

Examination of Science Teachers' Burnout Levels in Terms of School Climate and Various Variables

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Abstract

The burnout levels of science teachers hold significant implications for both educators and students. Burnout can evolve in response to significant social events or be influenced by various variables. In this context, the objective of this study is to examine the burnout levels of science teachers, taking into account factors such as gender, age, length of service, and working time in the institution, with a particular focus on the perception of the school climate. The study adopted a descriptive survey model, utilizing a convenience sampling method, and involved 182 science teachers employed in Adana province. Data collection instruments encompassed the "School Climate Survey" and the "Maslach Burnout Inventory", along with their sub-dimensions. Data were gathered through a face-to-face survey conducted by one of the researchers following rigorous efforts. The results showed that the burnout levels of science teachers were relatively low. In addition, when evaluated in general in terms of all the variables examined, it was determined that all averages in the dimension of emotional exhaustion, one of the three sub-dimensions of burnout, were always higher, while the values in the dimension of depersonalization were always lower. Although it varied according to gender, age, length of service, and working time in the institution, it was found that burnout differed either in the overall scale or in at least one sub-dimension. Notably, science teachers with a low perception of the school climate experienced significantly higher burnout levels across the overall school climate scale, encompassing all sub-dimensions of burnout. While this pattern varied within sub-dimensions of school climate perception, dimensions exhibiting significant differences also favored those with lower climate perception. In the final section of the study, various recommendations are presented in light of these findings.

Keywords: Science teachers, burnout levels, school climate

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Introduction

Healthy and contented teachers play a crucial role in enhancing student achievement (Brasfield et al., 2019). Despite finding their profession rewarding and satisfying, teachers can often face stressors arising from inadequate working conditions, student disciplinary issues, and time constraints (Zhu et al., 2018). Schaufeli and Enzmann (1998) stated that long-term stress can lead to burnout in individuals. They define burnout as a psychological condition marked by emotional exhaustion, depersonalization, and diminished personal accomplishment, which may manifest when individuals collaborate in work settings. Specifically, emotional exhaustion signifies the exhaustion of one's emotional reservoirs; depersonalization involves adopting a detached attitude toward colleagues; and a loss of personal accomplishment reflects feelings of ineffectiveness and inadequacy in job performance and work-related situations (Togia, 2005). Teacher burnout can be attributed to several factors, including excessive workloads, conflicting demands, an imbalance between effort and rewards, dysfunctional school-organizational relations, role conflicts or uncertainties regarding work tasks, and the prevalence of students with behavioral disorders (Räsänen et al., 2022). Importantly, when teachers experience burnout, it can detrimentally impact student achievement. Teacher burnout not only negatively affects students' physical and emotional well-being but also hampers their academic success, ultimately creating an unfavorable classroom atmosphere (Çelik & Kahraman, 2019). Considering the adverse repercussions of teacher burnout on teachers, students, educational institutions, and society as a whole, it is imperative to allocate greater attention to factors associated with teacher burnout (Saloviita & Pakarinen, 2021). Furthermore, teacher burnout may also exert an influence on motivation (Cengiz et al., 2023). Given the significance of science education in both the educational context and national development, it is essential to prioritize the investigation of teacher burnout levels and the underlying causes among those who are responsible for bridging the gap between science education and everyday life.

Certain demographic characteristics are known to contribute to burnout among teachers, as evidenced in the literature (Aydın et al., 2022). These factors include gender, age, length of service, and working time in the institution. When the gender variable is evaluated, the rates of adopting teacher identity may differ in both genders. Societal perceptions may lead to a slightly higher prevalence of teacher identity among women (Uçar-Çelebi, 2018). However, women's increased professional responsibilities and dedication may also heighten their susceptibility to burnout. Additionally, emphasizing gender disparities within the family may further exacerbate the impact of gender on burnout (Gündüz, 2016).

In terms of the age variable, different age levels may have different effects on individuals. Especially in the younger age group, a lack of perceived competence and an inability to manage responsibilities may contribute to burnout (Gündüz, 2016). On the other hand, the fact that individuals are in the young age group may cause them to approach the profession more idealistically and thus increase their motivation. In the older age group, individuals may have more knowledge about coping with problems. On the other hand, individuals with excessive responsibility may feel burnout. And they may get tired of constantly solving problems (Özipek-Karabıyık, 2006).

The length of service can have both positive and negative implications for burnout. Prolonged service may lead to a decline in professional enthusiasm, a reduced focus on improving working conditions, and lower expectations, potentially contributing to burnout (Acar, 2020). However, extended tenure in an institution can also foster greater adherence to institutional norms and promote a more balanced and patient attitude (Tekin-Yenigün, 2021). Conversely, working in an unsupportive or oppressive institutional environment for an extended period can lead to burnout, especially if professional satisfaction is lacking (Koç & Doğan, 2022). A review of relevant literature reveals numerous studies investigating the relationship between demographic variables and burnout among science teachers. Among these, Tatar and Aslan (2020) found a difference between length of service and burnout level in a study conducted with science teachers. In contrast, Kılınc's (2018) study with science teachers found no significant correlations between burnout and gender, seniority, age, marital status, weekly course load, or place of employment. Yıldırım (2019) examined age and gender variables in his study with science teachers and determined that they may affect burnout levels at the end of the research. Arslan (2020) determined that the length of service will affect burnout as a result of his study with science teachers.

When the literature is examined from a broader perspective, it is evident that studies have been conducted on many other factors that may affect teacher burnout. These are psychological empowerment (Okan & Yılmaz, 2017), professional social support levels (Gökhan & Kılıç, 2023), professional satisfaction levels (Korkutan & Tekin, 2017), attitude towards unwanted student behaviors (Hanedar & Öçalın, 2018), colleagues (Emre-Erden & Kılınç, 2021), daily rhythm preference and sleep variable (Yurduseven & Önder, 2019), professional burnout and psychological well-being (Söner & Yılmaz, 2020), toxic leadership behaviors of school principals (Ordu & Çetinkaya, 2018), teachers' positive psychological capital perceptions (Oral et al., 2017), organizational alienation tendencies (Örücü et al., 2022), life satisfaction (Çelik & Üstüner, 2018), organizational socialization (Baş & Coşkun, 2020), self-efficacy (Tokmak, 2018), perfectionism levels (Sancar et al., 2021). There are also studies (Dönük & Bindak, 2022; Kocaoğlu & Demirdağ, 2022) on school climate.

The concept of school climate organization is one of the important factors affecting burnout (Kocaoğlu & Demirdağ, 2022). Organizations are structures formed by multiple individuals to achieve specific objectives within a social framework. Considering the attributes of organizations, it can be said that schools with a bureaucratic structure where responsibility and authority are distributed hierarchically are also organizations (Hoy et al., 1991). The comprehensive concept that encompasses interpersonal, organizational, and instructional dimensions, ultimately shaping the quality of interactions within a school, is termed "school climate" (Hoy et al., 1991). School climate is the relationship between all stakeholders in the school—students, teachers, parents, and administrators—and the feelings that develop as a result of this relationship (Kaplan & Geoffroy, 1990). Teachers' daily interactions with students and colleagues make social relationships pivotal to their work (Pyhältö et al., 2021). According to Bayat (2015), a school's climate encompasses all the distinctive characteristics that set it apart from others. As per Balcı (2013), who defines school climate as the lifestyle cultivated by a school over time, it's appropriate to view school climate as the school's personality.

A review of studies specifically focused on science teachers reveals research concerning burnout levels and their causes (Tatar & Arslan, 2020), the examination of burnout levels in terms of some variables (Kılınç, 2018), the relationship between burnout levels and job satisfaction (Yıldırım, 2019), the levels of burnout with the use of new methods and techniques (Okumuşoğlu & Geçikli, 2021), and the relationship between daily rhythm preferences and sleep patterns on burnout (Yurduseven & Önder, 2019). Additionally, there is substantial evidence suggesting that social relationships within the context of school climate can contribute significantly to teachers' well-being (Berkovich & Eyal, 2018). Furthermore, positive relationships with colleagues have been demonstrated to alleviate teacher stress, while research has highlighted that a weak sense of community and disruptive tensions in social interactions, both with students and colleagues, are associated with teacher burnout (Pyhältö et al., 2021). Research on the relationship between school climate and teacher burnout has involved various groups, including mathematics teachers (Dönük & Bindak, 2022), classroom teachers (Bayat, 2015), secondary school students (Şahin, 2020), and school administrators (Kocaoğlu & Demirdağ, 2022). However, there is a notable absence of research specifically examining burnout among science teachers within the context of school climate. Given this gap in knowledge, the main goal of this research is to explore the levels of burnout syndrome experienced by science teachers in relation to several key variables, with a particular focus on school climate perception. In this regard, the study is directed by the subsequent research questions:

1. Is there a significant difference in teachers' burnout levels according to gender?
2. Is there a significant difference in teachers' burnout levels according to age?
3. Is there a significant difference in teachers' burnout levels according to length of service?
4. Is there a significant difference in teachers' burnout levels according to their working time in their institutions?
5. Is there a significant difference in teachers' burnout levels according to school climate perception?

Method

In this study, the descriptive survey method was used to examine the burnout levels of science teachers in terms of gender, age, total length of service, working time in the institution, and school climate perceptions.

Participants

The study group for this convenience sampling research consisted of science teachers working in secondary schools affiliated with the Ministry of National Education (MoNE) in Adana province in the 2021–2022 academic year. A total of 182 teachers participated in the study. Various characteristics of the science teachers participating in the study are given in Table 1.

Table 1.

Characteristics of Participants

Variable	Group	<i>N</i>	%
Gender	Female	111	61.0
	Male	71	39.0
Age	40 years or under	92	50.5
	41 years or older	90	49.5
Length of service	Under 16 years	89	48.9
	16 years or over	93	51.1
Working time in the institution	Under 5 years	86	47.3
	5 years or over	96	52.7
School climate perception	Below 3 points	82	45.1
	3 points or above	100	54.9

When Table 1 is analyzed, it is seen that the teachers participating in the study are predominantly female (61.0%). In terms of the age variable, the cut-off value determined to divide the participants into two groups with approximately the same number of participants was 40, and those who were “40 years of age or under” constituted 50.5% of the whole group. When compared according to the length of service, it was found that the group with “under 16 years” and the group with “16 years or over” were at approximately the same rate. In terms of working time in the institution, it was understood that the proportion of the group of teachers with “5 years or over” (52.7%) was slightly higher. When the participant science teachers were grouped according to their perceptions of school climate, it was observed that slightly more teachers (100) had item response averages of “3 points or above” (high in terms of school climate perception) than those with lower perceptions of school climate.

Data Collection Tools

Maslach Burnout Inventory (MBI) and School Climate Survey (SCS) were used as data collection tools.

Maslach Burnout Inventory

The MBI used in the study was developed by Maslach and Jackson (1981) to measure aspects of burnout syndrome. Çam (1993) first adapted this inventory into Turkish to determine the burnout level of healthcare workers. Validity and reliability studies were conducted. The 22 items of the MBI used in this study were obtained from the study conducted by Gündüz (2006). These items are of the five-point Likert type and are graded from one to five. Gündüz (2006) determined that the MBI has three sub-dimensions: emotional exhaustion, depersonalization, and personal accomplishment. All seven items in the personal accomplishment dimension are negative. The Cronbach’s alpha reliability coefficients calculated by Gündüz (2006) are given in the “original (α)” column in Table 2, and the items constituting the dimensions are given in the “items-original” column.

Table 2.

Original and New Versions of MBI Items and Alpha Values

Dimension	Items-Original	Original (α)	Items-New	New (α)
Emotional exhaustion	1, 2, 3, 6, 8, 13, 14, 16, 20	.85	1, 2, 3, 6, 8, 13, 14, 16, 20	.87
Depersonalization	5, 10, 11, 15, 22	.65	5, 10, 11, 15, 21 , 22	.77
Personal accomplishment	4, 7, 9, 12, 17, 18, 19, 21	.73	4, 7, 9, 12, 17, 18, 19	.81

This study also involved factor analysis, revealing that scale items were loaded onto three factors. Notably, Item 21, highlighted in Table 2, shifted to the depersonalization dimension instead of personal accomplishment. This is because the composure in this item, “I deal with emotional problems in my job with composure”, was perceived as depersonalization rather than accomplishment by the participants of

this study. The reliability values calculated according to these new item groupings are presented in Table 2, and sample items for each sub-dimension are given in Table 3. Parallel to the increase in dimension-based reliability values, Cronbach's alpha coefficient for the overall scale was calculated as .91.

Table 3.
Sample Items for Each Dimension of the MBI

Dimension	Sample Items
Emotional exhaustion	1. I feel emotionally drained from my work.
	8. I feel burned out from my work.
Depersonalization	5. I feel I treat some students as if they were impersonal objects.
	10. I've become more callous toward people since I took this job.
Personal accomplishment	4. I can easily understand how my students feel about things.
	17. I can easily create a relaxed atmosphere with my students.

School Climate Survey

To assess science teachers' perceptions of the organizational climate, we utilized the SCS, originally developed by Hoy et al. (1991). Adapted from Şenel's (2015) study, the original 42-item scale was reduced to 35 items through factor analysis. The items on the five-point Likert-type scale were rated from one to five. Şenel's (2015) factor analysis revealed that the scale comprised six dimensions. The items related to principal behaviors, totaling 19 items, were categorized into three dimensions: supportive, directive, and restrictive. Meanwhile, the items pertaining to teacher behaviors, totaling 16 items, were grouped into three dimensions: collegial, intimate, and disengaged. Table 4 provides the names of these dimensions, the corresponding items, and their Cronbach's alpha reliability values.

Table 4.
Original and New Versions of SCS Items and Alpha Values

Dimension	Items-Original	Original (α)	Items-New	New (α)
Supportive principal	3, 6, 12, 13, 19, 20, 24, 25, 35	.93	3, 6, 12, 13, 14 , 19, 20, 21 , 24, 25, 35	.95
Directive principal	7, 14, 21, 26, 29, 30, 34	.81	7, 26, 29, 30, 34	.86
Restrictive principal	8, 15, 31	.67	8, 15, 31	.57
Collegial teacher	1, 9, 16, 22, 27, 33	.71	1, 9, 16, 17 , 22, 23 , 27, 32 , 33	.88
Intimate teacher	2, 4, 10, 17, 23, 28, 32	.84	2, 4, 10, 28	.71
Disengaged teacher	5, 11, 18	.58	5, 11, 18	.58

In our study, the factor analysis also identified three dimensions for both principal and teacher behaviors. However, among the five bolded items in Table 4, items 14 and 21 were perceived as indicative of supportive principal behaviors rather than directive principal behaviors. Additionally, three bolded items (17, 23, and 32) were considered representative of collegial teacher behaviors rather than intimate teacher behaviors by the participating science teachers. All other items remained within their respective factors. Şenel (2015) determined the Cronbach alpha reliability coefficient of the scale as .90. In this study, it was found to be .92. The recalculated Cronbach's alpha reliability coefficients for all sub-dimensions and the previously calculated values are given in Table 4, and sample items for each sub-dimension of the SCS are presented in Table 5.

Table 5.
Sample Items for Each Dimension of the SCS

Dimension	Sample Items
Supportive principal	3. The principal goes out of his or her way to help teachers.
Directive principal	26. The principal closely checks teacher activities.
Restrictive principal	8. Routine duties interfere with the job of teaching.
Collegial teacher	16. Teachers help and support each other.
Intimate teacher	10. Teachers know the family backgrounds of other teachers.
Disengaged teacher	5. There is a minority group of teachers who always oppose the majority.

Data Collection Procedure

The data collection process was conducted rigorously and ethically, with prior approval from the ethics committee and under the supervision of the MoNE. In the context of data collection, the survey technique was used. With the data collection tools used, the participants answered the MBI and SCS, respectively. However, before starting to answer, one of the researchers gave information about the study and explained the instructions for the scales. In particular, it was stated that participation was voluntary, and the participants voluntarily participated in the study. The data collection tools were administered manually and took approximately 25 minutes to complete. After a concerted effort, data were collected from a total of 184 teachers.

Data Analysis

First, all data were transferred to a computer environment for data cleaning. Upon examination, it was found that only six participating teachers had missing data. The percentage values of the missing data in the items on both scales were below 5%, so the missing data were filled by giving the serial averages of the items. To identify and analyze outlier data, separate box and whisker plots were generated for each variable. Consequently, the data from two teachers who exhibited multiple extreme outliers across different variables were excluded from the study. After the kurtosis and skewness values were checked and confirmed, and the box plot diagrams were checked again, the analysis of the study continued with the data of the remaining 182 teachers. Finally, independent samples t-tests were conducted to examine the burnout levels of science teachers according to gender, age, length of service, working time in the institution, and school climate perception variables, whose categories are expressed in Table 1.

Findings

Table 6 summarizes the descriptive findings related to the burnout levels of science teachers in terms of gender, age, length of service, working time in the institution, and school climate perception variables.

Table 6.

Mean Scores in MBI and Its Dimensions According to Variables

Variable	Group	Emotional Exhaustion	Depersonalization	Personal Accomplishment	MBI
Gender	Female	2.46	1.74	2.02	2.12
	Male	2.18	1.55	2.01	1.96
Age	40 years or under	2.46	1.78	2.11	2.16
	41 years or older	2.24	1.55	1.92	1.95
Length of service	Under 16 years	2.42	1.77	2.14	2.16
	16 years or over	2.28	1.57	1.90	1.96
Working time in the institution	Under 5 years	2.48	1.80	2.11	2.18
	5 years or over	2.24	1.55	1.93	1.95
School climate perception	Below 3 points	2.64	1.91	2.22	2.30
	3 points or above	2.12	1.47	1.85	1.86

Table 6 shows that female science teachers have higher levels of burnout than male science teachers. This was evident in the mean scores of the MBI and its sub-dimensions, which were higher for female teachers than male teachers. In terms of the age variable, it was understood that the mean scores of the teachers 40 years of age or younger in the MBI and all its sub-dimensions were higher than the group 41 years of age or older. It was found that the mean scores of the group with less than 16 years of service were higher than the group with “16 years or over” in the MBI and all sub-dimensions. Similarly, both the group with less than 5 years of working time in the institution had higher mean scores than the group with “5 years or over”, and the group with “below 3 points” (low) school climate perception had higher mean scores than the group with “3 points or above” (high) school climate perception. When the values in Table 6 were evaluated in general in terms of all variables, it was found that all averages in the dimension of emotional exhaustion among the three sub-dimensions were always higher, while the values in the dimension of depersonalization were always lower.

The results of independent samples t-tests conducted to examine the burnout levels of science teachers according to gender variable are given in Table 7. As seen in Table 7, it is understood that the higher mean burnout level scores of female teachers are statistically significantly different from those of male teachers [$t(180) = 2.19, p = .030$]. It was seen that this difference was caused by significant differences, especially in emotional exhaustion [$t(180) = 2.65, p = .009$] and depersonalization [$t(180) = 2.32, p = .022$] dimensions.

Table 7.

Independent Samples T-test Results Related to the First Research Question

Dimension	Female (\bar{X})	Male (\bar{X})	<i>t</i>	<i>p</i>
Emotional exhaustion	2.46	2.18	2.65	.009
Depersonalization	1.74	1.55	2.32	.022
Personal accomplishment	2.02	2.01	0.16	.987
MBI	2.12	1.96	2.19	.030

The results of the independent samples t-test conducted to determine whether the burnout levels of the science teachers who participated in the study differed significantly in terms of the age variable are presented in Table 8. Upon analyzing this table, it becomes evident that burnout levels differ significantly ($p < .05$) in MBI and all sub-dimensions. In other words, the burnout levels of science teachers aged 40 years or under in the MBI and all its sub-dimensions were significantly higher than the group aged 41 years or older.

Table 8.

Independent Samples T-test Results Related to the Second Research Question

Dimension	40 Years or Under (\bar{X})	41 Years or Older (\bar{X})	<i>t</i>	<i>p</i>
Emotional exhaustion	2.46	2.24	2.22	.028
Depersonalization	1.78	1.55	2.88	.005
Personal accomplishment	2.11	1.92	2.65	.009
MBI	2.16	1.95	2.98	.003

Table 9 presents the results of the independent samples t-test analysis concerning participants' length of service. Upon examination of this table, it becomes evident that there is a statistically significant difference in burnout levels among science teachers, favoring the group with less than 16 years of service [$t(180) = 2.61, p = .010$]. Furthermore, within the sub-dimensions, statistically significant differences were observed in both the depersonalization dimension [$t(180) = 2.54, p = .012$] and the personal accomplishment dimension [$t(180) = 3.34, p = .001$], once again favoring the groups with less than 16 years of service.

Table 9.

Independent Samples T-test Results Related to the Third Research Question

Dimension	Under 16 Years (\bar{X})	16 Years or Over (\bar{X})	<i>t</i>	<i>p</i>
Emotional exhaustion	2.42	2.28	1.38	.171
Depersonalization	1.77	1.57	2.54	.012
Personal accomplishment	2.14	1.90	3.34	.001
MBI	2.16	1.96	2.61	.010

Table 10 presents the results of an independent samples t-test analysis conducted to assess whether there exists a significant difference in burnout levels among science teachers based on their tenure within the institution. As depicted in this table, there is a statistically significant difference in burnout levels among teachers, favoring those with less than 5 years of tenure in the institution [$t(180) = 3.11, p = .002$]. Moreover, statistically significant differences ($p < .05$) were observed in the sub-dimensions of emotional exhaustion and personal accomplishment, more clearly in the depersonalization sub-dimension [$t(180) = 3.16, p = .002$], in favor of the groups with less than 5 years of working time in the institution.

Table 10.
Independent Samples T-test Results Related to the Fourth Research Question

Dimension	Under 5 Years (\bar{X})	5 Years or Over (\bar{X})	<i>t</i>	<i>p</i>
Emotional exhaustion	2.48	2.24	2.32	.022
Depersonalization	1.80	1.55	3.16	.002
Personal accomplishment	2.11	1.93	2.58	.011
MBI	2.18	1.95	3.11	.002

The results of the analysis conducted to understand whether the burnout levels of science teachers differ significantly according to the school climate perception variable are shown in Table 11.

Table 11.
Independent Samples T-test Results Related to the Fifth Research Question

Dimension	Value	Emotional Exhaustion	Depersonalization	Personal Accomplishment	MBI
Supportive principal	Low (\bar{X})	2.67	1.95	2.21	2.33
	High (\bar{X})	2.16	1.49	1.90	1.89
	<i>t</i>	5.22	5.94	4.21	6.25
	<i>p</i>	< .001	< .001	< .001	< .001
Directive principal	Low (\bar{X})	2.50	1.77	2.15	2.19
	High (\bar{X})	2.24	1.59	1.92	1.96
	<i>t</i>	2.47	2.14	3.12	3.06
	<i>p</i>	.014	.033	.002	.003
Restrictive principal	Low (\bar{X})	2.35	1.66	2.10	2.08
	High (\bar{X})	2.35	1.67	1.97	2.04
	<i>t</i>	0.03	-0.20	1.65	0.48
	<i>p</i>	.975	.843	.101	.632
Collegial teacher	Low (\bar{X})	2.73	2.01	2.32	2.40
	High (\bar{X})	2.24	1.57	1.93	1.96
	<i>t</i>	4.15	4.76	4.62	5.37
	<i>p</i>	< .001	< .001	< .001	< .001
Intimate teacher	Low (\bar{X})	2.40	1.71	2.10	2.12
	High (\bar{X})	2.26	1.57	1.84	1.94
	<i>t</i>	1.24	1.67	3.41	2.29
	<i>p</i>	.215	.097	.001	.023
Disengaged teacher	Low (\bar{X})	2.33	1.63	2.03	2.04
	High (\bar{X})	2.50	1.90	1.94	2.16
	<i>t</i>	-1.22	-1.75	0.82	-1.15
	<i>p</i>	.224	.091	.413	.251
SCS	Low (\bar{X})	2.64	1.91	2.22	2.30
	High (\bar{X})	2.12	1.47	1.85	1.86
	<i>t</i>	5.45	5.76	5.28	6.73
	<i>p</i>	< .001	< .001	< .001	< .001

When Table 11 is examined, it is understood that the burnout levels of the teachers (in terms of the MBI score) were statistically significantly different in favor of the group with low school climate perception [$t(180) = 6.73, p < .001$]. Notably, statistically significant differences ($p < .05$) were observed in favor of the low school climate perception groups across all three sub-dimensions of the MBI. When the sub-dimensions of the SCS were examined, it was seen that there were significant ($p < .05$) differences in favor of the groups with low school climate perception in all sub-dimensions of the MBI and MBI only for the sub-dimensions of “supportive principal”, “directive principal”, and “collegial teacher” among the six sub-dimensions of the SCS. It’s important to mention that while a statistically significant difference was observed in the “intimate teacher” sub-dimension of the SCS in favor of the low school climate perception group [$t(180) = 2.29, p = .023$], further analysis revealed that this difference in terms of burnout was primarily driven by distinctions in the “personal accomplishment” sub-dimension [$t(180) = 3.41, p = .001$]. Lastly, in the “restrictive principal” and “disengaged teacher” sub-dimensions of the

SCS, it was determined that there were no significant differences in the burnout levels of the teachers ($p > .05$) as measured by the MBI and all associated sub-dimensions.

Discussion, Conclusion, and Suggestions

When the mean scores of the MBI and its sub-dimensions in Table 6, which descriptively reveal the burnout levels of science teachers, are examined in terms of gender, age, length of service, working time in the institution, and school climate perception variables, they can be considered relatively low. It was observed that these averages, calculated on a five-point scale, ranged between 1.47 and 2.64 and remained below 3. Among the three sub-dimensions of MBI, emotional exhaustion was consistently the highest (ranging between 2.12 and 2.64), followed by personal accomplishment (ranging between 1.85 and 2.22), and depersonalization was consistently the lowest (ranging between 1.47 and 1.91). Among these values in the depersonalization sub-dimension, it was understood that the lowest and highest averages among the examined variables were in school climate perception. This is because individuals can distance themselves from depersonalization for various reasons (Görgülü, 2018). Examples include the individual's characteristics, the ability to cope with problems (Güngör-Uğurtaş, 2020), teacher-student interaction (Göksal, 2018), and the attitude of the school administration (Alkevli, 2021). When the literature is examined, it is seen that there are similar results (Adıgüzel & İpek, 2016).

The findings obtained for the first research question of this study showed that the burnout levels of female teachers were higher than those of male teachers. Some studies in the literature (Kılınç, 2018; Yıldırım, 2019) reveal different results. In this context, in Yavuz and Akdeniz's (2019) study examining the relationship between KPSS (Public Personnel Selection Examination) anxiety levels and burnout levels of pre-service science teachers, no significant difference was found in terms of gender variable. However, the findings of the studies in the literature (Acar, 2020; Bıçak, 2018) generally support our study. Purvanova and Muros (2010) emphasized that while women may be more susceptible to stress structurally, the numerical and cultural dominance of one gender in a specific profession may generate negative experiences for members of the other gender. For instance, working in traditionally male-dominated professions could lead to role stress for women. On the other hand, working in traditionally female-dominated professions may result in low social status and lower pay, which, in turn, could lead to higher levels of burnout among individuals. Moreover, work-family and family-work conflict is typically defined as a form of inter-role conflict in which the demands from one's work and family roles are inherently contradictory in certain respects, and, for example, investing more time at work can encroach upon time dedicated to the family or household responsibilities, leading to late arrivals at work (Netemeyer et al., 1996). The common belief is that women experience work-family conflict more than men and are more affected by it. Particularly given that women continue to bear the responsibility for over 50% of household chores and often act as caregivers for elderly family members, they tend to face a greater number of family-related demands, including challenges related to role conflict and role ambiguity. When looking at burnout from a gender perspective, excessive stress related to academic sources or other stress factors can lead to burnout, a condition where an individual experiences emotional exhaustion, depersonalization, and a reduced sense of personal accomplishment. Gender differences, in addition to physiological factors, are influenced by the nature of the job as well as cultural and social contexts, affecting job satisfaction and burnout (Kara, 2020). Regarding the sub-dimensions, there was no significant gender difference in the personal accomplishment dimension when examining burnout levels among science teachers. Similar results were observed in previous studies (Çelebi, 2018). Considering that personal accomplishment loss is defined as a state of inefficacy and inadequacy in the face of job performance and situations encountered in workplaces (Akdemir, 2019), it can be interpreted that individuals of both genders may have adopted similar coping strategies.

The findings obtained for the second research question showed that the burnout levels of science teachers did change significantly according to the categories of the age variable. Yıldırım's (2019) study supports this finding. In this context, the positive benefits of advancing age can be taken into consideration. For example, it is known that mature people can actively use emotion-focused coping strategies (Mefoh et al., 2019). At the same time, people can create various ways to be satisfied with their jobs in different age groups (Rožman et al., 2019). Despite the potential for professional burnout, the fact that individuals become more proficient in their profession as they age and address professional challenges with a more seasoned approach can be considered a contributing factor in preventing burnout

(Gomez-Polo et al., 2022). Simultaneously, while younger teachers may be more active, the growing sense of self-assurance in areas such as decision-making, fear of making errors, and job responsibilities as individuals' age might lead to a deeper affinity for the profession (Wijeratne et al., 2021). Kolachev and Novikov (2020) pointed out in their research that different factors may have an effect on the age variable burnout. For example, workloads may be proportional. Simplifying workloads, implementing job sharing, introducing breaks, and age-related improvements in economic factors may all impact burnout (McDuffy, 2016). Similarly, life experiences can either enhance or diminish work adjustment (Johnson et al., 2017). When the sub-dimensions of the burnout scale are analyzed according to the age variable, significant differentiation is observed in all dimensions. The emotional exhaustion dimension can be associated with the stress experienced by the individual. Younger individuals are less able to cope with stress, which may cause them to feel under pressure, tired, and have low motivation (Yıldırım, 2019). Teachers who experience emotional exhaustion may also become depersonalized and thus show indifferent and cold attitudes towards the individuals in the organization (Arslan, 2020). Since young teachers have less experience, they may feel inadequate in solving problems related to students or mastering the profession, which may cause the individual to experience burnout in the personal accomplishment dimension.

The findings pertaining to the third research question in this study have revealed a significant variation in the burnout levels among science teachers in relation to their length of service. While some studies in the literature (Özel, 2016; Tatar & Arslan, 2020; Yurduseven, 2020) support this finding, a different result was obtained in Kılınç's (2018) study. As experience accumulates, a notable decrease in burnout levels is observed, concomitant with individuals gaining confidence through their tenure and developing effective strategies to cope with challenges (Çelik & Üstüner, 2018). Moreover, as the length of service increases, individuals become better at shaping their expectations. Novice professionals entering the field may commence with heightened expectations, only to experience disappointment when these aspirations are not met. Additionally, an overwhelming workload can contribute to an escalation in burnout levels (Demirtaş, 2020). When evaluating the sub-dimensions of burnout, a significant difference was found only in the emotional exhaustion dimension. Emotional exhaustion refers to depleting one's emotional resources, while depersonalization represents a more distant attitude towards colleagues in the workplace (Togia, 2005). In a study conducted by Thomas et al. (2014) on a sample of California human services workers, they found that, when controlling for education and caseload size, age was a positive predictor of burnout, while years of experience were not related to burnout. The research findings can be interpreted as suggesting that newcomers to the field may be less susceptible to burnout due to a reduced degree of professional distortion. Çelik (2021) also stated that individuals, even with many years of experience in the profession, may not experience burnout over time due to their ability to advance their professional skills, develop coping mechanisms for challenges, and experience an increase in self-confidence.

The results obtained for the fourth research question, concerning the length of service within the institution, unveiled a notable disparity in the burnout levels of science teachers based on their working time in the institution. Akkaya's (2019) examination of the correlation between individual-organization fit among academics and burnout levels yielded findings that parallel the outcomes of the current study. Similarly, the results derived from Birkan's (2020) exploration of the impact of teachers' burnout levels on their work-life balance align with the findings of our study. The length of time spent at school increases the communication of individuals with the school environment. The state of the school having the necessary equipment, the positive or negative school climate, the relationship between the administrator and teachers, the relationship between teachers and teachers, and the student demographics can collectively influence the teachers' burnout levels (Caruso et al., 2014; Von der Embse et al., 2016). At the same time, the administration's perception of justice is another factor affecting teachers' professional status (Spell & Arnold, 2007). Upon scrutinizing the sub-dimensions, it became evident that the lowest averages were recorded in the depersonalization dimension. Within this context, consistent human relations or recurring issues within the same institution may contribute to depersonalization among individuals. Depersonalization can induce stress, potentially leading to a diminished sense of accomplishment within one's role (Alkevli, 2021).

The findings pertaining to the final research question of the study underscored a significant distinction in the burnout levels of science teachers based on their perceptions of the school climate, whether high or low. Upon reviewing the existing literature, no study was identified that specifically delved into the correlation between school climate and the burnout levels of science teachers. When the sub-dimensions of SCS were examined, it was seen that there was a significant difference in favor of the groups with low school climate perception in all sub-dimensions of MBI and MBI only for the sub-dimensions of “supportive principal”, “directive principal”, and “collegial teacher” among the six sub-dimensions. In instances characterized by supportive principal behavior, principals typically provide considerable support to teachers, fostering an environment where employees can work in a secure and constructive atmosphere (Göksal, 2018). This approach is generally preferred within the school climate, contributing significantly to a positive work environment for teachers (Bayat, 2015). Consequently, the observed significant relationship between these factors and burnout levels can be comprehended within this context. Conversely, within directive principal behavior, the principal’s lack of respect for teachers and the manifestation of a rigid attitude are prevalent (Göksal, 2018). This dynamic often leads to a lack of decision-making autonomy for teachers, resulting in diminished motivation and job satisfaction (Bayat, 2015). Hence, the significant relationship identified between these factors and burnout is explicable within this framework. Regarding collegial teacher behavior, teachers benefit from a collaborative work environment that fosters mutual respect among colleagues (Şenel, 2015). The establishment of a positive climate perception among teachers often stems from an environment where collaboration is encouraged and a sense of safety is fostered. Such an environment has the potential to alleviate the feeling of burnout among teachers (Alkevli, 2021). Hence, the significant relationship between these factors comes as an anticipated outcome. Upon examining the study’s findings, a noticeable distinction was observed solely in the “personal accomplishment” dimension within the “intimate teacher” behavior sub-dimension of the SCS. This result implies that teachers may not face communication challenges among themselves; however, they might experience a lack of satisfaction in terms of their professional competencies. In schools situated in low socioeconomic areas or rural settings, despite the existence of collaboration within the school environment, the subpar academic performance of students can lead to professional dissatisfaction among teachers. This finding finds support in the existing literature (Alkevli, 2021). In addition, Spell and Arnold (2007) reported that school climate dimensions such as rules indicating relationships with students, time allocated for learning activities, and external interventions can affect individuals’ job satisfaction and thus their burnout. Positive relationships with colleagues and principals are very important in establishing common values and norms and creating a collective goal orientation (Spell & Arnold, 2007). On the other hand, it is consistent with the literature that principal leadership predicts teachers’ stress level and self-efficacy (Malinen & Savolainen, 2016). At the same time, cooperation also emerges as a vital factor in stress reduction. Interpersonal trust, both among teachers and between teachers and principals, along with the perception of a favorable school climate, have been shown to play pivotal roles in various studies (Caruso et al., 2014). Upon closer examination of sub-dimensions, no significant difference was observed in restrictive principal behavior and disengaged teacher behavior concerning burnout. Restrictive principal behavior refers to the fact that principals impose too much workload on teachers (Şenel & Buluç, 2016). The fact that there is no difference in this dimension can be interpreted as teachers’ high interest in the profession, and as a result, they willingly do their job even if it is overloaded. On the other hand, disengaged teacher behavior involves teachers’ working with each other, and it is generally seen that teachers with this attitude focus only on professional studies. Teachers do not set a common goal and often criticize each other (Şenel & Buluç, 2016). The absence of a difference in this dimension may indicate that teachers are inclined towards independent work and remain open to constructive criticism.

Consequently, the study underscores the variances in burnout levels among science teachers based on the variables of gender, age, length of service, working time in the institution, and school climate perception. The distinctions within the emotional exhaustion, depersonalization, and personal accomplishment sub-dimensions further emphasize the complexities of the issue. Thus, it is imperative that more extensive and detailed research be conducted across various regions. Comprehensive quantitative and qualitative investigations are expected to facilitate the development of actionable policies and practices aimed at mitigating science teachers’ burnout. Notably, the influence of school climate on burnout levels among science teachers highlights the need for studies dedicated to fostering

and sustaining a supportive school environment, particularly for school administrators and policymakers. Furthermore, it is understood that there is a need for studies that examine the effects of school climate on teachers' job satisfaction, motivation, and general well-being in more detail.

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Ethics statement: In this study, we declare that the rules stated in the “Higher Education Institutions Scientific Research and Publication Ethics Directive” are complied with and that we do not take any of the actions based on “Actions against scientific research and publication ethics”. At the same time, we declare that there is no conflict of interest between the authors, that all authors contribute to the study, and that all responsibility belongs to the article's authors in case of any ethical violations.

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