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Burnout as a Mediator Between Physical Activity and Successful Aging: A Cross-Sectional Study on Teachers

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ABSTRACT
The rate of global population aging is accelerating faster than in the past. Therefore, the direct and indirect effects of successful aging are important. This study aimed to investigate the mediating role of burnout in the relationship between physical activity and successful aging. Data were collected from a sample of 418 teachers (200 females, 218 males; age mean = 55.7, SD = 5.70) in Turkey using a cross-sectional survey design. Confirmatory factor analysis and structural equation modeling were utilized to analyze the data. The results indicated that physical activity was negatively associated with emotional exhaustion and depersonalization, while it was positively related to personal accomplishment. Emotional exhaustion and depersonalization were found to have a negative relationship with successful aging, whereas personal accomplishment showed a significant positive association. Mediation analysis revealed that burnout partially mediated the relationship between physical activity and successful aging. These findings suggest that engaging in physical activity may promote successful aging by reducing emotional exhaustion and depersonalization while enhancing personal accomplishment.

Keywords: *emotional exhaustion; depersonalization; personal accomplishment; aging; physical activity*

1. INTRODUCTION

The rate of global population aging is accelerating rapidly; it is estimated that by 2030, one out of every six individuals worldwide will be aged 60 or older (WHO, 2024). Aging brings numerous physiological and psychological challenges, but engaging in physical activity—a term described as any bodily movement involving skeletal muscle contraction leading to energy expenditure— is vital in mitigating these effects (Caspersen et al., 1985). Physical activity contributes significantly to overall health across various age groups. For instance, it enhances cardiovascular efficiency by 10% to 30% depending on exercise intensity, lowers cardiovascular risk factors, reduces body fat percentage, and strengthens muscle systems. Beyond these physiological benefits, physical activity also positively impacts mental well-being by alleviating symptoms of depression, anxiety, and negative mood states, while improving self-esteem and mental health (Madigan et al., 2023; Sharma et al., 2006). Hollmann et al. (2007) further emphasized that although certain bodily functions naturally deteriorate with age, regular physical activity can slow down or even counteract this decline. Research also indicates that staying physically active allows individuals to experience a more fulfilling life and supports the concept of successful aging (Daskalopoulou et al., 2017).

Successful aging encompasses various concepts such as physical and mental well-being, psychological well-being, avoidance of diseases, a positive outlook on life, and life satisfaction (Bowling & Dieppe, 2005). In short, successful aging refers to a state of low disease prevalence and overall physical and mental well-being (Rowe & Kahn, 1998). The most important indicators of successful aging include being socially and physically active, achieving personal goals and objectives, understanding one's body, maintaining self-control, and adopting an active perspective on life (Neugarten, 1968).

Therefore, burnout, a psychological concept, must not be overlooked when considering successful aging. Burnout is a state of failure that occurs when individuals face stressful situations (Farber, 1984). Another definition describes it as a psychological condition that arises in circumstances involving failure, loss of strength and potential, and exhaustion (Freudenberger, 1974). Maslach (2003) characterizes burnout as the experience of reduced personal accomplishment, emotional exhaustion, and depersonalization caused by interpersonal interactions within one's professional role. Psychological pressure in the workplace often leads to low personal accomplishment. Emotional exhaustion occurs

predominantly in professions requiring high levels of interpersonal interaction, as excessive interaction can result in emotional depletion. Depersonalization, on the other hand, manifests as cynical, indifferent, and derogatory attitudes toward those receiving one's services (Maslach, 2003).

While the relationship between physical activity and burnout has been extensively studied in various populations, there is a paucity of research focusing on high-stress occupational groups, such as teachers. Teachers face unique challenges, including emotional labor, high workload, and interpersonal demands, which may alter the dynamics of this relationship. Moreover, the mediating role of burnout in the link between physical activity and successful aging remains underexplored, particularly in the context of aging teachers. This study aims to fill this gap by examining the indirect effects of physical activity on successful aging through the dimensions of burnout (depersonalization, emotional exhaustion, and personal accomplishment) among teachers.

Theoretical Background

Burnout, which is commonly defined by symptoms such as emotional exhaustion, depersonalization, and diminished personal accomplishment, often stems from prolonged exposure to workplace stressors (Maslach, 2018). Numerous studies emphasize the high prevalence of burnout among teachers, attributing it to factors like excessive workload, emotional strain, and insufficient organizational support (Polatcan et al., 2019). Despite these challenges, physical activity has been recognized as a potential buffer against burnout. Evidence indicates that engaging in regular physical activity can mitigate symptoms such as persistent stress and mental fatigue (Naczenski et al., 2017). For instance, Lindwall et al. (2014) observed that increases in physical activity levels are inversely related to burnout symptoms over time, suggesting that staying active could lower the likelihood of experiencing burnout. Additionally, systematic reviews highlight a consistent link between physical activity and reduced burnout levels across a range of professions and work environments (Brand et al., 2020; Naczenski et al., 2017).

The hypotheses regarding the relationship between physical activity and burnout in our study are as follows:

H1: Physical activity negatively affects emotional exhaustion (EE).

H2: Physical activity negatively affects depersonalization (DP).

H3: Physical activity positively affects personal accomplishment (PACC).

The relationship between physical activity and successful aging is also of critical importance. Successful aging encompasses not only the absence of disease but also the maintenance of physical and mental health (Tsai & Tsou, 2022). Engaging in regular physical activity has been linked to improved mental health outcomes, which can enhance overall life satisfaction and well-being in older adults (Callow et al., 2020). Maintaining an active lifestyle for older individuals not only reduces burnout but also promotes a more successful aging process by increasing resilience against the psychological demands of their professional roles (Trică et al., 2024).

Conversely, an increase in burnout can create a vicious cycle, reducing an individual's capacity to participate in physical activity, which in turn negatively affects mental health and aging outcomes (Neto et al., 2024). For example, emotional exhaustion—a core component of burnout—can lead to decreased motivation for physical activity, further intensifying feelings of fatigue and disengagement (Carson et al., 2010). Regular physical activity may act as a buffer against burnout, thereby facilitating a more positive aging experience (Brand et al., 2020). Based on this framework, the additional hypotheses in our study are as follows, and the hypothetical model illustrating the relationships among physical activity, successful aging, and burnout can be seen in Figure 1:

H4: Emotional exhaustion (EE) negatively affects successful aging.

H5: Depersonalization (DP) negatively affects successful aging.

H6: Personal accomplishment (PACC) positively affects successful aging.

H7: Burnout mediates the relationship between physical activity and successful aging.

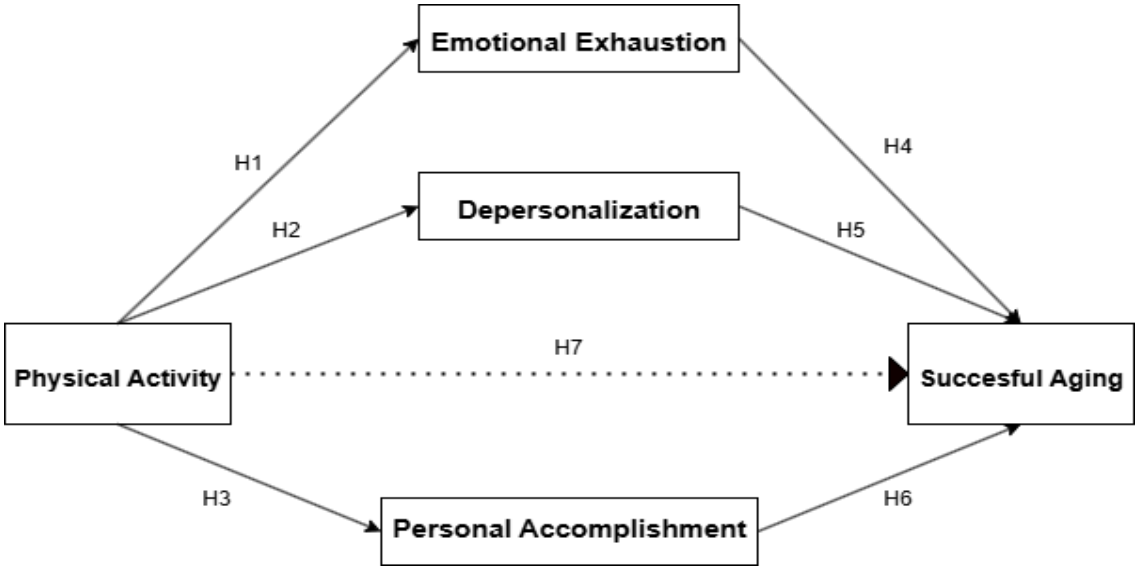

Fig. 1 Hypothetical model of the relationships among physical activity, successful aging, and burnout.

2. METHOD

Participants and Procedure

Teachers are frequently identified as a high-risk occupational group for experiencing burnout due to their demanding work environment, emotional labor, and significant responsibilities (Maslach et al., 2001). The nature of their profession, which often involves managing interpersonal relationships, balancing administrative tasks, and coping with job-related stress, makes them a relevant population for examining the effects of burnout on well-being outcomes, such as successful aging. Moreover, teachers' roles require both physical and mental resilience, highlighting the importance of physical activity as a potential buffer against burnout and its consequences (Skaalvik & Skaalvik, 2017). For this reason, the participants in this study were selected from among teachers.

In this study, a non-probability sampling method, specifically convenience sampling, was utilized. This method is widely employed across various fields due to its practical advantages, such as ease of data collection and lower costs for storage and transportation of materials (Clark, 2007). The study group consisted of 418 teachers (200 females, 218 males; age Mean = 55.7, SD = 5.70) from different disciplines (60 special talent, 122 science, 132 social sciences, 42 languages, and 62 primary school teachers) working or having worked in Mardin, Turkey.

The adequacy of the sample size was tested using Monte Carlo power analysis (Schoemann et al., 2017). The sample size was based on standardized coefficients and standard deviation data from the Study results, with a target power of 0.90, 95% confidence level, and 20,000 Monte Carlo draws per replication. As a result, power values for the three different instruments emerged and the minimum power value for the three instruments was 0.99. Therefore, the data obtained for this study were considered to be of sufficient size.

Ethical approval for the study was obtained from the ethics committee. The data were collected via Google Forms. Before data collection, participants were informed about the purpose of the research and their voluntary participation was confirmed through informed consent. A total of 430 responses were collected; however, 12 responses with missing or incomplete data were excluded from the analysis.

In this study, ChatGPT-assisted linguistic checking and editing was performed to ensure linguistic accuracy and improve text flow, and then the text was checked by authors. In accordance with ethical rules, AI technology was used for structural and contextual corrections.

Measures

International Physical Activity Questionnaire (IPAQ)

The short form of the International Physical Activity Questionnaire (IPAQ), validated and adapted to Turkish by Öztürk (2005), was used to assess participants' physical activity levels (Craig et al., 2003). The questionnaire consists of seven items measuring time spent walking, performing moderate-intensity, and vigorous-intensity activities, as well as sedentary behavior. Total scores are calculated using the duration (minutes) and frequency (days) for each activity type, multiplied by corresponding MET values: walking = 3.3 MET, moderate-intensity = 4 MET, vigorous-intensity = 8 MET, and sitting = 1.5

MET. For example, an individual walking for 45 minutes, three days a week would have a walking MET score of 3.3 × 3 × 45 = 445.5 MET-minutes/week.

Successful Aging Scale

The Successful Aging Scale (SAS), developed by Reker (2009) and adapted to Turkish by Özsungur and Hazer (2017), was used to measure successful aging. The scale consists of 10 items under two sub-dimensions: Coping with Problems (7 items) and Healthy Living (3 items). Responses are provided on a 7-point Likert scale (1 = Strongly disagree, 7 = Strongly agree). The internal consistency of the scale was reported as Cronbach's α = 0.825. Total scores range from 10 to 70, with higher scores indicating higher levels of successful aging. Reliability values for the SAS in the present study are provided in Table 1.

Maslach Burnout Inventory (MBI)

Burnout was measured using the Maslach Burnout Inventory (MBI), originally developed by Maslach and Jackson (1981) and adapted to Turkish by Ergin (1992). The inventory consists of 22 items divided into three sub-scales: Emotional Exhaustion (9 items), Depersonalization (5 items), and Personal Accomplishment (8 items). Responses are rated on a 5-point Likert scale (1 = Not at all, 5 = Very often). Scores for each sub-scale are calculated separately, as no total burnout score is obtained. Higher scores on Emotional Exhaustion and Depersonalization, combined with lower scores on Personal Accomplishment, indicate greater levels of burnout. Reliability values for the MBI in the present study are reported in Table 1.

Analytic Approach

This study investigates the mediating role of burnout in the relationship between physical activity and successful aging. The analysis employed multivariate structural equation modeling (SEM) using Maximum Likelihood estimation via AMOS and Jamovi software. Before analysis, data normality was assessed through skewness, kurtosis, and Z-scores to identify and exclude outliers. The data demonstrated a normal distribution, with skewness and kurtosis values falling within the acceptable range of −1.5 to +1.5, and Z-scores within the normal range (Tabachnick et al., 2013). Twelve data points were removed based on these criteria.

A multicollinearity check was conducted, revealing that variance inflation factors (VIF < 5) and tolerance indices (TI > 0.10) were within acceptable ranges, indicating no significant multicollinearity issues among the variables.

To test our hypotheses, we employed a systematic approach:

1. Descriptive statistical analyses, including means (M), standard deviations (SD), and Pearson's correlation analyses (r), were conducted to examine the relationships between variables (Table 1). Data from total physical activity points and the scales were standardized, and analyses were performed using Z-scores.
2. SEM was used to quantify both direct and indirect associations between the variables, guided by insights from the descriptive analyses.
3. Bootstrap analysis with a sample size of 2000 was conducted to ensure the robustness of our findings. The lower and upper bounds of the 95% Confidence Intervals (CI) were checked to confirm that they did not contain zero (0), as recommended by Preacher and Hayes (2008).

Table 1. Fit Indices of the Scales

Scales	α	x^2/df	RMSEA	CFI	TLI	SRMR
SA	0.93	3.63	0.079	0.97	0.96	0.02
Burnout	0.94	3.55	0.078	0.90	0.90	0.06
EE	0.93	-	-	-	-	-
DP	0.82	-	-	-	-	-
PACC	0.85	-	-	-	-	-

Note. SA: Succesful Aging, EE: emotional exhaustion, DP: depersonalization, PACC: personal accomplishment

3. RESULTS

Validity and Reliability Analysis

A second-order confirmatory factor analysis (CFA) was performed to evaluate the scales rated by teachers. The fit indices for the CFA model are summarized in Table 1. The findings revealed that the model demonstrated a good fit for both the

Successful Aging and Burnout constructs, confirming sufficient construct validity. Reliability was examined through Cronbach's Alpha, where all scales exhibited strong internal consistency ($\alpha > 0.70$). Additionally, convergent validity and composite reliability criteria were satisfied, with the Average Variance Extracted (AVE > 0.50) and Composite Reliability (CR > 0.70) values surpassing the recommended thresholds.

Preliminary Analysis

Descriptive statistics and correlations are provided in Table 2. As shown, all variables were significantly correlated. Physical activity exhibited a positive relationship with both Successful Aging ($r = 0.274$, $p < 0.001$) and personal accomplishment ($r = 0.273$, $p < 0.001$), while showing negative associations with emotional exhaustion ($r = -0.265$, $p < 0.001$) and depersonalization ($r = -0.184$, $p < 0.001$). Successful Aging was negatively associated with emotional exhaustion ($r = -0.561$, $p < 0.001$) and depersonalization ($r = -0.587$, $p < 0.001$), and positively related to personal accomplishment ($r = 0.759$, $p < 0.001$). Emotional exhaustion was positively correlated with depersonalization ($r = 0.793$, $p < 0.001$) and negatively with personal accomplishment ($r = -0.534$, $p < 0.001$). Depersonalization was also negatively correlated with personal accomplishment ($r = -0.576$, $p < 0.001$).

Table 2. Descriptive statistics and correlations among variables

Variables	M (SD)	1	2	3	4	5
1.Physical Activity	1508.61(1734.51)	-	0.274***	-0.265***	-0.184***	0.273***
2.Succesful Aging	4.9581 (1.40)		-	-0.561***	-0.587***	0.759***
3.Emotional Exaustion	2.8178(0.99)			-	0.793***	-0.534***
4.Depersonalization	2.3835(0.89)				-	-0.576***
5.Personal accomplishment	3.4812(0.70)					-

Notes. *: p<0.05, **: p<0.01, ***: p < 0.001, M: Mean, SD: Standard Deviation

Hypothesis Testing

To test the proposed hypotheses, we conducted a structural equation model (SEM) mediation analysis using Jamovi (see Figure 2, Table 3). The direct association between physical activity and Successful Aging was significant ($\beta = 0.0704$, SE = 0.036, $p < 0.05$; [LCI = 0.009; UCI = 0.149]). The link between physical activity and emotional exhaustion was negative and significant ($\beta = -0.268$, SE = 0.052, $p < 0.001$; [LCI = -0.403; UCI = -0.197]). The association between physical activity and depersonalization was also negative and significant ($\beta = -0.202$, SE = 0.053, $p < 0.001$; [LCI = -0.331; UCI = -0.121]). Additionally, the relationship between physical activity and personal accomplishment was positive and significant ($\beta = 0.284$, SE = 0.052, $p < 0.001$; [LCI = 0.214; UCI = 0.419]). Thus, hypotheses H1, H2, and H3 were supported.

Table 3. Indirect and Total Effects

				95% C.I. (a)				
Type	**Effect**	**Estimate**	**SE**	**Lower**	**Upper**	**β**	**z**	**p**
Indirect	PA ⇒ EE ⇒ SA	0.0345	0.0164	0.0023	0.0667	0.0308	2.10	0.035
	PA ⇒ DP ⇒ SA	0.0313	0.0139	0.0040	0.0586	0.0280	2.25	0.024
	PA ⇒ PACC ⇒ SA	0.1909	0.0337	0.1247	0.2570	0.1703	5.66	< .001

Table 3. Indirect and Total Effects

				95% C.I. (a)				
Type	**Effect**	**Estimate**	**SE**	**Lower**	**Upper**	**β**	**z**	**p**
Total Indirect	PA ⇒ Burnout ⇒ SA	0.2567	0.0400	0.1784	0.3350	0.2291	6.42	< .001
Component	PA ⇒ EE	-0.3002	0.0527	-0.40351	-0.1970	-0.2685	-5.70	< .001
	EE ⇒ SA	-0.1150	0.0508	-0.21460	-0.0154	-0.1147	-2.26	0.024
	PA ⇒ DP	-0.2262	0.0537	-0.33144	-0.1210	-0.2019	-4.21	< .001
	DP ⇒ SA	-0.1385	0.0520	-0.24036	-0.0367	-0.1385	-2.67	0.008
	PA ⇒ PACC	0.3166	0.0523	0.21415	0.4191	0.2840	6.06	< .001
	PACC ⇒ SA	0.6030	0.0380	0.52856	0.6774	0.5997	15.88	< .001
Direct	PA ⇒ SA	0.0789	0.0356	0.00906	0.1487	0.0704	2.21	0.027
Total	PA ⇒ SA	0.3356	0.0524	0.23299	0.4383	0.2994	6.41	< .001

Note. Confidence intervals computed with method: Standard (Delta method). Betas are completely standardized effect sizes.

Note. PA: Physical Activity, SA: Succesful Aging, EE: emotional exhaustion, DP: depersonalization, PACC: personal accomplishment, SE: Standardized Error

Furthermore, we observed negative and significant relationships between emotional exhaustion (β = -0.114, SE = 0.051, p < 0.05; [LCI = -0.214; UCI = -0.015]) and depersonalization (β = -0.138, SE = 0.052, p < 0.01; [LCI = -0.240; UCI = -0.036]) with Successful Aging. Meanwhile, a positive and significant relationship was found between personal accomplishment and Successful Aging (β = 0.599, SE = 0.038, p < 0.001; [LCI = 0.528; UCI = 0.677]). Therefore, hypotheses H4, H5, and H6 were supported.

Finally, we examined the indirect associations between physical activity and Successful Aging through burnout dimensions (emotional exhaustion, depersonalization, and personal accomplishment) using a bootstrap method (Preacher & Hayes,

2008). The results showed a significant indirect relationship between physical activity and successful aging via burnout (β = 0.229, SE = 0.040, p < 0.01; [LCI = 0.178; UCI = 0.335]), supporting Hypothesis H7.

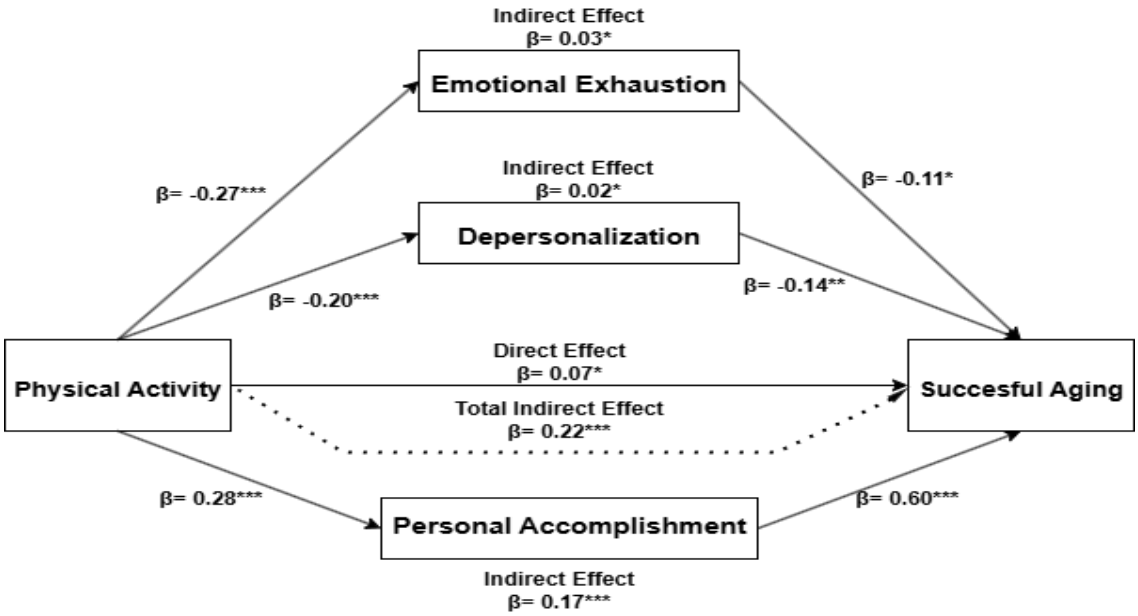

Fig. 2 Statistical Diagram

4. DISCUSSION AND CONCLUSION

This study aimed to contribute to the existing literature by examining the indirect effects of physical activity on successful aging via burnout dimensions. Our findings indicated that physical activity was significantly and negatively associated with emotional exhaustion and depersonalization, while it was positively related to personal accomplishment. This suggests that as teachers' levels of physical activity increase, they experience lower emotional exhaustion and depersonalization, and higher personal accomplishment. These results align with previous research (Carson et al., 2010; Mabele et al., 2024; Neto et al., 2024), which has shown that regular physical activity reduces stress levels, promotes positive emotional states, and enhances individuals' sense of competence (Biddle & Mutrie, 2007). Emotional exhaustion and depersonalization, particularly in high-stress professions like teaching, are common burnout indicators. Thus, physical activity may play a preventive role in reducing burnout and enhancing psychological well-being (Xu et al., 2022).

The positive association between physical activity and personal accomplishment is not surprising. Physical activity has been shown to enhance both physical and psychological energy, contributing to increased motivation and performance in work-life (Lubans et al., 2016). Moreover, the potential for physical activity to foster social support could further bolster personal accomplishment, as it often involves social interactions that strengthen confidence and success (Warburton et al., 2006).

Our findings revealed significant negative associations between emotional exhaustion and depersonalization with successful aging. These results suggest that lower levels of emotional exhaustion and depersonalization may contribute to more successful aging. This is consistent with the literature, which shows that burnout symptoms such as emotional exhaustion can negatively impact individuals' overall quality of life and psychological well-being (Maslach, 2018; Schaufeli & Enzmann, 2020). Depersonalization, in particular, is linked to alienation from one's work, colleagues, and environment (Maslach & Jackson, 1981), which can hinder successful aging. Successful aging is closely tied to social connectedness and support, making it likely that reducing depersonalization can improve these outcomes (Rowe & Kahn, 1998).

In contrast, the positive relationship between personal accomplishment and successful aging highlights how a sense of competence and self-worth can enhance life satisfaction during the aging process (Bandura, 1997). In teachers, personal accomplishment is often associated with job satisfaction and a sense of belonging (Skaalvik & Skaalvik, 2010), both of which are critical for successful aging.

Lastly, our results confirmed the mediating role of burnout dimensions (emotional exhaustion, depersonalization, and personal accomplishment) in the relationship between physical activity and successful aging. This finding aligns with prior research emphasizing the positive impact of physical activity on psychological well-being and burnout reduction (Lindwall et al., 2014; McAuley et al., 2006; Schuch & Stubbs, 2019). Physical activity was observed to reduce emotional exhaustion and depersonalization while enhancing personal accomplishment, thereby contributing to improved well-being and successful aging.

In conclusion, physical activity contributes to successful aging by mitigating burnout symptoms and fostering a greater sense of personal accomplishment. These findings underscore the importance of promoting physical activity as a means to support healthier aging processes, particularly in high-stress occupations like teaching, where burnout can be prevalent. By addressing burnout dimensions, physical activity can help enhance overall psychological well-being, leading to a more positive aging experience.

5. LIMITATIONS

Our study has several limitations. First, due to its cross-sectional design, we were unable to establish causal relationships among the study variables. Future research should consider longitudinal or experimental designs to examine the causality of the observed associations more thoroughly. Second, the sample consisted of teachers from a single province, Mardin, in Turkey, which may limit the generalizability of the findings. Although the sample closely represents the national distribution of teachers in terms of demographic characteristics, future studies should aim to include more diverse regional samples to enhance the external validity of the results. Third, we employed subjective measurement methods, relying on self-reported scales for assessing physical activity, successful aging, and burnout dimensions. Future research could incorporate objective measurement techniques, such as wearable devices or more standardized assessments, to reduce bias and provide more precise data.

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