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Stress and neurocognitive efficiency in managerial contexts

A study on technology-mediated mindfulness practice

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Abstract

Purpose – The purpose of this paper is to test the potential of an innovative technology-mediated mental training protocol for the empowerment of stress management and neurocognitive efficiency in highly stressful professional contexts, with people who occupy top management positions. The innovative protocol specifically combines mindfulness practice and a wearable neurofeedback system managed via smartphone.

Design/methodology/approach – The longitudinal research included pre- and post-training assessment steps in order to test training effects with respect to subjective level and physiological markers of stress, anxiety and mood profiles, cognitive abilities and markers of neurocognitive efficiency.

Findings – Results showed decreased stress, anxiety, anger and mental fatigue; increased participants’ information-processing efficiency; increased electrophysiological markers concerning the balance and reactivity of the mind-brain system; and improved physiological markers of vagal tone.

Research limitations/implications – Though further investigation and replication with larger samples would strengthen present findings, the authors suggest that observed outcomes, together with the limited duration of the overall protocol and of daily practices, make the training a potentially valuable tool especially for people whose professional position imposes time limitations and elevated job duties, thus increasing the risk of drop-out from traditional stress management programs.

Originality/value – The combination of mindfulness-based mental training with the advantages offered by a novel brain-sensing wearable technology allows for overcoming the weak points of traditional approaches (e.g. notable time expense) and optimizing training opportunities and outcomes. Furthermore, this is, to the authors’ best knowledge, the first systematic report of the application of such methodology in an organization and with top management professionals.

Keywords Wearable technology, Mindfulness, Neurocognitive efficiency, Neurofeedback, Neuromanagement, Stress management

Paper type Research paper

1. Introduction

Professionals occupying managerial positions are primarily involved in challenging tasks characterized by high cognitive load and requiring remarkable cognitive resources. Thus, they are exposed to extremely high pressure to succeed, and are characterized by elevated responsibilities and substantial workload. Notwithstanding known protective factors – such as high level of job satisfaction, elevated earnings, job autonomy, non-routine work and schedule control (Mirowsky and Ross, 2005; Mühlhaus and Bouwmeester, 2016) – all those aspects of manager’s jobs significantly contribute to the high level of stress they experience (Mohr and Wolfram, 2010; Schieman and Glavin, 2016).

Systematic research on the impact of stress on managers is actually limited, despite the attention globally paid to the topic of occupational stress. Still, available literature quite consistently underlines the negative impact of occupational stress on managers’ mood, perceived health and performance efficacy (Institute of Management, 1993; Schieman and Reid, 2009; Mohr and Wolfram, 2010; Dewa et al., 2011; Schieman and Glavin, 2016).
Consequently, the influence of managers’ health and level of stress on their performance at work, on well-being of the employees and on the organization’s effectiveness is nowadays a hot topic in organizations and management research, together with research on effective ways to manage the high stress load managers are exposed to and its consequences (Little et al., 2007; Balconi, Natale et al., 2017; Crivelli and Balconi, 2017a).

Indeed, a high level of chronic stress may become at last dysfunctional, since it can alter mental abilities, wear out cognitive resources and worsen performance (Lupien and McEwen, 1997; Chrousos, 2009). Therefore, considering the negative consequences of chronic stress levels on physical, mental health and on quality of life (Schneiderman et al., 2005; Chrousos, 2009), in the last years research on stress management within work contexts strongly indicates that occupational stress can increase cardiovascular risk and directly alter the neural regulation of cardiovascular activity (Rosengren et al., 2004; Backé et al., 2012); alter the functionality of endocrine and immune systems, thus increasing individual susceptibility to various diseases (Chandola et al., 2010); affect autonomic responsivity and regulation, with heightened heart rate (HR) and blood pressure and reduced vagal tone (i.e. reduction of the ability of the parasympathetic system to down-regulate autonomic arousal associated, e.g., to chronic distress) not only at work but even during leisure time (Vrijkotte et al., 2000; Lucini et al., 2007); and more generally, affect quality of life and psychological well-being because of interpersonal conflicts and work-to-home interference (Institute of Management, 1993; Schieman and Reid, 2009; Dewa et al., 2011; Schieman and Glavin, 2016).

In addition, sustained exposure to stress also has implication on neural activity and on the efficiency of cognitive systems involved in attention regulation, which are mediated by a broad frontal–parietal network (Ptak, 2012). Then, sustained hyperactivation related to stress responses influences neural and cognitive functioning by affecting the ability to properly exert executive, attentive, decision-making and memory processes (see Roozendaal et al., 2009; Girotti et al., 2018). Indeed, the brain is particularly sensitive to the damaging effects of high stress levels, as shown by some studies that have observed how prolonged exposure to high stress levels causes the worsening of executive functions (Arnsten, 2009; Girotti et al., 2018), which are the set of basic and crucial cognitive skills that allow us to monitor ourselves and the context, adaptively respond to environmental requests, distribute cognitive resources and regulate our behavior. Furthermore, prolonged exposure to stressful experiences also affects the activity of hippocampus, amygdala and prefrontal cortex, thus resulting in the dysfunctional alteration of self-monitoring and affective regulation skills (McEwen and Gianaros, 2011; Arnsten, 2015).

Among the educational and intervention protocols designed to empower stress management skills in the workplace and to try to prevent health risks and reduced performance by lowering the negative influence of exposure to stressors, the most diffused are relaxation techniques, cognitive-behavioral psychological training and meditation practices (Lamontagne et al., 2007; Richardson and Rothstein, 2008). Mindfulness-based interventions have been, in particular, deemed as valuable ways to cope with stress-related problems, since they have been shown to efficiently reduce stress and related consequences in different clinical and non-clinical contexts (Creswell, 2017). Even when used in organizations and work environments to manage occupational stress mindfulness meditation showed an interesting potential, as reported in various reviews on the topic (Ravalier et al., 2016; Janssen et al., 2018), though actual outcomes and methodological limitations of such approaches are still debated (Jamieson and Tuckey, 2017) and also negative results have been reported (see e.g. Bartlett et al., 2018).

Recently, novel approaches that integrate mental training practices with wearable brain-sensing devices showed their improved potential for neurocognitive empowerment – understood as the improvement of cognitive skills and of neural processes supporting
them – and for promoting efficient stress management skills with respect to traditional intervention protocols (Bhayee et al., 2016; Balconi, Fronda et al., 2017; Crivelli et al., 2019; Balconi and Crivelli, 2019). In particular, they have also been shown to induce measurable improvements of participants’ cardiovascular functionality (namely, the vagal tone) at rest and under high cognitive workload (Balconi et al., 2018, 2019), as well as improved electrophysiological markers of relaxation, focus and attention regulation (Crivelli et al., 2019). The present study aimed at testing the potential of an innovative technology-mediated mental training protocol for the empowerment of stress management skills and of neurocognitive efficiency (i.e. the efficiency of performance at cognitive tasks) even in highly stressful professional contexts, with people who occupy positions characterized by very high levels of responsibilities and top management duties. The innovative protocol specifically combines mindfulness meditation practice and a wearable neurofeedback system managed via a dedicated smartphone app.

Building on previous findings, we expected that, after specific training on the wearable device, participants would have presented: reduced perceived levels of stress, anxiety and mental fatigue; a concurrent improvement of autonomic down-regulation of physiological stress responses, as measured by cardiovascular markers of increased vagal tone, especially during exposure to a stressful situation; improved performance at challenging cognitive tasks, as marked by the reduction of time needed to process task-relevant information; and a consistent improvement of electrophysiological markers of neurocognitive efficiency, as marked by the modulation of EEG activity especially in correspondence to prefrontal and parietal areas, which constitute a network that mediates attention regulation and is negatively affected by repeated exposure to stressors.

2. Methods
2.1 Sample
The sample was constituted by 16 professionals (8 women; $M_{age} = 44.38$, $SD_{age} = 6.22$; $M_{edu} = 19.13$, $SD_{edu} = 2.47$) with top management duties at a public service company, which operates in the greater Milan area and in part of the province. Exclusion criteria were: history of psychiatric or neurological diseases; ongoing concurrent therapies based on psychoactive drugs that can alter central nervous system functioning; clinically relevant stress, anxiety or depression levels; occurrence of significant stressful life events during the last six months; and preceding systematic meditation experience. None of the participants reported a history of neurology or psychiatric disturbances. Absence of clinical or subclinical signs of cognitive impairment was checked via standardized neuropsychological assessment based on cognitive tests standardized on the Italian reference population (Spinnler and Tognoni, 1987; Caffarra et al., 2002). Absence of clinically relevant signs of stress, anxiety and depression was checked via standardized psychometric tests (Perceived Stress Scale (PSS), Cohen et al., 1983; State-Trait Anxiety Inventory (STAI), Pedrabissi and Santinello, 1989; Beck Depression Inventory, Ghisi et al., 2006). All of the participants had normal or corrected-to-normal hearing and vision.

Written informed consent to participate in the study was collected from all participants. The experimental design and procedures follow the principles of the Declaration of Helsinki and were approved by the Ethics Committee of the Department of Psychology of the Catholic University of the Sacred Heart.

2.2 Experimental procedure
Building on previous pilot and fully structured trials (Balconi, Fronda et al., 2017; Balconi et al., 2018, 2019; Crivelli et al., 2019; Balconi and Crivelli, 2019), the present study was designed as a longitudinal study including two main assessment steps – before and at the end of the training – in order to keep track and test potential effects of the
technology-supported mental training with respect to subjective level and physiological markers of stress, anxiety and mood profiles, cognitive abilities and markers of neurocognitive efficiency. Each assessment session lasted approximately 90 min.

2.2.1 Training protocol. The training protocol is based on mental training practices based on the mindfulness meditation tradition. In the protocol, however, such practices are supported by dedicated wearable neurofeedback devices (Lowdown Focus brain-sensing eyeglasses, SmithOptics Inc., Clearfield, UT, USA), i.e. highly usable technological devices able to non-invasively collect users’ EEG activity and, thanks to a smartphone app, to convert such activity into real-time feedbacks mirroring the modulation of users’ mindset and related neural activity. In particular, the device and the app that we have tested can inform the wearer on the focused vs distracted/agitated status of their minds and brains, thus helping them to develop deeper awareness of their bodily arousal and greater stress coping resources.

The protocol lasted for two weeks and included daily sessions of practice (total number of sessions: 14). The duration of daily practices were gradually incremented starting from 10 min a day till 20 min a day (1st to 5th session – 10 min; 6th to 10th session – 15 min; 11th to 14th session – 20 min), so to introduce progressively increasing levels of commitment and challenge. Participants were further requested to be constant in their practices and to systematically plan them at the same moment of the day, in order to control for potential influence of the physiological modulation of cognitive and bodily processes due to circadian rhythms.

During practice, participants were asked to find a quiet place, sit comfortably and intentionally focus their attention on breathing and related bodily sensations. Such breathing awareness practice derives from Vipāsana meditation and is currently considered a form of focused attention meditation, which is thought to primarily strengthen concentration, focusing and self-regulation skills (Lutz et al., 2008; Lippelt et al., 2014; Hommel and Colzato, 2017). Such practice was chosen because it is among the simplest mindfulness-related practices, and it can be then easily taught to and performed by people that, for the first time, approach mental training. In the meanwhile they also wore the brain-sensing eyeglasses that, by using dry electrodes embedded over the nose bridge and in the temples, non-invasively collected practitioners’ EEG activity and transferred it via Bluetooth to the smartphone app. The app then used such source of information to deliver real-time acoustic feedbacks on changes of the physiological signature of practitioner’s mindset, namely, it used modulations of the EEG profile (e.g. when moving from a focused mindset to an agitated and distracted mindset) to manipulate the sound environment in which the practicer is immersed (e.g. by progressively increasing the intensity of wind and rainstorm sounds).

2.2.2 Assessment protocol. 2.2.2.1 Subjective level of stress, anxiety and mood profile. Potential effects of the training on subjectively perceived level of stress was tested via the PSS (Cohen et al., 1983). The PSS is constituted by ten items, scored on 0–4 Likert scales, and is deemed as a quick and reliable tool in basic and applied research on stress and coping skills (Monroe, 2008). Training effects on the level of situational anxiety were, instead, tested via the state subscale of the STAI (Pedrabissi and Santinello, 1989). The state subscale of such tool is constituted by 20 items, scored on a 1–4 Likert scale, which also mirror negative effects associated with signs of anxiety. Finally, the modulation of mood profile was assessed via the Profile of Mood States (POMS) inventory (McNair et al., 1971). The POMS is constituted by 53 adjectives describing different mood states and the examinee has to rate how much those items describe their feelings on a 0–4 Likert scale. Responses are then used to calculate six subscales: tension, depression, anger, confusion, fatigue and vigor. The POMS, together with the STAI, is deemed as a valuable tool to explore modulation of mood in experimental trials testing the potential of stress management interventions (Rossi and Pourtois, 2012).
2.2.2.2 Cognitive abilities. Given the unique cognitive profile of participants, the efficiency of their information-processing and cognitive control skills was tested via challenging computerized tasks tapping on attention, monitoring and executive functions. Going down to specifics, participants were asked to complete the MIDA battery (De Tanti et al., 1998), a digitalized battery based on a series of reaction time subtasks. The subtasks differ in terms of cognitive effort and were designed to explore various aspects of attention control, from basic orienting responses to discrimination and response inhibition skills. During all subtasks, participants reaction times are scored, together with omitted responses (a sign of lack of attention), early responses (a sign of lack of control) and – during the most difficult subtask – false alarms (i.e. responses that are given when they should have been withheld, a sign of lack of inhibition). The MIDA computerized battery has been standardized in Italy (normative sample \( n = 354 \)).

A further computerized task was instead designed to better investigate response selection and executive control mechanisms under time pressure. Namely, participants were asked to complete a Stroop-like task (Stim2 software, Compumedics Neuroscan, Charlotte, NC). During this task, four color-related words (the Italian words for yellow, blue, green and red) were rapidly presented on a PC screen (duration: 300 ms; total number of stimuli: 160). Each of them could have been written in yellow, blue, green or red, and participants had to discriminate between congruent and incongruent color–word associations by quickly pressing two different response buttons. Participants’ performance was scored by computing mean response times, response accuracy and number of omitted responses.

2.2.2.3 Markers of neurocognitive efficiency. Electrophysiological markers of neurocognitive efficiency were assessed both during rest (both eyes-open and eyes-closed resting, three 90-s run each) via neurometrics based on frequency-domain continuous EEG activity and during an activating task (the above-described computerized Stroop-like task) via event-related potentials (ERP).

As for the former, we recorded participants’ electroencephalographic activity via a portable EEG system (V-Amp system, Brain Products GmbH, Gilching, Germany). Data were collected by using a 15-channel montage (Ag/AgCl electrodes referenced to linked earlobes, Figure 1). Sensors were placed according to the 10-10 International System (Chatrian et al., 1988). vEOG was also recorded in order to keep track of ocular artifacts for subsequent correction and rejection, so to avoid data contamination.

To compute a first set of neurometrics based on frequency-domain EEG measures, neural activity during resting recordings (both eyes open and eyes closed) were then processed offline by applying a bandpass filter (range: 0.1–50 Hz) to reduce environmental and biological noise and an ocular correction algorithm (ICA based; Jung et al., 2000) to minimize the impact of eye-movements and blinks on collected data. After segmentation and further visual inspection of data, they were converted into frequency components by Fast Fourier Transformation to extract power density values of standard EEG frequency bands (\( \delta \): 0.5–3.5 Hz, \( \theta \): 4–7.5 Hz, \( \alpha \): 8–12.5 Hz, \( \beta \): 13–30 Hz and \( \gamma \): 30.5–50 Hz). Values from selected scalp regions (frontal area (Fz), central area (Cz) and parietal area (Pz)) were then used to compute two main neurometric measures: the alpha–beta ratio (ABr) and the alpha blocking index (ABlock). The ABr – a quantification of the balance between neural correlates of a relaxed/focused vs overactive/agitated mindset – provides a measure related to the global status of the system. The ABlock – a quantification of the prompt modification of neural oscillations linked to information processing – provides a measure of the global responsiveness and reactivity to environmental stimulations of the neural system. ABr measures were computed as the ratio of the power density of the alpha band to the power density of the beta band recorded during eyes-closed and eyes-open resting. ABlock measures were computed as the average of the decrease of alpha power density following the eyes-closed to eyes-open transitions.
To investigate potential markers of improved information processing and allocation of neural resources during a high cognitive load, task-related modulations of EEG responses (ERP; Crivelli and Balconi, 2017b) during the challenging computerized task were also processed offline by applying a bandpass filter (range: 0.1–30 Hz) and artifact correction. Data were then segmented with reference to the stimuli onset (epoch length: 1,000 ms; baseline: 200 ms), classified according to the experimental condition (congruent and incongruent trials) and visually inspected for residual artifacts. Artifact-free segments were then averaged to compute condition-specific individual average waveforms. Following morphological analysis of such waveforms, we extracted peak amplitude and latency data of the N2 ERP deflection, which is thought to mark automatic attention orientation and implicit response control mechanisms. ERP amplitude is typically thought to mirror the intensity of the cognitive process it is associated with, while its latency is thought to mirror the timing of such process.

2.2.2.4 Physiological markers of stress. During both resting-state recordings and exposure to a cognitive stressor, namely, an effortful and challenging cognitive task, we also collected physiological markers of participants’ stress responses. In particular, we non-invasively collected autonomic measures of cardiovascular activity via photoplethysmography (Biofeedback2000xpert system, Schuhfried GmbH, Modling, Austria).

Autonomic data were recorded by a peripheral sensor, placed on the distal phalanx of the second finger of the non-dominant hand. After qualitative and quantitative inspection of data to detect and remove recording or biological artifacts, we computed both standard measures of cardiac activity (HR, inter-beat interval (IBI)) and a measure of HR variability (the standard deviation of IBI), so to have a broad picture of stress-related cardiac responses and a measure of vagal tone, which is linked to the functionality of parasympathetic recovery mechanisms that foster the return to bodily homeostasis by down-regulating arousal (Mendes, 2009).
2.3 Statistical analyses
Pre- and post-training data were statistically compared via paired-sample t-tests (PASW Statistics 18, SPSS Inc., Quarry Bay, HK). Time (pre vs post) was used as a within factor. Normality of data distributions was preliminarily checked by computing asymmetry and kurtosis values. Finally, we computed Cohen’s $d$ values as a measure of within-group effect size. Effect sizes have been deemed as small when $\geq 0.2$, medium when $\geq 0.5$ and large when $\geq 0.8$, in agreement with Cohen’s (1988) norms.

3. Results
Table I reports a synopsis of outcome measures that showed a significant modulation following the training, as well as effect size values for statistically significant differences.

3.1 Subjective level of stress, anxiety and mood profile
Statistical comparisons of pre- and post-training psychometric measures highlighted a significant decrease of perceived stress scores ($t(15) = -2.341, p = 0.033$, Figure 2(a)), situational anxiety (STAI-state subscale, $t(15) = -3.640, p = 0.002$, Figure 2(b)) and both anger and fatigue scores of the POMS inventory (anger: $t(15) = -5.882, p < 0.001$, Figure 2(c); fatigue: $t(15) = -3.878, p = 0.001$, Figure 2(d)). No other psychometric measure presented statistically significant modulations.

3.2 Cognitive abilities
The analysis of pre- and post-training data concerning participants’ cognitive performance highlighted a significant decrease of response times during the computerized Stroop-like task ($t(15) = -2.780, p = 0.016$, Figure 3(a)) and during the complex RT task of the MIDA battery ($t(15) = -2.156, p = 0.048$, Figure 3(b)). No other performance measure presented statistically significant modulations.

3.3 Markers of neurocognitive efficiency
As for EEG markers of neurocognitive efficiency, statistical analyses highlighted a significant increase of the ABr index over frontal areas during eyes-closed resting ($t(15) = 2.262, p = 0.039$, Figure 4(a)) and a significant increase of the ABlock quantification

<table>
<thead>
<tr>
<th>Table I.</th>
<th>Synopsis of statistically significant modulations of outcome measures: pre- and post-training data and effect size values</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSS (raw score)</td>
<td>12.06 (4.19)</td>
</tr>
<tr>
<td>STAI – state (raw score)</td>
<td>33.31 (5.71)</td>
</tr>
<tr>
<td>POMS – anger (raw score)</td>
<td>5.75 (4.21)</td>
</tr>
<tr>
<td>POMS – fatigue (raw score)</td>
<td>3.75 (2.46)</td>
</tr>
<tr>
<td>Stroop task – RTs (ms)</td>
<td>655.34 (72.83)</td>
</tr>
<tr>
<td>MIDA – complex RTs (ms)</td>
<td>489.06 (80.82)</td>
</tr>
<tr>
<td>ABr – frontal areas (unit)</td>
<td>2.83 (1.80)</td>
</tr>
<tr>
<td>ABlock – frontal areas (unit)</td>
<td>−0.01 (0.10)</td>
</tr>
<tr>
<td>ABlock – parietal areas (unit)</td>
<td>−0.05 (0.15)</td>
</tr>
<tr>
<td>HRV – resting (unit)</td>
<td>61.18 (18.62)</td>
</tr>
<tr>
<td>HRV – stressor (unit)</td>
<td>60.38 (19.12)</td>
</tr>
</tbody>
</table>

Notes: PSS, Perceived Stress Scale; STAI, State-Trait Anxiety Inventory; POMS, Profile of Mood States; RTs, reaction times; ABr, alpha–beta ratio; ABlock, alpha blocking index; HRV, Heart Rate Variability; ms, milliseconds
Notes: Bars represent ±1 SE. (a) Subjective level of stress as measured by the Perceived Stress Scale (PSS); (b) situational anxiety as measured by the State-Trait Anxiety Inventory (STAI) state subscale; (c) level of anger as measured by the Profile of Mood States (POMS) anger subscale; (d) level of mental fatigue as measured by the POMS fatigue subscale.

Figure 2. Psychometric measures, pre- and post-training group data

Notes: Bars represent ±1 SE. (a) Reaction times (RTs) at the Stroop-like computerized task; (b) RTs at the Complex Reaction Times subtask of the MIDA computerized battery.

Figure 3. Cognitive performance measures, pre- and post-training group data
over frontal and parietal areas (frontal: \( t(15) = 2.904, p = 0.011 \), Figure 4(b); parietal: \( t(15) = 3.205, p = 0.006 \), Figure 4(c)). No other EEG/ERP marker presented statistically significant modulations.

3.4 Physiological markers of stress

Finally, statistical analyses of autonomic measures highlighted a significant increase of the HRV measure during both eyes-open resting \( (t(15) = 3.395, p = 0.004, \text{Figure } 5(a)) \) and during the exposure to a cognitive stressor \( (t(15) = 5.529, p < 0.001, \text{Figure } 5(b)) \). No other autonomic measure presented statistically significant modulations.

4. Discussion

With the present study, we aimed at further extending previous efficacy data concerning a novel technology-mediated mindfulness training and at testing its potential as a way to tackle psychophysiological consequences of occupational stress at top management organization level. Pre- and post-training data were statistically compared to evaluate the outcomes of the training protocol in terms of subjectively perceived stress and anxiety, modulations of mood, and cognitive performance, as well as via neurometric and autonomic objective measures of neurocognitive efficiency (i.e. efficiency of performance at cognitive tasks) and stress responses. At the end of the training, we observed these main results: a
significant decrease of stress, anxiety, anger and mental fatigue; a significant increase of participants’ information-processing efficiency during cognitive tasks; an increase of electrophysiological markers of relaxation, ability to focus and reactivity of the mind-brain system; and improved physiological markers of equanimity and effective recovery from stress response.

Overall, the pattern of training outcomes depicts a broad positive scenario and seems to outline a potential increase of participants’ well-being. Namely, perceived stress, situational anxiety and reported levels of anger and mental fatigue were lowered. Since it is now commonly accepted that dysfunctional stress levels and altered psychological health of the management staff have negative influences not only on their working and family life, but also on the well-being of their employees, on team productivity and on the effectiveness of organizations (Little et al., 2007), we suggest that the tested protocol might represent a valuable training opportunity with implications both on the individual and organization welfare. In addition, available findings highlight notable practical implications for practitioners who would like to plan interventions to enable stress management skills and improve cognitive efficiency at workplace. Indeed it seemed that combining traditional approaches with highly usable and non-invasive technological devices shortens the efforts and time needed to obtain measurable improvements of cognitive and affective regulation skills even in professionals exposed to repeated stressors, with remarkable potential. Such reduction of the “dose” of practice and of practitioners’ commitment then translates in a reduction of monetary and time costs to implement the training protocol and of drop-outs, thus allowing to devise and offer easily accessible and replicated training opportunities by taking advantage of economies of scale and transferability.

Second, the significant reduction of perceived mental fatigue was coupled with a slight but significant improvement of information-processing efficacy, as measured by reaction times, during two challenging cognitive tasks. Such pieces of evidence, together, are in line with available literature on the effects of mindfulness practices on cognitive skills besides affective regulation ones (Lutz et al., 2008; Hommel and Colzato, 2017), and depose in favor of the potential for this kind of mental training, even as a form of cognitive empowerment. Such interpretation is further strengthened by neurometric findings. Indeed, at the end of the protocol, managers presented improved objective measures mirroring the shift from a primarily agitated to a relaxed-focused mindset even at rest – a change that suggests a more
efficient containment of the carry-over effect of hyperactivation outside work environment. And again they also showed improvement of automatic responsivity of their neural system, which suggests that the protocol might have helped keeping practitioners’ minds fresh and responsive and reduce the negative impact of stress on cognitive functioning (Arnsten, 2009; Roozendaal et al., 2009). The localization of observed effects on electrophysiological activity also supports that interpretation. Indeed, frontal and parietal areas are known to be the core hubs of a broad neural network mediating cognitive control and attention regulation and supporting the selection of relevant environmental information (Ptak, 2012) – a skill that becomes particularly critical to efficiently self-regulate and adapt our behavior to complex environments, like fluid and highly requesting business contexts (Balconi, Natale et al., 2017; Crivelli and Balconi, 2017a). Therefore, we suggest that the focused attention meditation practices implemented during the training protocol lead, in addition to above-discussed effects on subjective stress and mood factors, to secondary beneficial effects on the efficiency of participants’ reasoning and cognitive processes due to the training of focus and attention orientation skills.

Finally, the multi-methods assessment procedure we used also allowed us to detect a potentially interesting effect of the integrated protocol on cardiovascular measures of managers’ autonomic profiles. In particular, we observed a significant increase of vagal tone, as measured by greater time-domain HRV metrics (Mendes, 2009), both during a resting condition and during exposure to a cognitive stressor. The vagal tone primarily depends on the efficiency and responsivity of the parasympathetic branch of the autonomous nervous system, which is critical for physiological recovery and down-regulation of bodily arousal after task-related or context-related hyperactivation. Therefore, HRV is considered an informative autonomic measure mirroring the impact on an individual of stressors and trying situations, as well as a valuable measure mirroring the efficiency of physiological coping skills with practical implications both for assessment and intervention on stress management in various context (Subhani et al., 2018). The increase of HRV values suggests that intense mindfulness practice with the support of the wearable device was able to foster efficient psychophysiological reactivity and homeostatic mechanisms with measurable consequences even on physiological markers of stress response. Furthermore, it is worth noting that the modulation of vagal tone was found even during resting recordings, which suggests that the competences that were trained by constant practice might have partly transferred also to everyday-life functioning, besides acute stress situations. We think that this last point might be particularly important for practice in light of the broad literature on the relation between occupational stress and cardiovascular health (Collins et al., 2005; Eller et al., 2011; Backé et al., 2012). The negative impact of work-related stress on cardiovascular activity is indeed thought to follow excessive sympathetic reactivity (i.e. dysfunctional physiological hyperactivation) during workday and altered parasympathetic recovery during leisure time (i.e. maintenance of disfunctionally heightened physiological activation even after working hours). Introducing effective and intensive training devised to enable and optimize stress management skills of professionals at risk with the support of wearable technologies may therefore help containing health-related complications, thus lowering potential costs for the company and improving physical and psychological well-being of the workforce with limited investment with respect to standard welfare interventions.

To conclude, the present experimentation with top management professionals highlighted that the tested technology-mediated mindfulness training leads to a consistent set of outcomes, which encompassed both subjective and objective measures of psychological well-being and neurocognitive efficiency. Observed effects are also globally consistent with previous evidence from pilot and fully structured studies that tested the protocol with young adults presenting with mild-to-moderate stress levels (Balconi, Fronda et al., 2017; Balconi et al., 2018, 2019; Crivelli et al., 2019; Balconi and Crivelli, 2019). Furthermore, it extends previous findings by
showing that, at least in a sample of professionals exposed to high stressful working conditions, it is possible to observe training effects even after two weeks of intensive practice. We suggest that this point, together with the limited time required by daily sessions of practice with respect to the notable commitment requested by traditional mindfulness protocols (typical mindfulness-based stress reduction programs include approximately one hour of daily practice), makes the integrated training a potentially valuable tool especially for people whose professional position imposes strict schedules, time limitations and elevated job duties, thus increasing the risk of drop-out from traditional stress management programs.

Despite such potential, we acknowledge that present observations would benefit from more extended testing and also from critical comparison with a control group composed by age-matched managers not involved in specific training, or even following a traditional mental training protocol with no wearable technology to support their practice and provide them with real-time feedback on their performance. This would allow us to make the practical implications of this approach stronger, and further corroborate the present empirical observations, even in light of recent findings on app-based mindfulness trainings in work environments that reported no specific support for such brief trainings (see Bartlett et al., 2018). And again, it would be also interesting to investigate the effect of the technology-mediated training with samples of managers coming from different companies, or even different categories of professionals exposed to occupational and performance stress, so to evaluate the robustness of practice outcomes. Furthermore, we acknowledge that in the present project we were not able to collect outcome data concerning company climate, working experience and productivity from participants’ collaborators. Future investigation would benefit from the inclusion of such additional measures concerning productivity and climate of managers’ staff and companies, in order to paint a clearer picture of the extent of the impact that a training dedicated to top organization positions might have at group and company levels and to better estimate related potential economical, other than psychological, advantages.

References


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An exploratory study of the injured worker’s experience and relationship with the workplace return to work coordinator in NSW, Australia

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Abstract
Purpose – The purpose of this paper is to provide insight into the injured worker’s perspective of experiences with their workplace return to work coordinator (RTWC), and explore some of the barriers they encountered in the return to work process.

Design/methodology/approach – Semi-structured interviews were conducted with ten injured workers from New South Wales, Australia. The thematic analysis of transcripts was completed.

Findings – The findings provide an insight into the experiences of injured workers and their relationship with RTWCs. Five key themes emerged from the data: return to work experiences and the RTWC role, high turnover and lack of consistency in the role, RTWC “ideal”, knowledge and skills, communication skills and the RTWC role and GP visits privacy and conflict of interest with peer RTWCs.

Practical implications – The role of the workplace RTWC in the return to work process for injured workers is important and these findings are highly relevant to the return to work sector. Consistency within the role at the workplace and careful consideration of the specific traits and characteristics required by an individual to perform the role need to be observed during the selection process by employers when appointing a workplace RTWC to assist injured workers return to work.

Originality/value – This is the first Australian study to examine the injured workers views and experiences with the workplace RTWC and other factors that shape the return to work process.

Keywords Qualitative research, Return to work, Disability managers, Injured workers, Return to work coordinators

Paper type Research paper

Introduction
Returning to work is an important progression in the recovery of an injured worker. In Australia, the return to work process is regulated through the workers’ compensation system at the Commonwealth, Federal and State Government level. The responsibility to ensure workers’ compensation legislation is implemented and enforced lies with each state or territory jurisdiction (Williams and Westmorland, 2002). The premise of all Australian workers’ compensation schemes is to reduce costs by intervening early
following injury, and seeking to maximise the opportunity for a worker to return to employment (Howe, 2015).

In 1987, noteworthy changes occurred to the New South Wales (NSW) Workers’ Compensation Act. These changes shifted the focus from litigation and financial settlements for injured workers and emphasised the need for rehabilitation in the workplace. In turn, this placed the onus on the employer to establish policies, procedures and workplace programs to assist the return to work of an employee following an injury (Kenny, 1998a). A further initiative, resulting from changes to the Act, was the introduction of the workplace return to work coordinator (RTWC) (Kenny, 1998b) to support injured workers during this process.

While international comparisons may be problematic due to differences and variances in nomenclature there are some similarities with the principal activities of Canadian RTWCs. (Westmorland and Buys, 2004). However, in Canada this role is responsible for disability management (DM) which is not commonly used in Australian workplaces. In Canada, the term DM encompasses a wide range of interventions such as claims management, case management, vocational rehabilitation and benefits management (Westmorland and Buys, 2004). Some of the principle undertakings of RTWCs in NSW are somewhat comparable to the Canadian counterparts such as the facilitation of RTW for the injured worker and the development of RTW plans (Pransky et al., 2010).

In NSW, a RTWC is defined as “an employee nominated by an employer, whose principal role is to support injured workers as they recover at work” (State Insurance Regulatory Authority, 2016a). Employers with 20 or more employees are required to nominate a workplace RTWC whose primary role is to assist the employer by liaising with key stakeholders, negotiating suitable duties and providing the injured worker with relevant information. The workplace RTWC can be employed in a part-time or full-time capacity, and under certain circumstances may be shared with other employers to oversee their injured workers (State Insurance Regulatory Authority, 2016a). In most Australian states RTWCs undertake a basic two day training course and are expected to understand the legal and personal complexities involved in returning an injured employee to work (Bohatko-Naismith et al., 2016; State Insurance Regulatory Authority, 2016a). Furthermore, they are expected to guide the injured worker unreservedly through an inherently adversarial process (House of Representatives Standing Committee on Employment and Workplace Relations, 2003; Roberts-Yates, 2006; RMIT School of Management, 2008).

The role of the workplace RTWC in NSW includes but is not limited to: assessing the workplace, facilitating communication among stakeholders and preparing the injured worker for transitional duties (State Insurance Regulatory Authority, 2015). When an employee sustains an injury at the workplace, the process of rehabilitation and return to work should be straightforward, under the guidance of a trained and competent RTWC (Kenny, 1998b). However, injured workers often encounter various obstacles as they make their way through the return to work process (Shaw et al., 2008). While many recover from their injuries and return to work in a relatively uncomplicated manner, MacEachen et al. (2006) argue that others can experience extraordinary difficulties and barriers as they slowly lose control over their work, personal and social lives.

Conversely, an injured worker’s hostility and frustration with both the workers’ compensation system and the return to work process can commence from the time of the injury or claims lodgement, and can be present throughout the entire process (Roberts-Yates, 2006). The adversarial nature of the workers’ compensation system along with input from a variety of other stakeholders, often sanction a return to work for injured workers well before they are deemed fit by their general practitioner (GP) (Thornwaite and Markey, 2017). It is often at this point that tension and conflict begin to occur between
the injured worker and the employer and also between the GP and the employer (Strunin and Boden, 2000).

Similarly, it has been reported that further problems may arise when employers are not able to, or are unwilling to, provide suitable duties for the injured worker (MacEachen et al., 2010; Seing, MacEachen, Ekberg and Stahl, 2015; Strunin and Boden, 2000). Under reporting of injuries is becoming more frequent in numerous jurisdictions, with many injured workers suggesting they were frightened of being viewed negatively by their employers if they declared their injury (Lippel, 2012). A negative response of this nature from the employer can generate a sense of being undervalued and a feeling of being discarded by the injured worker (Sager and James, 2005). Providing meaningful or useful suitable duties is a key factor in the return to work process (Westmorland et al., 2005). Research highlights the importance of an injured worker re-engaging with the workplace following an injury, with the support of a competent workplace RTWC and a meaningful return to work plan (Lane et al., 2018; Shaw et al., 2008). The return to work plan requires consultation between the injured worker, the GP and the RTWC, and needs to be compatible with the injured worker’s projected recovery time (Young et al., 2005).

During the return to work process, injured workers report that they endure a loss of self-esteem and identity, a loss of control over their life, and feelings of shame, anger, stress, guilt, anxiety, self-blame and depression (Roberts-Yates, 2003). Furthermore, dealing with conflict both outside the workplace and within the workplace, and having to justify the genuineness of their injury can diminish an injured worker’s self-value and add to their feeling of helplessness (Roberts-Yates, 2003; Lippel, 2012; Strunin and Boden, 2000).

It is proposed that the coordination of the return to work process by a workplace RTWC can help address some of the problems encountered by the injured worker and potentially produce a more favourable outcome for injured workers (Franche et al., 2005; Southgate et al., 2011; Foreman et al., 2006; Gardner et al., 2010). Despite the importance of the relationship between the injured worker and the workplace RTWC, and how this relationship may affect the return to work process, there still remains a paucity of evidence. A systematic review by Franche et al. (2005) found that early intervention at the workplace was favourable in reducing work disability duration and associated costs. Similarly, Gardner et al. (2010) and Southgate et al. (2011) concur with the findings of Franche et al. (2005) and furthermore identified that the contribution of a workplace RTWC is essential in the return to work of an injured worker, and more importantly highlight that a workplace RTWC assists with achieving these successful outcomes. It is therefore important to obtain a clearer understanding regarding the engagement between the injured worker and the workplace RTWC which can help inform the RTWC role and the selection of suitable persons to be RTWCs (Bolatko-Naismith et al., 2015). This can shape appropriate training programs to meet the needs of the RTWC and the injured worker. This study aimed to provide an insight from the perspective of the injured worker in relation to their experiences with their workplace RTWC, and to explore some of the barriers they may encounter during the return to work process.

Methods
A qualitative study was conducted to gain an understanding of the relationship between the injured worker and the workplace RTWC (Holloway and Wheeler, 2010). Ethical approval for the study was granted by The University of Newcastle Human Research Ethics Committee.

Participants/recruitment
Purposive sampling was used to recruit injured workers from the Hunter, Upper Hunter and Central Coast regions of NSW, Australia. This method of sampling identifies participants...
who are able to provide rich, in-depth information on the topic being investigated (Liamputtong, 2014). The inclusion criteria for this study were as follows: individuals over 18 years of age who sustained a workplace compensable injury between 2010 and 2014, and reported contact with a workplace RTWC from the time of the workplace injury, English speaking and capable of giving informed consent.

To recruit participants a community call announcement for injured workers was placed with a local radio station requesting voluntary participation in the study. Three people responded to the community announcement. Subsequently snowball sampling was used to recruit participants (Holloway and Wheeler, 2010). This involved the initial group of research participants recommending to others they knew in the target population for recruitment (Bowling, 2002). Snowballing recruited a further seven participants (Holloway and Wheeler, 2010). Despite the use of several methods for recruitment, only ten injured workers contacted the researcher by telephone or e-mail expressing interest in the study and volunteered to participate. A mutually convenient time was arranged with each participant to conduct the interview. All participants were mailed or emailed an information statement about the research and a consent to participate form which they returned at the interview.

Data collection
Data were collected using semi-structured interviews. This method allows the participant to express their views in their own terms and provides flexibility for the interviewer to probe for responses and clarify any ambiguities (Bowling, 2002). The interviews ranged from 30 to 40 min, allowing sufficient time for the topic to be explored. Each interview included a pre-determined set of open questions designed to prompt discussion. This provided uniformity and allowed the interviewer to explore particular responses (DiCicco-Bloom and Crabtree, 2006; Liamputtong, 2014). To avoid distracting the participant during the interview, notes were made by the researcher at the end of each interview (Muswazi and Nhamo, 2013). The interviews were conducted at various facilities of the University of Newcastle and in local public libraries between August 2015 and January 2016. Within the interviews, injured workers were asked to describe their experience with their workplace RTWC. The interviews were facilitated by one of the researchers (JBN) and explored the participant’s experiences and perception of their RTWC following a workplace injury. Prior to the commencement of the interview, written consent was obtained from each participant following discussion of any questions or concerns with the researcher. Participants were informed that they could withdraw from the study at any time and also withdraw their data. Participants were also given the option to cease the interview at any stage, however all participants completed the interview despite the sensitive nature of the topic. Issues of confidentiality and anonymity were discussed and participants were further informed that the interview would be recorded for accurate transcription.

Data analysis
Data analysis commenced upon completion of all interviews. An inductive approach was used to analyse the data. Initially, one researcher coded and compiled a coding book with memos and descriptions and another researcher coded the transcripts. A discussion followed with both researchers to identify codes and categories which best described the experience of the participants until a consensus was reached (Holloway and Wheeler, 2010).

A key method to evoking insight and developing meaning is reflexive iteration (Srivastava and Hopwood, 2009). During this iterative process, the researchers reviewed and re-reviewed the data to connect them with the emerging insights, which progressively led to
a more refined focus and understanding of the data. The codes were then categorised into initial themes, and finally redefined into five key themes. During this process, trustworthiness was established with peer debriefing. In addition, participants were given the option of member checking their transcripts to ensure participant validation as a method of exploring the credibility of the results (Birt et al., 2016). However, no participant accepted the invitation.

Results
Semi-structured interviews were held with ten injured workers over the age of 45 from the Hunter, Upper Hunter and Central Coast regions of NSW, Australia. Table I describes the demographic characteristics of individual participants.

To protect the anonymity of the participants, pseudonyms were used (Ogden, 2012). All ten participants in this study had returned to work in some capacity. Although the role of the RTWC is a key to the process of return to work, some reported that they had gone through the process without the support of a consistent workplace RTWC and some perceived the workplace RTWC to be incompetent. Most cited financial necessity as the reason for their return to work.

Analysis of the data identified five key themes that emerged from the injured workers’ experiences with the workplace RTWC. These themes included the: return to work experiences and the RTWC role, high turnover and lack of consistency in the role, RTWC “ideal”, knowledge and skills, communication skills and the RTWC role and, GP visits privacy and conflict of interest with peer RTWCs.

Return to work experiences and the RTWC role
Eight of the participants found the return to work process to be unpleasant and difficult to manage without support from a workplace RTWC, with one participant very reluctant to report her injury:

[...] I did not want to be part of the process, it is a quagmire, unpleasant, getting caught up in the system [...] RTWCs are necessary in the process, who else would advocate for the injured worker? [...] I would not have managed the process on my own, I would still be caught up in it! (Carol)

Seven participants expressed how saddened they were by the lack of support from their RTWC and indicated that the absence of this support often caused delays in their timely return to work. Many of the participants in this study experienced various difficulties

<table>
<thead>
<tr>
<th>Participant pseudonym</th>
<th>Age</th>
<th>Gender</th>
<th>Type of workplace</th>
<th>Reported injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albert</td>
<td>52</td>
<td>Male</td>
<td>Manufacturing/metal</td>
<td>Lacerated hand</td>
</tr>
<tr>
<td>Bella</td>
<td>71</td>
<td>Female</td>
<td>Health</td>
<td>Fractured patella</td>
</tr>
<tr>
<td>Carol</td>
<td>45</td>
<td>Female</td>
<td>Education</td>
<td>Repetitive strain injury to elbow</td>
</tr>
<tr>
<td>Deidre</td>
<td>47</td>
<td>Female</td>
<td>Retail</td>
<td>Non-specific lower back injury following a fall</td>
</tr>
<tr>
<td>Eliza</td>
<td>53</td>
<td>Female</td>
<td>Retail</td>
<td>Damage to discs in neck</td>
</tr>
<tr>
<td>Frances</td>
<td>49</td>
<td>Female</td>
<td>Retail</td>
<td>Sprained thumb/complex regional pain syndrome</td>
</tr>
<tr>
<td>Glenda</td>
<td>61</td>
<td>Female</td>
<td>Education</td>
<td>Non-specific knee, neck and lower back injury following a fall</td>
</tr>
<tr>
<td>Helen</td>
<td>56</td>
<td>Female</td>
<td>Retail</td>
<td>Non-specific shoulder injury</td>
</tr>
<tr>
<td>Ian</td>
<td>49</td>
<td>Male</td>
<td>Health</td>
<td>Psychological stress</td>
</tr>
<tr>
<td>Jane</td>
<td>50</td>
<td>Female</td>
<td>Education</td>
<td>Damage to nerves in neck</td>
</tr>
</tbody>
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Table I. Participant characteristics
with their RTWC following their workplace injury, and clearly expressed this at the interview. This included reporting that their RTWC was unsupportive, inexperienced and apathetic.

Deidre reported her experience of feeling unsupported by her workplace RTWC and added:

[...] she (RTWC) never came down on the floor to see how I was going either [...] not once has that woman come down to see how I'm handling the jobs. (Deidre)

Two of the injured workers in this study reported that they felt that they had no alternative but to turn to their legal representative for support. As reported by Ian: “If I've wanted to know a question, I'll be honest, I ask my lawyer’. With Helen adding: ‘I would ring my lawyer up [...] and he tells me more than what they’ve ever told me’.

Notably, some of the participants in this study found the experience of returning to work to be a positive one due to the positive experience with the RTWC. Bella affirms, adding: “My RTWC was very clear about the boundaries that we were working within [...] she had empathy but she also had knowledge [...] she had understanding [...] she had to, I guess that I was lucky [...] I think I had a good RTWC”.

Repeating my story: high turnover and lack of consistency in the RTWC role

The participants came from various occupational backgrounds with eight of the injured workers employed by large organisations (> 50 employees) and two employed by smaller organisations (< 50 employees). Participants within the large organisations highlighted the difficulties of having a manager appointed as their workplace RTWC because managers could be transferred internally to another location. This was a common experience among the injured workers employed by large organisations, with six of the eight participants reporting having more than one RTWC during the return to work process. Frances described how this “high turnover” (of managers) resulted in “having to repeat your story for every new manager [...] the previous manager’s good, new managers not interested, no support”.

The participants reported that this caused increasing frustration due to having to repeat their experience and stories to a newly appointed workplace RTWC. Some expressed negative sentiments about the person who had been appointed to the role in their respective workplace. Helen reported that during her return to work process:

I had so many (RTWCs), I never knew who was going to be my work coordinator the next week or the next month [...] I was going through hell with this (name) who was my RTWC [...] he put me through hell [...] he was so rude, no manner about him or nothing, and what he said was blunt and straightforward, no feeling, no nothing [...] it got to the stage where I was scared to go to work if he was there.

The participants in this study agreed that there is a need for careful selection when appointing a workplace RTWC to assist injured workers return to work.

RTWC “ideal”, knowledge and skills

Participants were asked for their perception of an ideal workplace RTWC. Having considered this in relation to their experiences with the workplace RTWC, injured workers identified certain characteristics they felt the RTWC needed to possess. This was further highlighted by comments from some of the participants in this study:

[...] workplace RTWCs need to be [...] emotionally supportive, understanding, and that sometimes someone that’s been through the system themselves isn’t such a bad thing [...] they should be schooled and tested on the knowledge of the legislation, the Act [...] (Ian)

Bella recognised that her positive experience was due to her workplace RTWC and added that: “My RTWC should be cloned’, adding”[...] as well as having empathy and people skills
and the ability to be able to relay right at the beginning what the return to work process will be and also what the insurance company actually expects”.

RTWCs require the necessary skills, diplomacy and determination to negotiate within organisations and with stakeholders, such as employers who may hinder a successful return to work (Bohatko-Naismith et al., 2012).

Communication skills and the RTWC role
The injured workers identified communication as often being problematic between themselves and the RTWC. Some participants reported that they were reluctant to approach their workplace RTWC to ask for assistance or to discuss their situation. Participants commented that they would often be responded to abruptly, or simply be dismissed, by the RTWC. The participants perceived this was due a lack of interest in engaging with them as stated by Eliza:

 […] communication with the RTWC would often depend […] sort of what mood she (RTWC) was in on the day […] she didn’t have time to be interested.

Participants also reported experiencing difficulties when attempting to communicate with their workplace RTWC, with one participant stating: “[…] communication was […] minimal and basic” (Glenda). While others recalled their experiences with communication as: “one off is our communication. I – I sit and listen” (Frances). Helen also reported: “I would like to see someone that actually listens, face-to-face, and takes at least some of it in, you know”.

Often a workplace RTWCs is appointed to the role by their employer and may not have the essential qualities and traits required to successfully manage the return to work process for the injured worker (Bohatko-Naismith et al., 2015).

GP visits privacy and conflict of interest with peer RTWCs
In Australia, a worker who sustains an injury is able to nominate their treating doctor, and in most cases and as a matter of convenience, choose their family GP to assist in the management of their treatment (Russell et al., 2005; Mazza et al., 2015). Generally, a typical consultation with a GP is considered highly confidential to help ensure the utmost privacy for a patient. However, during the return to work process workplace RTWCs can request to attend GP consultations with an injured worker. This is because regular consultations with the GPs are required to gain medical certificates that identify and detail any recommended work restrictions for the injured worker.

During this study, participants discussed issues that occurred when attending medical appointments with their workplace RTWCs. Some of the participants reported being forced to forfeit their right to privacy and confidentiality with their family GP, as their workplace RTWC insisted on attending their medical appointments. As one participant stated: “GP visits are private […] for discussion with the GP, venting frustrations within the workplace and things like that” (Jane).

Other participants were of the opinion that it was a reasonable request and had no objection to their workplace RTWC attending their medical appointments. Bella added: “it just adds that extra level of pressure”.

Even if the injured worker was open to the idea of the workplace RTWC attending their medical appointments it was not without some complications. Helen stated: “[…] some days I’d go by myself, they wouldn’t even turn up, they’d tell me they’d turn up and they wouldn’t’. With a similar experience of her own, Frances added: ‘Every time I’ve said, I’m going to the doctor’s this week; are you ready to come with me?, I get a phone call the next – the day before saying, I can’t make it, or I’m not going to come […]’.
Following their injury, a return to work plan was prepared for most participants by their workplace RTWC. For some the return to work plan was clear and concise and assisted in a timely return to work. According to Bella: “[…] it (RTW plan) was reviewed every time there was a new doctor’s certificate”.

However, for other injured workers it was reported that their RTWCs often failed to adhere to the workplace return to work plan, with one injured worker commenting on their negative experience with the RTWC:

You (RTWC) wrote this plan out, I’m trying to stick to it because you got up me the other day, dragged me up to the office and […] said that if I couldn’t do the job that I might as well leave or cut my hours back or you’d make it hard for me […] I’d come back and I’d be in tears and crying and everything, so then it got to the stage where the plan went out the door because he would tell me what to do and dictate to me […] (Helen)

Deidre added that her RTWC failed to provide her with any support with her return to work plan […] “She (RTWC) just said, here you go, read it and sign it […]”.

Notably all participants in this study were working at the time of the interviews either on suitable or normal duties; however, some of them were disillusioned with their suitable duties and the way they were determined. For some injured workers, suitable duties were short-lived or even non-existent depending on the workplace or the RTWC. Ian reported: “Management say no suitable duties for me, yet other injured workers have suitable duties?” Helen further added:

The RTWC ignored the GPs advice […] Having been on suitable duties and now suddenly there are no suitable duties […] because the RTWC decided there were no suitable duties […] so they asked me to use my sick leave to prevent paying me, I said no.

Under the NSW legislation employers must provide injured worker with suitable duties (State Insurance Regulatory Authority, 2017); however, identifying suitable duties for an injured worker may present with some difficulties when a small organisation has more than one injured worker on suitable duties.

Discussion
This is the first Australian study to examine the perceptions and experiences of injured workers about workplace RTWCs and how they impact upon the return to work process. The insights from the injured workers in this study highlight broad areas of concern. These findings build upon other studies which recognise the importance of a workplace RTWC during the return to work process (Shaw et al., 2008; MacEachen et al., 2006; Lane et al., 2018). The current study indicates that while the intention of the RTWC role is to facilitate the return to work process, a lack of personal qualities, valued by injured workers, can act as a barrier to the process. These findings indicate that despite the important role played by the RTWC in facilitating the rehabilitation process, they may be perceived by the injured worker as inexperienced, unsupportive and possess poor communication skills. Previous research indicates injured workers respond positively to RTWCs who meet their needs, who address any concerns they may have, doing so with respect and support, and who provide relevant information about the return to work process (Shaw et al., 2008). It is acknowledged that the support of an appropriately trained RTWC can produce positive outcomes for a worker following a workplace injury (Bohatko-Naismith et al., 2016). Indeed the participants in this study who reported a positive return to work experience were guided throughout the entire process by the same workplace RTWC. However, workers in larger organisations reported having to work with a series of RTWCs when there is a high turnover of staff. This appears to exacerbate issues such as privacy and conflict of interest, particularly if the RTWC is also in
a management supervisory role. Within the present study those who reported a positive relationship with the RTWC had experienced consistency, with the RTWC role being occupied by one person for the duration of their return to work.

The findings from this study support previous work that highlighted the importance of careful recruitment of a RTWC to ensure the selection of someone who can effectively and successfully manage the return to work process (Bohatko-Naismith et al., 2015; Pransky et al., 2010). In particular, the findings from previous studies indicate the importance of specific qualities, such as empathy, compassion and understanding (Bohatko-Naismith et al., 2015) of those appointed to the role of the workplace RTWC, because such qualities facilitate a safe and sustainable return to work for the injured worker (Ahlstrom et al., 2013). The experiences conveyed by the injured workers suggest that more effort is needed during the selection process of a RTWC to ensure an individual with the appropriate inherent inter-personal attributes and skills is engaged to manage this complex process. While inexperience and a lack of knowledge about the process may be inevitable for newly appointed RTWCs, this can be largely overcome by providing consistent suitable training to ensure that they have the knowledge and the competencies to help the injured worker navigate the return to work process (Lane et al., 2018; Bohatko-Naismith et al., 2015).

Although the role of the workplace RTWC is considered to be a key in the return to work process, the current study’s findings indicate that in many workplaces there is a high turnover of RTWCs. This may suggest that the role is not being prioritised or supported by employers and/or that the role is often secondary to other work duties (WorkCover NSW, 2014). The lack of priority given to the role of workplace RTWC may account for the cancellations of appointments, failure to attend pre-arranged appointments, and the lack of availability to provide updates as noted by the injured workers in this study. Employers need to provide the necessary support to current workplace RTWCs to ensure they prioritise this role to ensure the safe and effective return to work of injured workers.

The issue of excessive turnover in the RTWC role was recently highlighted in another Australian study (RMIT School of Management, 2008), which reported that a high proportion of workers were unaware of who was their designated workplace RTWC. The impact of having multiple RTWCs upon return to work outcomes needs further investigation specifically to consider how this impacts on injured workers with complex injuries with longer durations of recovery, longer claims and longer duration of return to work plans.

In addition to the complex and potentially confusing workers’ compensation system, the lack of consistency and lack of support of a regular RTWC can be detrimental in the timely return to work of an injured worker to their pre-injury duties (Shaw et al., 2008).

This propounds the view that without the appropriate support and mechanisms in place at work, injured workers may begin to feel undervalued, which can be accentuated by the inattention of RTWCs when they return to work following injury (Strunin and Boden, 2000).

As previously identified the communication skills of the RTWC in this study were identified as paramount in the injured workers’ perceptions of feeling supported in their return to work. Westmorland et al. (2005) have similarly reported that communication is a crucial factor in the return to work process; however, the participants in this study suggested that the communication initiated by an injured worker is not always responded to by the RTWC. International and Australian studies have further emphasised the need for effective communication and listening skills as fundamental qualities required by the workplace RTWC to facilitate a successful return to work (Pransky et al., 2010; Bohatko-Naismith et al., 2015). Skills and training in effective communication strategies should be considered as a key component of becoming a workplace RTWC.
Following a workplace injury, workers tend to seek advice from their family GP (Mazza et al., 2015; Russell et al., 2005) whom they trust to protect their privacy and provide the appropriate care. Indeed, the participants in the present study affirmed that some treatment and rehabilitation decisions were being made for them by the RTWC, or other stakeholders who have limited medical knowledge and expertise and also as found by Mazza et al. (2015), sometimes the decisions were not consistent with their GP’s recommendations. Notably, in some cases GPs have a lack of understanding of the injured worker’s role and work environment which can result in vague and unclear work restrictions being prescribed by the GP. Further difficulties may also arise due to the inability of the workplace RTWC to liaise directly with the injured workers GP (Bohatko-Naismith et al., 2015) which often causes unnecessary delays to the return to work process. The participants in this current study recounted feeling a loss of control and frustration over their treatment and rehabilitation at the workplace. This is consistent with the literature which reports that decisions being made for an injured worker by other stakeholders are often in direct conflict with the recommendations of the GP (Roberts-Yates, 2006; Lippel, 2012; Strunin and Boden, 2000).

The importance of training for RTWCs on injured workers’ rights to privacy was stressed by some workers in this study. Some participants reported being compelled to forfeit their right to privacy and confidentiality by their RTWC (or other stakeholders) who insisted that they also attend the worker’s appointments with their GP. This is arguably contrary to their rights as stated by the regulatory body for NSW that “an employer cannot insist that they or their representative is present during a consultation” and can only attend if consent is provided by the injured worker (State Insurance Regulatory Authority, 2016b). Injured workers who perceive themselves under pressure from their RTWC are less likely to return to work and report detrimental effects upon their well-being and work productivity (Munir et al., 2012). Subsequently, some of the injured workers in the present study found it difficult to advocate for themselves and, therefore, were forced to seek legal advice for further clarity and support around the return to work process. Participants reported their legal representatives to be of great assistance and most supportive in such instances.

Some injured workers in this study highlighted the difficulties they experienced with managers who were also the workplace RTWC, particularly in relation to determining suitable duties. They were often given tasks with which they were unfamiliar or unable to perform. Consistent with the literature, the suitable duties provided for them were sometimes for a short duration or were suitable in name only (Strunin and Boden, 2000). In a study conducted in Sweden, Seing, MacEachen, Stahl and Ekberg (2015) found that long-term injured workers (> 60 days) felt a sense of entitlement to return to their pre-injury employment tasks (with the necessary adjustments) due to their ongoing loyalty to the organisation. However, some long-term injured workers (> 60 days) in this study were informed that no suitable duties were available for them and it was suggested by the workplace RTWC that they leave the organisation or reduce their hours of employment. This is consistent with a recent Australian study which reports injured workers are being told to return to either pre-injury duties with no restrictions or resign from their position at the workplace (Thornwaite and Markey, 2017).

Although this study offers new insights on the injured worker’s perspective on their return to work experience with their workplace RTWC, it has some limitations. First, despite various strategies to facilitate recruitment the sample included only ten injured workers from a small geographical region in NSW, who were mostly female and of similar age. It should also be noted that the variation in the time individuals had off work may potentially impact their experience during the return to work process. The results may therefore not be generalisable beyond this region. Difficulty in recruitment may have
somewhat been due to prior negative experiences, with injured workers unwilling to recall their adverse personal experiences. Second, the use of the snowballing technique as part of the recruitment strategy may have led to selection and volunteer bias (Atkinson and Flint, 2001; Liamputtong, 2014). Selection bias may have resulted, as this method only includes members of a specific network (Bowling, 2002). Volunteer bias may have occurred as those who chose to participate may have some differing views to those who chose not to volunteer (Bowling, 2002). Indeed the sample is not truly representative, however this does not mean that the findings could not be replicated in a wider population. Third, it may have been problematic for the participants to recall their experiences accurately since their injury and return to work, raising the possibility of recall bias. Finally, the workers’ compensation legislation governing the participants’ return to work process was specific to NSW, Australia and as such there may be legislative differences impacting on the injured worker’s experiences in other jurisdictions nationally or internationally.

Conclusion
This Australian study provides new insights into the perspectives of injured workers regarding their workplace RTWCs during the return to work process. Further research with a larger representative sample is required to determine whether the injured workers’ perspectives identified in this study are consistent with other injured workers both in Australia or internationally. This study highlights important factors in the selection and training of RTWCs to ensure that RTWCs have the skills and capacity to facilitate the return to work process for injured workers. It may be useful for SafeWork NSW (formerly known as WorkCover NSW) to provide guidelines on how to select appropriate RTWCs for employers uncertain about recruitment into such a vital role. In addition, strategies to reduce the turnover of RTWCs appear to be important to avoid unnecessary delays. It is recommended that further investigation is required into the impact of the high turnover of workplace RTWCs to the injured worker. Furthermore, it is recommended that the regulatory body monitor workplaces to ensure that workplace RTWCs are receiving the mandatory training. The information gained from this study may be of assistance to stakeholders and policy makers involved in the return to work process.

References


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Gain cycles in healthcare workers: the role of job resources and hardy personality

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Abstract

Purpose – The association between resources and work engagement has been well-established among different occupational groups. The purpose of this paper is to go one step further through the investigation of the relationship between personal (i.e. hardy personality) and job-related (i.e. opportunity for learning and development) resources and work engagement in the long run.

Design/methodology/approach – A two-wave longitudinal study was conducted on a sample of healthcare professionals working in a spinal cord and brain injury rehabilitation hospital located in northern Italy.

Findings – The results of cross-lagged structural equation modeling indicated the occurrence of reciprocal causal relationships between the study variables. In particular, personal and job-related resources were related to an increase in work engagement over the course of the study. The level of engagement displayed by participants, in turn, was positively related to their personal and job-related resources over time, thus revealing the occurrence of positive cycles in the workplace.

Originality/value – On the whole, these findings provide a deeper understanding of the role played by hardy personality as a personal resource able to promote employees’ motivation and, at the same time, they advance the scientific knowledge concerning the construct of positive cycle.

Keywords Engagement, JD-R model, Gain cycle, Hardy personality, Healthcare workers, Learning opportunities

Paper type Research paper

Introduction

The growing interest in enhancing employees' performance and well-being has fostered the flourishing of approaches such as positive occupational health psychology, a branch of learning essentially focused on the promotion and cultivation of healthy organizational contexts. Consequently, the investigation on the affective-motivational state of mind labeled as work engagement, as well as job and personal resources, has become increasingly popular (e.g. Van den Broeck et al., 2017). In particular, recent literature showed that positive states (i.e. work engagement) trigger positive cycles, which lead to resource building over time and enhance the likelihood of workers performing well and feeling good in the future (Xanthopoulou et al., 2009a). Starting from these considerations, the main goal of this two-wave longitudinal study was to assess the positive and reciprocal relationship between resources (i.e. job and personal) and work engagement, focusing on hardy personality as a personal resource.

Work engagement is described as a positive, fulfilling, work-related condition characterized by the three interrelated dimensions of vigor, dedication and absorption.
Bakker, 2011; Bakker and Schaufeli, 2014). Vigor entails high levels of energy and mental resilience while working, the inclination to spend effort in one's work and the willingness to overcome in spite of adversity. Dedication is characterized by a strong involvement in one's work and a sense of meaning, enthusiasm, enjoyment and challenge. Absorption is defined as being completely focused on their activities and being happily engrossed in them, so that time flies and they can hardly detach themselves from work. In fact, the absorption dimension of engagement has shown some overlaps with the notion of flow, a short-time peak experience entailing an intense concentration on the current moment, combined with lacking self-consciousness and an alteration of temporal experience (Nakamura and Csikszentmihalyi, 2002). Thus, vigor and dedication have been widely recognized as the key features of work engagement (Schaufeli and Bakker, 2004); in line with this description, the present study focused only on these two key components of engagement. There is a compelling evidence that work engagement is associated with a wide range of positive outcomes in all life domains: in particular, engaged employees report better mental and physical health, are characterized by a greater organizational commitment, are more satisfied with their jobs, and exhibit higher levels of proactivity and an enhanced job performance (for a review, see Kim et al., 2013). Overall, these findings corroborate the conception of engagement as a positive condition, which enables the promotion of positive outcomes both within and beyond the organizational context.

Work engagement has been extensively studied following the job demands-resources (JD-R) model (Bakker and Demerouti, 2017; Lesener et al., 2018), with the purpose of revealing its nomological network. Consistent with the JD-R model, employees' well-being is related to a variety of workplace characteristics grouped into two overarching categories, namely, job demands and job resources. In particular, the motivational process of the JD-R model predicts that job resources stimulate employee engagement by playing a twofold role. On the one hand, they are instrumental in coping with the demanding aspects of one's job; on the other hand, they stimulate employees to learn from their job and flourish within it, thus promoting their motivation, their feelings of success and their level of commitment (Bakker and Derks, 2010). In their attempt to include work engagement in a more exhaustive theoretical framework, Bakker and Demerouti (2008) drew on the JD-R model, developing an overall model of work engagement. This model was grounded on two core hypotheses: the first postulated that job resources trigger a motivational process resulting in higher levels of engagement and, subsequently, an enhanced job performance. The second hypothesis posited that resources are particularly relevant when employees have to face high levels of job demands (e.g. excessive workload). On the one hand, job resources foster extrinsic motivation by allowing employees to cope with job demands and to attain their work goals. On the other hand, they foster employees' knowledge and development through the fulfillment of basic human needs of autonomy, belongingness and competence, so they are also intrinsically motivating (Van den Broeck et al., 2008).

The weight of personal resources: does hardy personality play a role?

The overall model of work engagement included personal resources as its motivational antecedents (Bakker and Demerouti, 2008). Personal resources are defined as positive self-evaluations referring to individuals' perception of their capability to control and influence their environment efficiently (Hobfoll et al., 2003). A considerable amount of research has established a positive association between personal resources and engagement. For instance, previous cross-sectional studies indicated that work engagement relates to crucial personal resources such as self-efficacy, thus suggesting that engaged employees firmly believe that they can deal with a broad range of demands within various contexts (Xanthopoulou et al., 2007). Furthermore, a noteworthy study among healthcare personnel revealed that organizational-based self-esteem represented a main predictor of work
engagement over time (Mauno et al., 2007). Hence, the confidence of employees in satisfying their needs by participating in roles within the organizational context was highly related to their level of engagement.

Subsequently, Xanthopoulou et al. (2009b) provided additional evidence to these findings revealing that engaged employees exhibit higher levels of optimism. More recently, empirical results indicated that engagement is positively associated with psychological capital, an individual resource entailing the combination of hope, optimism, efficacy and resilience (Mazzetti et al., 2016). As outlined in a noteworthy literature review conducted by Bailey et al. (2017), these findings concur in proving that employees’ positive perceptions of their personal strength and abilities (i.e. personal resources) play a significant role in shaping work engagement, which, in turn, might result in positive organizational outcomes and improve individual health and well-being.

Although there is a substantial consensus on the role played by personal resources within the motivational process of engagement, research findings are mainly driven by a one-directional approach that does not contemplate reciprocal causation relationships between resources and engagement, thus hindering the chance to explain their development over time. In contrast, a greater comprehension of the relationship between resources and work engagement could stem from the investigation of loops in which reciprocal relationships among constructs are present over time.

Empirical results indicated that personal resources, such as emotional and mental competencies, might predict work engagement in the long term (Lorente et al., 2008). Additionally, longitudinal research on work engagement supported the assumption that this positive work-related condition could also be considered an antecedent of job and personal resources, thus creating a positive cycle of motivation in the workplace (Xanthopoulou et al., 2009a). In a similar vein, Weigl et al. (2010) revealed the occurrence of a positive reciprocal association between engagement and active coping, a personal resource entailing the individual tendency to adopt a problem-focused and persistent behavior in order to deal successfully with various sources of distressing or dissatisfying circumstances. Similarly, Ouweneel et al. (2012) found a causal effect of personal resources (i.e. hope, optimism and self-efficacy) on engagement and a reversed impact of engagement on positive emotions at work. Overall, these findings corroborated the hypothesized occurrence of gain cycles; in other words, they suggest that personal resources and work engagement are related positively and reciprocally to each other over time (Salanova et al., 2011).

These associations have been interpreted using two well-established theoretical perspectives. In particular, the conservation of resources (COR) theory (Hobfoll and Shirom, 2001) could be applied to the understanding of gain cycles, linking personal and job resources and, subsequently, employees’ motivation and involvement in their work (i.e. their level of engagement). According to this theoretical framework, people attempt to obtain and retain resources, defined as objects, conditions, characteristics and energies that are inherently critical and/or may represent a strategic tool for obtaining centrally valued objectives. The COR theory postulates that people invest their resources in order to cope with stressful conditions, avoid potential resource loss, recover their resources and obtain new ones. To date, a growing body of the literature supports the assumption of the COR theory in personal and job resources as well as well-being developed into a cycle that allows employees’ positive adaptation (Hakanen et al., 2008).

A further insight into gain cycles between resources and engagement could be grounded in the broaden-and-build theory (Fredrickson, 2004), which assumes that positive emotions and states can broaden individuals’ thought-action repertoires and build their enduring personal resources by creating learning opportunities. Empirical findings concerning the broaden-and-build theory suggest the presence of upward spirals generated by positive emotions. That is, broadening an individual’s thought-action repertoire and building their
resources is likely to promote well-being and adaptive functioning, as well as the likelihood to experience positive emotions. Accordingly, this theoretical framework has been employed to make sense of the evidence that positive states, such as work engagement, trigger positive cycles that lead to resource building over time as well as increasing the likelihood that people will perform well and feel good in the future (Xanthopoulou et al., 2009b).

Drawing from these considerations, the present research was aimed at evaluating the positive and reciprocal association between resources and work engagement (i.e. the occurrence of gain cycles) using a longitudinal design with two waves. In particular, learning opportunities in the workplace were considered as a job resource. Indeed, providing employees with opportunities to enhance their theoretical knowledge and develop new practical skills constitutes a resource capable of boosting employees’ levels of work engagement (Idris et al., 2015; Sarti, 2014).

Moreover, hardy personality was included in the current study as a personal resource. This personal characteristic describes the inclination to derive meaning from stressful situations and involves three core dimensions: commitment to life and work, feelings of control over the events and outcomes and the belief that life changes are positive challenges, not threats (Kobasa, 1979). Although commitment (as a dimension of hardy personality) and dedication (as a component of work engagement) can share some conceptual aspects, their focus is different. Commitment refers to believing in the value of oneself, and one’s work. This includes the tendency to be involved in all the activities of life (e.g. work, interpersonal relations and social institutions). It also includes a feeling of community and corporation: for instance, on the one hand, committed people are conscious they can help other people who are facing stressful situations (Garrosa et al., 2010). On the other hand, dedication is more specific to the work field, as it refers to being strongly involved in one’s work, which can lead to experiencing a sense of inspiration, enthusiasm and pride (Schaufeli, 2014).

Accordingly, previous studies have consistently substantiated the role played by this personal resource in promoting employees’ health and reducing the incidence of harmful conditions, such as depression and burnout (e.g. Da Silva et al., 2014). Overall, a hardy personality seems to buffer the detrimental consequences of stressful circumstances on employees’ health and performance and enables them to adopt effective coping strategies in demanding situations (Bartone et al., 2016; Maddi, 2013).

To date, only a few studies have tried to investigate the relationship between hardy personality and work engagement. In particular, a cross-sectional study on a sample of Spanish nurses indicated that hardy personality was negatively related to burnout and positively associated with work engagement (Garrosa et al., 2011). This result was corroborated by empirical findings obtained on a sample of nurses from China and Spain; according to these results, the commitment dimension of hardy personality was associated with greater levels of engagement in both samples (Garrosa et al., 2014). In particular, nurses reporting high levels of commitment were able to effectively handle their responsibilities and problems. Overall, these results concur in depicting hardy personality as a key factor in preventing symptoms of burnout and, at the same time, in promoting higher levels of engagement. Nevertheless, research in gain cycles occurring between resources and engagement could be significantly improved through efforts to investigate the role played by hardy personality.

Accordingly, the present study aimed to contribute to the existing literature by exploring the occurrence of gain cycles, where both job-related (i.e. learning opportunities) and personal (i.e. hardy personality) resources are reciprocally and positively related to work engagement over time.

In particular, the following hypotheses were formulated:

H1. Time 1 (T1) learning opportunities and hardy personality relate positively to Time 2 (T2) work engagement.
H2. T1 work engagement is positively related to T2 learning opportunities and hardy personality.

H3. Learning opportunities and work engagement (a), as well as hardy personality and work engagement (b), relate reciprocally over time.

**Method**

**Participants and procedure**

To investigate the reciprocal causal relationships between learning opportunities (as a job resource), hardy personality (as a personal resource) and work engagement, a longitudinal design was employed. Data were gathered between January and June 2014 from healthcare professionals working in a spinal cord and brain injury rehabilitation hospital. Participants were approached twice to complete a questionnaire with a time lag of two months between assessments. At T1, 120 healthcare professionals from five different departments were invited to participate (response rate: 74.1 percent, \( n = 89 \)). At T2, two months later, participants filled out the second questionnaire (response rate: 50 percent, \( n = 60 \)). The panel group that took part in both waves of data collection included 60 employees (80 percent female), with an average age of 39.17 years (SD = 7.28) and an average experience in the healthcare sector of 13.14 years (SD = 6.77). With regard to the professional profiles involved, the sample was mainly composed of nurses (42.4 percent), physiotherapists (27.1 percent), medical assistants (20.3 percent), doctors (8.5 percent) and others in sanitation roles (1.7 percent). Missing data were replaced with expectation-maximization algorithm.

To test whether drop-outs differed from the panel group, we compared participants in the panel group (\( n = 60 \)) with the drop-outs (\( n = 29 \)) with regard to demographic characteristics (i.e. gender, age, job tenure and professional role), and also study variables (learning opportunities, hardy personality and work engagement). The results from \( \chi^2 \) tests showed that the panel group did not differ from the drop-outs in terms of gender (\( \chi^2(1) = 1.16, \text{ ns} \)), age (\( t(86) = 0.438, \text{ ns} \)), job tenure (\( t(84) = 0.415, \text{ ns} \)) and professional role (\( \chi^2(4) = 3.33, \text{ ns} \)). Moreover, multivariate analysis of variance revealed that there were no significant differences between the panel group and the drop-outs with regard to the mean values of the study variables (Wilks' \( \lambda = 0.99, F(3, 85) = 0.37, \text{ ns} \)). We therefore concluded that selective drop-out is not a problem in the present study.

**Measures**

Measures of the designated variables were collected with two self-report questionnaires at T1 and T2.

Learning opportunities were measured with five items developed by Guglielmi et al. (2011). Sample items were “My job gives me many opportunities to use competencies and skills that I acquired” and “My job gives me opportunities for personal development.” These items were scored on a five-point Likert scale, ranging from 1 = never to 5 = very often.

Hardy personality was measured with 15 items from the Nursing Burnout Scale (NBS; Moreno-Jiménez et al., 2000), with five items for each dimension of commitment, challenge and control. For this study, an Italian version of the NBS was developed based on a standard translation–back-translation procedure (Brislin, 1970). Sample items were “I get involved in what I do because it is the best way to achieve my goals” (commitment), “Even if it requires more effort, I prefer jobs that are a new experience for me” (challenge) and “I do everything possible to be sure to control the results of my work” (control). Responses were given on a four-point Likert scale ranging from 1 = totally disagree to 4 = totally agree. We computed a global hardy personality index.

Work engagement was measured through the key dimensions of vigor and dedication, using the 9-item version of the Utrecht Work Engagement Scale (UWES-9; Schaufeli et al., 2006;
Strategy of analysis

To test the hypotheses, a model including all hypothesized relationships was tested with cross-lagged structural equation modeling (SEM), in AMOS 21.0 (Arbuckle, 2012). Using maximum-likelihood estimation methods, four competing models of causal relationships between variables were compared. Given the limited sample size, the complexity of the models was reduced by cutting the number of freely estimated parameters through the employment of manifest variables (Byrne, 2016). First, a stability model (M1) with synchronous and auto-correlations was assessed: synchronous correlations between each error of the constructs were measured at the same time, while auto-correlations were measured between errors of each construct at T1 and T2. This stability model was used as a comparison for three nested models. The causality model (M2) was equal to the stability model but included a structural path from T1 resources (learning opportunities and hardy personality) to T2 engagement. Moreover, the reversed-causation model (M3) was again equal to the stability model but included paths from T1 work engagement to T2 resources (learning opportunities and hardy personality). The last model, defined as reciprocal model (M4), comprised all paths of the previous models. These nested models' fit quality was assessed with \( \chi^2 \) statistics, the goodness-of-fit index (GFI) and the root mean square error of approximation (RMSEA). In addition, three indices less susceptible to sample size were explored: the comparative fit index (CFI), the incremental fit index (IFI) and the Tucker–Lewis index (TLI). In general, values \( \geq 0.90 \) (for GFI, CFI, IFI and TLI) and \( \leq 0.08 \) for RMSEA denote a good fit (Byrne, 2016).

Finally, since descriptive results indicated a statistically significant correlation between participants’ age and work engagement at T2, age was included as a manifest variable loading on work engagement at both waves.

Results

Descriptive results

The means, standard deviations, correlations and internal consistencies (Cronbach’s \( \alpha \)) were calculated for all study variables (Table I). All correlations were in expected directions while test-retest correlations ranging from 0.60 to 0.75 (\( p < 0.001 \)) indicated that variables were stable over time. Moreover, all scales had satisfactory internal consistency at both measurement times (\( \alpha \geq 0.78 \)).

Testing the model

Table II shows fit indices of competing nested models and their comparisons. Models M1 and M2 displayed poor fit to data whereas, the reversed-causation model (M3), while still not having an acceptable fit, showed some improvement over M2. The reciprocal model (M4) was the only one with very good fit to data; the GFI, CFI, IFI and TLI were well above 0.95, while the RMSEA index was well under 0.05. The \( \chi^2 \) difference test (\( \Delta \chi^2 \)) showed that both M2 and M3 were significantly superior to the stability model (M1), which suggests that inclusion of paths connecting learning opportunities and hardy personality to work engagement (M2) and vice versa (M3) was necessary. Finally, according to the \( \chi^2 \) difference test, the reciprocal model (M4) provided better fit to data than the stability model (M4 vs M1, \( \Delta \chi^2 = 39.27, \Delta df = 4, p < 0.001 \)), the normal-causal model (M4 vs M2, \( \Delta \chi^2 = 32.04, \Delta df = 2, \)
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<th></th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
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<th>4</th>
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<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
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<tbody>
<tr>
<td>Learning opp. T1</td>
<td>3.75</td>
<td>0.64</td>
<td></td>
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<td></td>
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<tr>
<td>Hardy personality T1</td>
<td>3.14</td>
<td>0.37</td>
<td>0.28*</td>
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<tr>
<td>Work engagement T1</td>
<td>4.54</td>
<td>0.96</td>
<td>0.50***</td>
<td>0.49***</td>
<td></td>
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<tr>
<td>Learning opp. T2</td>
<td>3.71</td>
<td>0.68</td>
<td>0.66***</td>
<td>0.33**</td>
<td>0.46***</td>
<td></td>
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<tr>
<td>Hardy personality T2</td>
<td>3.10</td>
<td>0.36</td>
<td>0.32***</td>
<td>0.75***</td>
<td>0.55***</td>
<td>0.46***</td>
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<tr>
<td>Work engagement T2</td>
<td>4.45</td>
<td>0.94</td>
<td>0.42***</td>
<td>0.32**</td>
<td>0.60***</td>
<td>0.54***</td>
<td>0.52***</td>
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<tr>
<td>Gender (1 = female)</td>
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<td>0.40</td>
<td>0.05</td>
<td>0.12</td>
<td>0.10</td>
<td>0.02</td>
<td>−0.12</td>
<td>0.13</td>
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<tr>
<td>Age</td>
<td>39.17</td>
<td>7.28</td>
<td>0.14</td>
<td>−0.00</td>
<td>0.22</td>
<td>0.23</td>
<td>0.21</td>
<td>0.27*</td>
<td>0.10</td>
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<td>Job tenure</td>
<td>13.14</td>
<td>6.77</td>
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<td>−0.07</td>
<td>−0.08</td>
<td>0.02</td>
<td>0.11</td>
<td>0.03</td>
<td>0.04</td>
<td>0.64***</td>
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</tr>
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Notes: n = 60. T1, Time 1; T2, Time 2. *p < 0.05; **p < 0.01; ***p < 0.001

Table I. Means (M), standard deviations (SD), Cronbach's α (in parentheses) and correlations among the study variables.
p < 0.001) and the reversed-causal model (M4 vs M3, \( \Delta \chi^2 = 14.42, \Delta df = 2, p < 0.001 \)). The great and significant improvement in fit indices of the reciprocal model (M4) suggested that including reciprocal causal relationships between variables best explained our data.

Specifically, as predicted, learning opportunities and hardy personality at T1 related positively to work engagement at T2, thus supporting \( H1 \). At the same time, work engagement at T1 related positively to learning opportunities and hardy personality at T2, meaning that \( H2 \) was also supported. Finally, \( H3 \), (a) and (b) were confirmed by results of reciprocal relationships between variables. Indeed, M4 showed the best fit to data; in addition, all hypothesized effects were significant and in the expected direction. These results indicated that T1 learning opportunities and T1 hardy personality related to T2 work engagement, and that T1 work engagement related to T2 learning opportunities, as well as T2 hardy personality. Finally, the control variable of age was found to have a weak but significant causal relationship with work engagement at T1 (\( \beta = 0.22, p < 0.05 \)). Figure 1 shows all significant standardized cross-lagged effects observed in the reciprocal model (M4).

### Discussion

The main aim of the current study was to test a structural model of a gain cycle among resources and work engagement based on assumptions of the COR theory (Hobfoll et al., 2003) and the broaden-and-build theory (Fredrickson, 2004). More specifically, this research was designed to investigate: the impact of learning opportunities (i.e. a job resource) and hardy personality (i.e. a personal resource) on work engagement; the effect of work engagement on job and personal resources (i.e. learning opportunities and hardy personality); and the occurrence of reciprocal relationships between resources (i.e. learning opportunities and hardy personality) and work engagement over time. For that purpose, a two-wave study was conducted on a sample of healthcare professionals working in a rehabilitation hospital in northern Italy.

The current results replicate previous evidence proving the relevance of job resources in enhancing work engagement (Schaufeli and Taris, 2014). In particular, employees provided with adequate opportunities to develop their knowledge and skills are more intrinsically motivated to achieve their goals and feel more vigorous and dedicated across time. This can be explained by the social exchange theory (Cook et al., 2013): according to this perspective, fair social exchanges lead to strong relationships that prompt successful work behaviors and positive employee attitudes, as shown in engaged employees. Moreover, these fair social interactions seem to generate unspecified obligations for individuals so that employees try to repay their organizations for resources they receive through their level of engagement. In other words, when employees perceive great learning opportunities in their workplaces, they tend to reciprocate by showing higher levels of engagement. The current study
corroborated this assumption by showing that learning opportunities led to enhanced levels of engagement across time.

Moreover, the recent literature has shown that personal resources play an equally fundamental role in the development of work engagement (e.g., Xanthopoulou et al., 2009a; Mazzetti et al., 2016). The present findings provide an initial evidence of the role played by hardy personality in fostering employees' engagement. Employees that perceive themselves as able to influence the course of events and translate challenges into chances in order to learn and develop are more likely to become involved and motivated in performing their work tasks, thus exhibiting high levels of engagement. From a theoretical perspective, this evidence is consistent with the main assumptions of the COR theory, which posits that people invest their resources in dealing with stressful conditions and preventing themselves from reaching negative outcomes. Accordingly, employees characterized by greater pools of job and personal resources are less vulnerable to stress and more likely to experience higher levels of engagement.

Moreover, the obtained results indicate that work engagement positively affects job and personal resources over time. In line with the broaden-and-build theory, engaged employees are able to shape and enhance their resources. In other words, they might create opportunities for learning and development at work, simultaneously nourishing their hardy personality. This result also aligns with social cognitive theory, which suggests that positive emotional states represent the most important source of efficacy beliefs (Bandura, 2001). In other words, when people feel pleased and satisfied with their job, they are more likely to perceive themselves as competent.

In addition, the current findings based on a longitudinal design clearly corroborated the assumption that the relationships under investigation should not be considered in isolation.

Notes: Autocorrelations and synchronous correlations are omitted for reasons of clarity. *p<0.05; ***p<0.001
nor can the variables be defined as mere hypothetical antecedents or outcomes of work engagement. Compared to other nested models, the reciprocal model (M4) received the most solid empirical support, suggesting that the relationships among learning opportunities, hardy personality and work engagement are best explained when all potential effects are simultaneously considered. These results substantiate previous results suggesting that employees’ resources and well-being are reciprocally involved in a dynamic process that leads them to act in cycles (e.g. Simbula et al., 2011). On the one hand, the current research provides further empirical evidence for the occurrence of gain cycles among resources and engagement; on the other hand, it represents an initial attempt to explore the role of hardy personality in fostering the occurrence of this virtuous circle in the workplace. In fact, this study outlined hardy personality as a personal resource able to promote employees’ level of engagement and their chance to develop additional resources.

Study limitations
Despite notable results, the present research has certain limitations that should be mentioned. First, this research was based on a limited sample from a single rehabilitation hospital, and this could limit the generalizability of the results herein. Although the number of participants is quite modest, the present results suggest that relationships among learning opportunities, hardy personality and work engagement are reciprocal.

As mentioned before, owing to the small sample size, we reduced the number of freely estimated parameters by using manifest variables, instead of latent variables. However, the use of observed variables restricts the power of SEM to control for measurement error through latent variables. Furthermore, the time lag between waves was limited to two months. As only a few longitudinal studies on the presence of gain cycles exist, little is known about the importance of time lags in this respect. In the absence of commonly accepted guidelines (De Lange et al., 2003), this time lag was chosen due to constraints imposed by hospital arrangements.

Although the findings do not suggest the occurrence of gain spirals, since resources and engagement did not increase significantly over time, they still support the presence of positive reciprocal relationships among them, thus supporting the hypothesis of gain cycles. Hence, it can be concluded that learning opportunities, hardy personality and work engagement might activate and conserve positive conditions, beliefs and affective states. Future research should employ longer time intervals or a third wave to investigate the presence of gain spirals, which entail reciprocal relationships with increased levels of learning opportunities, hardy personality and work engagement over time.

Practical implications
In order to increase employees’ engagement, the latest advancements of the JD-R model suggest that attempting to reduce job demands at the organizational level may not represent the best intervention strategy (Schaufeli and Taris, 2014). In fact, this might lead to the side effect of eliminating job challenges, which play an essential role in the motivational process.

In line with present findings, a successful approach entails enhancement of resources available in the workplace. This strategy would rely on the motivating potential of job and personal resources in order to stimulate employees’ growth and development (Schaufeli and Salanova, 2010). The present study indicated that the relationship between learning opportunities and employees’ work engagement is reciprocal. Thus, employees and work teams should be provided with learning and development opportunities not only through formal training initiatives, but also through the attempt to increase informal opportunities for learning and development by means of job training, coaching, mentoring, performance planning and assessment of employees’ learning needs. At the same time, workshops focused on employees’ health and well-being should be aimed at increasing individual
resources such as hardy personality. Indeed, due to their state-like character (Luthans et al., 2008), personal resources are open to development and can quite easily be enhanced by person-level interventions. This study showed that hardy personality could be considered as an antecedent of work engagement. Academic research suggests that this personal resource can be enhanced: hardiness training has been successfully conducted as an occupational health intervention among nurses’ managers (e.g. Judkins et al., 2006). Organizations should adopt such formal training to foster employees’ hardy personality, increase their perceived ability to intervene in the course of events and encourage them to consider changes and demands as chances to learn and develop.

Conclusions
The present study shows that both learning opportunities and hardy personality are positively related to work engagement over time. In turn, work engagement is positively related to these resources over time, thus suggesting the occurrence of a gain cycle. These findings contribute to ongoing research on the JD-R model, providing more accurate comprehension of the role of personal resources in the motivational process of engagement. Moreover, the study sheds new light on the construct of gain cycles and recognizes hardy personality as a personal resource capable of promoting employees’ motivation. These results enable a better understanding of additional strategies to build resources and achieve work engagement, especially in healthcare settings. For healthcare professionals, work engagement has been found to predict a better service quality for patients and the surrounding community and is thus essential for health organizations, their employees and their patients. Overall, organizations should invest in fostering job and personal resources with the aim of maintaining or improving employees’ engagement, which, in turn, allows the gathering of new resources.

References


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Work demand, stress and work-related musculoskeletal disorders among emergency workers

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Abstract

Purpose – The demanding nature of firefighting exposes firefighters to unprecedented work stress and work-related musculoskeletal disorders (WMSDs). Even though relationships among work demand, work stress and WMSDs have been examined, the mediating role of work stress in the relationship between work demand and WMSDs requires more attention, particularly among emergency workers. The purpose of this paper is to therefore assess the mediation role of firefighters’ work stress in the pathway of work demand and WMSDs.

Design/methodology/approach – A quantitative research design was used. Convenient sampling was employed to select 320 firefighters from the Greater Accra region of Ghana. Data were analyzed using descriptive, correlation and regression.

Findings – The findings revealed that work demand and stress significantly affect WMSDs. Also, work demand has a significant positive effect on work stress. It was further found that work stress partially mediates the relationship between work demand and WMSDs.

Research limitations/implications – The usage of cross-sectional data limits the strength of causality and observation of changes within units of observation over time, hence the need to use longitudinal data in future studies.

Originality/value – The novelty of this study lies in the revelation of the influence of stress in the pathway of work demand and WMSDs among emergency professionals, using an African lens.

Keywords Stress, Firefighters, Work demand, Work-related musculoskeletal disorders

Paper type Research paper

Introduction

The firefighting profession is dominated by speed, pressure, uncertainty and massive workload. Categorized among highly injurious occupations universally, firefighters face lots of hazards such as falls from heights, heat, stress, burns, work-related musculoskeletal disorders (WMSDs) and respiratory complications caused by the inhalation of smoke and other chemicals (Heinrichs et al., 2005; ILO, 2016; Kim et al., 2013; Malek et al., 2009, 2010; Throne et al., 2000). The ILO (2003) estimated that the ratio of firefighter to citizen among European countries was 1: 1,000–1,200, whereas that of Africa (Mali) was 1: 33,435. Accelerating fire outbreaks in developing nations like Ghana can lead to increased firefighter work demand. In Ghana for instance, the GNFS (2016) fights thousands of fires on yearly basis. Most of these firefighting activities place huge work demands on firefighters, which can lead to the development of work stress and WMSDs. In 2015 for example, the GNFS (2016) fought 6,214 fires throughout Ghana. It is worth noting that WMSDs have been associated with work stress, high workload and demand, low job control and work monotony (Cañadas-De la Fuente et al., 2015; Norlund et al., 2010), thereby suggesting a pathway between work demand and workplace health complications.
(Lusa et al., 2015). According to the ILO (2016), an estimated 2.2m annual deaths occur at the workplace. This alarming situation needs the concerted effort of researchers, practitioners, national governments and international bodies. According to Larsman et al. (2006), perceived work demand explains 36 percent of variance in stress, whereas both perceived work demand and stress explain 20 percent of variance in musculoskeletal disorders. Sprigg et al. (2007) contended that musculoskeletal complaints in modern work organizations can be attributed to work demand. It was further indicated that the association between workload and musculoskeletal disorders can be mediated by job-related strain (Sprigg et al., 2007). Similarly, Larsman et al. (2006) examined the relationship among workload, WMSDs and felt stress among computer users. Their findings indicated that felt stress fully mediates the relationship between work demand and neck/shoulder musculoskeletal symptoms. Even though some studies have explored the concepts of work demand, WMSDs and work stress, they seem to be sparsely studied (Fonseca and Fernandes, 2010; Kim et al., 2013). Recent studies have shown that the demand of one’s work can lead to the development of stress and WMSDs (Azma et al., 2015; ILO, 2016). Meanwhile, the influential role of work stress in the trajectory between work demand and WMSDs appears not to have received the needed scholarly attention in the African setting, particularly among emergency workers. The current study therefore seeks to examine the mediation role of work stress in the relationship between work demand and WMSDs among firefighters.

**Work demand and work stress**

Jones and Fletcher (1996) defined “work demand as the degree to which the working environment contains stimuli that require some effort” (p. 34). The notion is that job demands may lead to work stress if they necessitate extra effort above the normal way of attaining work targets (Demerouti et al., 2001). It can therefore be said that for job demand to exist, there should be aspects of the job that require a worker to exert additional energies in order to perform his or her work. Both quantitative (workload) and qualitative (pressure/speed) work demand can lead to adverse health effects on workers. Selye (1974) defined stressors “as events that trigger a physiological and psychological response from the organism, in order to distinguish stimulus from response” (p. 171). Hence, stress can be a negative or positive circumstance that reacts to a stressor and that can have an impact on the mental or physical health and well-being of a person. Similarly, the ILO (2016) defined stress as “the harmful physical and emotional response caused by an imbalance between the perceived demands and the perceived resources and abilities of individuals to cope with those demands” (p. 2). Work stress may result from the organization, work design and interpersonal relations, and happens when work demands do not match or outweigh the abilities, resources or needs of the worker, or when the knowledge or capabilities of an individual worker or group to cope are not matched with the expectations of the institution. According to Drakopoulos et al. (2012), work stress is a health problem that affects industrial performance.

The relationship between work demand and stress has received considerable attention. The Health and Safety Executive (2007), for instance, explained that work stress is the adverse reaction people have due to excessive pressure or other types of demands placed on them. Similarly, Noblet and Lamontagne (2006) opined that occupational stress occurs when external demands and conditions do not match a person’s needs, expectations or ideas or exceed their physical capacity, skills or knowledge for comfortably handling a role. In England, the association between work demand and coping in predicting levels of stress and depression was tested using 870 respondents (Mark and Smith, 2011), and was found that job demand, extrinsic effort and over-commitment were associated with higher levels of anxiety and depression. Herrero et al. (2012) tested for work demand-induced stress among men and women and reported that work demand significantly predicted work stress.
Further, stress levels were high among females than males when exposed to demanding tasks. Løkke and Madsen (2014) examined stress among Danish managers and found that workload, managerial level, work situation and amount of work at home predict work stress. From the findings of Haus et al. (2016), emergency service managers face a lot of work demands which lead to stress. Some of such stressors are event-specific stressors as well as group-specific stressors. Other work demand aspects that cause stress to emergency workers include dealing with the media, assuming responsibility for decisions made and justification for failed assignments (Haus et al., 2016). The findings of Løkke and Madsen (2014) indicate that stress in emergency professions can be caused by activities at the workplace and off the workplace but Haus et al. (2016) categorized stress into event-specific, group-specific and general work stress. This shows that stress can emanate from multiple sources from both on-the-job and off-the-job factors. Even though workload is related to stress and exhaustion, job control and personal development buffer the relationship (Panari et al., 2010). However, too much workload can lead to burnout if not managed well (Moyer et al., 2017). Contrastingly, Gardner and Fletcher (2009) reported that a potentially stressful work demand could result in positive rather than negative outcomes. Notwithstanding this contrasting finding, work demand is likely to lead to work stress among firefighters. 

Work demand and WMSDs

WMSDs can have multiple causes from both inside and outside the work environment. According to Nunes (2009), “WMSDs include a wide range of inflammatory and degenerative conditions affecting muscles, tendons, ligaments, joints, peripheral nerves and supporting blood vessels” (p. 121). Basically, musculoskeletal disorders have been used to indicate complications in the nerves, tendons, muscles and supporting structures of the body. Musculoskeletal conditions may occur when muscles or tendons are overextended or over-used beyond their capabilities. Research indicates that WMSDs are common among rescue and emergency service workers, particularly firefighters (Kim et al., 2013; Lim et al., 2014; Lusa et al., 2015). Westgaard and Winkel (1997) contended that firefighters are predisposed to musculoskeletal disorders and need support. As such, Lim et al. (2014) proposed for the adoption of an integrated health management system for emergency service workers because musculoskeletal complaints, shift work and depression were found to be related to sleep problems due to their engagement in catastrophic activities (Dirkzwager et al., 2004; Lusa et al., 2015). Oranye et al. (2017) maintained that work-related musculoskeletal injuries are caused by organizational processes and policies. The extent of work demands placed on workers can result into musculoskeletal injuries. In Korea, Kim et al. (2013) reported that organizational factors such as work demand, physical environment, organizational structure, occupational climate, inadequate rewards and job insecurity lead to WMSDs. Similarly, the findings of Cole et al. (2005) revealed that apart from sex and education, psychological demand, job insecurity and physical exertion also lead to work-related injuries. Even though both the findings of Kim et al. (2013) and Cole et al. (2005) reveal that work demands lead to WMSDs, the former places much emphasis on only physical work demands while the latter stresses on both physical and psychological work demands. Fonseca and Fernandes (2010) also revealed that physical work demands such as handling heavy materials, poor sitting posture and repetitive tasks, psychosocial demands and hazardous physical fitness result in work-related musculoskeletal complaints in the neck, shoulder or upper back and the lower back. While previous studies have centered on causes of musculoskeletal complaints (Azma et al., 2015; Kim et al., 2013; Lim et al., 2014; Lusa et al., 2015), da Costa and Vieira (2008) suggested that stretching can minimize the occurrence of WMSDs. According to Keea and Seo (2007), the shoulder is the most predisposed body part to WMSDs, followed by the knee, lower back, hand or wrist, neck, ankle or feet, finger and then other areas of body but differ among countries.
In a related study among Asian nurses, Smith et al. (2006) reported that WMSDs were predicted by manually lifting sick people, carrying out physically backbreaking tasks and high mental demands. Also, Lee et al. (2008) found that high job uncertainty suggestively augmented the danger for lower-back musculoskeletal complaints after controlling for physical workload and individual characteristics. The findings of Smith et al. (2006) point to the effect of both physical and psychological job demands as causes of WMSDs, whereas Lee et al. (2008) attributed causes of WMSDs to physical work demands and personal characteristics of individual workers. Oakman and Bartram (2017) suggested that physical and psychosocial workplace factors are key to WMSDs development. In respect of these factors, Krause et al.’s (2005) report indicated that workers who are exposed to high levels of physical workload and ergonomic activities are three to five times more likely to experience higher musculoskeletal levels than their colleagues with minimal exposures. From the review, it is evident that the more demanding tasks assigned to workers, the higher their likelihood of developing WMSDs. Hence, work demand will have a significant positive effect on WMSDs.

Work stress and WMSDs
Workers who are more stressed are more likely to develop WMSDs. Among the causes of WMSDs are repetitive motion, awkward posture, forceful exertions, pressure points and static postures (NIOSH, 2007). When workers are given tasks that exceed their capabilities in the absence of needed resources, they are likely to use means that will result in repetitive injuries. WMSDs are among the leading reported health complaints in emergency and health care services (Oranye et al., 2017; Smyth et al., 2017). Although Abaraogu et al. (2017) reported that no stress dimension significantly relates to WMSDs, Azma et al. (2015) demonstrated that factors like stress, job demand, control and changes lead to disorders in body parts like the neck, shoulders, back and hip. Kim et al. (2013) also examined the levels of WMSDs among Korean male fire service workers and found that work stress has a significant relationship with WMSDs. In addition, Azma et al. (2015) reported a relationship between work stress and pain in specific body parts such as the neck, shoulder and back, while Kim et al. (2013) also reported of a relationship between work stress and WMSDs in general. A study by Mehta and Parijat (2012) revealed that psychosocial risk factors such as stress predict WMSDs. Further, the finding of Leino (1989) indicated that the prevalence of chronic musculoskeletal disease was associated with symptomatic stress among both men and women. Psychosocial and work factors are among the leading causes of WMSDs (Wahlstrom, 2005). Devereux and Buckle (2000) contended that work stress reactions lead to WMSDs and suggested a reciprocal relationship between them. da Costa and Vieira (2010) also revealed that apart from physical work demands, WMSDs are caused by high psychosocial work demands, hence the need to test for a causal relationship. This implies that work stress can cause pain and hurt in specific body parts or in all body parts depending on the severity of the stress.

Work demand, work stress and WMSDs
Both work demand and work stress are contributory factors to WMSDs development (da Costa and Vieira, 2008), although perceptions may differ among different people (Oranye et al., 2017). Previous studies established links among musculoskeletal disorders and physical and psychosocial work factors such as stress (Carayon et al., 1999; Hagen et al., 1998). For instance, it is presumable that workers whose work environments require them to exert extra energies are likely to be more susceptible to WMSDs than workers with low work demands. Research suggests relationships among work demand, work stress and WMSDs. Kim et al. (2013), for example, revealed that among the work stress subgroup, physical environment, work demand, organizational structure, occupational climate,
inadequate rewards and job insecurity had relationships with the manifestation of WMSDs, but not with work control and conflict. However, in general, work stress was correlated to the incidence of WMSDs. In Canada, Cole et al. (2005) found that apart from sex, education and job insecurity, high levels of physical exertion and psychological demands relate with work-related repetitive strain injuries. Park and Jang (2010) also found that work demand had a significant relationship with neck and shoulder complaints. The findings further revealed that high work demand and low decision opportunity significantly predicted shoulder and neck complaints among respondents. It was suggested that further studies need to be conducted to clarify the association between psychosocial factors and upper extremity musculoskeletal disorders and possibly work stress. The studies of Kim et al. (2013), Park and Jang (2010) and Cole et al. (2005) suggest a relationship between work demand and WMSDs, but Kim et al. (2013) treated work stress and work demand as composite variables other than as sub-dimensions. This shows that work demand and work stress can affect WMSDs at the same time. On the other hand, work demand can cause work stress, which, in turn, can lead to WMSDs. In Brazil, Fonseca and Fernandes (2010) also reported that work-related musculoskeletal complaints in the neck, shoulder or upper back and the lower back had relationships with physical work demands (handling heavy materials, poor back position and repetitive tasks), psychosocial demands and hazardous physical fitness. Apart from that, musculoskeletal complaints in distal upper parts were related to physical work demands (repetitive and energetic tasks) as well as number of years in service. In the USA, Krause et al. (2005) reported that occurrences of extreme bodily aches were 47 percent in general, 43 percent (neck), 59 percent (upper back) and 63 percent (low back pain). Respondents who fell within the uppermost exposure quartiles for physical workload and ergonomic complaints were more probable to report extreme aches than those in the lowermost quartile. Carayon et al. (1999) hinted of possible pathways of physiological, psychological and behavioral reactions to stress that can also directly or indirectly affect WMSDs. It was further expressed that psychosocial work factors such as work pressure and lack of control which cause stress can also lead to ergonomic factors such as forceful exertions, repetitive action and awkward posture that have been linked to WMSDs. In order to fully understand the etiology of WMSDs, it is important to examine both physical ergonomic and psychosocial work factors simultaneously (Carayon et al., 1999). From the review, WMSDs are a major industrial health concern and workers whose tasks are characterized by a lot of demands are more likely to develop WMSDs than those whose tasks are less demanding. Both work demands and work stress have relationships with WMSDs. Further, work demand has a significant relationship with work stress. These indicate that there can be a pathway from work demand to WMSDs through work stress. Hence, it is proposed that work stress will mediate the relationship between work demand and WMSDs (Figure 1).

**Hypotheses**

H1. Firefighters’ work demand will have a significant positive effect on WMSDs.

H2. Firefighters’ work demand will have a significant positive effect on work stress.
H3. Firefighters’ work stress will have a significant positive effect on WMSDs.

H4. Firefighters’ work stress will mediate the relationship between work demand and WMSDs.

Method
Design and participants
Using a cross-sectional survey design, the study conveniently sampled 320 firefighters in the Greater Accra Regional Fire Command, Ghana. The Greater Accra region was selected due to its high records of fire outbreaks in Ghana (GNFS, 2016). Participants were sampled from the lowest rank (Recruit firefighter) to the highest rank (Chief fire officer). The sample comprised of 234 (73.1 percent) males and 86 (26.9 percent) females. The majority of the respondents 104 (32.5 percent) were aged $25 \leq 34$ years, while the majority 181 (56.6 percent) worked for more than 12 h per day.

Measures
A self-reported questionnaire was used for data collection. The questionnaire had four sections: demography, work demand, WMSDs and work stress. The demography section was made up of items such as gender, age and working hours. Sex (Cole et al., 2005), age (Shaik et al., 2014) and working hours (Park and Jang, 2010) were controlled for since they can affect WMSDs. Van Veldhoven and Meijman’s (1994) eight-item questionnaire was adapted to measure work demand. Rated on a five-point Likert scale (1 – strongly disagree, 2 – disagree, 3 – neutral, 4 – agree to 5 – strongly agree), the instrument had an original Cronbach’s $\alpha$ coefficient of 0.87 and had typical statements like “I have to work fast.” The Cronbach’s $\alpha$ value for the current study is 0.80. Also, WMSDs were measured using the standardized Nordic questionnaire (Kuorinka et al., 1987). The Nordic questionnaire measures pains, hurts or aches in any of nine body parts (neck, shoulder, elbow, wrist, upper back, lower back, hip, knee and ankle) for the last 12 months. Items were rated on a five-point Likert scale (1 – very unlikely, 2 – unlikely, 3 – neutral, 4 – likely and 5 – very likely) with a Cronbach’s $\alpha$ coefficient of 0.92 for the current study.

The Impact of Event scale developed by Horowitz et al. (1979) was adapted to measure work stress. This 15-item scale comprised of statements that examined whether a firefighter had ever been stressed as a result of a firefighting event or activity (Horowitz et al., 1979; Weiss and Marmar, 1997). The scale was rated on a five-point Likert scale (1 – never, 2 – rarely, 3 – sometimes, 4 – often to 5 – always) and had an original reliability value of 0.86. The scale had typical statements like “I thought about it when I didn’t mean to.” The Cronbach’s $\alpha$ coefficient for the current study was 0.75.

Data collection and analysis
Data for this study were collected from March to May 2016. Questionnaires were self-administered to firefighters within the Greater Accra Regional Fire Command. Ethical considerations such as approval, informed consent, voluntarily participation, confidentiality and anonymity were adhered to. Predictive Analytics Software (PASW) version 22.0 was the tool used for data analyses. Respondents’ demography was analyzed descriptively. Correlation test was preliminarily used to test relationships among variables. Further, simple linear and multiple regressions were used to test for the direct effect of work demand and work stress on WMSDs, and the mediation role of work stress in the relationship between work demand and WMSDs, respectively. Baron and Kenny’s (1986) mediation analysis procedure was used to test whether work stress mediates the relationship between work demand and WMSDs.
Results

From Table I, skewness for work demand, work stress and WMSDs was (−0.110, −0.257 and −0.206), respectively. Also kurtoses for work demand, work stress and WMSDs was (−0.305, −0.121 and −1.367), respectively. Since all variables were within the bound of (−1.96 – 1.96), they were all normally distributed. Further, there was no multicollinearity since all variables had correlates below 0.80, as shown in Table II. Expectation maximization approach was used to manage missing data.

In order to determine the relationship among the variables, a Pearson’s correlation test was carried out. From Table II, sex (r = −0.059, p > 0.05) and age (r = 0.023, p > 0.05) did not have significant relationships with WMSDs. However, working hours (r = 0.150**, p < 0.01), work demand (r = 0.228**, p < 0.01) and work stress (r = 0.180**, p < 0.01) were significantly related with WMSDs. Also, work demand and work stress were significantly related (r = 0.206**, p < 0.01).

Effect testing

The effect of firefighters’ work demand on WMSDs

The first hypothesis sought to find out whether firefighters’ work demand had a significant positive effect on WMSDs. A Pearson’s correlation test was first carried out to find out if work demand and WMSDs have any relationship. From Table II, work demand and WMSDs were significantly related (r = 0.228**, p < 0.01). Further, a linear regression was conducted, where work demand was used to predict WMSDs. From Table III, work demand has a significant positive effect on WMSDs (β = 0.228, p < 0.01). Therefore, H1 was supported. This suggests that a unit increase in the work demand of firefighters will lead to a 22.8 percent increase in the development of WMSDs. In addition, work demand explained 5.2 percent of variation in WMSDs (R² = 0.052).

The effect of firefighters’ work demand on work stress

H2 sought to determine whether the work demand of firefighters will have a significant effect on work stress. In order to determine whether work demand and work stress are related, a Pearson’s correlation test was conducted. From Table II, there was a significant

<table>
<thead>
<tr>
<th>Variable</th>
<th>Skewness</th>
<th>SE</th>
<th>z-Scores</th>
<th>Kurtosis</th>
<th>SE</th>
<th>z-Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. WD</td>
<td>−0.015</td>
<td>0.136</td>
<td>−0.110</td>
<td>−0.083</td>
<td>0.272</td>
<td>−0.305</td>
</tr>
<tr>
<td>2. WS</td>
<td>−0.035</td>
<td>0.136</td>
<td>−0.257</td>
<td>−0.033</td>
<td>0.272</td>
<td>−0.121</td>
</tr>
<tr>
<td>3. WMSDs</td>
<td>−0.028</td>
<td>0.136</td>
<td>−0.206</td>
<td>−0.372</td>
<td>0.272</td>
<td>−1.367</td>
</tr>
</tbody>
</table>

Notes: WD, work demand; WS, work stress; WMSDs, work-related musculoskeletal disorders

Table I. Test of normality

<table>
<thead>
<tr>
<th>Variables</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sex</td>
<td>0.27</td>
<td>0.44</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Age</td>
<td>0.92</td>
<td>0.27</td>
<td>−0.026</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. WHrs</td>
<td>0.43</td>
<td>0.50</td>
<td>0.251**</td>
<td>0.030</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. WD</td>
<td>29.24</td>
<td>4.17</td>
<td>−0.064</td>
<td>−0.002</td>
<td>0.008</td>
<td>1</td>
<td></td>
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<tr>
<td>5. WS</td>
<td>47.64</td>
<td>8.12</td>
<td>−0.049</td>
<td>0.005</td>
<td>−0.109</td>
<td>0.206**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6. WMSDs</td>
<td>32.28</td>
<td>8.44</td>
<td>−0.059</td>
<td>0.023</td>
<td>0.150**</td>
<td>0.228**</td>
<td>0.238**</td>
<td>1</td>
</tr>
</tbody>
</table>

Notes: WHrs, working hours; WD, work demand; WMSDs, work-related musculoskeletal disorders; WS, work stress; M, mean. **p < 0.01 (two-tailed)

Table II. Correlation test
positive relationship between work demand and work stress \( (r = 0.206**, p < 0.01) \). In order to determine the extent of the relationship, a linear regression test was carried out. From Table III, the results show that work demand has a significant positive effect on work stress \( (\beta = 0.206, p < 0.01) \). Hence, \( H2 \) was supported. This implies that a unit increase in work demand will lead to a 20.6 unit increase in work stress. It was also found that work demand explained 4.3 percent of variance in work stress \( (R^2 = 0.043) \).

The effect of firefighters' work stress on the development of WMSDs

\( H3 \) sought to find out whether work stress will have a significant positive effect on WMSDs. In order to determine the relationship between work stress and WMSDs, a Pearson's correlation test was carried out. From Table II, work stress and WMSDs had a significant positive relationship \( (r = 0.180**, p < 0.01) \). To test whether firefighters' work stress has a significant positive effect on the development of WMSDs, a regression test was conducted, whereby work stress was used to predict WMSDs. From Table III, work stress has a significant positive effect on WMSDs \( (\beta = 0.138, p < 0.05) \). Therefore, \( H3 \) was supported. This suggests that a unit increase in firefighters' work stress will lead to a 13.8 percent increase in WMSDs.

The mediation effect of work stress in the relationship between work demand and WMSDs

\( H4 \) sought to find out whether work stress mediates the relationship between work demand and WMSDs. In order to test this hypothesis, a three-step regression test was conducted using Baron and Kenny's (1986) mediation approach. From Table III, in step 1, work demand was used to predict WMSDs and the coefficient was significantly positive \( (\beta = 0.228, p < 0.01) \). In step 2, work demand was used to predict work stress. From Table III, work demand had a significant positive effect on work stress \( (\beta = 0.206, p < 0.01) \). Both work demand and work stress were regressed on WMSDs in step 3. From Table III, both work stress \( (\beta = 0.138, p < 0.05) \) and work demand \( (\beta = 0.199, p < 0.01) \) have significant positive effects on WMSDs. In all the steps, the models were fit as indicated by the F-statistics \( (\text{step 1} = 17.362***, \text{step 2} = 14.129**, \text{and step 3} = 11.955***) \). Further, in step 3, there was a significant change in \( R^2 \) \( (\Delta R^2 = 0.070) \). Since the regression coefficient for work demand in step 3 \( (\beta = 0.199, p < 0.01) \) is less than the coefficient in step 1 \( (\beta = 0.228, p < 0.01) \), and yet significant, work stress partially mediates the relationship between work demand and WMSDs. Therefore, \( H4 \) was supported.

Discussion

The study sought to find out whether work stress mediates the relationship between work demand and WMSDs. The first objective sought to find out whether firefighters' work demand had a significant positive effect on WMSDs. The findings revealed that work demand has a significant positive effect on WMSDs. This suggests that an increase in the work demand of workers will lead to increase in the development of WMSDs. This finding

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
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<tr>
<td>WMSDs (DV)</td>
<td>WS (DV)</td>
<td>WMSDs (DV)</td>
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<tr>
<td>WD</td>
<td>0.228***</td>
<td>0.206***</td>
</tr>
<tr>
<td>WS</td>
<td>0.138*</td>
<td>0.199***</td>
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<tr>
<td>F-stats</td>
<td>17.362***</td>
<td>14.129**</td>
</tr>
<tr>
<td>R^2</td>
<td>0.052</td>
<td>0.043</td>
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<tr>
<td>( \Delta R^2 )</td>
<td>0.070</td>
<td>0.070</td>
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Notes: DV, dependent variable; F-stats, F-statistics; \( \Delta R^2 \), change in \( R^2 \). *p < 0.05; **p < 0.01
agrees with an earlier finding by Kim et al. (2013) which indicated that organizational factors such as work demand, physical environment and other organization factors lead to WMSDs. The finding also supports an earlier finding of Cole et al. (2005) that revealed that apart from sex and education, psychological demand and physical exertion also lead to work-related injuries. The finding also buttresses Smith et al.’s (2006) report that revealed that WMSDs are predicted by manually lifting sick people, carrying out physically backbreaking tasks and high mental demands. Lee et al. (2008) also found that high job uncertainty suggestively augmented the danger for lower-back musculoskeletal complaints after controlling for physical workload and individual characteristics. These findings reveal that when workers are subjected to high work demand, it will predispose them to higher levels of WMSDs. Therefore in the firefighting profession, when firefighters are assigned tasks that demand a lot of effort such as speed, climbing, lifting of water hose and standing to fight fire for long hours in awkward positions, they are more likely to experience WMSDs. This implies that when workers are engaged in highly demanding work activities, the likelihood to exert more energy is higher, and which can result in WMSDs.

The second objective sought to determine whether work demands of firefighters significantly affect work stress. It was found that work demand has a significant positive effect on work stress. This implies that an increase in work demand will result in an increase in work stress. The current finding confirms Noblet and Lamontagne’s (2006) postulation that work stress occurs when external demand and conditions do not match a person’s needs, expectations or ideas or exceed their physical capacity, skills or knowledge for comfortably handling a situation. The research outcome also agrees with Mark and Smith’s (2011) findings that indicated that job demand, extrinsic effort and over-commitment were associated with higher levels of anxiety and depression. Similarly, Herrero et al. (2012) found work demand to predict work stress among both men and women. Løkke and Madsen (2014) also found that workload, managerial level, work situation and working at home lead to work stress. However, the finding contrasts with findings by Gardner and Fletcher (2009) that revealed that a potentially stressful work demand could result in positive rather than negative outcomes. Notwithstanding this contrasting finding, a lot of research points to the fact that high work demands lead to some elevated stress levels. These findings are suggestive that physical and psychosocial work demand can cause stress at the workplace. When firefighters are subjected to extreme work demands such as taking quick decisions in emergency situations, having to deal with complex fire outbreaks and handling of injured and dead persons they become prone to stress.

The third objective sought to find out whether work stress will have a significant positive effect on WMSDs. The finding shows that work stress has a significant positive effect on WMSDs. This implies that as work stress increases, WMSDs also increase. Although the finding contradicts Abaraogu et al.’s (2017) report that indicated that no stress dimension significantly relates to WMSDs, the result supports findings by Azma et al. (2015) who revealed that factors like stress, job demand, control and changes lead to disorders in parts of the body such as the neck, shoulders, back and hip. The finding also supports those of Kim et al. (2013) who found work stress to be significantly related with WMSDs among Korean male firefighters, Mehtaa and Parijat (2012) who revealed that psychosocial risk factors such as stress predict WMSDs and Leino (1989) who reported a relationship between chronic musculoskeletal ailments and symptomatic stress. This seems to reinforce Wahlstrom’s (2005) opinion that psychosocial and work factors are among the leading causes of WMSDs. The current finding affirms earlier findings by Devereux and Buckle (2000) that revealed that work stress leads to WMSDs and suggested a reciprocal relationship between them. Based on these, it is suggestive that the more workers get stressed, the higher their chances of developing WMSDs.

The fourth objective sought to find out whether work stress mediates the relationship between work demand and WMSDs. The finding revealed that work stress partially
mediates the relationship between work demand and WMSDs. This implies that work demand can lead to work stress which can consequently lead to WMSDs. However, work demands can also affect WMSDs directly. This finding confirms Carayon et al.'s (1999) suggestion of possible pathways of physiological, psychological and behavioral reactions to stress that can also directly or indirectly affect WMSDs. It is indicative that psychosocial work factors such as work pressure and lack of control which cause stress can also lead to ergonomic factors such as forceful exertions, repetitive action and awkward posture that have been linked to WMSDs (Cole et al., 2005; Kim et al., 2013; Park and Jang, 2010). The findings suggest that although work demand can cause work stress, which can consequently lead to WMSDs, work demands can also lead to WMSDs without the intervention of work stress. Hence, work stress lies in the pathway between work demand and WMSDs. However, work demand can culminate into WMSDs without necessarily causing work stress which will rather lead to WMSDs.

**Conclusion**

Despite the strides in occupational health management and employee well-being activities, health research in the fire service appears scanty, particularly in developing countries. It is indicative that work demand and work stress lead to WMSDs. However, work demand also leads to work stress. Tasks that expose workers to high stimuli that necessitate emotional and physical responses due to discrepancies in resource availability and task requirements will lead to exhaustion and depersonalization. There is the possibility that some workers may be assigned to jobs that exceed their capacity in the absence of resources or support which can result in stress or emotional exhaustion. In order to manage work demand-induced stress, there is a need for managers and supervisors to assign tasks to workers based on their individual capacities to reduce stress incidences at the workplace. However, within the fire service, it is accepted that this may not always be possible, given the nature of the job. Also managers need to provide support in terms of equipment, resources and training to help workers overcome stress tendencies.

Again, work demand leads to WMSDs. When workers are assigned tasks that contain stimuli that require extra effort in accomplishing them, they may exert energies that exceed their normal capacities. This will lead to potential overstretching and overworking which can result in pains, aches and hurts in joints, tendons and body parts. Sometimes workers use unorthodox or crude means to accomplish tasks that are demanding, and this can lead to the development of WMSDs. In order to minimize the tendencies of WMSDs, organizational leaders are entreated to evaluate jobs to ascertain their demands before assigning them to workers. Apart from that, it is necessary for organizational leaders to mechanize extremely demanding manual tasks to curtail the incidences of WMSDs. While it is ideal that extremely demanding manual tasks are mechanized, this can be challenging to achieve within a fire service – where control over the task is often limited. In addition, there should be regular physical and medical checks on workers to assess their fitness levels in order to assign the right task to the right person at the right time.

Further, even though work stress affects WMSDs, work demands can also affect WMSDs through work stress. Per the nature of the firefighting job, it is not always possible to minimize demands within the fire service – as demands are created externally. However, more support can be offered to mitigate these demands to some degree. This suggests that when workers are exposed to demanding assignments they will be stressed, and when the stress is not managed, it can result in WMSDs. Jobs that are characterized by heavy workload, speed and pressure can lead to exhaustion if there are no resources to match the demand, which can consequently lead to pains, aches and discomfort in body parts, joints and tendons. Since work stress lies in the trajectory between work demand and WMSDs, it is prudent to minimize the demand associated with tasks which is a root cause. This can
minimize or prevent work stress from occurring, and consequently WMSDs. Hence, managers and supervisors should design and assign tasks to workers, having in mind suitable workers to handle them as well as provide the needed resources to aid them accomplish the tasks without overexertion. Where work demands lead to work stress, where possible, managers could consider preventing it from culminating into WMSDs by reassigning other employees to assist workers with demanding tasks, providing equipment to make the work easier, altering the work design to help accomplish results with minimal exertion and counseling workers to cope with stress. Workers should also be encouraged to seek assistance or support from supervisors and co-workers, when they realize that their work demands are above their capacities.

Limitations and areas for further research
This study used cross-sectional data for analysis, which limits the ability to establish causality. It is therefore suggested that future studies should use longitudinal designs to strengthen the acceptability of causality. Longitudinal designs will also help to assess changes within units of observation over time. Also the scope of the study is limited to only firefighters, although there are other similar emergency professions which could have been considered. It is therefore recommended that further studies be conducted in other emergency occupations such as the military, police and other hazardous professions. Geographically, the study can be expanded to cover other parts of the country and other developing countries. Finally, the adoption of a quantitative research approach limits the in-depth nature of information collected. In order to get in-depth responses from respondents, a qualitative approach is deemed necessary.

References


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