organization's goals. It is possible for human resources to act in line with common goals with the management's proper functioning. In educational organizations, school principals are responsible for achieving goals and providing direction for teachers, students, and parents, in other words, the stakeholders within the school. Principals assume responsibility for ensuring the schools' efficiency by creating an alliance between material and human resources in addition to enacting to support all stakeholders in overcoming problems encountered in the school.
School principals are practically assigned responsibility for teachers, school buses, parents, canteen, training and curriculum supervision and all aspects concerning the school. The principal is responsible for all managerial tasks and the aforementioned aspects become complicated day by day (Grubb & Flessa, 2009). Principals have the complex responsibility for managing the school, guiding teachers, communicating with external stakeholders; moreover, they are routinely in charge of finances, personnel management, legal issues arising in their schools and student learning (Beausaert et al., 2016). It can then be stated that principals fulfil numerous roles. Furthermore, when they lag behind these roles, principals may question their leadership competences, causing a sense of discontentment and non-accomplishment. This can lead to increased stress and possibly burnout (Friedman, 2002). Many studies on school principals' burnout have revealed that prolonged period of office (Kelley & Gill, 1993), stress (Cherniss, 1988; Gmelch et al., 1994) and lack of experience (Callison, 1993) lead to burnout. Further research on the factors affecting principal burnout appears to be warranted. This paper is designed to investigate the effects of organizational psychological capital, organizational citizenship behavior and individual performance on school principals' burnout based on their views through data mining method.

Organizational Psychological Capital

Organizational psychological capital is a term emerging on the basis of positive psychology (Avey et al., 2008; Çetin & Basım, 2012). Seligman (2002), the pioneer of positive psychology, stated that after a conversation with his daughter he realized that examining people was much more than focusing on the wrong/ weak things. Seligman in his now famous 1998 American Psychological Association presidential address made the call for a "positive psychology" that explicitly focuses on studying and understanding "normal" people's well-being, productivity, optimal functioning, and realizing one's full potential (Luthans &Yousef-Morgan, 2017). Accordingly, a theory and approach were initiated encompassing a numerous positive-oriented forces, such as traits, skills, virtues, happiness etc. by highlighting the importance of focusing on the wrong things in people (Luthans & Yousef, 2004).

Positive psychology has paved the way for two related movements administering positivity and power-based management in businesses. The first was Positive Organizational Scholarship (POS), based on the works of the researchers at the University of Michigan, which can foster effectivity in times of crisis and adverse conditions and the second was the Positive Organizational Behavior (POB) that was the study of positively oriented strengths and capacities to be measured in today's workplace suggested by Luthans and his colleagues (Luthans & Youssef, 2004). POB focuses more on specific positive constructs whereas POS is an umbrella concept. POB is defined as the study and application of positively oriented human resources strengths and psychological capacities that can be measured, developed, and effectively managed for performance improvement in today's workplace (Luthans & Youssef-Morgan, 2017). With Luthans and his colleagues' emphasis on positive powers of individuals as the core following the analysis of characteristics and differences of economic, human, and social capital, the concept of "psychological capital" (Zhao & Hou, 2009) was set forth.

Psychological capital is defined as the core of POB and psychological elements of individuals' general

positive nature (Luthans et al., 2006). Psychological capital also refers to a person's sense of his/her ability to successfully utilize the financial, human and/or social capital s/he brings to an organization in a productive manner (Envick, 2005). It basically focuses on what individuals are and what they will be in the future, emphasizing their developable and changeable aspects rather than settled personal traits (Erkuş & Fındıklı, 2013).

Psychological capital integrates four POB resources: hope, efficacy, resilience and optimism (Luthans & Youssef-Morgan, 2017; Luthans & Youssef, 2004). *Efficacy i*s defined as the individual's conviction about his/her abilities to mobilize the motivation, cognitive resources and courses of action needed to execute a specific task. Self-efficient people choose challenging tasks and pursuit and strive to achieve their goals and persevere when faced with obstacles (Luthans & Youssef, 2004). *Hope* is defined as a positive motivational state based on an interactively derived sense of successful goal-directed energy and planning to meet goals (Snyder, 2002). *Optimism i*s a positive explanatory style that attributes positive events to personal, permanent, and pervasive causes, and interprets negative events in terms of external, temporary and situation-specific factors. *Resilience* is defined as the capacity to rebound from adversity, conflict, failure or even positive events and increased responsibility (Luthans & Youssef, 2004). Individuals with high level of resilience tend to be more effective in various life processes (Luthans et al., 2005). Individuals with high level of these four components can have a variety of positive psychological resources to deal with the challenges of organizational change (Avey et al., 2008).

Organizational Citizenship Behavior (OCB)

The foundations of OCB are rooted in Barnard 1938 and the notion that individuals' willingness to cooperate is crucially important and, similarly, Katz, in 1964, alludes to OCB with its assertion that joining and staying with the organization is necessary to organizational functioning (Borman, 2004). Katz and Kahn (1977) extend this idea by describing spontaneous behaviors that are intrinsically cooperative and absolutely necessary to organizational functioning. Bateman and Organ (1983) were influenced by these ideas and defined organizational citizenship behavior.

Organ (1997) defined OCB as individual behavior that is discretionary, not directly or explicitly recognized by the formal reward system and that in the aggregate promotes organization's effective functioning. In this context, it is stated that OCB has a significant impact on organizational output (İpek, 2012) and is critical in the survival of the organization (Jahangir et al., 2004)

According to Organ (1988), OCB has five dimensions including altruism, civic virtue, conscientiousness, courtesy, and sportsmanship. *Altruism* is defined as voluntarily helping others with work-related issues or preventing problems such as helping new co-workers or allocating time to others. *Civic virtue*, related to the interests of the organization, is all about willingness to contribute actively to its governance (Jahangir et al., 2004). *Conscientiousness* is referred to adherence with the standards, guidelines and regulations even when the behavior is not monitored or controlled. The employee who cannot complete his/her work within the working time strives to complete it out of the working time and to go to work even when s/he is sick (Urgan & Erdoğan, 2021). *Courtesy* refers to discretionary behaviors preventing work-related problems with other co-workers. It is the anticipation of possible problems, informing and warning colleagues in advance against threatening factors (Podsakoff et al., 2000; Kandlousi et al., 2010). *Sportsmanship* is all about the willingness to tolerate the inevitable drawbacks and impositions without complaining. Not complaining when disturbed, showing positive attitudes even if things are not going well can be given as examples (Podsakoff et al., 2000).

Individual Performance

The concept of performance is used to describe various situations such as capacity to do a job, power to influence, and endurance. It is generally defined as an indicator of the extent to which the specified level has been reached (Küçük, 2017). It is also considered as a function of the relationship between what the employee should do in his/her task and what s/he actually does (Başaran, 2008). Accordingly, performance which is critical for the institution's success and future plans (Uludağ, 2018) can be stated to be related to the efficiency and effectiveness of purposeful actions (Neely et al., 1995).

Various elements comprise of individual performance in organizations such as *focusing* (the employee is aware of what s/he does), *competence* (the employee has the skills related to his/her job) and *commitment* (the employee is willing to contribute). These elements can be considered separate or intertwined, yet high individual performance requires all of them together (Kuşçu-Karatepe et al., 2019; Paşa, 2007).

Burnout

The phenomenon of burnout became popular in the mid-1970s as a description of negative reactions against work, notably in human-service settings, and was addressed in numerous symposia (Söderfeldt et al., 1995). Generally identified as a form of job stress, burnout is a syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishment occurring among individuals doing "people-work" of some kind (Maslach & Jackson, 1985). Burnout is also considered as a syndrome including varying levels of dissatisfaction, physical exhaustion, helplessness, hopelessness, disappointment about the profession, a negative self-perception, and having negative feelings towards his/her work and colleagues (Durak & Seferoğlu, 2017).

Maslach and Jackson (1981) conceptualize burnout as a response to chronic work stress. There are three stages to stress: alarm, resistance and exhaustion. In the alarm stage, the individual perceives any external stimulus as a stressing factor. The individual feeling that his/her physical and spiritual limits are being pushed, attempts to return to the old order of harmony by fight-or-flight response and shows a resistance. In the resistance stage, the individual attempts to return to "a normal balance" after the negative effects of the stress factor are dealt with. However, if the stimulus is severe and the individual is unable to eliminate the negative effects while trying to combat stress for an extended period, the exhaustion stage occurs (Sağlam-Arı & Çına-Bal, 2008).

The most accepted categories of burnout are as follows: bodily or mental exhaustion, non-fulfillment, and depersonalization (Friedman, 1995). *Mental exhaustion* is often regarded as a state of exhaustion resulting from the excess of desired psychological and emotional demands when helping other people. Non-fulfillment is considered as the constant failure of efforts made to yield positive results. Depersonalization refers to treating people as if they were objects (Tümkaya, 1996). Burnout can occur at various stages of work life, and its components can also emerge in different variations based on working situations (Sağlam-Arı & Çına-Bal, 2008).

Objective

The present study aims to investigate the extent to which organizational psychological capital, organizational citizenship behavior, individual performance and various demographic variables affect school principals' burnout in line with the opinions of the principals working in public schools. To this end, following question guided the study:

Depending on the data obtained from school principals, what are the significance levels of principals' burnout for various predictors based on XGBoost model?

METHOD

The research aligned with survey model, one of quantitative research models. In survey model, research data regarding a group is gathered as a result of examinations on sample (Leedy & Ormrod, 2005).

Data

The data were obtained from 276 principals working in Diyarbakır province and districts between 2016-2017. Excluding 12 improperly-responded questionnaire, the data from 264 participants were taken into consideration. The data from 10 principals were deleted due to incomplete data. A total of 254 principals constitutes the sample of this study.

Data Collection Instruments

The Organizational Psychological Capital Scale (Çetin & Basım, 2012), organizational citizenship behavior scale (Polat & Celep, 2008), individual performance scale (Aydoğan & Kara, 2015) and school principal burnout scale (Özer et al., 2012) were used and a questionnaire including demographic information regarding principals was administered. Factor analysis methods and McDonald's omega coefficient were employed to provide evidence

for the reliability and validity of the scales and the evidence are presented below. For factor analysis methods RMSEA values equal to or less than 0,08 are interpreted as acceptable (Lomax & Schumacher, 2004) and CFI, GFI, AGFI values equal to or greater than 0,90 are indicative of a good fit (Sümer, 2000). The values equal to 0,90 are interpreted as a good fit.

Psychological capital scale consists of 21 items developed by Luthans et al., (2007) and adapted into Turkish by Çetin & Basım (2012). Based on the results of explanatory factor analysis, the scale consists of four dimensions: *optimism* (ranging between 0,45 and 0,62) (4 items); *resilience* (0,50 – 0,72) (5 items); *hope* (0,48 – 0,71) (6 items) and self-efficacy (0,64 – 0,73) (6 items). At the end of confirmatory analysis, the ratio of chi-square statistics of the scale to degrees of freedom was found CFI (0,88), GFI (0,90), AGFI (0,89) and RMSEA (0,077), indicating that the scale reached adequate matching values. Since it was found that factor loads of the items were not equal, the reliability was calculated through McDonald's omega coefficient (Yurdagül, 2006) and coefficients of sub-dimensions of the scale were found as 0.81 for *optimism*, 0.83 for *resilience*, 0.84 for *hope* and 0.89 for *self-efficacy*. Total coefficient of the scale was found as 0.87, being at acceptable levels.

Organizational citizenship behavior scale developed by Podsakoff et al. (1990) and adapted into Turkish Polat and Celep (2008) consists of 20 items. According to the results of explanatory factor analysis, the scale includes four dimensions: *altruism* (0, 61 the lowest and 0,74 the highest) (8 items); *sportsmanship* (0,64 – 0,84) (4 items); *conscientiousness* (0,78 – 0,83) (4 items) and *civic virtue* (0,49 – 0,79) (4 items). Three items to be responded by teachers under conscientiousness dimension (*"I don't take extra or long breaks while on duty"*, *"My attendance at work is above the norm"*, *"I obey organizational rules even when no one is watching")* were excluded from the scale since the sample was consisted of principals and there was one item left (*"I get to my work on time"*), less than three items, the aforementioned dimension (4 items) was excluded from the scale, thereby administering with three dimensions. Therefore, explanatory factor analysis (EFA) was re-applied and based on KMO coefficient (0,869) and Barlett's test of sphericity (p=0,00), the study group were deemed suitable, and data were deemed fit for factor analysis. It was also revealed that the three-dimensional structure was maintained consisting of 16 items, *altruism* (ranging between 0,57 and 0,68) (8 items), *sportsmanship* (0,44 – 0,80) (4 items) and *civic virtue* (0,69 – 0,80) (4 items) with %52,70 variance accounted for total variance. Since the factor loads of the items are not equal, reliability was computed via McDonald's omega coefficient (Yurdagül, 2006), and the values for *Altruism* were 0.82, for *Sportsmanship* 0.81 and for *Civic Virtue* 0.83. The reliability of the scale was 0.85, deemed fit for reliability.

Individual Performance scale developed by Sigler and Pearson (2000) and adapted in to Turkish by Aydoğan and Kara (2015) is one-dimensional scale consisting of 4 items. At the end of exploratory factor analysis (EFA), the lowest factor load was found as 0,54 and 0,77 the highest. In the next step, based on the results of the confirmatory factor analysis, following results have been produced: ($\chi 2/df$) 2,1 ($\chi 2$=4,309 df=2), CFI (0,97), GFI (0,98), AGFI (0,90), and RMSEA (0,026), having acceptable fit and justifying one-dimensional structure. Since the factor loads of the items are not equal, reliability was computed via McDonald's omega coefficient (Yurdagül, 2006), and reliability was found as 0,81, deemed acceptable.

School principal burnout scale developed by Friedman (2002) and adapted into Turkish by Özer et al. (2012) consists of 20 items. At the end of the explanatory factor analysis, it is a three-dimensional scale consisting of *depersonalization* factor (ranging between 0,46 and 0,81) (6 items), *exhaustion* factor (0,59 – 0,83) (8 items) and *personal accomplishment* factor (0,55 - 0,72) (5 items). The confirmatory factor analysis results indicated that CFI (0,93), GFI (0,89), AGFI (0,86), and RMSEA (0,069) were within the acceptable values. The factor loads of the items are not equal, reliability was computed via McDonald's omega coefficient (Yurdagül, 2006). The results were found "0,88" *depersonalization* factor, "0,91" *exhaustion* factor and "0,83" *personal accomplishment* factor. The reliability of the scale was found as 0,92, deemed acceptable.

In the study, in addition to the scales, demographic and personal information regarding principals were also presented in Table 1.

Table 1. *Descriptive statistics on predictive variables*

Predictors	Variables	Categories	%
Gender	Nominal	Female	15.7
		Male	84.3
Education Level	Ordinal	Bachelor's degree	83.5
		Master's degree	16.5
Marital Status	Nominal	Married	76.4
		Unmarried	23.6
Type of the School	Ordinal	Preschool	2
		Primary School	50.8
		Secondary School	24.4
		High School	22.8
District of the School	Nominal	Central district	42.9
		County town	18.1
		Village/ Neighbourhood area	39
School Principal's Length of Service	Ordinal	>5	49.2
		5-9	28.7
		10- 14	12.2
		≥ 15	9.8
Professional Seniority	Nominal	>5	8.7
		5-9	17.7
		10- 14	24.4
		15- 19	22.8
		20- 24	15.7
		≥ 25	10.6
Branch	Nominal	Classroom Teacher	46.5
		Numerical Courses	16.2
		Verbal Courses	29.5
		Applied Courses	7.9

The demographic and personal information seen in Table 1 was selected considering that they may affect the principals' burnout levels and the questionnaires were developed accordingly.

A Priori Methods (Testing the Assumptions).

Various assumptions have been tested to decide the analysis methods (parametric or non-parametric) to be used in data analysis. The normality assumption was initially tested and not ensured both by Kolmogorov Smirnov ($p<0,05$) test and skewness (0,903/0,153=5,901) and kurtosis (0,654/0,304=2,151). The scatterplot of standardized residuals and variables were examined, and it was observed that the variables showed an elliptical curve with the dependent variable and assumption of linearity was not provided. Levene's test results for homogeneity were monitored ($p<0,05$) and it was seen that the homogeneity of variances was not ensured. Therefore, in this study, apart from parametric tests (ANOVA, Regression, t- test etc.), the "Extreme Gradient Boosting (xgboost)" analysis

method, one of Ensemble Learning methods, which is a non-parametric test not requiring to ensure assumptions, was used. The Tolerance and Variance Inflation Factor (VIF) were considered among the variables in the analysis, and it was tested whether there was multi-collinearity. VIF values >10 and Tolerance values <0.1 are usually considered as evidence for substantial multicollinearity (Keller et al., 2012). In this dataset, for all variables (by dummy coding in categorical variables), VIF values ranged from 1,162 to 2738 and Tolerance values from 0,420 to 0,610, indicating no multicollinearity among the variables.

Analysis

Extreme Gradient Boosting (XGBoost) Data Mining Method was initially developed Chen ve Guestrin (2016). It is an analysis method based on boosting algorithm and notably used in classification and regression (Chen & Guestrin, 2016). Ensemble methods are based on the idea of combining multiple models to generate a stronger model. Based on the gradient boosting method, XGBoost creates a stronger model by combining multiple weak learners (usually decision trees). It is a mining method combining the predictions of numerous weak models (decision trees) to create strong and accurate model. XGBoost uses a method computing significance levels to optimize the trees' structures (Wade, 2020). While creating XGBoost tree structure, the significance levels are calculated and optimize the tree structure based on this significance order (Chen & Guestrin, 2016). Thus, characteristics with less significance are located at lower levels in the tree whereas more significant characteristics are at higher levels. This method allows trees to branch less and be more elaborative, ensuring better generalization. XGBoost is a method operating quickly and yielding accurate results even on large datasets (Wade, 2020). It is also resistant to overfitting and easy to use (Osman et al., 2021). XGBoost is an algorithm giving successful results notably in Kaggle competitions in data science field (competition held in data mining, machine learning, artificial intelligence etc.) (Wade, 2020; Zopluoğlu, 2019) and widely used in various disciplines such as health, engineering and education.

In Education, Zopluoğlu (2019) classified students' fraudulent behaviors in an exam on a dataset observed from large-scale tests through XGBoost. Jeganathan et al. (2022) conducted a study to forecast the academic achievement of immigrant students in terms of various variables via XGBoost and other mining methods by using PISA data. Guang-yu and Geng (2019) used XGBoost method to predict the behavior styles and academic achievement of university students through XGBoost model in their study. Woo and Kim (2022) investigated the effect of learning orientation on the modelling stage based on gender via XGBoost model. Nirmala et al. (2022) compared the performance of Random Forest and XGBoost models in predicting the completion status of the students reaching the maximum length of study.

Performance Criteria of the Models

Mean Squared Error (MSE)

$$MSE = \frac{1}{n}\sum_{i=1}^{n}(\hat{y}_i - y_i)^2$$

In data mining and machine learning, it is a statistical measurement to assess the accuracy of the prediction/ predictor, giving the proximity of a series of points to the regression curve. It is also defined as the average squared difference between the estimated values and the actual value. MSE measures the average of the squares of the errors and is always strictly positive (not zero) and MSE's being to zero indicates that the predictor accurately performs.

Root Mean Square Error (*RMSE)*

$$RMSE = \sqrt{\sum_{i=1}^{n}\frac{(\hat{y}_i - y_i)^2}{n}}$$

Root Mean Squared Error (RMSE) measures the average difference between values predicted by a model and the actual values and has the same units as the quantity being estimated. As in MSE, a value close to zero represents better quality of the estimator/ predictor.

Mean Absolute Error (MAE)

$$MAE = \frac{\sum_{i=1}^{n} |\hat{y}_i - y_i|}{n}$$

Mean Absolute Error and Root Mean Squared Error are similar, yet MAE is the average absolute error between actual and predicted values, without considering their direction. MAE provides a measure of average absolute difference between predicted and actual values and has the same units as the quantity. Unlike MSE and RMSE, MAE gives the same weight to all errors, making it more robust against outliers. In general, lower MAE values reveal better model performance since they indicate that the predicted values are closer to the actual ones.

Coefficient of Determination- R^2

$$R^2 = 1 - \frac{\sum_i (\hat{y}_i - y_i)^2}{\sum_i (\hat{y} - y_i)^2}$$

Coefficient of Determination (R^2) is a statistical measurement representing the goodness of fit of a regression model. It shows the proportion of the variation in the dependent variable that is predictable from the independent variable(s), ranging from 0 to 1.

Ethic

Within the scope of taking ethical principles as a basis in the research, dated 24-03-2023 and 2023/07-09 numbered ethics committee approval of Van Yuzuncu Yıl University Social and Human Sciences Scientific Research Publication Ethics Committee was obtained.

FINDINGS

This section covers the obtained results in terms of the metric values of the research. The default values of the Orange 3.34 package program were used as a base for XGBoost mining model. Accordingly, the model was set up as %70 training data and %30 testing data. The values for this model are presented in Table 2.

Table 2. *Performance Criteria of XGBoost Model*

	MSE	RMSE	MAE	R^2
Extreme Gradient Boosting (XGBoost)	107.949	10.390	7.943	0.355

As noted in Table 2, MSE was found as 107.949; RMSE as 10.390; MAE as 7.943 and R^2 as 0,355. The values of RMSE and MAE were found to be close to zero. The total explained variance was found as %35,5, indicating that the independent variables included in the study accounted for %35 of the dependent variable. The model set up in Orange data mining program using xgboost package of the python programming language is illustrated in Figure 1.

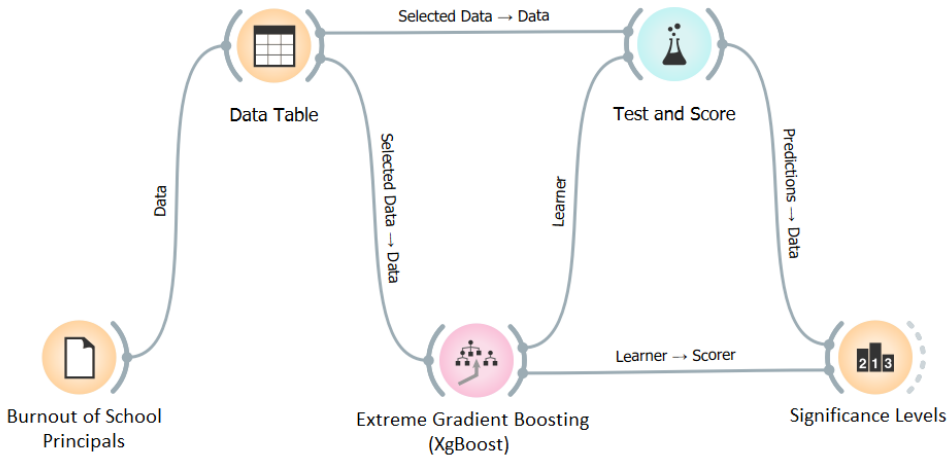


Figure 1. Diagram of the XGBoost Model Set up in the Orange Package Program

The variables included in the model and the most significant predictors obtained on the dependent variable are given in Table 3.

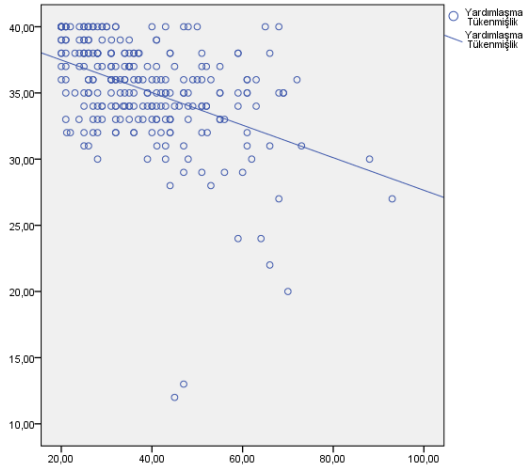
Table 3. *Significance Levels of Variables Affecting School Principals'*

	Variables	Type of Data	Significance Level	Percentage
1	Altruism	Numerical	0,1697	%16,97
2	Resilience	Numerical	0,1209	%12,09
3	Professional Seniority	Categorical (6)[1]	0,1063	%10,63
4	Individual Performance	Numerical	0,0867	%8,67
5	Civic Virtue	Numerical	0,0741	%7,41
6	Type of the School	Categorical (2)[2]	0,0559	%5,59
7	Hope	Numerical	0,0446	%4,46
8	Sportsmanship	Numerical	0,0375	%3,75
9	School Principal's Length of Service	Categorical (4)[3]	0,0351	%3,51
10	Self-efficacy	Numerical	0,0286	%2,86
11	Optimism	Numerical	0,0267	%2,67
12	Marital Status	Categorical (2)[4]	0,0244	%2,44
13	District of the School	Categorical (3)[5]	0,0215	%2,15
14	Branch	Categorical (1)[6]	0,0081	%0,81
15	Education Level	Categorical (2)[7]	0,0026	%0,26
16	Gender	Categorical (2)[8]	0,0015	%0,15

[1]Categorical 6: "25 and above" [2] Categorical 2: "Primary School" [3] Categorical 4: "15 and above" [4] Categorical 2: "Married" [5] Categorical 3: "Village/Neighbourhood"[6] Categorical 1: "Classroom Teacher"[7] Categorical 2: "Master's degree"[8]Categorical 2: "Male"

Examining Table 3, the most important predictors of principals' burnout were revealed as altruism, resilience, professional seniority, individual performance, civic virtue, type of the school, hope, sportsmanship, school principal's length of service, self-efficacy, optimism, marital status, district of the school, branch, education level and gender respectively. The significance levels of categorical variables on principals' burnout were listed as their sub-categories found significant in the model. According to Table 3, principals with professional seniority (6) of 25 years and above have higher burnout levels; as type of schools (2), primary school principals have higher

burnout levels; in terms of length of service (4), principals with 15 years or more of service have higher burnout levels; as marital status (2), married principals have higher burnout levels and in terms of district of the school (3) principals in the neighborhood/ village area have higher burnout levels. The significance levels of the last three independent variables were not interpreted since they were close to zero. The scatterplots indicating the correlation between numerical variables among independent ones and school belonging are as follows:



2a

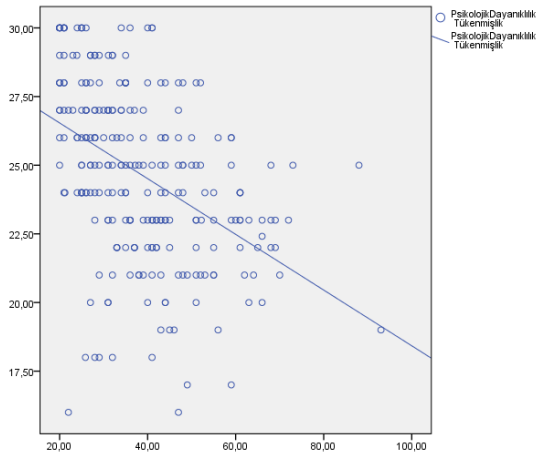


Figure 2b

Figure

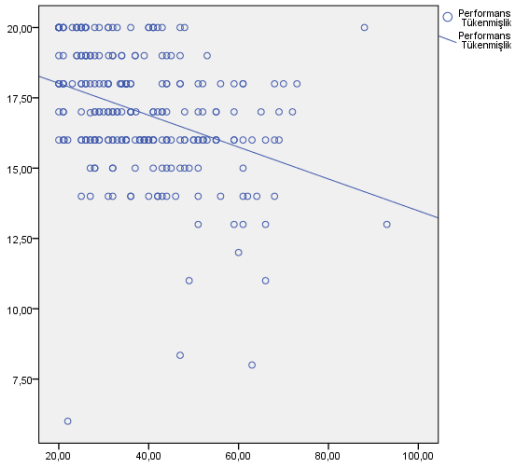


Figure 2c

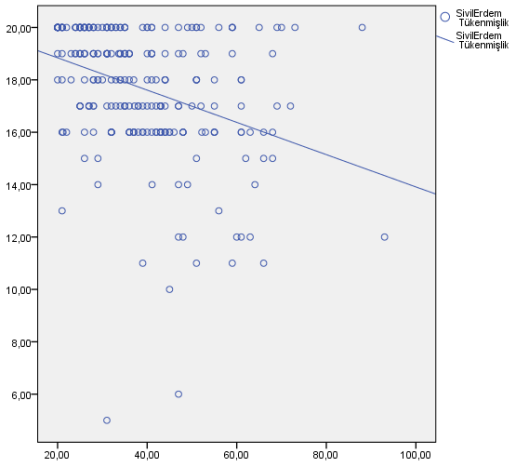
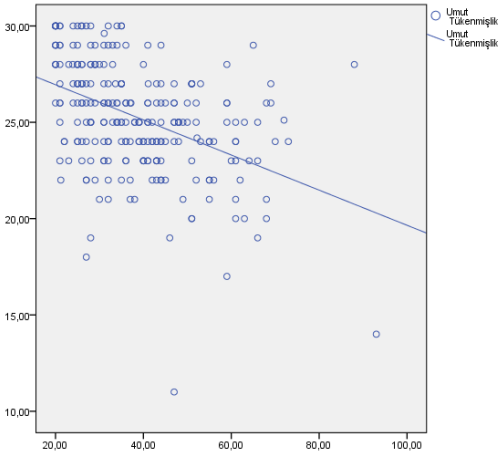


Figure 2d



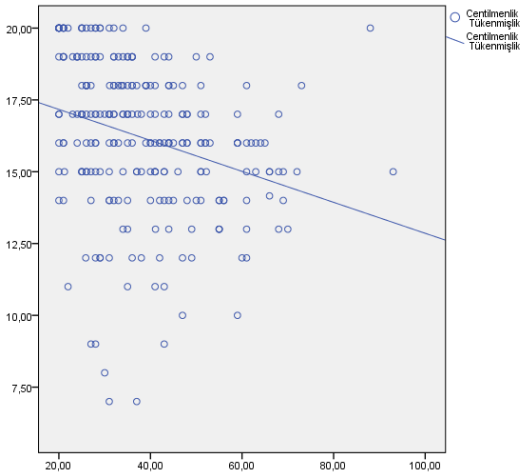


Figure 2e

Figure 2f

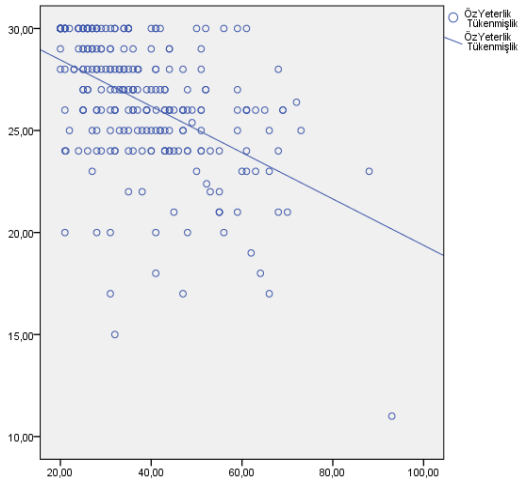


Figure 2g

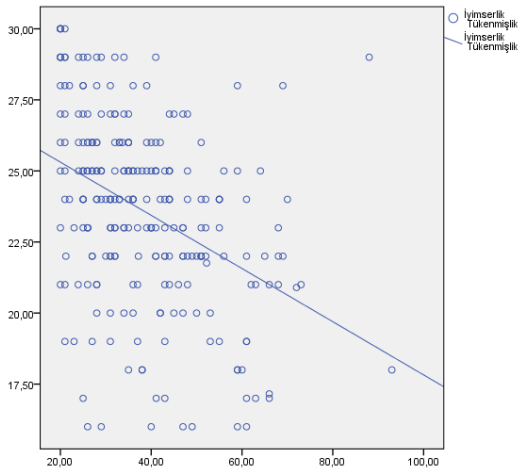


Figure 2h

As displayed in Figure 2, a negative association between school principals' burnout and numerical variables obtained at the scale level is observed. Figure 2a shows that as *altruism* decreases, principals' burnout level increases. Figure 2b reveals that as *resilience* decreases, principals' burnout level increases. Figure 2c indicates that as *individual performance* decreases, principals' burnout level increases. According to Figure 2d, as *civic virtue* decreases, principals' burnout level increases. Figure 2e shows that as *hope* decreases, principals' burnout level increases. Figure 2f indicates that as *sportsmanship* decreases, principals' burnout levels increase. According to 2g, as *self-efficacy* decreases, principals' burnout level increases. Finally, Figure 2h indicates that as *optimism* decreases, principals' burnout level increases.

CONCLUSION AND SUGGESTIONS

The research reveals that the most significant effect on the principals' burnout is the sub-dimension of altruism of organizational citizenship behavior. Altruism is regarded as all direct or indirect voluntary behaviors of employees to aid other employees in organizational tasks and problems. An experienced manager who teaches the rules of the business to a new manager even though it is not in his/ her job description can be considered in this context (Yılmaz, 2020). In the same vein, although it is not in his/ her job description, it can be considered in this context that the principal explains to newly appointed teacher how to communicate with students, informs about the institution, and helps the teacher communicate the parents. It can be stated that as the principal's behaviors of altruism increase, s/he may regard himself/ herself as more competent, self-confident, and having high level of communication skills, which may reflect positively on the roles s/he assumes and adversely affecting burnout. Yıldırım (2009) concluded that altruism was the second most important value by primary school principals. There are studies yielding corresponding results regarding this correlation. In her study with classroom teachers, Yücel (2006) found that altruism had a significant and negative effect on burnout. The research also revealed that burnout level would increase as altruism decreased. Similarly, Sezgin and Kılınç (2012) in their study with primary classroom teachers found that altruism had a negative effect on burnout. In a meta-analysis by Doğru (2018), including 103 studies, a negative relationship was revealed between the altruism dimension of organizational citizenship behavior and burnout.

The second important effect observed in the study on principals' burnout is resilience sub-dimension of psychological capital. Psychological resiliency is defined as the capacity to sustain and bounce back from adversity, conflict, and failure and even beyond to attain success (Luthans et al., 2006). It is argued that if one wants to be successful in distressing situations, there is a need for endurance (Maddi, 2002). Considering burnout as a reaction to stressors at work (Maslach, 2003), the negative effect of resilience on burnout becomes clear. The similar results were yielded in studies conducted by Ocak and Güler (2017) with teachers and by Çelikkaleli (2020) with university students.

The findings revealed that professional seniority had a significant effect on principals' burnout and that the principals with 25or more years of service had higher burnout levels. Given that school principals also have teaching experience, they have experiences in conducting educational activities as well as leadership experiences in implementation of these activities. Principals deal with school personnel, students and parents during daily working hours as well as coping with different expectations from inner and external environment of the school (Özer et al., 2012). Accordingly, they fulfill vital roles; however, the professional world of principals is characterized by overwhelming responsibilities, information perplexity and emotional anxiety. A good principal must be both a professional educator, a leader and a successful manager (Friedman, 2002). Principals are often subjected to the pressure and burden stemming from inner and external environment. Therefore, the roles required to be assumed can become more complicated by the day and exert pressure on principals, providing insight into the effect of principals' prolonged experiences on burnout (Durak & Seferoğlu, 2017; Sönmez, 2010). Previous research on teachers shows that as professional seniority increases, burnout levels also increase (Duras, 2022; Dinç & Ilgar, 2021; Yavuz & Yıkmış, 2021). DeMathews et al. (2019) and Izgar (2000) found that principals having more professional seniority had lower burnout levels.

In the research, it was found that the third factor having a significant effect on principals' burnout is individual performance. As individual performance decreases, principals' burnout increases. Individual performance is defined as the competencies used by the individual in order for the organization to achieve its goals (Büte, 2011). The efforts made by principals in achieving the school's objectives and management can be regarded as their performance. As the principal realized that s/he fulfilled his/ her responsibilities and that s/he was effective, reducing their burnout. Studies yielding similar results can be found in the literature. Doğan and Kır (2018) detected a negative correlation between individual performance and burnout on state and private hospital employees. Wright and Bonett (1997) found a negative relationship between burnout and performance on public sector personnel. In the same vein, Taris (2006) in their meta-analysis research based on the results of 16 previous studies detected a negative correlation between burnout and performance.

The sub-dimension of *civic virtue* of organizational citizenship behavior is another factor affecting principals' burnout. As civic virtue decreases, burnout increases. It is conceived as individuals' dedication to common welfare and their participation in decisions in a responsible and voluntary way. There is individual initiative in civic virtue. It encompasses individuals' discussion on issues related to the organization, developing solutions and participation in decisions (Meydan et al., 2011). As principals take initiative, discussing school-related issues with teachers, developing solutions, and adopting a participatory approach in decisions, they may have less difficulty in solving problems or assuming their roles, which may result in a negative effect on burnout. Similarly, Eroğlu (2019) detected a negative association between civic virtue and burnout and depersonalization.

It was found in the study that primary school principals' burnout was higher than the principals in preschool, secondary and high school. Primary school teachers can also be principals in primary schools. Primary schools are the schools where children acquire fundamental knowledge, skills, behaviors and habits. In addition to schools' learning dimension, children in primary schools are raised in numerous ways, posing various responsibilities. Primary school principals may, therefore, experience higher burnout level. No study investigating principals' burnout in terms of school type has been encountered; however, classroom teachers' burnout was higher than branch teachers, and similarly, teachers in primary schools had higher burnout level compared to teachers working in other schools (Seferoğlu et al., 2014) in studies comparing burnout levels of classroom teachers and branch teachers in other schools (Ersoy-Yılmaz et al., 2014), corresponding the results of this study.

The sub-dimension of *hope* was found to affect principals' burnout ranked seventh by level of significance. It was revealed that as hope decreases, burnout increases. Individuals with higher levels of hope are motivated by a sense of ability to find ways of achieving their goals, giving them the ability to generate alternative ways (Luthans & Youssef, 2004). As a matter of fact, Çetin et al., (2013) revealed that as the public employees' level of hope decreases, their burnout increases.

The sub-dimension of hope is followed by sportsmanship in terms of affecting school principals' burnout according to the level of significance. Sportsmanship is defined as avoiding negative behaviors causing conflicts

with co-workers and continuing one's work enthusiastically without complaining in the face of problems (Dede, 2019). Therefore, principals' behaviors to create a positive climate without complaints and exaggerating the problems can negatively affect their burnout. Yücel (2006) also yielded similar results with teachers. Likewise, Meydan et al. (2011) detected a high-level and negative correlation between sportsmanship and burnout regarding public administrators.

Another result of the study is that principals with 15 years or more of experience as a principal have higher burnout levels. The roles of principals expand to include providing supportive environments for teachers, enhancing academic success, fostering student engagement and motivation, ensuring motivated and sustainable professional development, building relationships and monitoring development through data-driven decision-making (Angelle & Bilton, 2009). All these roles can lead to stress. Stress is one of the leading factors of burnout (Başol & Altay, 2009). It may be difficult to cope with stress due to the prolonged experience as a school principal (Madenoğlu, 2013). Another research carried out by Shanefelt vd. (2012) corresponds to the results of the current study, revealing that the higher the professional seniority increases, the higher the burnout level is. Similarly, studies revealing that principals having 11-15 years of experience in school management have higher burnout levels have been encountered in the literature (Izgar, 2000).

This study also indicates that as self-efficacy level decreases, burnout increases. Self-efficacy is one's belief and confidence in his/ her own abilities. Individuals conceiving themselves highly self-sufficient make tough choices while performing their tasks and insist on holding on to their beliefs despite the emerging drawback (Çetin & Basım, 2012). As school principals' perception of self-efficacy increases, their motivation to achieve increases, in which case burnout may decrease. Similar results have been yielded by the studies by Ferradas et al. (2019) and Pu et al. (2016) on teachers.

Optimism, another sub-dimension of psychological capital on principals' burnout, is ranked last based on the level of significance. As seen in Figure 2h, as optimism decreases, principals' burnout increases. Optimism is regarded as individuals' reference to internal, permanent and generalizable causes while explaining positive events they have experienced, and to external, temporary and situation-specific causes while explaining negative experiences (Akçay, 2012). Optimism encompasses positive emotions and motivation (Luthans, 2002). As principals develop positive emotions and they think that they will be more successful, their burnout may decrease. Nes and Segerstom (2006) determined that positive emotions produced with an optimistic approach allowed individuals to be more active in maintaining their goals in stressful or challenging situations, thus reducing burnout. Considering the results of the study, principals' burnout may increase as their optimism decreases.

In the study, it was found that married principals' burnout was higher than that of unmarried principals. This may be due to the fact that married principals assume greater responsibilities in their professional and private lives. Similar results were yielded in the studies by Çokluk (1999) and Başol and Altay (2009). On the contrary, there are also research findings that do not correspond to the results of this study. Maslach and Jackson (1985) reported that unmarried principals had lower burnout levels.

According to the findings of the study, burnout level of principals' working in neighborhood/ village area were higher than that of principals' working in county town and central districts. This may result from the socio-economic status of neighborhood/ village area, schools' physical equipment, personnel status, students' readiness, the socio-cultural status of parents and educational approach. Izgar (2000) revealed that the burnout levels of principals' working in neighborhood/ villages were higher, corresponding to the results of this study.

Burnout may lead to loss of energy and lack of motivation (I-Chi et al., 2020), however, reduce individual's commitment, development and voluntary working (Cole et al., 2012). Principals may experience burnout resulting from negative pressures in educational organizations; additional responsibilities assigned by school-centered administration, and reduced authority (Daly, 1992). In light of the findings, it has been recommended that arrangement should be generalized in order for the principals to exhibit cooperative behaviors and appropriate environments where principals can perform their roles as teaching leaders by reducing their responsibilities should be created. It has also been recommended that necessary psychological support should be provided to generate resilience. As professional seniority increases, principals are required to be included in different activities to benefit

from their experiences and subjected to in-service trainings to increase their individual performance. Principals should also be provided more chances to express their goals. Certain arrangements are proposed to embark on a management approach enabling them to adopt their schools and assume initiatives.

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GENİŞLETİLMİŞ ÖZET

Giriş: Bu araştırmada kamu okullarında görev yapan okul müdürlerinin görüşleri doğrultusunda örgütsel psikolojik sermayenin, örgütsel vatandaşlığın, bireysel performansın ve çeşitli demografik değişkenlerin okul müdürlerinin tükenmişliğini ne düzeyde etkilediğini tespit etmek amaçlanmıştır. Bu amaç doğrultusunda aşağıdaki soruya yanıt aranmıştır;

Okul müdürlerinden elde edilen bilgiler doğrultusunda XGBoost veri madenciliği yöntemine dayalı olarak okul müdürlerinin tükenmişliğinin çeşitli yordayıcıları açısından önem düzeyleri nelerdir?

Yöntem

Araştırma Modeli: Bu araştırma nicel araştırma yöntemlerinden betimsel yönde tarama araştırmaları modelinde tasarlanmıştır. Tarama modeli ile bir örneklem üzerinde gerçekleştirilen incelemeler sonucu bir grup hakkında bilgi edinilmesi söz konusudur (Leedy & Ormrod, 2005).

Çalışma Grubu: Bu çalışmaya ait veriler 2016-2017 yılları arasında Diyarbakır merkez ve ilçelerinde görev yapan 276 okul müdürünün katılımıyla elde edilmiş olup 12 kadarının ölçek maddelerini baştan savma özensizce doldurulduklarını tespit edildiğinden elenerek 264 okul müdürünün verisi dikkate alınmıştır. Yine eksik veriler muhteva eden 10 kadar okul müdürüne ait veri, dizin yoluyla silme işlemi uygulanmıştır. Toplamda 254 okul müdürü bu çalışmanın örneklemini oluşturmaktadır.

Ölçme Araçları: Bu çalışma kapsamında okul müdürlerine yönelik psikolojik sermaye ölçeği (Çetin & Basım, 2012), örgütsel vatandaşlık davranış ölçeği (Polat & Celep, 2008), bireysel performans ölçeği (Aydogan & Kara, 2015) ve okul müdürleri tükenmişlik ölçeği (Özer vd., 2012) olmak üzere dört ölçek gerekli izinlerin alınması sonrasında kullanılmış olup yine okul müdürlerine ait bazı demografik bilgileri içeren bir anket formu uygulanmıştır.

Sonuç ve Tartışma: Okul müdürlerinin tükenmişlikleri üzerinde en önemli ilk 3 değişken sırasıyla yardımlaşma, psikolojik dayanıklılık ve mesleki kıdem değişkenleridir.

Araştırma sonucunda okul müdürlerinin tükenmişlikleri üzerinde en önemli etkinin örgütsel vatandaşlık davranışının alt boyutu olan yardımlaşma boyutunda olduğu görülmektedir. Yardımlaşma, çalışanların örgütsel görevlerde ya da sorunlarda diğer çalışanlara yardım etmeye yönelik gösterdikleri doğrudan ya da dolaylı tüm gönüllü davranışlar olarak değerlendirilmektedir. Deneyimli bir yöneticinin yeni bir yöneticiye görev tanımında olmamasına rağmen işin kurallarını öğretmesi bu kapsamda değerlendirilebilir (Yılmaz, 2020). Benzer şekilde okul müdürünün görev tanımında olmadığı halde yeni göreve başlayan öğretmene öğrenci ile nasıl iletişim kurulacağını anlatması, kurumu tanıtması, öğretmenin velilerle iletişimini sağlama yolları konusunda yardımcı olması bu kapsamda düşünülebilir. Okul müdürünün yardımlaşma davranışları arttıkça kendini daha yeterli, öz güvenli ve iletişim becerisi yüksek olarak değerlendirebileceği, bu durumun da gerçekleştirdiği rollere olumlu yansıyabileceği bu durumun da tükenmişliği olumsuz yönde etkileyebileceği ifade edilebilir. Yıldırım'ın (2009) ilköğretim okulu yöneticileri üzerinde yaptığı araştırmada yardımlaşmanın yöneticiler tarafından en önemsenen ikinci değer olduğu bulunmuştur. Alan yazında bu ilişkiyi destekleyen çalışmalar bulunmaktadır. Yücel (2006) sınıf öğretmenleri ile yaptığı çalışmada yardımlaşmanın tükenmişlik üzerinde anlamlı ve negatif bir etkisi olduğunu bulmuştur. Araştırma sonucunda yardımlaşma azaldıkça tükenmişliğin artacağı tespit edilmiştir. Benzer şekilde Sezgin ve Kılınç (2012) tarafından ilköğretim öğretmenleri üzerinde yapılan araştırmada yardımseverliğin duygusal tükenmişlik üzerinde negatif etkisi olduğunu belirlenmiştir. Doğru (2018)'nun 103 çalışmayı dâhil ederek yaptığı meta-analiz çalışmasında örgütsel vatandaşlığın yardımlaşma boyutu ile tükenmişlik arasında negatif bir ilişki bulunmuştur.

Araştırmada okul müdürlerinin tükenmişliği üzerinde ikinci önemli etki örgütsel psikolojik sermayenin alt boyutu olan psikolojik dayanıklılık boyutundadır. Psikolojik dayanıklılık; sıkıntı, çatışma, başarısızlık gibi olaylardan sonra kendini toparlama, sürdürme, sıçrama hatta başarıya ulaşmanın ötesine geçme olarak tanımlanmaktadır (Luthans vd., 2006). Stres ve sıkıntılı durumlarda başarılı olunmak isteniyorsa dayanıklılığa ihtiyaç olduğu (Maddi, 2002) iddia edilmektedir. Tükenmişlik, iş yerindeki stres kaynaklarına bir tepki olarak (Maslach, 2003) düşünüldüğünde psikolojik dayanıklılığın tükenmişlik üzerindeki negatif etkisi anlaşılır niteliktedir. Ocak ve Güler (2017) tarafından öğretmenlerle yürütülen çalışmada da psikolojik dayanıklılığın tükenmişlik üzerindeki negatif etkisi tespit edilmiştir. Çelikkaleli'nin (2020) üniversite öğrencileri üzerinde yaptığı çalışmada da benzer sonuca ulaşılmıştır.

Araştırma sonucunda kamu okullarında görev yapan okul müdürlerinin tükenmişlikleri üzerinde mesleki kıdemin önemli etkisi olduğu 25 yıl ve üstü kıdeme sahip okul müdürlerinin tükenmişlik düzeylerinin daha fazla olduğu belirlenmiştir. Okul müdürlerinin öğretmenlik deneyimleri de olduğu düşünüldüğünde eğitim öğretim faaliyetlerini yürütmenin yanında bu faaliyetlerin yürütülmesinde liderlik yapma deneyimleri de bulunmaktadır. Okul müdürleri günlük mesai saatleri dahilinde okul personeli, öğrenciler ve velilerle ilgilenmenin yanında okulun iç ve dış çevresinden gelen farklı beklentilerle de ilgilenmektedirler (Özer vd., 2012). Bu bağlamda birçok rolü yerine getirmektedirler. Ancak okul müdürünün profesyonel dünyası; ezici sorumluluklar, bilgi karmaşası ve duygusal kaygı ile karakterize edilmektedir. İyi bir müdür hem profesyonel

bir eğitimci, hem lider hem de başarılı bir yönetici olmalıdır (Friedman, 2002). Okul müdürleri çoğu zaman iç ve dış çevrenin baskı ve yüklenmesine maruz kalabilmektedirler. Böylece gerçekleştirmeleri gereken roller gün geçtikçe daha karmaşık hale gelebilmekte ve okul müdürleri üzerinde baskı yaratabilmektedir. Bu durum okul müdürlerinin deneyimlerinin artmasının tükenmişlik düzeyleri üzerindeki etkisini anlaşılır kılabilir. Araştırmanın bu bulgusunu destekleyen çeşitli çalışmalar (Durak & Seferoğlu, 2017; Sönmez, 2010) bulunmaktadır. Öğretmenler üzerinde yapılan araştırmalarda da (Duras, 2022; Dinç & İlgar, 2021; Yavuz & Yıkmış, 2021) kıdem yılı arttıkça tükenmişlik düzeyi artmaktadır. Öte yandan DeMathews ve diğ. (2019) ve Izgar (2000) yaptıkları çalışmalarda daha fazla deneyime sahip olan okul müdürlerinin daha düşük tükenmişlik düzeylerine sahip olduğunu bulmuşlardır.

Öneriler: Ulaşılan sonuçlar çerçevesinde okul müdürlerinin tükenmişliğini olumsuz yönde etkileyen değişkenler dikkate alındığında okul müdürlerinin tükenmişliklerinin önüne geçmek için yardımlaşma davranışlarını sergileyebilecekleri fırsatlara sahip olmaları yönünde düzenlemelerin yaygınlaştırılması, sorumluluklarının azaltılarak öğretim liderliği rolünü gerçekleştirecekleri ortamların yaratılması, psikolojik dayanıklılıklarının oluşması yönünde gerekli psikolojik desteklerin bir program dahilinde yürütülmesi, kıdem yılı arttıkça okul müdürlerinin deneyimlerinden faydalanma yönünde farklı etkinliklere dahil edilmeleri, bireysel performanslarının artmasını sağlayacak rutin hizmet içi eğitimlerden geçirilmeleri, okul müdürlerinin hedeflerini ifade edecek imkanların genişletilmesi, okullarını benimsemelerini sağlayacak, insiyatif kullanabilecekleri yönetim anlayışının yerleştirilmesi, yönünde düzenlemelerin yapılması önerilmektedir.