Capturing the dynamics of a work day:

Ecological momentary assessment of work stressors on the health of long-term caregivers

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Abstract

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Abstract: The long-term care sector in Canada is undergoing fundamental transformation. Despite these changes, there is a scarcity of empirical research about the psychological and physiological demands of working in long-term care. The current study aimed to gain a better understanding of this issue by investigating the relationships between experiences at work and psychological and physiological outcomes. Hourly perceived experiences and cardiovascular reactivity during the workdays of 30 female long-term care workers were obtained using diaries and ambulatory blood pressure monitors. Multi-level modeling revealed that work overload, and noisy, fast-paced environments led to higher stress, more negative affectivity, and exacerbated systolic blood pressure reactivity. High quality interactions with residents and break times at work lowered stress and increased positive affectivity. Furthermore, negative affectivity increased systolic and diastolic blood pressure reactivity. Implications for long-term care practices and for occupational health psychology are discussed.

July 5th, 2012

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Residential care facilities in Canada are steadily expanding and undergoing substantial transformations. As of 2010, there were 4,633 residential care facilities serving 247,270 residents, compared to 4,185 facilities and 219,472 residents in 2004 (Statistic Canada, 2010). This sector will continue to grow as more baby boomers are aging. Also, an increasing number of residents admitted are diagnosed with mental disorders and require additional attention on top of traditional personal care (Statistic Canada, 2010). Despite these developments, our understanding of the job design and stress of caregiving has not changed. The majority of the research that examined work stressors in health care has been done in acute care facilities, even though emotional exhaustion experienced by nurses in long-term care is found to be higher compared to acute care nurses (Hare & Pratt, 1988; Van den Berg, Landeweerd, Tummers & van Merode, 2006). The research that has been conducted in long-term care work settings has found that high levels of job-related stress are associated with turnover (Schaefer & Moos, 1996), making the burdens of staff retention and training new staff two of the major consequences of workplace stress in these organizations.

In addition to the organization and staff level outcomes mentioned, long-term care workplace stressors are linked to the well-being of residents (Hannan, Norman & Redfern, 2001). When staff members experience health outcomes such as burnout and psychological distress, these are associated with conflict and aggression toward residents (Goodridge, Johnston, Thomson, 1996; Macpherson, Eastley, Richards & Mian, 1994).

Burnout in particular partially mediates the link between job stressors and abusive behaviours against residents (Shinan-Altman & Cohen, 2009).

These data suggest that the stress of providing long-term care has implications for residents, staff and the organizations. Therefore, the primary objective of this study is to gain a better understanding of how long-term care workplace stressors influence psychological and physiological experiences from the staff members' perspectives. The contribution of this knowledge will benefit all the stakeholders involved in the long-term care sector. The secondary objective of this study is to examine the roles of emotions as responses to stressors and also as antecedents to psychological and physiological experiences. Emotions and stress are conceptually related yet distinct in research. A more comprehensive understanding of the process of stress can be achieved by unifying the two areas of research.

The study's objectives will be examined using a unique type of data sampling technique called ecological momentary assessment. This type of experience sampling method captures behaviours and experiences in real-time (Shiffman, Stone & Hufford, 2008). Health outcomes in occupational health psychology research have been predominantly quantified as subjective, retrospective recalls of well-being, stress or a checklist of somatic symptoms giving rise to a legitimate concern about participants' recall biases. Recalls of strong stimuli tend to be an overestimate when compared to real-time assessments, likely because observations that more salient are more readily available to be recalled (Van der Brink, Bandell-Hoekstra, Abu-Saad, 2001). Thus, ecological momentary assessment is used in organizational research to examine participants' moods and states during real-time to overcome recall bias (Fullager & Kelloway, 2009; Ilies, Dimotakis, & Watson, 2010).

In addition, given the complexity of a workday, another issue with global measures of psychological and physiological health is that they may not capture the critical and intricate dips and highs that unfold over the course of a working day. Even physiological measures taken in a laboratory under controlled conditions may not be properly representative of naturalistic physiological reactivity. For example, "White-coat hypertension" refers to elevated blood pressure in some normally healthy individuals when taken by physicians or researchers, making them appear to have hypertension (Pickering & Friedman, 1991). Multiple sampling either on a fixed or random interval or with self-initiated readings over the testing period is typical of ecological momentary assessment and that type of sampling schedule allows for changes and progression of health to be tracked. By using the ecological momentary sampling technique in the study, a better understanding of the dynamics of workplace stressors and their health outcomes in long-term care facilities is expected.

Stressors, Stress and Strains Experienced by Healthcare Workers

There are two existing theoretical conceptualizations of sources of workplace stressors in health care settings. The researchers who established the first model hypothesized that long-term care workplace stressors can come from the institutional level, the unit level, and the patient level (Cohen-Mansfield, 1995). The institutional level refers to the organization as a whole. An example from the unit level is the social exchange between staff members. Similarly, an example from the patient level is the social exchange between staff and residents and their families. Another model developed by Schaefer and Moos (1993) theorized that there are three different sources of stressors in healthcare: systems, tasks and relationships. System-related stressors arise from the way health care facilities are managed. Task-related stressors result from the duties that staff members perform. Relationship-related stressors come from the interactions staff have with others. These two models conceptualize the same workplace stressors but they are defined in different ways, and because of this substantial overlap both models can be combined together. Hence, in this study I conceptualize workplace stressors to come from the (1) system level, divided into organization and environment factors (2) task level, divided into general job task and patient care tasks, and (3) relationship level, divided into interactions with supervisor/physicians, co-workers, and residents.

Of the three sources of stressors, organizational system stressors have been investigated the most in the long-term care literature, and are consistently negatively related to staff's health and well-being. Stressors such as workload and scheduling, and how facilities are designed and managed are included in this category. Poor role clarity, role conflict and role ambiguity, and work overload were associated with higher reports of staff burnout (Barber & Iwai, 1996; Moniz-Cook, Millington & Silver, 1997). Two studies found that the emotional exhaustion and depersonalization components of burnout were specifically impacted by these organizational stressors (Rai, 2010; Van den Berg et al., 2006). Physical environmental stressors that are not related to the way organizations are being managed, such as cleanliness, tidiness, the pace at which work is accomplished and the overall noise level, are often overlooked, but are also considered as significant workplace stressors (McCoy & Evans, 2005). Cardiovascular markers of stress were more prominent in workers who were annoyed with the noise level in the workplace (Lercher, Hortnagl & Kofler, 1993).

In terms of relationship stressors, the personal caregiving literature reveals that much of the stress resulting from caring for a client with deteriorating health is detrimental to the caregiver's own well-being. Providing care for residents with illnesses such as dementia or other psychiatric illnesses is physically and psychologically draining and is associated with increased distress in staff members (Pekkarinen et al., 2006; Van den Berg et al., 2006). Furthermore, because long-term care facilities are set up so that staff work with other staff members in units that are managed by supervisors, and are frequently consulting with physicians regarding residents' care, one cannot ignore the contribution of these work relationships to work stress. Stronger work group cohesiveness and positive staff relationships have been associated with higher job satisfaction in long-term care staff facilities (Cummings et al., 2008; Tourangeau, Cranley, Laschinger & Pachis, 2010). Social support from colleagues and supervisor was negatively related to emotional exhaustion in burnout (Van den Berg et al., 2006). Leadership related factors were significantly correlated with perceived stress, psychological distress, somatic health symptoms and job satisfaction (Cummings et al., 2008; Testad, Mikkelsen, Ballard & Aarsland, 2010).

Lastly, because the staffing approaches of long-term care facilities have been changing, one must re-examine the stress from the new ways that tasks are assigned. Newer homes are migrating away from an institutional-like physical design and have residents situated in neighborhoods. As a consequence, staff members in charge of neighborhood-style units are required to be skilled and efficient in a wide spectrum of tasks including those that are unrelated to traditional patient care duties such as housekeeping and laundry. The delegation of tasks ties in closely with the issue of work overload, which contributes to poorer residents' quality of care (Pekkarinen, Sinervo, Perala & Elovainio, 2004). Although no research to date has examined the task stressors' impact on staff members' health, Schaefer & Moos' (1993) found they were associated with less job satisfaction.

Blood Pressure at Work and its Implication for Health

Of the types of ecological momentary assessment techniques available, ambulatory blood pressure and heart rate are prime choices for occupational health psychology studies because the cardiovascular system is relatively susceptible to psychosocial stressors (Heaphy & Dutton, 2008). In response to acute stress, the body exhibits the well-known "fight or flight" response (Cannon, 1915). The biological changes that are associated with this response are an activation of the sympathetic nervous system, which then releases epinephrine and norepinephrine, thus increasing blood pressure and heart rate and diverting energy away from internal organs and towards the body's extremities (Sapolsky, 1994). Workplace stressors are associated with high ambulatory systolic blood pressure and diastolic blood pressure during work and at home (Schnall, Schwartz, Landsbergis, Warren, & Pickering, 1998) as well as with high heart rate and rate pressure product (heart rate x systolic blood pressure in mmHg/min; Bishop et al., 2003). Studies of workplace stress indeed demonstrate a strong association of work stress with cardiovascular diseases such as coronary heart disease (Kuper, Marmot & Hemingway, 2002), myocardial infarction (Bosma, Peter, Siegrist, & Marmot, 1998), and cardiovascular mortality (Kivimaki et al., 2002).

In the long-term care work settings, self-reported negative interactions with residents are positively related to burnout and distress (Goodridge et al., 1996; Macpherson et al., 1994). Larger amounts of positive interaction with colleagues and residents were found in group homes where staff reported lower levels of stress (Rose, Jones & Fletcher, 1998). Given this, high quality social interactions among residents, co-workers and supervisor/physicians are associated with better health and well-being in staff members, and poor quality social interactions are associated with worse outcomes. Based upon these previous findings, I hypothesize that:

H1. High levels of organizational stressors (work overload, role conflict and ambiguity, environmental factors), task stressors (recreational, personal care, medical care, general, leisure), and relationship stressors (poor quality social interactions) will predict higher ambulatory psychological stress, blood pressure and heart rate readings at work.

Pathways of Psychosomatic Symptoms

To examine how work stressors affect staff health, the role of emotional responses will be explored in the current study. Although research on emotion and stress are two distinct streams, the theoretical boundaries of both are blurred for stress and emotions are different conceptualization of the same reaction to stimulus. In fact, Lazarus (1999) speculated that both areas of research can be unified, and Smith and Kirby (2010) suggested that defining stress with emotions would add depth to the understanding of coping and adaptation. Indeed, emotions are considered both as a reaction to stressors and also an adaptive response to cope with them (Finan, Zautra & Wershba, 2010; Schulkin, Thompson & Rosen, 2003). Rationally, positive experiences such as high quality social interactions are associated with positive emotions, whereas workplace stressors are associated with negative emotions.

H2. High levels of organizational stressors (work overload, role conflict and ambiguity, environmental factors), task stressors (recreational, personal care, medical care, general, leisure), and relationship stressors (poor quality social interactions) will predict more ambulatory negative emotions at work.

When considering emotions and the physiological responses to them, not only should the valence of the emotions be noted, but also the arousal state. Arousing states, regardless of the underlying affectivity, are found to induce cardiovascular changes via the sympathetic nervous system using neurobiological pathways (Lovallo, 2004; Posner, Russell & Peterson, 2005). Physiological responses to acute stress may be more dependent on the degree of arousal rather than the actual affectivity of the emotion itself. A study by Ilies et al. (2010) that took momentary measures of perceived affect and ambulatory blood pressure readings at work supports this claim. The authors found that negative affect was positively related to systolic and diastolic blood pressure within individuals, but no such relationships were found for positive affect. Negative affect's association with blood pressure, and consequently with the activation of the sympathetic nervous system, further exemplifies the relationship between negative emotions, distress, and health. However, positive affect and negative affect were both related to heart rate, likely because the Positive Affect and Negative Affect Scale (Watson, Clark & Tellegen, 1988) in the study assessed aroused states.

While negative emotions is associated with acute stress responses, positive emotions have an "undoing" effect on cardiovascular health. Participants primed with an anxiety-inducing cardiovascular reactivity task returned quickly to baseline when watching a film that evoked positive emotions (Fredrickson, Mancuso, Branagan & Tugade, 2000). Although positive emotions were not associated with blood pressure during work in Ilies et al.'s study (2010), perhaps the relationship between positive emotions and ambulatory blood pressure will be captured better during the period of recovery and unwinding after work. In fact, a review of the impact of positive social interactions at work shows that the ameliorative effects extend beyond lowering cardiovascular reactivity at work, also appearing to influence reactivity after work (Heaphy & Dutton, 2008). Therefore, based on the review regarding emotions and cardiovascular measures, I hypothesize that:

H3a. High arousal emotions, regardless of affectivity, will predict higher heart rate at work.

H3b. The interaction of emotional affect and arousal will predict cardiovascular and perceived stress reactivity at work. Specifically, negative high arousal emotions will predict higher systolic blood pressure, diastolic blood pressure, and perceived stress at work than positive high arousal emotions.

H3c. Positive emotions from workplace stressors will predict lower perceived stress, lower ambulatory blood pressure and lower heart rate after work, regardless of underlying arousal state.

Method

Participants

A total of 30 female care workers participated in the study, recruited from five care homes across Nova Scotia. The average age of the sample was 41.40 years (SD = 8.71 years, Range: 25 – 58 years). The majority of the participants are Caucasian (97%). Twenty-eight percent of the sample had an education level of less than Grade 12, while 34.5% received a high school diploma, 34.5% attended college, and 3% received Bachelor degree. The majority of participants were personal care workers (60%), 33% were in nursing, and 7% worked primarily in food preparation. A typical day shift ranged from seven to 12 hours, and hours worked per week varied from 8 to 56, likely because 27% were part-time workers. The average time in the job was 9.34 years (SD = 6.25, Range: 7 months – 24 years). Thirty percent of the sample worked in specialized units (Alzheimer's, adult residential care). None of the participants had been clinically diagnosed with high blood pressure and 28% of them were regular smokers. Average body mass index was 28.06 (SD = 4.29, Range: 21 – 40). Participants were excluded if they reported being on antihypertensive or psychoactive medication, for it would interfere with blood pressure readings.

Equipment

Ambulatory blood pressure and heart rate measurements were collected using the Suntech Oscar 2 (Suntech Medical Instruments, Raleigh, North Carolina). It is a light-weight (0.284 kg) device that uses oscillometry with step deflation to assess heart rate, systolic blood pressure, and diastolic blood pressure reading ("Oscar 2 Ambulatory Blood Pressure Monitor," 2012). For the current study, the ambulatory blood pressure monitor was programed to automatically inflate every hour throughout the data collection period. The Suntech Oscar 2 is clinically validated by international standards and protocols (Goodwin, Bilous, Winship, Finn & Jones, 2007; Jones, Bilous, Winship, Finn & Goodwin, 2004).

Participants were also given a paper diary booklet to record down their experiences during the day (see Appendix A). The diary entries consisted of questions assessing location (work, home, transit), posture (sitting, standing, walking, running), and consumption in the past hour (food, caffeine, cigarettes). Single items were used to assess emotions (emotional affectivity, emotional arousal, and perceived stress) and stressors. Ratings of the intensity of the organizational (role overload, ambiguity and conflict) and environmental stressors (noise level, smelliness, cleanliness, tidiness, and work pace) experienced in the past hour were obtained. Relationship stressors were assessed by asking for the qualitative nature of any social interactions in the last 15 minutes before the reading. Task stressors were assessed by a checklist of tasks being completed at the time of reading. The use of single items in diary studies is advantageous because it allows each diary entry to be brief, thus minimizing attrition rates. Acceptable reliability of single items in organizational research had been demonstrated for constructs traditionally measured by scales (Nagy, 2002; Wanous & Hudy, 2001). Furthermore, the items for environmental and organizational stressors were chosen for their high face and concurrent validity (Gilbert & Kelloway, N.d.).

Pre-data Collection Questionnaire

A questionnaire was administered to all participants prior to collecting the daily diary data (see Appendix B). The questionnaire assessed participants' demographics, job history, medical history, and trait hostility. Hostility was measured with the 27 items Cook-Medley Scale (Barefoot, Dodge, Peterson, Dahlstrom, & Williams, 1989; $\alpha = .72$). Participants answered either *"True = 1"* or *"False = 0"* on each items. A sample item was "It is safer not to trust anybody". A higher summed score on the Cook-Medley Scale indicated higher trait hostility. This dispositional variable was used as a control variable for the models predicting blood pressure and heart rate outcomes, for there is a strong relationship between trait hostility and cardiovascular reactivity and this is considered common practice in cardiovascular research (Barefoot et al., 1989).

Procedures

The study took place over the time span of a work week in three phases. In the first phase, participants were asked not to eat, drink caffeine, or smoke an hour before meeting the researcher so proper blood pressure baselines could be taken. After giving informed consent, participants filled out a pre-test questionnaire. The researcher then demonstrated how to put on the ambulatory blood pressure monitor. Two consecutive seated readings and three standing readings were taken as baselines. During the readings participants were told to be as motionless as possible and asked to practice filling out a diary entry promptly after that particular reading. Participants were in possession of the ambulatory blood pressure monitor for a full day of data sampling on a midweek work day. All participants were strongly encouraged to seek professional medical advice if they consistently had exceedingly high ambulatory blood pressure readings. On data collection day, participants wore the ambulatory blood pressure monitor as part of their daily routine of getting ready for work. The ambulatory blood pressure cuff was programmed to inflate every hour to take a reading. The readings continued after work and were terminated each night right before the participants went to bed.

At the last phase of the study, the researcher returned to the worksite to collect the study materials and to provide feedback. Participants were compensated $50 for their full participation (pro-rated compensation if they withdraw before the end of the study). On top of a summary report of the overall study, each job site that participated in the study received a facility-specific report of the findings.

Analyses

The dataset was cleaned for erroneous ambulatory blood pressure readings and checked for assumptions. Readings associated with an error message from the ambulatory blood pressure monitor were removed. There were no multivariate outliers; all Cook's Distance values were under 1. Inter-correlations of study variables can be observed in Table 1.

Table 1.

Intercorrelations among study variables (N=30)

		Correlations																						
	Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*
1	Work Perceived Stress																							
2	Work Affect	-.47[c]																						
3	Work Arousal	-.12	.43[c]																					
4	Work Systolic Blood Pressure	.26[c]	-.08	.19[b]																				
5	Work Diastolic Blood Pressure	.17[b]	-.06	.19[b]	.72[c]																			
6	Work Heart Rate	.20[b]	-.02	.12	.30[c]	.40[c]																		
7	Noisy Environment	.24[c]	-.12	.10	.24[c]	.16[a]	.20[b]																	
8	Smelly Environment	.17[b]	-.11	.01	.24[c]	.12	.34[c]	.41[c]																
9	Dirty Environment	.13[a]	-.12	-.04	.16[a]	.07	.29[c]	.27[c]	.54[c]															
10	Disorganized Environment	.23[c]	-.16[a]	-.04	.16[a]	.08	.29[c]	.41[c]	.33[c]	.67[c]														
11	Fast-paced Environment	.33[c]	-.12	.10	.25[c]	.17[b]	.27[c]	.49[c]	.33[c]	.37[c]	.50[c]													

12	Work Overload	.32[c]	-.05	.11	.31[c]	.19[b]	.07	.17[a]	.07	.07	.26[c]	.39[c]												
13	Role Conflict	.27[c]	-.30[c]	-.04	.29[c]	.16[a]	.03	.14[a]	.10	.01	.20[b]	.34[c]	.47[c]											
14	Role Clarity	.00	.00	.06	-.06	.01	-.06	-.03	-.10	-.17[a]	-.18[b]	-.04	-.09	-.12										
15	Recreational Tasks	.00	.12	.21[b]	.11	.06	.14[a]	.10	.06	-.04	-.08	.15[a]	-.15[a]	.07	.02									
16	Medical Care Tasks	-.04	.13[a]	.06	.01	-.05	-.17[b]	-.07	-.12	-.17[a]	-.15[a]	.01	.16[a]	.15[a]	.00	.21[b]								
17	Personal Care Tasks	.19[b]	.06	.13[a]	.25[c]	.25[c]	.36[c]	.24[c]	.28[c]	.11	.02	.39[c]	.15[a]	.23[c]	.06	.45[c]	.15[a]							
18	General Tasks	-.09	.08	.15[a]	.11	.07	.08	-.00	-.01	-.00	.16[a]	.19[b]	-.00	.06	.06	-.02	.05	-.05						
19	Leisure Tasks	-.12[a]	-.01	-.04	.11	.03	.04	-.03	.00	-.04	-.03	-.12	-.07	.13[a]	-.12	.07	-.03	.02	-.21[b]					
20	Quality of Supervisor Interactions	.01	.11	.06	-.03	.02	.07	-.18[b]	-.02	.02	-.18[b]	-.11	-.06	-.15[a]	.12	-.02	.04	-.01	-.13[a]	.02				
21	Quality of Coworker Interactions	-.22[c]	.34[c]	.20[b]	.02	.02	-.07	-.10	-.05	-.04	-.13[a]	.11	.10	.10	.09	.01	.12[a]	.09	.02	.08	.22[c]			
22	Quality of Resident Interactions	-.22[b]	.41[c]	.27[c]	.09	.14[a]	.17[a]	-.12	-.06	-.14[a]	-.15[a]	.09	-.02	-.21[b]	.11	.29[c]	.14[a]	.27[c]	.20[b]	-.05	.09	.28[c]		
23	Quality of Resident's Family Member Interactions	-.08	.15[a]	.08	.12	.07	.02	.03	-.02	-.06	-.00	.07	-.05	-.04	.06	.23[a]	.18[b]	.13[a]	.15[a]	.14[a]	-.01	.08	.22[c]	
24	Quality of Stranger Interactions	-.01	-.05	-.07	-.04	-.04	.05	-.03	-.06	-.05	.05	.06	-.05	-.04	.04	.10	-.02	.05	.12	.04	-.01	.02	.14[a]	.10

[a]$p < .05$, [b]$p < .01$, [c]$p < .001$.

Of the total of 30 participants, responses from each home ranged from nine to 2. Eight responses came from the first home, nine from the second, two from the third, eight from the fourth and three from the final home. Data pertaining to hypotheses regarding individuals' experiences at work were analyzed using multi-level modeling with 265 observations (M = 8, SD = 2) from 30 participants. Data to test hypotheses pertaining to participants' experiences after work were analyzed using the same technique with 97 observations (M = 3, SD = 3) from the same 30 participants. Missing data points and differences in the length of a waking day explained the variability in observations. For all 2-level mixed models, the covariance structure used for level 2 (between persons) was variance components and for level 1 (within person) the scaled identity structure was used. All models had control variables and these controls are described in detail in the results section.

Testing began with running a null model (with only the outcome in the model, no levels specified), the unconditional model (levels specified, but without predictors), and then the random intercept model with predictors (Heck, Thomas & Tabata, 2010). A random intercept model tests for the differences in intercept between participants, but is assumed that the relationship between the predictor and outcome (slope) is the same for all individuals. The estimate of fit used was the -2 restricted log likelihood (Table 2). The baselines were obtained from the null models, and lower -2 restricted log likelihood numbers in the subsequent unconditional and random intercept models indicated better fit. Intraclass correlations were calculated for level 2 of all unconditional models (Table 2). The intraclass correlations are an indicator of the effect size of the model and the value represents the percentage of total variance that can be attributed to level-2, the between person level, prior to adding in predictors.

Table 2.

Model fit and ICC summary

	Null Model	Unconditional Model		Random Intercept Model
Dependent Variable	*-2LL*	*-2LL*	*ICC*	*-2LL*
Systolic Blood Pressure at Work	2235.79	2129.31	.46	
Workplace Stressors				1111.24
Affect × Arousal at Work				1334.59
Diastolic Blood Pressure at Work	2097.67	1989.17	.46	
Workplace Stressors				1031.43
Affect × Arousal at Work				1232.45
Heart Rate at Work	2223.13	2049.51	.61	
Workplace Stressors				1079.44
Affect × Arousal at Work				1309.03*
Perceived Stress at Work	867.92	785.35	.43	
Workplace Stressors				640.31**
Affect × Arousal at Work				678.34**
Affect at Work	792.16	668.45	.55	
Workplace Stressors				565.79**
Systolic Blood Pressure	1428.42	1386.57	.39	

after Work				
Affect Controlling for Arousal				1018.13
Diastolic Blood Pressure after Work	1343.37	1302.45	.40	
Affect Controlling for Arousal				960.99
Heart Rate after Work	1375.67	1300.93	.55	
Affect Controlling for Arousal				965.85
Perceived Stress after Work	580.05	530.88	.42	
Affect Controlling for Arousal				496.54**

Wald Z statistic significant at $^{*}p < .05$, $^{**}p < .01$.

While the raw ratings of system stressors were used directly as predictors, data preparation was required for the other types of stressors. "Yes" to a task item was coded as "1" and "No" was coded as "0". Tasks were summed into five groups: recreational ("Passive recreational activities with resident", and "Active recreational activities with resident"; inter-item r = .51), personal care ("Tending to resident's hygiene", "Feeding resident meals", "Giving mobility assistance to resident without the use of machinery", and "Giving mobility assistance to resident with the use of machinery"; $\alpha = .67$), medical care ("Tending to resident's chronic conditions", "Tending to resident's temporary illness", "Giving resident medications", and "Checking resident's charts"; $\alpha = .44$), general resident-unrelated ("Housekeeping", "Kitchen services", "Laundry", and "Inventory checks"; $\alpha = .47$), and leisure ("Break time", and "Having conversations with colleagues"; inter-item r = .01). For the types of social interactions that did not occurred prior to the blood pressure reading, the quality was rated as neutral at mid-scale, since the lack of the interaction evoked neither a negative nor a positive appraisal. All variables were standardized to aid interpretation of the results with the exception of timepoints, blood pressure and heart rate readings. The estimates for the cardiovascular reactivity reflect the actual changes in blood pressure (mm Hg) and heart rate (bpm) metrics.

Results

Hypothesis 1

Workplace stressors and ambulatory cardiovascular reactivity at work. Random intercept models of all three measurements of cardiovascular reactivity at work were tested with system, tasks and relationship stressors as predictors (Table 3). The control variables commonly used in cardiovascular research were entered in the final step along with the workplace stressors predictors. For level 1 they were posture, caffeine, cigarettes, and food, and level 2 control variables were age, body mass index, regular smoker, trait hostility, systolic blood pressure/diastolic blood pressure/heart rate baselines, shift type and timepoints. Several of the control variables were significant predictors of cardiovascular reactivity. Older participants (B = 4.25, $p < .05$) and participants with a higher body mass index (B = 4.31, $p < .05$) had higher systolic blood pressure. Sitting down was associated with lower diastolic blood pressure and heart rate (B = -6.23, $p < .05$; B = -6.76, $p < .05$ respectively). All cardiovascular measures were significantly associated with their baselines (systolic: B = 0.86, $p < .001$; diastolic: B = 0.73, $p < .01$; heart rate: B = 0.61, $p < .01$).

Noisy work environments predicted higher systolic blood pressure (B = 2.67, $p < .05$). Better quality interactions with strangers led to higher heart rate (B = 2.11, $p < .05$). No significant variances were left to explain in the between-subject level in the systolic blood pressure (Wald Z = 0.66, *ns*), diastolic blood pressure (Wald Z = 1.47, *ns*) and heart rate models (Wald Z = 1.90, *ns*).

Table 3.

Workplace stressors and ambulatory cardiovascular reactivity at work model summaries

	Estimate (SE)		
Fixed Effects	*SBP at Work*	*DBP at Work*	*HR at Work*
Controls			
Posture			
Sitting	0.02 (3.57)	-6.23 (2.58)*	-6.76 (3.05)*
Standing	-1.51 (2.79)	-1.66 (2.01)	-1.27 (2.37)
Caffeine	2.54 (2.82)	3.17 (2.09)	2.93 (2.53)
Cigarette	-0.28 (4.89)	5.89 (3.49)†	-1.57 (4.09)
Food	-0.60 (2.27)	-2.34 (1.62)	1.50 (1.89)
Smoker	0.78 (7.05)	3.56 (6.73)	7.86 (10.35)
Timepoint	-0.42 (0.39)	-0.27 (0.28)	-0.37 (0.34)
Age^z	4.25 (1.79)*	.07 (1.74)	0.43 (2.80)
Body Mass Index^z	4.31 (1.57)*	-.50 (1.49)	-2.76 (2.46)
Cook Medley's Hostility^z	3.08 (2.11)	-3.07 (2.06)	-1.69 (3.51)
Blood Pressure/Heart Rate Baselines	0.86 (0.14)***	0.73 (0.19)**	0.61 (.19)**
Shift Type			
Day	-5.23 (6.87)	4.83 (6.22)	0.36 (9.90)
Evening	-3.26 (6.81)	-0.33 (6.19)	4.98 (10.05)
Stressor Predictors			
Noisy Environment^z	2.67 (1.28)*	1.53 (.94)	.76 (1.12)
Smelly Environment^z	2.49 (1.32)†	-.10 (.97)	-.52 (1.16)

Dirty Environment^z	2.23 (1.55)	-.48 (1.11)	.13 (1.30)
Disorganized Environment^z	-2.97 (1.72)†	.75 (1.30)	1.10 (1.59)
Fast-paced Environment^z	.97 (1.82)	-.92 (1.41)	-.54 (1.74)
Work Overload^z	1.93 (1.56)	.01 (1.15)	1.41 (1.37)
Role Conflict^z	-.55 (1.63)	.73 (1.23)	-.54 (1.74)
Role Clarity^z	.84 (1.00)	.23 (.73)	1.41 (1.37)
Recreational Tasks	0.38 (1.73)	-0.36 (1.29)	0.29 (1.55)
Medical Care Tasks	0.25 (1.87)	1.58 (1.38)	-0.93 (1.68)
Personal Care Tasks	-0.44 (1.15)	-0.02 (0.85)	1.83 (1.03)†
General Tasks	-0.22 (1.70)	-2.45 (1.26)†	0.24 (1.52)
Leisure Tasks	0.61 (2.05)	0.32 (1.48)	0.70 (1.74)
Quality of Supervisor Interactions^z	-.10 (.92)	-.14 (.68)	.57 (.81)
Quality of Coworker Interactions^z	-.51 (1.28)	-.22 (.96)	-.80 (1.15)
Quality of Resident Interactions^z	-.53 (1.21)	-.18 (.89)	1.25 (1.06)
Quality of Resident's Family Member Interactions^z	.78 (.87)	.04 (.62)	-.56 (.74)
Quality of Stranger Interactions^z	-1.02 (1.22)	.02 (.87)	2.11 (1.03)*

^{z}Standardized.
$^*p < .05$, $^{**}p < .01$, $^{***}p < .001$, †$.05 < p < .10$.

Workplace stressors and ambulatory perceived stress at work. A random intercept model of perceived stress at work was tested with system, tasks and relationship stressors as predictors (Table 4). Control variables in this model included age, shift type and timepoints. Also, all three ambulatory cardiovascular variables were included as controls so the final model reflected relationships between stressors and perceived stress above and beyond physiological reactivity. Of these cardiovascular related variables only systolic blood pressure was positively associated with perceived stress at work (B = 0.01, $p < .05$). Fast-paced work environments predicted higher perceptions of stress (B = .28, $p < .05$). Partaking in leisure activities (B = -0.35, $p < .01$) and better quality interactions with residents (B = -.20, $p < .01$) were both significant predictors of lower perception of stress. There was significant variance left to be explained at the between-subject level in the random intercept model (Wald Z = 2.66, $p < .01$).

Table 4.

Workplace stressors and ambulatory perceived stress at work model summary

	Estimate (SE)
Fixed Effects	*Stress at Work*
Controls	
Systolic Blood Pressure	0.01 (0.01)*
Diastolic Blood Pressure	-0.002 (0.01)
Heart Rate	0.01 (0.01)†
Timepoint	-0.004 (0.02)
Age^z	0.07 (0.17)
Shift Type	
Day	-0.27 (0.53)
Evening	0.54 (0.58)
Stressor Predictors	
Noisy Environment^z	-.02 (.09)
Smelly Environment^z	.09 (.08)
Dirty Environment^z	-.18 (.11)†
Disorganized Environment^z	.17 (.11)†
Fast-paced Environment^z	.28 (.11)*
Work Overload^z	.07 (.09)
Role Conflict^z	-.01 (.10)
Role Clarity^z	-.03 (.06)
Recreational Tasks	-0.07 (0.12)
Medical Care Tasks	0.10 (0.09)

Personal Care Tasks	-0.02 (0.07)
General Tasks	0.03 (0.11)
Leisure Tasks	-0.35 (0.11)**
Quality of Supervisor Interactions[z]	.004 (.06)
Quality of Coworker Interactions[z]	.06 (.08)
Quality of Resident Interactions[z]	-.20 (.07)**
Quality of Resident's Family Member Interactions[z]	.06 (.05)
Quality of Stranger Interactions[z]	-.03 (.07)

[z]Standardized.
*$p < .05$, **$p < .01$, ***$p < .001$, †$.05 < p < .10$.

Hypothesis 2

Workplace stressors and ambulatory affectivity at work. A random intercept model of affectivity at work was tested with system, task and relationship stressors as predictors (Table 5). Control variables in this model included age, shift type and timepoints. When the sense of work overload increased, ratings of affectivity decreased, signifying more negative affect (B = -.20, $p < .05$). Better quality interactions with residents led to higher ratings of affectivity, indicating more positive affect (B = .20, $p < .01$). There was significant variance left to be explained at the between-subject level in the random intercept model (Wald Z = 2.77, $p < .01$).

Table 5.

Workplace stressors and ambulatory affectivity at work model summary

	Estimate (SE)
Fixed Effects	*Affect at Work*
Controls	
Timepoint	-.01 (.02)
Age[z]	.02 (.19)
Shift Type	
Day	-.28 (.59)
Evening	-.68 (.68)
Stressor Predictors	
Noisy Environment[z]	-.04 (.08)
Smelly Environment[z]	-.01 (.08)
Dirty Environment[z]	.004 (.09)
Disorganized Environment[z]	.14 (.12)
Fast-paced Environment[z]	-.04 (.11)
Work Overload[z]	-.20 (.10)*
Role Conflict[z]	-.01 (.11)
Role Clarity[z]	-.05 (.07)
Recreational Tasks	-0.08 (0.12)
Medical Care Tasks	-0.10 (0.09)
Personal Care Tasks	0.03 (0.08)
General Tasks	0.05 (0.11)
Leisure Tasks	0.01 (0.12)

Quality of Supervisor Interactions^z	.11 (.06)†
Quality of Coworker Interactions^z	.14 (.08)†
Quality of Resident Interactions^z	.20 (.07)**
Quality of Resident's Family Member Interactions^z	.05 (.05)
Quality of Stranger Interactions^z	-.04 (.08)

^{z}Standardized.
$^*p < .05$, $^{**}p < .01$, $^{***}p < .001$, †$.05 < p < .10$.

Hypothesis 3

Ambulatory affect, arousal and cardiovascular reactivity at work. Random intercept models of all three measurements of cardiovascular reactivity at work were tested with affectivity and arousal as predictors (Table 6). Once again, level 1 (posture, caffeine, cigarettes, food), and level 2 control variables (age, body mass index, regular smoker, trait hostility, systolic blood pressure/diastolic blood pressure/heart rate baselines, shift type and timepoints) were used as control variables. All cardiovascular measures were significantly associated with their baselines (systolic: B = 0.70, $p < .001$; diastolic: B = 0.70, $p < .01$; heart rate: B = 0.73, $p < .01$). Sitting down was associated with lower diastolic blood pressure and heart rate (B = -4.39, $p < .05$; B = -8.95, $p < .001$ respectively). Nicotine intake was related to a higher diastolic blood pressure reading (B = 8.83, $p < .01$). The consumption of food was associated with a higher heart rate (B = 3.86, $p < .05$). Within this model, systolic blood pressure decreased over the course of the work shift (B = -0.85, $p < .01$).

While arousal did not predict any of the cardiovascular reactivity, higher systolic and diastolic blood pressure were significant predictors of more negative affect, with the effect being stronger for systolic blood pressure (B = -5.06, $p < .001$; B = -2.19, $p < .05$ respectively). The interaction term between arousal and affectivity was not significant. No significant variances were left to explain in the between-subject level in the systolic blood pressure (Wald Z = 1.04, *ns*) and diastolic blood pressure model (Wald Z = 1.83, *ns*). However, there was significant variance left to be explained at the between-subject level in the heart rate model (Wald Z = 2.14, $p < .05$).

Table 6.

Ambulatory affect, arousal and cardiovascular reactivity at work model summaries

	Estimate (SE)		
Fixed Effects	*SBP at Work*	*DBP at Work*	*HR at Work*
Controls			
Posture			
Sitting	-1.21 (2.64)	-4.39 (1.93)*	-8.95 (2.41)***
Standing	.04 (2.21)	-0.48 (1.61)	-0.83 (2.00)
Caffeine	.06 (2.41)	1.72 (1.78)	1.19 (2.23)
Cigarette	5.11 (3.99)	8.83 (2.86)**	-3.32 (3.54)
Food	0.35 (2.00)	-1.44 (1.43)	3.86 (1.77)*
Smoker	-6.59 (5.47)	-1.12 (5.81)	6.64 (9.05)
Timepoint	-0.85 (0.32)**	-0.43 (0.24)†	-0.42 (0.30)
Age^z	1.95 (1.53)	.47 (1.73)	-.09 (2.63)
Body Mass Index^z	2.76 (1.28)†	-.27 (1.42)	-2.78 (2.30)
Cook Medley's Hostility^z	-3.02 (1.54)†	-3.28 (1.76)†	-1.73 (2.97)
Blood Pressure/Heart Rate Baselines	0.70 (.11)***	0.70 (.19)**	0.73 (0.19)**
Shift Type			
Day	-6.57 (5.61)	5.25 (5.79)	1.19 (9.11)
Evening	-1.20 (5.17)	4.01 (5.37)	10.31 (8.96)
Affect and Arousal Predictors			
Arousal at Work^z	.98 (1.32)	-.23 (.99)	1.04 (1.24)
Affect at Work^z	-5.06 (1.23)***	-2.19 (.95)*	-1.39 (1.23)

Affect × Arousal	1.13 (0.95)	-.12 (.71)	-.69 (.90)

[z]Standardized.
$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$, †$.05 < p < .10$.

Ambulatory affect, arousal and perceived stress at work. A random intercept model of perceived stress at work was tested with affectivity and arousal as predictors (Table 7). Again, age, shift type, timepoints and all three ambulatory cardiovascular variables from level-1 were included as controls so the final model reflected relationships between stressors and perceived stress above and beyond physiological reactivity. Only heart rate was positively associated with perceived stress at work (B = 0.02, $p < .01$). Higher arousal and more negative affectivity predicted higher perception of stress (B = .24, $p < .01$; B = -.63, $p < .001$ respectively). There was significant variance left to be explained at the between-subject level in the random intercept model (Wald Z = 2.83, $p < .01$).

Table 7.

Ambulatory affect, arousal and perceived stress at work model summary

	Estimate (SE)
Fixed Effects	*Stress at Work*
Controls	
Systolic Blood Pressure	0.01 (0.01)
Diastolic Blood Pressure	-0.002 (0.01)
Heart Rate	0.02 (0.01)**
Timepoint	-0.00004 (0.02)
Age[z]	0.09 (0.15)
Shift Type	
Day	-0.39 (0.43)
Evening	0.10 (0.50)
Affect and Arousal Predictors	
Arousal at Work[z]	.24 (.09)**
Affect at Work[z]	-.63 (.09)***
Affect × Arousal	.10 (.06)

[z]Standardized.
*$p < .05$, **$p < .01$, ***$p < .001$, †$.05 < p < .10$.

Ambulatory affect and arousal at work, and cardiovascular recovery after work. Random intercept models of all three measurements of cardiovascular recovery after work were tested with within-person average affectivity at work as the predictor while taking in account the within-person average arousal at work (Table 8). The same control variables from level-1 were used in the model (posture, caffeine, cigarettes, food, age, body mass index, regular smoker, trait hostility, systolic blood pressure/diastolic blood pressure/heart rate baselines, shift type and timepoints). Also, the within-person systolic blood pressure/diastolic blood pressure/heart rate at work averages were used as a control with their corresponding outcome models to examine the effect of cardiovascular recovery after work from the at work experiences.

Both blood pressures observed after work were significantly associated with their baselines (B = 1.11, $p < .05$; B = 1.09, $p < .05$ respectively). Diastolic blood pressure decreases over time after work (B = -0.64, $p < .01$). Average affectivity at work was not a significant predictor of after work cardiovascular recovery in any of the models. No significant variances were left to explain in the between-subject level in the systolic blood pressure after work (Wald Z = 0.69, *ns*), diastolic blood pressure (Wald Z = 1.16, *ns*), and heart rate after work model (Wald Z = 0.12, *ns*).

Table 8.

Ambulatory affect, arousal and cardiovascular reactivity after work model summaries

	Estimate (SE)		
Fixed Effects	*SBP after Work*	*DBP after Work*	*HR after Work*
Controls			
Posture			
Sitting	7.51 (13.24)	0.37 (10.37)	6.79 (10.33)
Standing	17.80 (13.32)	5.52 (10.44)	14.75 (10.37)
Walking	16.44 (13.41)	5.50 (10.53)	17.78 (10.47)†
Caffeine	2.26 (3.35)	2.38 (2.66)	-0.85 (2.69)
Cigarette	-0.43 (5.72)	5.56 (4.52)	0.93 (4.61)
Food	2.56 (2.50	1.51 (1.97)	2.51 (1.99)
Smoker	-10.06 (8.29)	13.01 (7.12)†	8.20 (8.13)
Timepoint	-0.24 (0.23)	-0.64 (0.18)**	-0.14 (0.18)
Age^z	-2.84 (2.39)	-3.08 (2.17)	2.32 (2.24)
Body Mass Index^z	-.74 (2.16)	-3.56 (1.84)†	-2.48 (2.32)
Cook Medley's Hostility^z	-.77 (2.41)	-.61 (2.20)	-.69 (3.04)
Blood Pressure/Heart Rate Baselines	1.11 (0.33)*	1.09 (0.37)*	0.15 (0.30)
Mean Blood Pressure/Heart Rate at Work	-0.14 (0.41)	-0.15 (0.35)	0.26 (0.28)
Shift Type			
Day	-2.92 (6.84)	6.84 (6.20)	-8.87 (7.82)
Evening	6.50 (6.25)	8.34 (6.17)	-18.26 (8.65)†
Affect and Arousal at Work Predictors			

Mean Arousal at Work[z]	-.74 (4.87)	.81 (4.40)	7.69 (6.89)
Mean Affect at Work[z]	-4.74 (4.72)	-2.77 (3.44)	-6.36 (5.98)

[z]Standardized.
$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$, †$.05 < p < .10$.

Ambulatory affect and arousal at work, and perceived stress recovery after work. A random intercept model of perceived stress recovery after work was tested with within-person average affectivity at work as the predictor while taking in account of the within-person arousal at work. Within-person perceived stress at work averages were placed in the outcome model to examine the effect of recovery after work from at work perceived stress experiences (Table 9). The same control variables from level-1 were used in the model (posture, caffeine, cigarettes, food, age, body mass index, regular smoker, trait hostility, systolic blood pressure/diastolic blood pressure/heart rate baselines, shift type and timepoints). Systolic blood pressure and heart rate were positively associated with perceived stress after work (B = 0.04, $p < .001$; B = 0.02, $p < .05$ respectively). Again, average affectivity at work was not a significant predictor of after work perceived stress recovery. There was significant variance left to be explained at the between-subject level in the perceived stress after model (Wald Z = 2.41, $p < .05$).

Table 9.

Ambulatory affect, arousal and perceived stress after work model summary

	Estimate (SE)
Fixed Effects	*Stress after work*
Controls	
Systolic Blood Pressure	0.04 (0.01)***
Diastolic Blood Pressure	-0.02 (0.01)†
Heart Rate	0.02 (0.01)*
Timepoint	0.003 (0.02)
Age^z	-.18 (.18)
Mean Perceived Stress at Work	-.01 (.32)
Shift Type	
Day	-0.97 (0.54)†
Evening	-0.32 (0.58)
Affect and Arousal at Work Predictors	
Mean Arousal at Work^z	-.10 (.38)
Mean Affect at Work^z	-.47 (.36)

^{z}Standardized.
$^*p < .05$, $^{**}p < .01$, $^{***}p < .001$, †$.05 < p < .10$.

Discussion

The three hypotheses of the current study can be grouped into two areas of discussion. First, as an empirical contribution to discovering the current demands of providing long-term care, a customized, full-scope model of work stressors was examined in predicting caregivers' cardiovascular and psychological outcomes. Second, to further the venture of positive psychology, the roles of affectivity and arousal in the stress and strain process were explored. While first investigated as consequences of workplace stressors, affectivity and arousal were later assessed as predictors of cardiovascular reactivity and perceived stress at work and after work. Support for the full-scope model of long-term care stressors and partial support for the roles of affectivity and arousal were found.

Full-scope model of long-term care stressors revealed unique predictors of caregivers' outcomes

Physical environment. The physical work environment is often overlooked as a potential workplace stressor in occupational research (McCoy & Evans, 2005), yet the current study supported the contrary. High ratings of noise in the long-term care work environment led to an increase in systolic blood pressure. Other past works by Evans found that chronic and acute high levels of noise were associated with elevated systolic blood pressure. For instance children residing in noisy environments had higher baselines of systolic blood pressure (Evans, Hygge & Bullinger, 1995). Within a controlled experimental design, a noise stressor caused a significant increase in systolic blood pressure and a marginally significant increase in diastolic blood pressure (Evans, Allen, Tafalla & O'Mearas, 1996). Furthermore, a longitudinal study of industrial workers revealed that higher systolic and diastolic blood pressure followed exposure to noise while performing jobs tasks that were complex (Melamed, Fried & Froom, 2001). The possibility of interactions between physical environmental factors and the nature of job tasks is an interesting point, especially because it reflects the work settings in reality - workplace stressors co-existing with each other.

A fast-paced work environment was perceived as stressful within the long-term care facilities. The reason why only this particular physical environment factor was perceived stressful may be that other environmental factors (noise, smell, dirt, disorganization) were anticipated as norms of working in the sector. Busy periods in long-term care generally occur prior to meal times and bed times, thus perception of fast-paced work environment may only apply to those periods. Even though such working conditions may be considered as a standard in long-term care settings, the current study and past research were able to show their detrimental consequences on the mental and physical well-being of employees. Other research has shown that exposure to these stressors also decreased task motivation and job performance (McCoy & Evans, 2005). For these reasons, environmental factors deserve a closer examination and a worthy acknowledgement in workplace practices.

Work overload. Overload of work responsibilities led to more ambulatory negative affectivity at work. Evidence for work overload as a precursor to negative mood at work is abundant in organizational literature. Intense workload experienced by long-term care staff was associated with less job satisfaction, the lack of which was further linked to depression (Motowidlo, Packard & Manning, 1986; Packard & Motowidlo, 1987). Distressed family caregivers reported that the main stressors they face while providing care were role and work overload (Robertson, Zarit, Duncan, Rovine, & Femia, 2007). It is important to acknowledge this relationship for negative affect at work could consequently manifest into other unfavourable organizational and resident-related outcomes such as turnover and resident abuse (Hannan, Norman & Redfern, 2001; Schaefer & Moos, 1996).

Resident interactions. High quality interactions with residents significantly predicted more positive affectivity and decreased perceptions of stress. The significance of the resident-caregiver relationship can be deduced from the current study. Resident care is at the core of the work description in the current study's sample of front-line care workers. Positive interactions with residents increased positive feelings and decreased perceived stress in caregivers, possibly through the sense of accomplishment and value in their work. In previous research, opportunities to help residents had a positive impact on the satisfaction of staff in long-term care (Quinn, 2002). Also, resident recognition of staff member's work was found to be one of the most influential factors in work satisfaction in a sample of nurses (Robertson et al., 1995). These positive interactions with residents may serve as a more authentic form of performance feedback and encouragement than formal evaluations because it comes directly and instantly from the person on the receiving end of the care. In fact, positive resident interactions are considered by nursing staff to be the precursor to high quality of care given (Bowers, Esmond & Jacobson, 2000).

Leisure breaks. Leisure activities at work (taking a break, having conversations with colleagues) led to lower perceived levels of stress. This further exemplifies the importance of taking breaks at work and interacting with coworkers for psychological well-being. Positive interactions with strangers were associated with higher heart rate, with the reasons behind this relationship being unclear. The scarcity of actual interactions with strangers may have driven this relationship.

Affect and arousal as predictors of psychological and physiological stress

Blood pressure reactivity. Though it had been suggested that the inconsistencies of findings in mood and ambulatory cardiovascular research may be attributed to emotional arousal (Dockray & Steptoe, 2010), this study did not find evidence to support that claim. Perceived arousal was not a significant predictor of ambulatory blood pressure or heart rate. The pathway between autonomic and emotion arousal appears to be more complex; other factors may moderate this relationship. Indeed, the perception of a stressor as a threat (outweighing the personal resources available to cope with it) or a challenge (within the capabilities of the individual to handle) has different influences on the cardiovascular system (Blascovich & Tomaka, 1996). Mood induction by listening to music elicited changes in emotional arousal that were non-contingent on autonomic arousal (Baltes, Avram, Miclea & Miu, 2011).

Ambulatory affect was a significant predictor of cardiovascular reactivity. More negative affect was associated with higher systolic blood pressure and, to a lesser extent, higher diastolic blood pressure. These were the exact outcomes discovered in the study by Ilies et al. (2010), but was demonstrated using a single item measure of affect instead of the 20 items Positive Affect and Negative Affect Scale (Watson et al., 1988). Also similar to Ilies et al. (2010) findings, there was no significant interaction of heart rate and affect on cardiovascular reactivity. Therefore, past and current evidence clearly supports the claim that negative emotions are associated with exacerbated acute blood pressure reactivity. The larger magnitude of reactivity in systolic blood pressure may have important implications for cardiovascular health. Systolic blood pressure is a consistent predictor of cardiovascular mortality whereas predictive ability of diastolic blood pressure is more pertinent in populations over the age of 65 (Pastor-Barriuso, Banegas, Damian, Appel & Gualler, 2003).

These findings also mirrored similar positive psychology research on ambulatory emotions and blood pressure. Positive affect has been related to lower systolic blood pressure (James, Yee, Harshfield, Blank & Pickering, 1986; Steptoe & Wardle, 2005). Unfortunately, the current study assessed ambulatory affectivity as a unidimensional construct measured on one continuum of affectivity instead of two separate scales for negative and positive. It is not possible to tease apart the distinct involvement of negative affect void of positive affect, or the impact of positive affect void of negative affect.

Perceived stress. Caregivers were able to perceive stress as a product of high arousal and negative affectivity. This supports the placement of the feeling stress on the circumplex model of emotions, in which emotions constitute a degree of affectivity and arousal (Posner et al., 2005). Stress is considered negative on affectivity and high on arousal. In addition, perceived stress predicted higher heart rate at work, and both higher heart rate and systolic blood pressure in the period after work. This opens up the possibility of exploring the interplay of emotions, stress appraisal and physiological reactivity. The potential combinations of mediated and moderated relationships to be tested are plentiful. For example, utilizing the cognitive appraisal stress theories developed by Lazarus (1999), one can explore the possibility of the associations between emotions and physiological recovery from stressors to be moderated by the appraisal of the stressfulness of the situation.

None of the affective experiences at work carried over to reduce perceived stress and assist with cardiovascular recovery after work. One reason why Frederickson's work (2001) was not replicated may be the different ways positive well-being are defined in literature. There are two types of positive well-being, eudemonic and hedonic. Although the current study captured the presence of positive affect, pleasantness and positive feelings typical of hedonic wellbeing, Frederickson (2001) focused more on eudemonic wellbeing – positive emotions with more depth that serve to guide an individual towards their potential (i.e., engagement, vitality). These two types of positive emotions have been suggested to have different effects or act through different pathways on thinking and biological functioning (Ryff, Singer, & Love, 2004).

Limitations

Although there was substantial support for the hypotheses of this study, one reason why there were not more significant findings may be that within the context of long-term care the true stressors are not the ones that are encountered daily. Care staff may be accustomed to the way the organization is managed, the tasks they perform, the physical environments they work in, the typical levels of social interactions they come across every day. The more traumatic stressors may be the very few times when there are serious violent outburst from residents or other staff, outbreak of disease in the units, and deaths of residents. The length of tenure at the facility the caregivers work in can be explored to determine whether or not there is habituation to daily stressors.

If daily stressors are indeed mild stressors, there is no valid need for recovery from them after work, which may explain the absence of significant findings of at work experiences predicting after work recovery. Alternatively, the observations of recovery after work were sparse in the study, and it may be due to the lack of power that significant results were not found. Also, cardiovascular research suggests that the recovery and revival period extends into the night and can be observed by nocturnal dipping: the decline in cardiovascular activity during sleep (Van Egeren, 1992). Future studies can expand on the timeframe of data collection to encompass the sleep period.

Another potential limitation is the unique nature of the sample collected. First, the participants were all female. This may influence some of the predictive relationships tested in the current study, for women are suggested to have different ways of coping with stress than men. While the tradition human stress response is "fight or flight," women can behave in a "tend and befriend" manner, exhibiting nurturant survival strategies such as seeking out social affiliation (Taylor et al., 2000). In addition, research has shown that women's psychophysiological arousal tend to persist after work, possibly because of maternal responsibilities preventing them from recovering adequently from work stress (Lundbert, 1996).

Second point about the nature of the sample is that the age is relatively young compared to other research studies conducted in long-term care settings. There may be a potential restriction in age due to the exclusion criteria of people currently on hypertensive or psychoactive medications. The technology aspects of the data collection procedures, such as using an ambulatory blood pressure monitor, may not appeal to older employees at the care homes. All these factors imply that the study's sample may not be completely representative of the employee pool in long-term care. The findings from the current study must be critically considered with these characteristics in mind.

Ecological momentary sampling provided an exceptionally rich dataset for this study. Yet, one drawback is the unbounded statistical possibilities of analyzing the data. While analyses were kept relatively simple, with the most complicated one being a level-1 interaction within a 2-level nested dataset, perhaps more can be explored with various combinations of cross-level modeling. Enduring psychosocial factors such as disposition and trait emotions (depression, hostility, work stress, control) were more consistently associated with markers of cardiovascular disease compared to perception of chronic stress (Brydon, Magid & Steptoe, 2006; Brunner et al., 1996). In addition, Papaousek et al. (2010) found that trait positive affectivity, but not state positive affectivity, was related to better cardiovascular and perceived stress recovery from stressors. It is possible to test out the potential cross-level moderations of outcome variables from dispositional traits at the participant-level as a future direction on this project. Also, due to the complexity of the employment relationships in long-term care, part-time/full-time status could potentially be used as a control variable. Given a larger sample, analyses can even expand to a 3-level model, with diary observations over time nested within individuals, nested within different long-term care facilities. Finally, because of the longitudinal design, it may be interesting to examine the cumulative or time-lagged effect of stressors on caregiver outcomes.

Practical and Research Implications

The current study offers suggestions for improving practices in the long-term care sector. Organizations need to reconsider the consequences of prolonged exposure to certain physical environmental factors and work overload on employees' health and well-being. Fostering high-quality resident-caregiver relationships and leisure time at work may help alleviate some of these effects. Some specific recommendations for practice include increasing the frequency of work breaks in staff rooms away from noisy and busy areas of the facility, and encouraging staff to interact socially with residents between work tasks. In addition, employee health promotion programs should focus on raising awareness about the physical health benefits from building up a resource of positive emotions and reducing daily negative emotions.

Although this study was conducted within the context of long-term care, it would be interesting to consider the generalizability of the full-scope model of workplace stressors in other types of jobs. System, relationships, and task stressors are prevalent across occupations, yet the specific stressors in the current study are closely related to the job description of long-term care workers. These specific stressors may also not predict psychological and physiological experiences to the same extent for job positions even within the same sector. The current study found that interactions with residents predicted positive outcomes in a sample of front-line care workers. These relationships may hold less weight for long-term care staff in management because of their limited exposure to residents. Future studies examining stressors at work can build from the current full-scope model but add in both sector and position relevant stressors.

One finding that may be generalizable across occupation is that ambulatory negative affect predicted higher systolic and diastolic blood pressure at work. This is because this relationship is not constrained to long-term care workplace stressors. In addition, identical findings with momentary affectivity were found in previous research (Ilies et al., 2010). All together, this suggests that there is a convincing link between negative emotions and cardiovascular reactivity, and potentially with cardiovascular disease risk. Careful interpretation of the health implications is needed, for the study did not reveal any significant findings in cardiovascular recovery and was only looking at experiences within the time frame of a day. It is the prolonged heightened reactivity to stressors over time that leads to the onset of cardiovascular disease and mortality.

As the calibre of occupational health psychology research increases steadily over time, there is a call for the field to move beyond cross-sectional data with self-reported assessments. This study achieved that by conducting field research with a longitudinal diary study design and using both objective and subjective measurements of outcomes. This study also hopes to serve as an encouragement for organizational researchers to utilize these methods and as a catalyst for open discussions of practical advice. For example, topics of debate for diary studies methodology could be single-item validity, clarity and accessibility, attrition factors, number of observations and length of time between observations.

Conclusions

The current study found support for the full-scope model of long-term care workplace stressors in predicting caregiver outcomes. A future endeavour for building on the current research is to examine the impacts of workplace stressors on organizational and residents' outcomes. Aforementioned at the beginning, stress experienced by long-term care staff has been associated with issues in staffing retention, and poorer residents' quality of care (Schaefer & Moos, 1996; Shinan-Altman & Cohen, 2009). Current research determined the critical role of negative emotions in cardiovascular reactivity. Yet, it also suggested that moderators such as stress appraisal, personality disposition, job history and job attitudes may play a part in moderating the psychosomatic pathways between emotions and health. There remains much to be explored and discovered of this intriguing stream of positive psychology in occupational health research.

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Appendix A
Diary Entry

1. ***Current** time:* _________ am / pm

2. ***Current** posture* (check one):

   - ❍ Sitting
   - ❍ Standing
   - ❍ Walking
   - ❍ Running
   - ❍ Others (specify): ___________

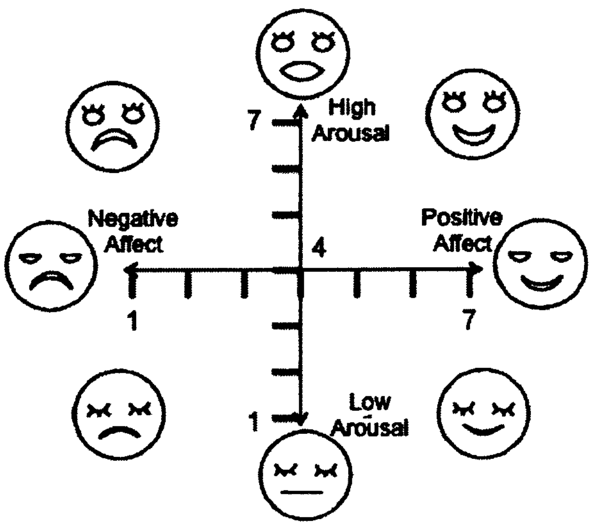
3. *In the **past hour** have you consumed* (check all that applies):

   - ❑ Caffeine
   - ❑ Cigarettes
   - ❑ Food

4. *How would you rate your **current** level of stress* (circle one)*?*

1	2	3	4	5	6	7
Very low	Low	Somewhat low	Moderate	Somewhat high	High	Very high

5. *Rate your **current** mood* (circle one red affect rating and one blue arousal rating; two overall):



6. ***Current** location* (check one):

- ❍ Work
- ❍ Home
- ❍ Others (specify): ________________

7. *Identify **all** the people you have been interacting with for the **last 15 minutes*** (leave this question blank if you have been alone):

❑ Supervisor(s).

Rate the quality of this interaction (circle one):

1 Negative	2	3 Neutral	4	5 Positive

❑ Co-worker(s).

Rate the quality of this interaction (circle one):

1 Negative	2	3 Neutral	4	5 Positive

❑ Resident(s).

Rate the quality of this interaction (circle one):

1 Negative	2	3 Neutral	4	5 Positive

❑ Resident's family member(s).

Rate the quality of this interaction (circle one):

1 Negative	2	3 Neutral	4	5 Positive

❑ Strangers.

Rate the quality of this interaction (circle one):

1 Negative	2	3 Neutral	4	5 Positive

8. ***Current** work activity* (check all that applies):

- ❑ Passive recreational activities with resident (ie. talking, reading)
- ❑ Active recreational activities with residents (ie. exercising, walking)
- ❑ Tending to resident's chronic conditions (ie. dementia, Alzheimer's)
- ❑ Tending to resident's temporary illness (ie. sores, headaches, flu)
- ❑ Tending to resident's hygiene (ie. washing, bathing, bathroom use)
- ❑ Feeding resident meals
- ❑ Giving resident medications
- ❑ Giving mobility assistance to resident without the use of machinery
- ❑ Giving mobility assistance to resident with the use of machinery
- ❑ Checking resident's charts
- ❑ Break time
- ❑ Having conversations with colleagues
- ❑ Housekeeping (ie. cleaning up the environment)
- ❑ Kitchen services (ie. food preparation, not feeding)
- ❑ Laundry
- ❑ Inventory checks

9. *Describe your **current** work environment* (circle one):

	Not at all				Very much
Noisy	1	2	3	4	5
Smelly	1	2	3	4	5
Dirty	1	2	3	4	5
Disorganized	1	2	3	4	5
Fast-paced	1	2	3	4	5

10.*In the* ***past hour*** *at work* (circle one):

	Very false						Very true
It was hard for me to keep up with the workload.	1	2	3	4	5	6	7
I received incompatible requests from two or more sources.	1	2	3	4	5	6	7
I knew what my responsibilities are.	1	2	3	4	5	6	7

Appendix B
Pre-data Collection Questionnaire

Section 1

Demographics:

Age: _____

Gender:

- ❍ Male
- ❍ Female

Ethnicity:

- ❍ White
- ❍ South Asian (e.g., East Indian, Pakistani, Sri Lankan, etc.)
- ❍ Chinese
- ❍ Aboriginal
- ❍ Black
- ❍ Filipino
- ❍ Latin American
- ❍ Arab
- ❍ Southeast Asian (e.g., Vietnamese, Cambodian, Malaysian, Laotian, etc.)
- ❍ West Asian (e.g., Iranian, Afghan, etc.)
- ❍ Korean
- ❍ Japanese

- ○ Other — Specify: ___________________________

Highest level of completed education:

- ○ Less than grade 12
- ○ Grade 12
- ○ College
- ○ Bachelor
- ○ Master or Professional Degree
- ○ Doctoral

Job description:

Job position: ____________________

Select **all** that applies:

- ☐ Permanent
- ☐ Casual (Float Staff)
- ☐ Supervisory
- ☐ Full-time
- ☐ Part-time

Average hours worked per shift: _____

Average hours worked each week: _____

Length of time worked at the care facility: _____ (months / years)

Average residents/staff ratio in your work unit: _____

Are you working in a specialized unit?

- ○ Yes, please specify what unit: ___________________;
  and length of time worked in this unit: ___________________ (months / years)

- ❍ No

What day of your work week do you plan to collect your data?

- ❍ Tuesday
- ❍ Wednesday
- ❍ Thursday

Medical history:

Are you currently on any prescribed medication?

- ❍ Yes, please fill out the chart below
- ❍ No

If yes, please name the medical condition and the medication for it:

Condition	Medication

Have you been diagnosed with high blood pressure in the past?

- ❍ Yes
- ❍ No

Are you a regular smoker?

- ❍ Yes
- ❍ No

Body Mass Index, consult the BMI chart if you are having difficulty: _____

Section 2

This section consists of 27 statements that describe **your general attitudes**. Read each statement carefully and circle whether the statement is **"true" or "false"**.

1. I have often had to take orders from someone who did not know as much as I did	True	False
2. I think a lot of people make their problems seem bigger than they are just to get other people to feel sorry for them	True	False
3. Most people won't believe the truth unless you argue a lot to convince them	True	False
4. I think most people would lie to get ahead	True	False
5. The main reason people tell the truth is they're afraid of getting caught	True	False
6. Most people will cheat to win, rather than lose	True	False
7. No one cares much what happens to you	True	False
8. It is safer not to trust anybody	True	False
9. The reason most people make friends is so they will have people to help them	True	False
10. Deep inside, most people don't like putting themselves out to help other people	True	False
11. I often have met people who were supposed to be experts at something, but they were no better than I was	True	False
12. Most people want more respect for their own rights than they are willing to give other people's rights	True	False
13. People often disappoint me	True	False
14. I feel like I should get back at people who do me wrong – just because it's the thing to do	True	False

15. I get inpatient when people interrupt me when I'm working on something – even if it's to ask my advice	True	False
16. Some people in my family have habits that bug and annoy me very much	True	False
17. I can be friendly with people who do things which I think are wrong	True	False
18. I think it's OK for people to try to get as much for themselves as they can in this world	True	False
19. I don't blame a person for taking advantage of someone who is a "sucker"	True	False
20. I don't get angry easily	True	False
21. I would very much enjoy tricking somebody who was trying to pull a trick on me	True	False
22. At times, I have had to get rough with people who were rude or "bugging" me	True	False
23. I dislike certain people so much that I am secretly happy when they get in trouble for something they have done	True	False
24. When someone has disagreed with me or been on opposite sides, I often want to try extra hard to beat them at something – even if it's a small thing	True	False
25. If I don't like someone, I don't try to hide it from them	True	False
26. Most of the time, I argue strongly for my ideas	True	False
27. A large number of people are guilty of bad sexual conduct	True	False

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