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The effect of using technology for work on burnout and work productivity among Saudi board residents: a cross-sectional study

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Abstract

Background: The use of technology for work has become an unavoidable component of most occupations. It is considered a double-edged sword; it has a massive impact on employees' mental health and productivity, mainly when used outside the working hours. This practice is referred to as technology-assisted supplemental work (TASW). This study aimed to determine the effect of supplemental work using technology behavior on burnout levels among Saudi board residents and its consequences on work productivity.

Results: Three hundred seventy-seven residents were involved in this study to assess their TASW behavior, burnout level, and presenteeism. The Maslach Burnout Inventory (MBI) scale is used to assess burnout, which is composed of three subscales: emotional exhaustion (EE), depersonalization (DP), and personal accomplishment (PA). This study revealed that a high risk of EE was found among 52.5% of residents, 12.2% were at high risk of DP, and 53.1% had low PA. The mean score of TASW was 19.7 (SD 3.75) out of 30 points, while the mean score of presenteeism (SPS-6) was 18.5 (SD 4.49) out of 30 points. A significant correlation was found between SPS-6 and MBI subscales including emotional exhaustion ($r=-0.642$, $p<0.001$), depersonalization ($r=-0.406$, $p<0.001$), and personal accomplishment ($r=0.206$, $p<0.001$), but association with TASW did not reach statistical significance ($p>0.05$).

Conclusion: Burnout "specifically Emotional Exhaustion" was noted to be significantly high among residents in different specialties in Saudi Arabia. Furthermore, several factors in the study were evidently demonstrated to be highly related to burnout which is directly associated with lost work productivity. However, our study suggests that extra working hours at home using technology were not associated with burnout or an increase in productivity.

Keywords: Residents, Work productivity, Presenteeism, Burnout, Supplemental work

Background

Technology-assisted supplemental work (TASW) is defined as "the practice of lengthening working time by remaining connected to work, coworkers, supervisors, and other organizational stakeholders from home via advanced digital information technology (i.e., personal and handheld computers, cellular phones, or pagers)" [1]. It has been recognized that to continue working after regular working hours has serious effect on employees' lives and relationships [2]. However, it is associated with increased work productivity and satisfaction when individuals manage their time wisely [3–5].

The use of smartphones and other communication devices after working hours to catch up has been related to more dangerous conditions such as high levels of stress and possible burnout, leading to a change in the employee's quality of care [6, 7].

Burnout syndrome is defined as a pathological condition developed because of prolonged work stress that

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affects the person's emotions and adaptation. According to Maslach, burnout syndrome has three dimensions: personal achievement, depersonalization, and emotional exhaustion [7, 8]. About 50% of physicians worldwide report suffering from at least one of those three dimensions. In a sequence of that, physician's mental health and job satisfaction have been decreased and lead to reductions in the work productivity and quality of patient care [9]. In Saudi Arabia, many studies reported moderate to high burnout levels among physicians, similar to the global average [10–13]. In several international studies, the highest level of burnout was seen in resident physicians compared to medical students and practicing physicians due to different stressors such as time demands, lack of control over time management, work planning, work environments, difficult job situations, and interpersonal relationships [14, 15].

Work productivity can manifest as either absenteeism when an employee is not present at work or low presenteeism when an employee presents physically at work but not meeting the standard quantity or quality of work [16, 17]. This can lead to severe problems, especially when it comes to the healthcare workplace. Additionally, a significant correlation was found between low productivity and making mistakes [18]. Therefore, many healthcare employees try to increase their work productivity by bringing work at home after official working hours using technology such as smartphones and computers.

However, due to the lack of data that investigates the impact of burnout and its risk factors on work productivity in Saudi Arabia, we aimed in this study to determine the relationship between burnout and work productivity among Saudi board residents, as well as to clarify the effect of using technology to supplement work on burnout and work productivity. The result of this study will support the database on work productivity in relation to burnout and its risk factors in the Middle East and Saudi Arabia in specific. It will also be useful for preparing of occupational wellness programs as health promotion in the workplace is necessary for maximum efficiency.

Methods

A cross-sectional study was conducted between October 2019 and March 2020 using an online survey. The survey includes five sections: general sociodemographic data; working conditions; Stanford Presenteeism Scale (SPS-6) measured on a 5-item Likert scale to assess the lost work productivity in which higher scores indicate higher presenteeism; technology-assisted supplemental work scale (TASW) measured on a 5-item Likert scale to assess the attitude of using technology to do job-related work outside the working hours in which higher scores indicate more supplemental work using technology; and lastly, Maslach Burnout Inventory (MBI) scale measured on a 7-item Likert scale to assess the burnout status which is composed of three subscales: emotional exhaustion (EE), depersonalization (DP), and personal accomplishment (PA). Higher EE and DP scores indicate higher levels of burnout, while higher PA scores indicate lower burnout levels. All three scales used are validated.

In Saudi Arabia, residency is a postgraduate training period in a specific medical specialty designed according to the Saudi Commission for Health Specialties (SCFHS) curriculum. The minimum duration of residency programs is 3 years, and each year considers a residency level with minimum core requirements that every trainee must accomplish to be promoted to the next level and finally become board certified [19].

The survey link was distributed in October 2019 via email through SCFHS among all registered residents in general residency programs who spend at least 3 months in the program. The email was sent again as a reminder in January 2019.

Total number of emails was 8620. According to population size, 368 residents were needed for this study. Four hundred forty-nine completed the survey with a 79% completion rate. We exclude some respondents who were pregnant or have their baby recently or were on medical leave as these factors might affect the study's results. Therefore, the total number of residents included in this study is 377.

Descriptive statistics have been presented using counts, proportions (%), range, mean, and standard deviation whenever appropriate. The comparison between MBI subscales versus sociodemographic characteristics and working conditions of residents had been conducted using the Mann-Whitney U test (2 categories) and the Kruskal-Wallis test (3 categories). p <0.05 was considered statistically significant. Normality, statistical interactions, and collinearity (i.e., variance inflation factor) were also assessed with the Kolmogorov-Smirnov and Shapiro-Wilk test; p-value <0.05 was considered as skewed data. Non-parametric correlation procedures were also conducted to determine the linear relationship between MBI subscales, SPS-6, and TASW. All data analyses were performed using Statistical Packages for Software Sciences (SPSS) version 21 Armonk, New York, IBM Corporation.

Results

Three hundred seventy-seven residents were involved in this study. Table 1 presents the sociodemographic characteristics as well as the working condition of the residents. The age range of residents was from 24 to 44 years old (mean 28.9 years), with the majority of them (67.9%) in the younger age group (<30 years). More than half (55.4%) were females, and the data were the same for married (56.5%). Furthermore, most of them had no

Table 1 Sociodemographic characteristics and working condition of residents (*n*=377)

Study data	N (%)
Age group	
<30 years	256 (67.9%)
≥30 years	121 (32.1%)
Gender	
Male	168 (44.6%)
Female	209 (55.4%)
Marital status	
Single	154 (40.8%)
Married	213 (56.5%)
Divorced or widowed	10 (02.7%)
Number of children	
None	221 (58.6%)
One	84 (22.3%)
More than one	72 (19.1%)
Residency training program	
Ob-Gyne	35 (8.86%)
Internal medicine	80 (20.25%)
General surgery	30 (7.59%)
Family medicine	125 (31.65%)
Pediatric	31 (7.85%)
Other (otolaryngology, ophthalmology, radiology, orthopedic, cardiology, neurology, urology, pathology, dermatology, psychiatry, anesthesia, clinical biochemistry, critical care, preventive medicine and plastic surgery|)	87 (22.03%)
Residency level	
R1	66 (17.5%)
R2	101 (26.8%)
R3	120 (31.8%)
R4	70 (18.6%)
R5	20 (05.3%)
R6	0
Location of center	
Central region	67 (17.8%)
Eastern region	210 (55.7%)
Western region	81 (21.5%)
Southern region	08 (02.1%)
Northern region	07 (01.9%)
Other gulf countries	04 (01.1%)
Type of center	
Government	356 (94.4%)
Private	21 (05.6%)
Mainly used type of medical records	
Paper	153 (40.6%)
Electronic	224 (59.4%)
Received hospital calls within the last month	
Yes	244 (64.7%)

Table 1 Sociodemographic characteristics and working condition of residents (*n*=377) *(Continued)*

Study data	N (%)
No	133 (35.3%)
Number of hospital calls	
≤5 calls	119 (48.8%)
>5 calls	125 (51.2%)
I would choose my specialty again	
Strongly disagree	40 (10.6%)
Disagree	34 (09.0%)
Neutral	90 (23.9%)
Agree	95 (25.2%)
Strongly agree	118 (31.3%)

children (58.6%), while 22.3% had one child. The most commonly mentioned resident level was R3 (31.8%) and R2 (26.8%). With regard to the location of the center, more than half (55.7%) were working in the Eastern region (55.7%), followed by the Western region (21.5%). Regarding the type of center, nearly all (94.4%) were working at the government center, with the mainly used type of medical records was electronic (59.4%). Likewise, nearly two-thirds of residents (64.7%) used to receive hospital calls within the last month, with more than five calls was the most frequent number of received calls (51.2%). In addition, the proportion of residents that stated that they would agree or strongly agree when asked if they would choose the specialty again was 25.2% and 31.3%, respectively.

Table 2 shows the descriptive statistics for SPS-6, TASW, and MBI subscales. Following the results, the mean score of SPS-6 was 18.5 (SD 4.49) out of 30 points while the mean score for TASW was 19.7 (SD 3.75) out of 30 points. For MBI subscales, the mean scores of emotional exhaustion, depersonalization, and personal accomplishment were 12.1, 6.13, and 12.6, respectively.

Figure 1 elaborates the level of burnout based on MBI subscales. Based on the cutoff points of 6 and 12, more than half of the residents (52.5%) were classified as having high emotional exhaustion while only 12.2% had high depersonalization whereas low personal accomplishment was detected among 53.1% of residents.

Table 3 describes the spearman correlation between MBI subscales, SPS-6, and TASW. Based on the results, an inverse correlation was found between SPS-6 and MBI subscales, including emotional exhaustion ($r=-0.642$, $p<0.001$) and depersonalization ($r=-0.406$, $p<0.001$) but showed positive correlation with personal accomplishment ($r=0.206$, $p<0.001$). We also found out that emotional exhaustion has highly positive significant correlation with depersonalization while personal accomplishment showed inverse correlation with depersonalization. On the other hand, MBI subscales showed no significant correlation with TASW ($p>0.05$) while the correlation between SPS-6 and TSAW did not reach statistical significance ($p>0.05$).

When measuring the association between the MBI subscales and the sociodemographic characteristics of the residents, we have learned from Table 4 that only gender showed significant association with emotional exhaustion ($t=-0.295$, $p=0.031$). Other variables such as age group, marital status, and having children showed no significant association with MBI subscales (all $p>0.05$). When measuring the association between MBI subscales and the working condition of residents, it was revealed that resident program showed significant association with emotional exhaustion ($F=2.822$, $p=0.036$) and depersonalization ($F=2.098$, $p=0.037$) but not with personal accomplishment ($F=1.558$, $p=0.095$). We also observed that location of center showed positive

Table 2 Outcome of SPS-6, TASW, and MBI subscale inventory score (*n*=377)

Variables	Possible range	Actual range	Mean ± SD	Mean %
SPS-6 score	6–30	6–30	18.5 ± 4.49	61.7%
TASW score	6–30	6–28	19.7 ± 3.75	65.7%
MBI scale score				
Emotional exhaustion	0–18	0–18	12.1 ± 4.66	67.2%
Depersonalization	0–18	0–18	6.13 ± 4.86	34.1%
Personal accomplishment	0–18	0–18	12.6 ± 3.63	70.0%

SPS-6 Stanford Presenteeism Scale, *TASW* Technology assisted supplemental work, *MBI* Maslach Burnout Inventory scale

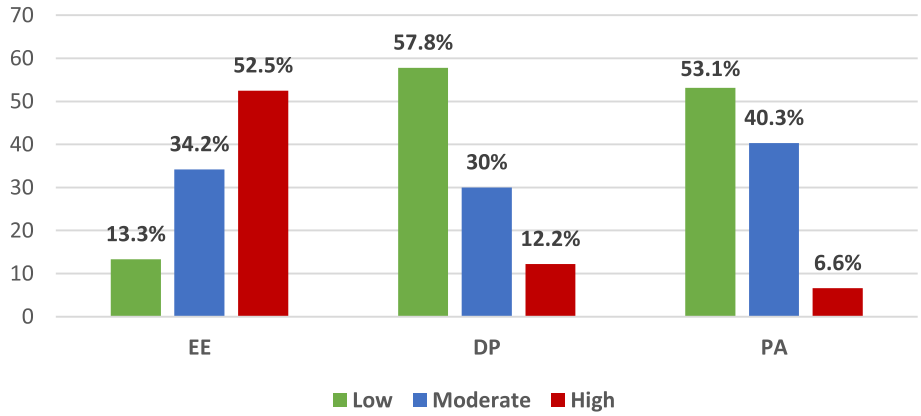

Fig. 1 Level of burnout using MBI subscales

association with emotional exhaustion (T=1.438, p=0.046) and depersonalization (T=2.248, p=0.024), but no significant association with personal accomplishment (T=1.057, p=0.284). Furthermore, received hospital calls had significant association with emotional exhaustion (T=5.127, $p<0.001$) and depersonalization (T=2.628, p=0.003). Additionally, choosing my specialty again showed significant association in all MBI subscales, including emotional exhaustion (F=11.442, $p<0.001$), depersonalization (F=5.554, p=0.014), and personal accomplishment (F=4.896, p=0.007). Only resident levels showed no significant association with MBI subscales ($p>0.05$) (Table 5).

When measuring the association between presenteeism and TASW, it was found that males (T=2.736, p=0.026) and those who have children (T=2.888, p=0.005) had significantly higher presenteeism score than their counterparts while those residents with pediatrics specialty (F=2.410, p=0.037) showed significantly lower presenteeism score. In TASW, only younger age group (<30 years) showed significantly lower TASW score (T=2.888, p=0.006). Other sociodemographic variables and working conditions of the residents did not show significant difference with TASW (all $p>0.05$) (Table 6).

Discussion

It is a well-known fact that in the medical field, taking measures to prevent illness is a better approach than treating the illness after it has occurred. This case is also similar to burnout. However, to apply preventive measures, someone has to have a better understanding of the causes and root of the problem. There were limited studies that examined supplemental working hours among residents and their effect on burnout and work productivity. The present study is one of the few studies that evaluated the subject mentioned above. In this study, EE was high among 52.5% of residents, while only 12.2% had a higher risk in DP and 53.1% had low PA (mean score 12.1, 12.6, and 6.13 out of 18 points, respectively). Several studies in Saudi Arabia reported a high prevalence of EE and DP varying from 15.7 to 54% [11–13, 16], which was consistent with our study.

Similarly, reports indicated that the prevalence of burnout among medical residents was high, ranging from 62.8 to 93.7% [20–24]. In abroad, one of the recent papers reported that high EE and DP were found among 21.5% and 41.9% of residents, while low PA accounted for 34% [20] which was in line with our results. The current data of burnout among medical residents in Saudi Arabia is alarming, and there should be a systematic approach to address this issue. Furthermore, it is also important to understand the effect of burnout among medical residents. To attain this, more studies are needed to determine which factors showed a significant effect on burnout.

Table 3 Spearman correlation between MBI subscales, SPS-6, and TASW (n=377)

Variables	SPS-6	TASW	EE	DP	PA
SPS-6 score	1				
TASW score	−0.011	1			
Emotional exhaustion (EE)	**−0.642** **	−0.030	1		
Depersonalization (DP)	**−0.406** **	−0.037	**0.565** **	1	
Personal accomplishment (PA)	**0.206** **	0.037	−0.025	**−0.113** *	1

SPS-6 Stanford Presenteeism Scale, *TASW* technology-assisted supplemental work, *MBI* Maslach Burnout Inventory scale
* Correlation was significant at $p<0.05$ level (2-tailed)
** Correlation was significant at $p<0.01$ level (2-tailed)

Table 4 Statistical association between the MBI subscales and the sociodemographic characteristics of residents (*n*=377)

Factor	EE Mean ± SD Total score (18)	DP Mean ± SD Total score (18)	PA Mean ± SD Total score (18)
Age group			
<30 years	12.3 ± 4.56	6.25 ± 4.83	12.6 ± 3.79
≥30 years	11.7 ± 4.85	5.89 ± 4.93	12.4 ± 3.27
T-test	***1.187***	***0.659***	***0.525***
***p*-value**	***0.296***	***0.421***	***0.302***
Gender			
Male	11.5 ± 4.85	6.61 ± 5.08	12.6 ± 3.62
Female	12.6 ± 4.45	5.75 ± 4.65	12.6 ± 3.65
T-test	***−2.295***	***1.1725***	***−0.131***
***p*-value**	***0.031 *****	***0.125***	***0.941***
Marital status			
Unmarried	12.3 ± 4.88	6.35 ± 5.01	12.8 ± 3.69
Married	11.9 ± 4.86	5.96 ± 4.75	12.4 ± 3.57
T-test	***0.665***	***0.774***	***1.167***
***p*-value**	***0.296***	***0.503***	***0.147***
Having children			
Yes	11.7 ± 4.62	5.83 ± 4.56	12.6 ± 3.53
No	12.4 ± 4.68	6.34 ± 5.06	12.6 ± 3.69
T-test	***−1.420***	***−1.004***	***−0.075***
***p*-value**	***0.105***	***0.463***	***0.808***

EE Emotional exhaustion, *DP* Depersonalization, *PA* Personal accomplishment
p-value has been calculated using Mann-Whitney U test
** Significant at $p<0.05$ level

Our study also found that being a female was more likely to be associated with EE than males. On the contrary, in a study of Alhaffar et al. [21], they found that males had a higher level of burnout than females; in another paper in Saudi Arabia, [11] indicated no significant correlation between burnout and gender, which was less substantial than our report. Furthermore, in a study by Al Sareai et al. [13] they accounted that a higher risk of EE was associated with younger age. This coincided with the paper of Alhaffar et al. [21] where they documented that age group showed a significant relationship with burnout. However, in our study, although the younger age group showed higher rates of burnout, this did not reach statistical significance, which was similar to the study reported in the USA [22]. Regarding additional responsibilities such as being married and caring for children, some studies showed no correlation between those factors and burnout. Surprisingly, although it is not statically significant, our data showed that married residents with children had a lower level of burnout, which is consistent with Collier et al.'s study [25] that considers parenting a protective factor against burnout which might increase humanistic feelings that result in less detachment and depersonalization [26].

The highest EE and DP scores were found in the second level of residency (R2), and that is probably because of the exams that evaluate the residents' competence for promotion from junior to senior phase in most general residency programs. Several studies reported different findings, such as Aldubai et al. [27] who find R4 to be the highest in burnout among family medicine residents as it is the last residency level. However, in Martini et al.'s [26] study, they reported R1 to be the most stressful level, arguing that the transition from a graduate student to a medical practitioner exposes junior residents to greater risk of burnout. The general surgery residents have the highest level of burnout in this study, and this finding is similar to other study conducted in Riyadh [12]. In international studies, obstetrics and gynecology residents were on the top of the list with a burnout rate that reaches 75% [26]. The residents who have on calls "working more than 8 hours per day" have higher EE and DP rate, and this finding was clear in other national study [28].

The PA score was significantly higher among residents who were satisfied with their choice of specialty. However, those who are not satisfied are significantly higher in EE and DP although the reasons behind their choice of specialty were unclear.

To measure the lost work productivity of medical residents, we used the Stanford Presenteeism Scale (SPS-6) [10]. Apparently, the study suggests that presenteeism posed a serious problem when it comes to the healthcare workplace, arguing that it could reduce the standard quantity or quality of work [8, 9]. In this study, the mean score of SPS-6 was 18.6 (SD 4.49) out of 30 points. About half of the residents (49.1%) scored above the mean score of SPS-6, indicating a concern in lost work productivity. Our result is higher than the study reported in China [23], where 30.7% of the doctors accounted for presenteeism syndrome. Being a male and having children, in addition to the training in the general surgery program, appear to be the factors most associated with high presenteeism in our study. However, in a study by Jena et al., none of these factors were a risk factor [29].

Many of the residents worked extended hours or by bringing work at home to reach the desired work productivity. These supplemental working hours affect their life after work that could lead to more stress [11–13]. Using the technology-assisted supplemental work scale (TASW), we assessed the residents' technology used to do work-related tasks after working hours [11]. The total mean score of TASW was 19.7 (SD 3.75), with 53.8% of respondents reported having a score above the mean indicating a higher rate of supplemental working hours. We find that the younger residents tend to use technology and bring their work home, and this might be due

Table 5 Statistical association between the MBI subscales and the working condition of residents (*n*=377)

Factor	EE Mean ± SD Total score (18)	DP Mean ± SD Total score (18)	PA Mean ± SD Total score (18)
Residency level [a]			
R1	11.9 ± 5.01	5.35 ± 5.03	13.2 ± 3.95
R2	12.8 ± 4.58	7.23 ± 5.23	12.1 ± 3.96
R3	11.7 ± 4.38	5.68 ± 4.53	12.5 ± 3.26
R4	11.8 ± 5.12	6.16 ± 4.69	12.8 ± 3.49
R5	13.1 ± 3.61	5.80 ± 4.36	12.4 ± 3.32
F-test	***1.059***	***2.011***	***0.977***
***p*-value**	***0.345***	***0.106***	***0.298***
Resident program [a]			
Ob-Gyne	12.4 ± 4.24	5.89 ± 5.04	12.4 ± 3.39
Internal medicine	12.7 ± 4.84	7.22 ± 4.89	11.9 ± 3.64
General surgery	12.1 ± 4.34	6.31 ± 3.95	13.4 ± 3.98
Family medicine	11.5 ± 4.86	5.61 ± 5.04	12.7 ± 3.56
Pediatrics	14.3 ± 2.75	6.50 ± 5.16	13.2 ± 3.22
Others	10.9 ± 4.92	5.04 ± 4.77	12.3 ± 3.68
F-test	***2.860***	***1.727***	***1.422***
***p*-value**	***0.022 *****	***0.063***	***0.116***
Location of center [b]			
Non-Eastern region	12.5 ± 4.91	6.76 ± 4.96	12.8 ± 3.57
Eastern region	11.8 ± 4.44	5.63 ± 4.74	12.4 ± 3.67
T-test	***1.438***	***2.248***	***1.057***
***p*-value**	***0.046 *****	***0.024 *****	***0.284***
Type of center [b]			
Government	12.1 ± 4.67	6.19 ± 4.87	12.5 ± 3.64
Private	12.2 ± 4.64	5.05 ± 4.62	14.3 ± 2.90
T-test	***−0.123***	***1.052***	***−2.291***
***p*-value**	***0.975***	***0.289***	***0.015 *****
Type of medical records [b]			
Paper	12.7 ± 4.30	6.58 ± 4.97	12.1 ± 3.74
Electronic	11.7 ± 4.86	5.83 ± 4.77	12.9 ± 3.52
T-test	***1.969***	***1.484***	***−0.293***
***p*-value**	***0.091***	***0.148***	***0.017 *****
Received hospital calls [b]			
Yes	12.9 ± 4.15	6.61 ± 4.75	12.8 ± 3.51
No	10.5 ± 5.11	5.25 ± 4.95	12.2 ± 3.81
T-test	***5.127***	***2.628***	***1.556***
***p*-value**	***<0.001 *****	***0.003 *****	***0.172***
I would choose my specialty again [a]			
Strongly disagree/disagree	13.1 ± 5.02	7.61 ± 5.55	11.5 ± 3.79
Neutral	13.6 ± 4.13	6.43 ± 4.79	12.4 ± 3.53
Strongly agree/agree	11.1 ± 4.52	5.49 ± 4.53	13.0 ± 3.54
F-test	***11.442***	***5.554***	***4.896***
***p*-value**	***<0.001 *****	***0.014 *****	***0.007 *****

EE Emotional exhaustion, *DP* Depersonalization, *PA* Personal accomplishment
[a]*p*-value has been calculated using Kruskal-Wallis Test
[b]*p*-value has been calculated using Mann-Whitney U test
**Significant at $p<0.05$ level

Table 6 Statistical association between the presenteeism and TASW among the sociodemographics and the working condition of residents (n=377)

Factor	Presenteeism Mean ± SD Score (30)	F/T test; p-value	TASW Mean ± SD Score (30)	F/T test; *p*-value
Age group [b]				
<30 years	18.5 ± 4.57	T=0.299; 0.607	20.1 ± 3.59	T=2.888; **0.006** **
≥30 years	18.4 ± 4.33		18.9 ± 3.95	
Gender [b]				
Male	19.1 ± 4.28	T=2.376; **0.026** **	19.5 ± 3.81	T=−0.914; 0.497
Female	17.9 ± 4.28		19.8 ± 3.69	
Marital status [b]				
Unmarried	17.9 ± 4.30	T=−1.993; 0.065	19.9 ± 3.71	T=1.043; 0.267
Married	18.9 ± 4.60		19.5 ± .77	
Having children [b]				
Yes	19.2 ± 4.47	T=2.888; **0.005** **	19.4 ± 3.87	T=−1.283; 0.221
No	17.9 ± 4.43		19.9 ± 3.65	
Residency level [a]				
R1	18.7 ± 4.79	F=1.322; 0.218	19.6 ± 3.81	F=0.380; 0.670
R2	17.8 ± 4.54		19.7 ± 3.67	
R3	19.1 ± 4.41		19.5 ± 3.71	
R4	18.1 ± 4.53		19.8 ± 4.03	
R5	18.3 ± 3.25		20.6 ± 3.33	
Resident program [a]				
Ob-Gyne	17.5 ± 3.97	F=2.410; **0.037** **	19.2 ± 4.15	F=0.615; 0.710
Internal medicine	17.9 ± 4.89		19.6 ± 3.29	
General surgery	18.9 ± 4.55		19.7 ± 3.75	
Family medicine	18.8 ± 4.44		19.7 ± 3.94	
Pediatrics	16.7 ± 4.19		19.1 ± 4.16	
Others	19.6 ± 3.86		20.4 ± 3.56	

[a] *p*-value has been calculated using Kruskal-Wallis test
[b] *p*-value has been calculated using Mann-Whitney U test
**Significant at $p<0.05$ level

to the huge engagement of the young generation in technology.

One of the most recent studies conducted in France reported that self-reported burnout and presenteeism were both associated with a higher risk of EE [17]. This corroborated the study done in China, where it indicated that physicians with a medium and high degree of EE were more likely to practice presenteeism [7, 23]. This had also been validated in our study, as presenteeism showed a significant effect in all MBI subscales, including EE, DP, and PA. Moreover, data in this study revealed that TASW has a positive correlation with burnout, but it was not statically significant. While there were limited papers that examined the effect of TASW in burnout, one of the literature mentioned that the use of technological tools excessively to accomplish pending works increased the level of stress resulting in burnout. However, respondents argued that it was difficult to separate from works, even at home and on weekends [22].

Our study is limited by the small number of participants in each specialty and the low completion rate, which may affect our results and make it difficult to predict the burnout level in those who did not respond. Furthermore, some factors that might influence burnout, such as medical condition; financial issues; immigration; and daily habits such as diet, exercise, and substance use, are not covered in our study. In addition, to our knowledge, this is the first paper in Saudi Arabia that measures the consumed time of the residents in doing supplemental work right after the duty using technology, so there was a limitation in comparing our data with other local studies. Finally, our study is a cross-sectional study, so we cannot identify the direction of the associations.

Conclusion

Burnout "specifically Emotional Exhaustion" was noted to be significantly high among residents in different specialties in Saudi Arabia. Furthermore, several factors in the study were evidently demonstrated to be highly related to burnout which is directly associated with lost work productivity. However, our study suggests that extra working hours at home using technology were not associated with burnout or an increase in productivity.

Many strategies are recommended to overcome residents' burnout and increase work productivity consequently, such as hiring more residents in high-workload specialties, engaging the residents in more entertainment activities, enrolling the new residents in occupational health awareness program to help them deal with residency challenges effectively, activating well-structured mental health insurance for the residents, and creating a monitoring system to make sure that training facility is not violating the ministry of health policies regarding working hours and on-call duties. However, further research is needed to explore additional factors that may exacerbate burnout and justify burnout's associated effect on lost work productivity, as well as prove whether supplemental working hours influence burnout.

Abbreviations

TASW: Technology-assisted supplemental work; MBI: The Maslach Burnout Inventory scale; EE: Emotional exhaustion; DP: Depersonalization; PA: Personal accomplishment; SPS-6: Stanford Presenteeism Scale; SCFHS: Saudi Commission for Health Specialties

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Authors' contributions

QJ: came up with the research idea and designed the study. AK: acquisition of data, analysis, and interpretation of data; wrote the article; revised the article; and finalized the version to be published. MA: acquisition of data, analysis, interpretation of data, and responsibility for the integrity of the work as a whole. All authors contributed to writing and revising the manuscript. The authors read and approved the final manuscript.

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Availability of data and materials

The data supporting the findings in this study are confidentially available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

Written informed consent was obtained from all participants. The study was ethically approved by the institutional review board at King Fahad Hospital (ethical approval no. E-18-2019, received on July 11, 2019).

Consent for publication

Not applicable.

Competing interests

The authors declare that they have competing interests.

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