Article

The International Journal of Aging
and Human Development
2016, Vol. 83(1) 26–43

DOI: 10.1177/0091415016645348
ahd.sagepub.com

The Influences of Employment Status and Daily Stressors on Physiological Functioning in a Sample of Midlife and Older Adults

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Abstract

This study examines the influences of employment status and the moderating role of daily stressors on cortisol levels and responsivity in 182 workers and 253 retirees between 55 and 75 years old from the National Survey of Midlife Development in the United States (MIDUS-II). As a part of the Daily Diary Study, participants completed telephone interviews about their daily experiences across eight evenings and provided saliva samples across 4 days. Multilevel models showed that workers who experienced greater number of non–work related daily stressors significantly exhibited higher cortisol level at 30 min post awakening ($b = 0.252$, $SE = 0.109$, $p < .05$) and greater cortisol awakening response ($b = 3.769$, $SE = 1.898$, $p < .05$) the following morning as compared with retirees who experienced similar amount of daily stressors. Findings demonstrate the important consideration of daily stressors in identifying the ways in which social roles influence physiological functioning in midlife and late adulthood.

Keywords

workers, daily stressors, cortisol, midlife and late adulthood

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Introduction

Work stress has been associated with a number of psychological and physical illnesses, including depression, cardiovascular diseases, and reduced immune functioning (e.g., Herr et al., 2015; Kivimaki et al., 2012; Stansfeld & Candy, 2006). One pathway in which work stress affects health is through the allostatic dysregulation of the hypothalamic–pituitary–adrenocortical (HPA) axis by the way of cortisol. The effects of workplace experiences often operate through job demand, pressure, and support, which in turn, affect cortisol regulation. Much of the employment and cortisol literature has focused on cortisol differences in workers (e.g., Bellingrath, Weigl, & Kudielka, 2008), between workers and individuals on short- or long-term unemployment (e.g., Ockenfels et al., 1995; Kunz-Ebrecht, Kirschbaum, & Steptoe, 2004), or in individuals on short- or long-term unemployment (e.g., Brown et al., 2003; Grossi, Perski, Lundberg, & Soares, 2001; Maier et al., 2006). Less attention has been directed at the effect of retirement, and thereby the withdrawal of work responsibilities, on physiological functioning. With approximately 16.1% of Americans aged 65 years and older participating in the labor force (Kromer & Howard, 2013) and a significant portion of older adults not working, we know little about retirees' physiological functioning as compared with workers. The present study examines how workers and retirees differ in their cortisol levels and responsivity, and the extent to which daily stressors moderate the association between employment status and physiological functioning.

Cortisol

Cortisol is the main product of the HPA axis and is considered to be a primary marker of biological stress reactivity (Adam & Gunnar, 2001). Cortisol secretion typically peaks 20 to 30 minutes after awakening and gradually declines throughout the day (e.g., Fries, Dettenborn, & Kirschbaum, 2009). Morning cortisol levels (e.g., awakening; 30 minutes post awakening) and cortisol awakening response (CAR; assessed by the difference between cortisol levels at awakening and 30 minutes post awakening) are considered to be markers of the HPA axis (e.g., Clow, Thorn, Evans, & Hucklebridge, 2004; Stadler et al., 2016). The HPA axis activates and secretes cortisol under conditions of threat or distress (Dickerson & Kemeny, 2004). Cortisol helps the body adapt to the environment and maintain homeostasis through various processes, including the stabilization of glucose levels, cell metabolism, and inflammatory responses (Heim, Ehlert, & Hellhammer, 2000). Cortisol has been implicated in a range of psychological, physiological, and physical health functioning, including depression, immune functioning, and cardiovascular diseases (e.g., Bhattacharyya, Molloy, & Steptoe, 2008; McEwen et al., 1997).

Employment, Stress, and Cortisol

Much of the employment and cortisol literature has focused on the role of work stress on physiological functioning via cortisol. However, the findings have been mixed. Examining a sample of teachers, Bellingrath et al. (2008) did not find any associations between burnout or vital exhaustion and basal cortisol activity. Other studies (Kunz-Ebrecht et al., 2004; Steptoe, Cropley, Griffith, & Kirschbaum, 2000) found that individuals who reported greater job demands at work were more likely to exhibit greater CAR than those with lower job demands. The works of Eller, Netterstrøm, and Hansen (2006) showed that working women who experienced high level of time pressure exhibited greater increase in awakening cortisol level than working women who did not experience time pressure. However, others documented negative or no associations between work stress and neuroendocrine functioning (e.g., Chandola, Heraclides, & Kumari, 2010). Thus, the nature of the association between work stress and cortisol appears to vary by the types of work stressors examined.

In addition to the examination of work stress on cortisol, there have been studies investigating cortisol in the context of unemployment. Ockenfels et al. (1995) compared cortisol levels and responsivity between workers and those receiving unemployment benefits. The researchers found that unemployed individuals exhibited higher levels of morning cortisol as well as a trend toward elevated morning cortisol response in comparison with working individuals. Focusing on a sample of long-term unemployed individuals, Grossi et al. (2001) found long-term unemployed women with high financial strain exhibited significantly higher overall cortisol level than women with low financial strain. In a study investigating the effects of short- and long-term unemployment, Maier et al. (2006) observed significantly higher serum cortisol levels in long-term unemployed individuals when compared with short-term unemployed individuals.

Together, these studies offer insights into the physiological functioning of working individuals and those who experienced short- or long-term unemployment. Lacking in the literature is the effects of retirement on cortisol levels and responsivity. Unlike retirement, which has been linked to both positive and negative psychological and physical health outcomes (e.g., Buxton, Singleton, & Melzer, 2005; Drentea, 2002; Van der Heide, Van Rijn, Robroek, Burdorf, & Proper, 2013), the effects of short- and long-term unemployment are predominately negative. Short- and long-term unemployment have been associated with adverse psychological and physical health outcomes, including depression, greater psychosomatic symptoms, and higher physiological stress reactions (e.g., Arnetz et al., 1987; Brown et al., 2003; Maier et al., 2006; McKee-Ryan, Song, Wanberg, & Kinicki, 2005). In contrast to employment and short- and long-term unemployment, retirement may offer individuals opportunities to be relieved of the stressors associated with paid work, thereby leading to healthier HPA regulation. At the same time, changes in role status may lead to a recalibration of one's daily life and result in some degree of stress (George, 1993). The present study contributes to this literature by investigating how employment status, specifically the comparison of workers and retirees, is associated with cortisol levels and responsivity.

Daily Stressors

This study also furthers the literature by examining the moderating role of daily stressors in the associations between employment status and cortisol levels and responsivity. Daily stressors are the routine challenges of day-to-day living which can disrupt daily lives (Almeida, 2005). Daily stressors occur more frequently than major life events, and they can have immediate and negative impact on psychological and physical functioning (Almeida, Wethington, & Kessler, 2002; Bolger, DeLongis, Kessler, & Schilling, 1989). Consequently, daily stressors can pile up over time and may result in more severe psychological and physical difficulties (e.g., depression, anxiety; Lazarus, 1999; Zautra, 2003). Studies have shown that the specificity of the stressors differentially impact neuroendocrine functioning (Wong, Mailick, Greenberg, Hong, & Coe, 2014). As noted earlier, much of the focus has been on stressors related to the work conditions. Overlooked is how other aspects of life may also shape neuroendocrine functioning. Thus, this study incorporates the examination of non–work related daily stressors to determine the influences of employment status on physiological functioning.

Life Course Daily Stress Perspective

This study utilizes the Life Course Daily Stress perspective (LCDS; Almeida & Wong, 2009), which integrates the life course framework with the daily stress literature. Life transitions, such as retirement, typically occur over longer periods than daily stress processes. However, life transitions affect daily well-being and health by increasing exposure and reactivity to daily stressors. Exposure is the likelihood that an individual will experience a daily stressor, whereas reactivity is how an individual experience daily stressors. The present study extends prior literature by investigating the effects of employment status and the moderating role of daily stressors on cortisol levels and responsivity in a sample of workers and retirees in midlife and late adulthood.

Current Study

There are different approaches to examining cortisol, and this study focuses on morning cortisol levels and CAR for the following reasons. The morning cortisol levels and response reflect the body's ability to mobilize energy to handle the tasks of the day (e.g., Clow et al., 2004). In contrast to cortisol levels in the subsequent day (e.g., lunchtime cortisol, bedtime cortisol) where it is difficult to separate out the influences of previous and same day stressors, the examination of cortisol levels and responsivity in the morning allow us to more confidently interpret the time-order effects of prior daily stressors on the next day's cortisol level and response.

The first study aim examines the main effect of employment status on cortisol levels at awakening and 30 minutes post awakening as well as CAR. It is predicted that workers will exhibit higher levels of cortisol at awakening and 30 minutes post awakening, and greater CAR than retirees due to the anticipation of work responsibilities in the upcoming day. The second aim assesses the interaction effect of employment status and non–work related daily stressors on cortisol levels and CAR. Specifically, we predict a between-person effect of daily stressors on cortisol such that workers who experienced greater number of daily stressors from the previous day will exhibit higher levels of cortisol upon awakening and 30 minutes post awakening, and greater CAR as compared with retirees who experienced greater number of daily stressors. We do not expect differences in morning cortisol levels or CAR between workers and retirees who experienced fewer numbers of daily stressors from the previous day.

Method

Sample and Procedure

Participants derived from the second wave of the National Survey of Midlife in the United States (MIDUS-II; Brim, Ryff, & Kessler, 2004). The Daily Diary Study comprised of 1,842 men and women between 33 and 84 years of age. Participants completed telephone interviews about daily stressors, time use, and mood experienced across eight consecutive evenings (Almeida et al., 2002). On Days 2 through 5, saliva samples were collected across four occasions on each day. Respondents were instructed to record the time they provided each sample, to collect their first sample before eating, drinking, or brushing their teeth, not to consume any caffeinated products before taking their samples, and to store all samples in the refrigerator.

A set of criteria was used to determine the analytic sample for the current study. Of the 1,842 participants in the Daily Diary Study, 235 did not provide saliva samples and were dropped from the study. Because age has been associated with the probability to work and retire (i.e., younger individuals are more likely to work; older individuals are more likely to retire; Banerjee & Blau, 2013; Lu, 2010), the sample was limited to those between 55 and 75 years of age, thereby reducing the sample to 754 men and women. Among the 754 respondents, 230 individuals who did not meet our employment status election criteria (see subsequent text) were dropped. Ten individuals who did not follow the cortisol collection procedures were excluded. Seventy-nine individuals did not provide complete data on medication use, which was needed for the present analysis, and were dropped. The final analytic sample consisted of 182 workers and 253 retirees.

Presented in Table 1 are the descriptive characteristics of the analytic sample by employment status. As compared with retirees, workers were significantly younger ($M = 60.35$, $SD = 4.55$), more likely to have obtained a college degree or higher (48.07%), and reported fewer number of chronic conditions ($M = 1.98$, $SD = 1.82$). Workers and retirees did not differ by sex, marital status, or medication usage during the saliva sample collection period.

Measures

Outcome variables

Salivary cortisol. On Days 2 to 5 of the Diary Study, saliva was collected upon awakening, 30 minutes post awakening, before lunch, and before bed. The 16 samples were assayed for cortisol via a commercially available luminescence immunoassay (IBL, Hamburg, Germany), with intra-assay coefficients of

Table 1. Descriptive Statistics of Demographic Characteristics by Employment Status.

		Workers ($n = 182$)	Retirees ($n = 253$)	p
Age	*M*	60.35	66.80	***
	SD	4.55	4.96	
	Range	55–74	55–75	
Sex				
Male	%	43.96	45.06	n.s.
Female	%	56.04	54.94	
Marital status				
Married	%	71.43	73.12	n.s.
Unmarried	%	28.57	26.88	
Number of chronic conditions	*M*	1.98	3.17	***
	SD	1.82	2.62	
Education				
Less than high school	%	1.66	10.71	**
High school degree or some college	%	50.28	50.79	
College graduate or higher	%	48.07	38.49	
Any medication usage				
No medications	%	54.4	52.6	n.s.
At least one medication	%	45.6	47.4	

*$p < .05$. **$p < .01$. ***$p < .001$.

variation below 5%. Salivary cortisol values higher than 60 nmol/L were recoded as 61 to minimize the influence of extreme outliers, following the Winsorization statistical approach (Dixon & Yuen, 1974). In this study, we focused on awakening cortisol level, 30 minutes post awakening cortisol level, and CAR. For cortisol levels at awakening and 30 minutes post awakening, cortisol data were log transformed to correct for positively skewed distributions. In line with past studies (e.g., Barker, Greenberg, Seltzer, & Almeida, 2012), CAR was calculated utilizing the raw scores for absolute levels of cortisol by taking the difference of cortisol level at awakening from cortisol level at 30 minutes post awakening.

Predictor variables

Employment status. Respondents self-reported their current employment situation using the following question, "What is your current employment situation?" Respondents reported yes, no, or do not know to each of the following response options: working now, self-employed, unemployed, temporarily laid off, retired, homemaker, full-time student, and part-time student. Respondents were instructed to select all response options that applied. Do-not-know responses and conflicting employment status responses (e.g., working and retired; self-employed and retired) were excluded from analyses. Because self-employment often differs from wage and salary workers in employment benefits and workplace flexibility (e.g., Hipple, 2010), individuals who were self-employed were excluded. This approach aimed for a mutually exclusive conceptualization of employment status by reducing potential murkiness in employment situations. Employment status was a dichotomous variable between retirees (0) and workers (1).

Daily stressors. Daily stressors were assessed with the Daily Inventory of Stressful Events (DISE; Almeida et al., 2002). The DISE consisted of a series of seven stems that identify whether certain types of daily stressful events (arguments, avoided arguments, home, work, network stressors, discrimination, and other stressors) occurred in the past 24 hours. Because we were interested in the moderating role of non–work related stressors on the association between employment status and cortisol, we excluded work stressor from the calculation. Responses to the six items were summed to create a total number of daily stressors score per day. To better determine the time-order effect of daily stressors and physiological functioning, the number of daily stressors was lagged from the previous day.

Covariates. A set of variables was included in the analyses to account for the characteristics of the respondent. Prior studies have documented the influences of age (e.g., Kudielka & Kirschbaum, 2003) and sex (Kunz-Ebrecht et al., 2004) on cortisol. Respondents' age (in years) and sex (0 = male, 1 = female) were included as controls. Marital status (0 = *unmarried*, 1 = *married*) and number of chronic conditions (from a list of 31 conditions, including diabetes and migraine headaches) experienced in the past year (Cleary, Zaborski, & Ayanian, 2004) have been linked to employment processes (Kubicek, Korunka, Hoonakker, & Raymo, 2010; Nicolaisen, Thorsen, & Eriksen, 2012; Pienta & Hayward, 2002; Shultz & Wang, 2007) and were included.

Prior research (e.g., Almeida, Neupert, Banks, & Serido, 2005) has documented an association between education level and stress processes; thus, education level (0 = *less than high school*, 1 = *high school degree or some college*, 2 = *college graduate or higher*) was included as a control. To account for potential medication effects on cortisol (Granger, Hibel, Fortunato, & Kapelewski, 2009), respondents indicated whether they took any allergy, steroid, birth control/hormonal, or antidepressant/antianxiety medications (0 = *none*, 1 = *at least one medication*) across the Daily Diary Study period. Saliva collection time (Keenan, Licinio, & Veldhuis, 2001) were coded in hours. Day of the week (0 = *weekday*, 1 = *weekend*) has been shown to influence the associations between employment and cortisol (e.g., Kunz-Ebrecht, Kirschbaum, Marmot, & Steptoe, 2004). Past studies have shown that negative affect often explained the observed association between daily stressors and cortisol (e.g., Stawski, Cichy, Piazza, & Almeida, 2013), and therefore, daily negative affect from the previous day was included. Daily negative affect was assessed with respondents reporting how frequently (0 = *none* to 4 = *all of the time*) they felt each of 14 negative emotions (e.g., hopeless, angry) in the past 24 hours (Ready, Akerstedt, & Mroczek, 2011).

Data Analyses

To assess the effects of employment status and the moderating role of daily stressors on cortisol at awakening, 30 minutes post awakening, and CAR the following morning, a set of two-level multilevel models (SAS Proc Mixed), where days were nested within persons, was used. All analyses were carried out in main effects only and interaction effect models. Using the person-mean center approach outlined by Hoffman and Stawski (2009), continuous variables at Level 1 (within person) were group-mean centered and grand-mean centered at Level 2 (between person). Preliminary analyses showed that a random intercept–only model had acceptable fit. Because marital status, chronic conditions, education level, and day of the week had no significant effects on the outcomes or significantly changed the predictors or covariates, these controls were dropped in the final models.

Results

The first set of multilevel models focused on cortisol levels at awakening and 30 minutes post awakening. Contrary to predication, no main effect of employment status was observed for cortisol level at awakening. Nor did we observe an interaction effect of employment status and daily stressors from the previous day on cortisol level at awakening. Next, we examined the main effect of employment status on cortisol level 30 minutes post awakening. Although there was no significant main effect of employment status on cortisol level 30 minutes post awakening, there was a significant interaction effect of employment status and number of daily stressors from previous day (between-person effect) on cortisol level 30 minutes post awakening (see Table 2, Figure 1). Workers who reported greater number (1 standard deviation above the mean) of daily stressors from the previous day significantly exhibited higher levels of

Table 2. Multilevel Models Predicting 30 Minutes Post Awakening (Log) Cortisol Level.

	30 Minutes post awakening (log)	
	Model 2a	Model 2b
Fixed effects		
Intercept	3.071 (0.047)***	3.073 (0.047)***
Employment status[a]	0.037 (0.057)	0.035 (0.057)
Age	0.012 (0.005)*	0.015 (0.005)*
Sex[b]	−0.065 (0.048)	−0.065 (0.047)
Any medication[c]	−0.016 (0.048)	−0.016 (0.048)
Saliva collection time (WP)	−0.027 (0.016)†	0.011 (0.005)*
Saliva collection time (BP)	−0.046 (0.018)*	−0.065 (0.047)
Negative affect (WP)	0.136 (0.058)*	0.136 (0.058)*
Negative affect (BP)	0.126 (0.126)	0.111 (0.126)
Number of stressors—previous day (WP)	0.003 (0.021)	0.022 (0.027)
Number of stressors—previous day (BP)	0.145 (0.057)*	0.059 (0.068)
Employment status[a] × Number of stressor—previous day (WP)		−0.044 (0.040)
Employment status[a] × Number of stressor—previous day (BP)		0.252 (0.109)*
Random effects (Variance components)		
BP intercept (Level 2)	0.188 (0.016)***	0.186 (0.016)***
	df = 425	*df* = 424
Within person (Level 1)	0.149 (0.006)***	0.149 (0.006)***

Note. BP = between person; WP = within person.
[a]Employment status: 0 = *retiree*, 1 = *worker.*
[b]Sex: 0 = *male*, 1 = *female*.
[c]Any medications: 0 = *no medication*, 1 = *yes, at least one medication.*
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

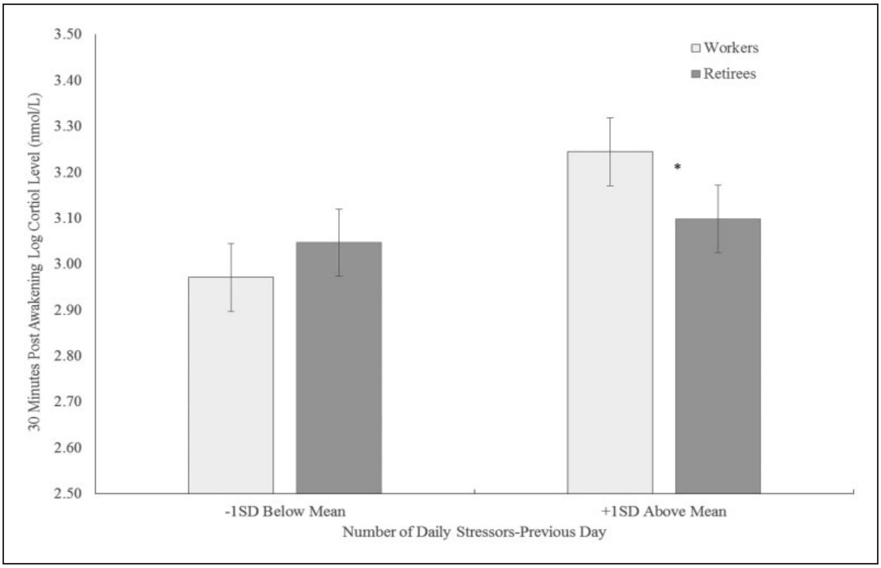

Figure 1. Employment status and daily stressors on 30 minutes post awakening (log) cortisol level.

cortisol at 30 minutes post awakening as compared with retirees who experienced similar amount of daily stressors from the previous day ($b = 0.252$, $SE = 0.109$, $p < .05$). No significant difference was observed for workers and retirees who experienced fewer daily stressors (1 standard deviation below the mean) from the previous day on cortisol level 30 minutes post awakening.

The second set of multilevel models examined the main effect of employment status and the moderating role of daily stressors from the previous day on CAR (see Table 3 and Figure 2). No main effect of employment status was observed for CAR. There was a significant interaction effect of employment status and number of daily stressors (between-person effect) from previous day on CAR. Similar to the pattern observed for cortisol level at 30 minutes post awakening, workers who experienced greater number (1 standard deviation above the mean) of daily stressors from the previous day significantly exhibited a greater CAR as compared with retirees who experienced similar amount of daily stressors from the previous day ($b = 3.769$, $SE = 1.898$, $p < .05$). Workers and retirees who experienced fewer (1 standard deviation below the mean) daily stressors from the previous day did not differ in CAR.

Discussion

The current study extends prior research by investigating how employment status in the context of non–work related daily stressors is associated with

Table 3. Multilevel Models Predicting CAR.

	CAR	
	Model 3a	Model 3b
Fixed effects		
Intercept	5.189 (0.814)***	5.204 (0.811)***
Employment status[a]	1.436 (0.982)	1.409 (0.978)
Age	0.213 (0.084)*	0.197 (0.084)*
Sex[b]	1.184 (0.818)	1.190 (0.815)
Any medication[c]	1.100 (0.830)	1.114 (0.827)
Saliva collection time (WP)	−0.884 (0.460)†	−0.886 (0.459)†
Saliva collection time (BP)	−0.882 (0.334)**	−0.847 (0.333)*
Negative affect (WP)	4.100 (1.620)*	4.097 (1.618)*
Negative affect (BP)	3.923 (2.178)†	3.746 (2.172)†
Number of stressor-previous day (WP)	−0.317 (0.588)	0.374 (0.762)
Number of stressor-previous day (BP)	1.082 (1.017)	−0.307 (1.226)
Employment status[a] × Number of stressor—previous day (WP)		−1.578 (1.134)
Employment status[a] × Number of stressor—previous day (BP)		3.769 (1.898)*
Random effects (Variance components)		
BP intercept (Level 2)	33.155 (4.891)***	32.710 (4.853)***
	df = 424	*df* = 423
WP (Level 1)	118.200 (5.142)***	117.920 (5.129)***

Note. BP = between person; CAR = cortisol awakening response; WP = within person.
[a]Employment status: 0 = *retiree*, 1 = *worker.*
[b]Sex: 0 = *male*, 1 = *female*.
[c]Any medications: 0 = *no medication*, 1 = *yes, at least one medication.*
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

morning cortisol levels and CAR in a sample of workers and retirees in midlife and late adulthood. Findings from this study resonate with the LCDS Perspective (Almeida & Wong, 2009) in highlighting the important consideration of contextual factors, specifically exposure to greater non–work related daily stressors, in identifying the impacts of work and retirement on physiological functioning. In our sample of midlife and older adults, the physiological toll of employment was evident when daily stressors from the previous day were accounted. Specifically, workers who reported greater number of daily stressors exhibited higher levels of cortisol 30 minutes post awakening and CAR the next morning as compared with retirees who experienced similar amount of daily stressors. These findings indicate that workers who experienced greater

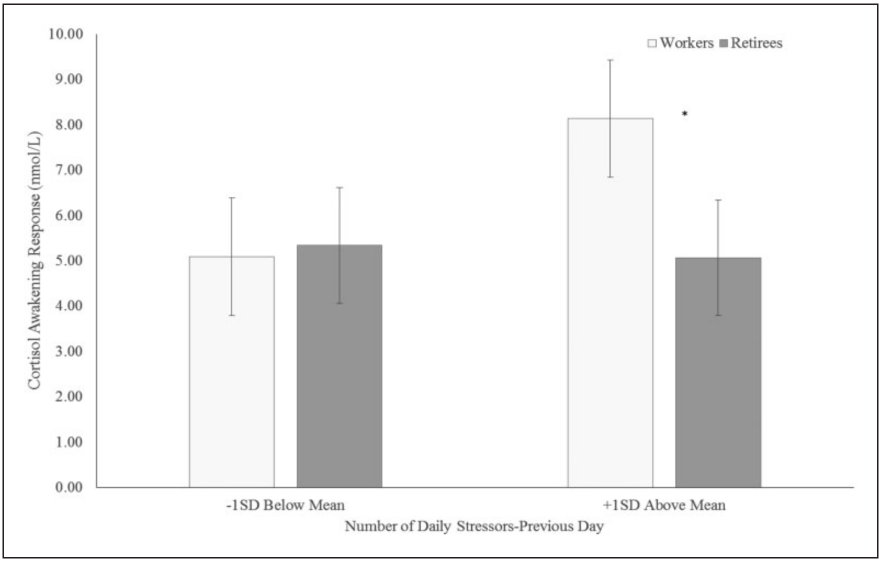

Figure 2. Employment status and daily stressors on cortisol awakening response (CAR).

number of daily stressors are at a higher risk for subsequent HPA dysregulation. It could be that the physiological toll is magnified for workers who have to navigate the responsibilities and demands associated with being a worker while handling greater than average number of daily stressors that involve other domains of their lives (e.g., family responsibilities). Although not assessed in this study, it is possible that workers were at a greater risk for dysregulated stress physiology due to greater strain of balancing work and family responsibilities (e.g., Adam & Gunnar, 2001; Wong et al., 2014). Future studies should investigate other contextual factors in identifying the influences of social role (worker vs. retiree) on daily health.

Our findings reinforce prior research documenting the importance of morning cortisol as an indicator of the body's ability to mobilize energy to handle the tasks of the day (Clow et al., 2004; Hellhammer et al., 2007). Being a worker and experiencing greater than average number of daily stressors had a significant physiological impact the next morning, thereby highlighting the lasting effect of daily stressors on the HPA system. Although we observed an interaction effect of employment status and daily stressors for cortisol level at 30 minutes and CAR the next morning, we did not observe a significant finding for cortisol level at awakening. One plausible explanation for the lack of finding could be that cortisol level at 30 minutes post awakening and CAR are more indicative markers of the HPA axis and perhaps better reflect the body's ability to mobilize energy to handle the tasks of the upcoming day (Clow et al., 2004; Hellhammer et al., 2007) in this sample of workers. Together, findings from this study indicate the needs for workplace wellness programs aimed to reduce the daily challenges of navigating work responsibilities and stressors in other areas of the workers' lives. It also would be valuable to incorporate programs aimed at enhancing workers' coping strategies to help them better handle the multiple demands and responsibilities.

In this study, we predicted a main effect of employment status where workers would exhibit greater levels of morning cortisol and CAR than retirees. However, employment status did not differentiate physiological functioning in our sample of workers and retirees. The lack of finding could be due to the workers examined in the study. Prior studies on work stress and cortisol typically focused on working individuals in the same, and often demanding, occupations (e.g., nurses, teachers; Bellingrath et al., 2008; Wingenfeld, Schulz, Damkroeger, Rose, & Driessen, 2009), where greater evidence of HPA dysregulations already may exist. Because we were interested in the impacts of being a worker, as compared with being a retiree, on cortisol levels and responsivity, our study included working individuals across different occupations. Furthermore, our approach aimed to examine the nature of being a worker, rather than being a worker in a specific occupation, as compared with the context of being a retiree, on physiological functioning.

There are few limitations of this study that warrant attention. Although the differences between workers and retirees with respect to the influences of number of daily stressors on cortisol level at 30 minutes post awakening and CAR were significant, the effect sizes were small in magnitude. Due to the design of the MIDUS, data on employment characteristics (e.g., reasons for employment or retirement, satisfaction with employment/retirement) were absent. Protective factors, such as coping strategies, were not examined, and it is possible that these strategies could help to buffer against daily stressors and should be considered in future studies. Prior research has demonstrated the differential influences of global and everyday stressors on cortisol level (e.g., Wong et al., 2012); due to study design, we were unable to assess other stress in the environment common to both workers and retirees.

This study is strengthened by the measurement of employment status. Our classification of employment status allowed respondents to self-identify multiple employment or nonemployment situations that they may occupy. This approach enabled us to better tease out the heterogeneity and complexity of work and retirement, which would be more difficult to identify had we simply asked respondents to reply yes, no, or do not know to "Are you currently working?" which is another item in MIDUS. The absence of a more objective measure of employment status (e.g., pension receipt) could be a concern. However, the use of a more objective measurement of employment status, such as pension receipt, is not without limitations. For example, individuals who are recipients of employer-sponsored or government-sponsored pensions (e.g., Social Security) can continue to work for pay; thus the issue of multiple employment situations arises again. Another limitation with pension receipt is that individuals who do not have pension access would be excluded from the analyses. Future studies should consider whether different measurements of employment situations result in similar findings.

Another strength of this study pertains to the saliva collection procedures. Rather than bringing participants into a controlled laboratory setting where they are asked to provide saliva samples in response to challenge tasks (e.g., Dickerson & Kemeny, 2004; Kirschbaum, Pirke, & Hellhammer, 1995), participants in this study provided saliva samples in their everyday setting. This methodological approach offered greater insights to the respondents' stress-responsive system as they live day-to-day in their own environment as well as the associations between naturally occurring stressors and cortisol.

In conclusion, this study contributes to the growing literature examining employment and cortisol in midlife and older adults. Findings from this study indicate the important consideration of daily stressors in identifying the ways in which social roles impact neuroendocrine functioning. Furthermore, findings from this study can help create programs and services aimed to promote and improve the quality of life of workers and retirees in middle and late adulthood.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The MIDUS II research was supported by a grant from the National Institute on Aging (P01-AG020166) to conduct a longitudinal follow-up of the MIDUS I investigation.

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