Evaluation of physical health, mental wellbeing, and injury in a UK Police Firearms unit

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Abstract

The aim was to examine the health and wellbeing of UK police firearms officers and to identify the incidence and severity of work-related injuries. Data from 96 officers were derived from an online self-report survey. General health indicators, physical activity levels, WHO-5 wellbeing score, and injury data from the previous 12-months were collected. Thirty work-related injuries (31%) occurred with an injury rate of 31 injuries per 100 FTE worked within the firearms unit in the previous year. Fifty percent of officers took no time off for recovery. 29% of injuries were classified as severe and the mechanisms of more severe injuries were linked to occupational demands. Officers who exercised ≥four times per week reported significantly less injuries, while low physical activity levels were associated with significantly lower wellbeing. UK police firearms officers are at a high risk of occupational injury and physical activity can play an important role in reducing injury and improve wellbeing.

Keywords: tactical police, firearms, injury, wellbeing, physical activity

Introduction

Police Firearms Officer is a highly specialised role within the United Kingdom (UK) Police Force, that is similar to SWAT officers in the USA (Davis et al., 2016), and Specialist Police officers in New Zealand or Australia (Alach & Crous, 2012; Irving, Orr, & Pope, 2019). Firearms Officers provide tactical response to serious, unpredictable, and potentially dangerous events (Williams & Westall, 2003), in which the requirements of the role such as carrying heavy equipment, may result in an increased risk of work-related musculoskeletal injury and fatigue (Dempsey, Handcock, & Rehrer, 2013; Larsen, Aisbett, & Silk, 2016a; Orr, Pope, Johnston & Coyle, 2013). Firearms officers are required to wear personal protective equipment such as a body armour vest or carbon plates, carry a personal firearm, and handle a larger assault firearm during long shift periods (Larsen, Andersson, Tranberg, & Ramstrand, 2018; Irving et al., 2019). This places the musculoskeletal system under greater strain due to repetitive dynamic mechanical loading, prolonged static loading, and localised stress during actions such as firearms handling (Larsen, Tranberg, & Ramstrand, 2016b; Larsen et al, 2018; Kemnitz, Johnson, Merullo, & Rice, 2001; Ramstrand & Larsen, 2012; Ramstrand, Zugner, Larsen, & Tranberg, 2016). This is likely to manifest in the lumbar region of the back (Holmes et al, 2013; Larsen et al., 2018) due to load of the equipment, often over prolonged time periods (Burton, Tillotson, Symonds, Burke, & Mathewson, 1996), in the upper extremities during movement of the firearm (Campbell, Roelofs, Davey, & Straker, 2013; Seay, Hasselquist, & Bensel, 2011), or grappling when actioning arrests or altercations (Vera Jimenez, Fernandez, Ayuso, & Acosta, 2020), and in the lower extremities with kinematic and kinetic changes in gait parameters due to equipment carriage (Kasovic, Stefan, Borovec, Zvonar, & Cacek, 2020; Larsen et al., 2016b; Ramstrand et al., 2016).

Musculoskeletal pain (45%) and injury are common within the general population (Carnes et al., 2007) and are often related to the workplace environment and demands (de Cássia Pereira Fernandes, Pataro, de Carvalho, & Burdorf, 2016; Haukka, Leino-Arjas, Solovieva, Ranta, Viikari-Juntura, & Riihimaki, 2006; Neupane, Miranda, Virtanen, Siukola, & Nygard, 2011; Neupane, Nygard, & Oakman, 2016). Larsen et al (2018) reported 41% of Swedish Police officers experienced multi-site musculoskeletal pain, highlighting the substantial impact on health as it is likely to affect physical ability. Injury incidence in emergency responders has been previously reported and shown to be relatively high. For example, the incidence of musculoskeletal injury in Australian police officers was 46 injuries per 1000 workers per annum (Gray & Collie, 2017) or 106 injuries/1000 personnel/year in Canadian police officers over a 41-month period (Lentz, Voaklader, Gross, Guptill, & Senthilselvan, 2020), and police officers account for more than half (52%) of all injury cases reported in United States emergency responders (Reichard & Jackson, 2010).

Comparison of data from different studies is problematic due to the non-standardised reporting of injury incidence in these cohorts. Injuries to police officers are mostly classed as mild to moderate in severity, with 99% resulting in discharge from the emergency department (Reichard & Jackson, 2010). Sprains and strains are the most common injury type (Reichard & Jackson, 2010; Lentz et al, 2020), and the arms (36%; Reichard & Jackson, 2010), shoulders (19.2%) and torso (13.5%; Lentz, 2020) or back and neck (17%; Reichard & Jackson, 2010; 43.2%; Larsen et al., 2018) the most frequent region-specific locations for injury. In an examination of new Federal Bureau of Investigation (FBI) agents, overuse and defensive tactics were indicated as high risk for injury but limited information was often a problem (Knapik et al., 2011). Additionally, physical movement has been reported as the most common cause of injury in United States (US) law enforcement injuries, resulting in 47% of all sprains and strains (Reichard & Jackson, 2010) and this was attributed to poor physical condition or posture during police work. Despite such epidemiological studies, little is known about the incidence and causes of injuries in UK Firearms Officers.

Specialist police officers provide support during highly stressful situations due to the potential for use of lethal force to secure suspects, prevent escalation and facilitate resolutions (Alach & Crous, 2012; Strader, Schram, Irving, Robinson, & Orr, 2020). This places an increased occupational burden and workload on the officers (Marins, Barbosa, Machado, Orr, Dawes, & Del Vecchio, 2020; Tomes, Orr, & Pope, 2017), that may affect their physical and mental wellbeing (Garbarino, Cuomo, Chiorri, & Magnavita, 2013; Demou, Hale, & Hunt, 2020). Good physical fitness can act as a preventative measure against musculoskeletal injury (Knapik, 2015). Previous research has suggested that decreases in fitness can result in work-related fatigue that may exacerbate the injury propensity in law enforcement officers (Knapik et al., 2011; Larsen et al, 2018; Tomes, Schram, Pope, & Orr, 2020). Nabeel and colleagues reported chronic pain was eight times greater in intensity in officers who reported poor or fair ratings of health in a sample of 332 active duty US police officers (Nabeel et al., 2007). Knapik et al. (2011) reported increased injury risk in new FBI agents with both slower 300 m sprint and 1500 m run times and lower physical fitness test scores. Similarly, male officers were 0.97 time less likely to become injured for every one-unit increase in VO_{2max} (Lentz et al., 2019), though interestingly, in the same study, female officers were at a higher risk of injury as fitness increased.

Higher levels of physical fitness have previously been related to increased risk of injury in the general and law enforcement populations (Tomes et al., 2020) due to an increase in exposure, i.e. people who participate in more bouts of physical activity (PA) are more likely to become injured (Hootman, Macera, Ainsworth, Martin, Addy, & Blair, 2001). Conversely, high levels of physical conditioning and fitness can prevent injury in police cohorts, with lowest rates of workers' compensation claims reported for officers in the highest fitness category (Boyce et al., 1992), and the enhanced physical condition making the officers more resilient to injury. However, physical capabilities are age dependent (Knapik et al., 2011). Lockie, Dawes, Kornhauser, and Holmes (2017) reported that older male police officers (40-59 years) presented with significantly lower abdominal strength, lower-body power, and aerobic fitness, while older female officers had decreased upper body strength, and this may potentially increase risk during tactical operations and performing occupational tasks. Additionally, good abdominal strength is likely to provide greater support to the lumbar spine region, so lower abdominal strength may increase the risk of lower back pain (Nourbakhsh & Arab, 2002), noting the lower back was reported as a common location of pain and injury in tactical police officers.

It is likely that all police officers are exposed to higher levels of psychological stress than the general population (Jaramillo, Nixon, & Sams, 2005; Purba & Demou, 2019; Shane, 2010), which is even higher in specialist tactical officers due to the occupational demands of the job (Planche et al., 2019). This is evident through increases from baseline of EEG theta brainwave values and heart rate during simulated firearms training (Munoz, Quintero, Stephens, & Pope, 2020), increases in heart rate during high pressure training practices (Oudejans, 2008), and increases in diurnal cortisol in tactical officers (Planche et al., 2019), which can impact performance. Decreases in shooting accuracy and judgement were observed in more stressful interactive training scenarios (Meyerhoff et al., 2004), alongside significant increases in heart rate, blood pressure and cortisol, indicative of higher physiological stress. It is widely accepted that increases in work-related stress have a detrimental impact on wellbeing (Dewa, McDaid, & Ettner, 2007; Purba & Demou, 2019; Wolter et al., 2019) and that low levels of cardiorespiratory fitness increase cardiovascular risk if exposed to high occupational stress (Schilling, Colledge, Ludyga, Puhse, Brand, & Gerber, 2019). Therefore, understanding the physical and mental wellbeing in specific cohorts (Demou et al., 2020) can assist in the development of injury prevention strategies and early mental health interventions that are targeted.

It is currently unknown to what extent the occupational demands of the role of a UK police firearms officer affect the physical health and wellbeing of the person in that role. Therefore, the aim of this study is to identify the physical health, wellbeing, and physical activity levels of officers, and to identify the incidence and severity of work-related injuries.

Methods

Participants

All employees of the Northumbria Police Firearms Unit were invited to participate in the study. Participants were recruited via an email invitation distributed through the Northumbria Police internal system. The email explained the purpose of the study and provided a link to the survey. The research was conducted in accordance with the Declaration of Helsinki (1964) and ethical approval was granted by the institutional Ethics Group. The first page of the survey included the participant information, including a description of the study and ethical statements and required the reader to consent to participate by affirmatively selecting to progress to the next step.

Survey development

The survey was developed and administered in Qualtrics (Qualtrics International Inc., Provo, UT), with sampling conducted over one month. Following initial distribution of the survey, a follow-up email was sent to all employees within the Unit after 14 days to improve response rates. Participants self-reported demographic information, general health, PA, and exercise-related health information. The participants then completed a modified version of the International Physical Activity Questionnaire-Short Form (IPAQ-SF) (Craig et al., 2003) and the World Health Organisation Wellbeing Index (WHO-5) (Staehr Johansen, 1998). Lastly, the survey collected self-reported information on work-related injury, with the participants prompted to provide details through free-text boxes of any injuries sustained at work, their nature and severity, and time lost to any injury.

Physical Activity levels were assessed by self-report. The aim was to explore whether PA levels were linked to the rate of injuries sustained. Participants were asked to record how many PA sessions they completed each week and on average how long a session lasted. Participants were also asked to rate their current activity level on a scale of 1 (inactive), 2 (moderately active) and 3 (very active).

Physical Activity levels were assessed by self-report using the International Physical Activity Questionnaire-Short Form (IPAQ-SF). This is a seven-item questionnaire in which participants are required to recall their PA over the previous seven days. The aim was to explore whether PA levels were linked to the rate of injuries sustained. Participants were asked to record how many PA sessions they completed each week and on average how long a session lasted. An explanation of low, moderate, and vigorous intensity was then provided for the participants who were asked to rate each session on a scale of 1 (low intensity), 2 (moderate intensity) and 3 (vigorous intensity). Participants were also asked to rate their current activity level on a scale of 1 (inactive), 2 (moderately active) and 3 (very active).

The World Health Organisation Wellbeing Index (WHO-5) is a five-item questionnaire where participants are asked to rate their subjective wellbeing over the past two-week period. The questionnaire measures six broad conceptual elements including physical health, emotional health, healthy behaviours, work environment, basic access, and life evaluation. The WHO-5 provides a score up to 100, representing best possible wellbeing. The WHO-5 questionnaire has been shown to display excellent validity and discriminatory power across 213 studies (Winther Topp, Østergaard, Søndergaard, & Bech, 2015).

Statistical Analysis

Physical activity and health-related responses were collated and presented as mean (±SD) or percentages of respondents and means were compared between sexes using an independent samples t-test and between levels of PA using one-way ANOVA with an LSD post hoc test to identify the location of significant differences. Examination of whether measures of wellbeing on the WHO-5 scale had a relationship with PA levels were explored through a linear regression analysis. Frequencies of work-related injuries were presented according to type, location, severity, and mode. Injury rates were calculated based on the numbers of firearms officers reported working and presented as number of injuries per 100 FTE workers (Reichard & Jackson, 2010). Injury data were classified according to the IPAQ-SF score, and differences in type, location, severity, and mode were explored using a Chi-squared analysis to identify if increases in PA level and intensity affected injury incidence. Injury types were graded as either low or high severity and a Chi-squared analysis was used to examine if the length of absence from work was related to severity. All statistical analysis was conducted in SPSS v26 (IBM Statistics Ltd, USA).

Results

Health and Wellbeing

In total, 96 employees completed the questionnaire, with a response rate of 83%. Table 1 summarises the characteristics of the study population. The mean age of the firearms officers was 40.0 (± 5.93) years, ranging from 28.9 to 55.4 years. Females made up 8% of the Firearms Unit. Four male participants reported chest pain when exercising. Out of those four participants, two stated this was an occasional feeling of tightness when running long distance, while one stated it was when pushing beyond normal training limits and the other stated it was due to an occasional stitch. Out of three participants that reported chest pain when not exercising (all male), one stated this was muscular strain and the other two reported it was very rare. There were seven participants (7.3%) that reported having dizzy spells out of which one was female. Three of those reported this was due to potential low blood pressure and one due to lack of food. Only eight participants (all male) reported they had been informed they had high blood pressure and of those only two reported they were taking medication for the condition. The percentage of smokers (1%) was substantially less than the UK population average of 14.9% (Office of National Statistics, 2018) and participants who reported drinking alcohol weekly (75%) was higher than the UK average of 58% (NHS Digital, 2018). However, 80% of the participants who reported drinking alcohol drank only on 1 or 2 days per week. Only two participants reported reasons that would prevent them from doing any form of exercise, with 39% reporting a joint problem that could be made worse by exercise. Mean sleep duration was 6.8 ± 1 hours per night and no significant difference in sleep existed between male and female officers.

Self-report shows that on average all participants engaged in 3.8 sessions per week which lasted on average 44 minutes (Table 2). No significant differences in exercise frequency, duration, or intensity existed between sexes, however there was a general tendency for female officers to perform PA more frequently (4.5 times per week) than males (3.7) and for female officers to exercise for a longer duration (51.3 minutes) than males (43.4). Across all measures of self-reported PA activity 13 participants reported engaging in PA at a low level, 57 at a moderate level and 26 at a vigorous level. The percentage of females who engaged in moderate PA (50%) was less than that for males (60%) whereas the percentage of females who engaged in vigorous PA (50%) was higher than that for males (25%). No females engaged in low PA compared to 14% of males who reported that they did.

Females had slightly better self-reported wellbeing scores (61.0) than males (56.8) on the WHO-5 questionnaire (Table 3). Those participants who reported engaging in PA at low levels had a significantly lower wellbeing score on the WHO-5 than both those exercising at moderate ($p = 0.01$) and vigorous ($p = 0.018$) PA levels and this was replicated across the sexes as well. Additionally, a moderate correlation coefficient ($r^2 = 0.42$) was calculated between PA level and WHO-5 score.

Injury Data

In total, 30 (31%) officers were injured in the past 12 months. This equates to an injury rate of 31 injuries per 100 FTE worked within the firearms unit in the previous year. No significant differences in injury rates were observed between age groups, or by number of hours worked. However, male officers reported a significantly higher injury rate (44.3 injuries per 100 FTE) than female officers (12.5 injuries per 100 FTE) ($\chi^2 = 7.9$; $p = 0.022$). Most injuries occurred in officers who exercised three times per week (52%), with a significant decrease in the likelihood of injury when officers trained four or more times per week ($\chi^2 = 14.3$; $p = 0.014$), however the intensity of the exercise was not significantly related to injury occurrence. The most common locations of injury were the lower back (21%) and the knee (21%), followed by the upper back/spine (16%) (Table 4). The most common type of injury was a muscle strain (38%) followed by swelling (13%), while the most common causes of injury were trunk bending (21%) and overuse (21%). Additionally, those who reported an injury in the previous 12 months reported significantly lower ($p = 0.042$) self-reported wellbeing on the WHO-5 scale (52) compared to non-injured officers (59.5).

Of officers who were injured, 50% took no time off work (Table 5). Additionally, 60% of all officers reported that they were unable to continue duty in some form if they were injured. Length of absence was significantly related to the severity of injury ($\chi^2 = 16.2$; $p = 0.04$), with no low severity injuries resulting in longer than three-week absences and the majority (65%) resulting in no time off work. High severity injuries resulted in six officers out of eight being absent from work for 4 weeks or longer. No significant differences in WHO-5 scores were found between officers who suffered low or high severity injuries

Discussion

The aim of the study was to identify the health and wellbeing and physical activity levels of police firearms officers and to identify the incidence and severity of work-related injuries. We found that firearms officers engaged in an average 3.8 sessions of PA per week lasting on average 44 minutes in duration. The majority of PA was classified as moderate or vigorous intensity, and female officers generally engaged in more sessions and longer sessions that the male officers, with a higher percentage of vigorous intensity PA. Mean officer self-reported wellbeing was 57.2 on the WHO-5 scale, and this was influenced by the PA level of the officers with officers who engaging in PA at low levels scoring significantly lower wellbeing scores. Police firearms officers suffered a total of 30 injuries in the previous 12 months, resulting in an injury rate of 31 injuries per 100 person years. The primary locations of injury were the lower back and knee and the most common injury types occurring were muscle strains and swelling, with more severe injuries occurring less often. The leading causes of injury were bending and overuse, followed by role-specific training and actioning arrests.

Thirty-one percent of firearms officers were injured in the previous 12 months. This figure is consistent with previous research on pain and injuries in specialist police officers with between 25.5% and 43.2% reported by Larsen et al. (2018) for single-site pain, and 33% of injured officers reported by Lentz et al. (2020), while prior studies on non-specialist police officers report lower rates of injury of between 4.6% and 25% (Gray & Collie, 2017; Reichard & Jackson, 2010). While it is possible that differences in reporting of injuries will account for some of the variance between our study and existing research, this does provide credence to the influence of the occupational demands experienced by firearms officers resulting in a greater risk of incurring injury. The negative outcome of such high an incidence is a likely disruption to the service that the unit is able to provide through increased absenteeism (Guazzi, Faggiano, Mureddu, Faden, Niebauer, & Temporelli, 2014; Lentz et al., 2019). While such data is unreported for firearms officers, Burton et al. (1996) previously reported absenteeism were 9% greater in police officers wearing body armour. This is especially important as the firearms officer role requires enhanced training, thus making it unfeasible to transfer in non-specialist officers to cover absences, and existing officers from within the unit fill the gap in police coverage through overtime, resulting in additional exposure and possible increased injury risk.

In the current study, half of firearms officers took no time off when injured. The number of work shifts lost to injury has previously been reported to be as high as 1107 over a four-year period in a single force with 170 officers per year (Larsen et al, 2016a), while 63% of Canadian workers who submitted a workers' compensation claim due to injury took no time off (Shannon & Lowe, 2002). As far as we know this is the first time that continuation of work has been reported when police officers have suffered injury in the United Kingdom. While understanding the reasons for this was beyond the scope of the current study, we postulate that this non-reporting may be due to officers attempting to limit the impact on individual or team performance, resulting in presenteeism whereby employees show up for work when ill. Additionally, all officers who took no time off were male and this may indicate an element of machoism within the unit where officers hide an injury.

In common with most other studies (Larsen et al., 2016a; Lentz et al., 2020; Reichard & Jackson, 2010), muscular strains, swelling, and ligament damage/sprains were the most common types of injury reported by the firearms officers. However, the percentage of these injuries (56%) in the current study is lower than in previous studies. A greater proportion of injuries were more severe, including trapped nerves, prolapsed discs, and detached or ruptured muscles, accounting for 29% of the total. Such injuries have not been specifically reported previously, with it likely that the classification falls under the general ‘other’ category (Reichard & Jackson, 2010), and so the opportunity for comparison is limited and we are unsure if such injuries occur more often in the United Kingdom policing or in the specific police group in the current study or if this is more widely observed. It seems that more severe injuries may be more common in firearms officers and this is a concern as they often lead to extended absence of greater than four weeks. While it can be argued that these types of injury may occur by chance or increased demands, it is possible that they are preventable through increased physical conditioning or assessment and reduction of occupational risks. The majority of injuries occurred in the back, the knee, and the shoulder. This is consistent with the findings reported by Reichard & Jackson (2010) in Canadian police officers but contradictory to the data reported in other specialist police forces such as Larsen et al (2016a) where the hand/wrist was the body part most commonly injured.

We hypothesised that firearms officers would suffer injuries related to the specific occupational demands including manual handling of firearms and wearing protective body armour. The most common modes of injury were bending motion, overuse, role-specific training, and actioning arrests, accounting for 59% of all injuries, and this was similar in previous studies. For example, Larsen et al., (2016a) reported arresting non-compliant offenders (31.4%), general duties (21%), and operational training (17.5%) were the predominant mechanisms, while Reichard & Jackson (2010) found that bodily motion and over exertion were the leading injury events for emergency responders. In the current study, three officers reported injuries where vehicular access and physical overload from carrying equipment were the mechanism of injury and these resulted in more severe injuries than other causes. Larsen et al. (2018) highlight the impact of mandatory body armour on general lower back pain. Previous biomechanical studies have indicated altered gait mechanics (Kasovic et al., 2020; Larsen et al., 2016b), decreased mobility (Dempsey et al., 2013; Carlton, Carbone, Stierli, & Orr, 2014), or altered posture (Philips, Bazrgari, & Shapiro, 2015). This may be due to standard load body armour, positioning of hip-mounted gun holsters, or firearm equipment, that create functional restrictions or increase task difficulty (Marins et al., 2020), and this may increase the risk of injury in specialist police officers. The incidence of lower back and shoulder injuries found in the current study indicate a relationship to the occupational demands associated with equipment usage. However, the specific occupational-related biomechanics demands on UK police firearms officers is currently unknown. Further investigation is required to fully understand any impact on their role capabilities.

Injuries were not related to officer age or the number of hours worked per week by the officers, however male officers reported a significantly higher injury rate than female officers. This is not reflected in previous studies that compared injury rates between sexes, with no significant differences reported between male and female police officers (Larsen et al., 2018; Lentz et al., 2019; Nabeel et al., 2007). It is possible that the higher injury rate observed in the current study is due to male officers responding to more serious incidents or hazardous situations. While this needs further investigation to fully understand the potential relationship, it is supported in the current study when considering the mechanism of injury. In female officers, the injuries were caused by equipment overuse or prolonged sitting in a vehicle.

While these were also mechanism of injury in male officers, more traumatic causes were road traffic collisions during a chase, assaulted when actioning arrests, detaining a violent suspect, impact when attending a firearms response, and completing an emergency entry to save a life.

PA impacted on injury likelihood with officers who engaged in four or more sessions per week at significantly lower risk of injury, similar to the dose-response relationship identified by Nabeel et al (2007). Decreases in physical fitness levels are related to higher injury rates in FBI trainees (Knapik et al., 2011), police officers (Lentz et al., 2019; Larsen et al, 2018; Tomes, et al., 2020) and in the military (Canham, McFerren, & Jones, 1996; Heir & Eide, 1997). Increases in the frequency and duration of physical training improve musculoskeletal strength (Grgic, Schoenfeld, Davies, Lazinica, Krieger & Pedisic, 2018) and cardiorespiratory fitness (Lin et al., 2015), and are associated with improved physiological responses that provide protective mechanisms that may prevent less severe physical injuries. Additionally, specialist tactical police units perform law enforcement activities that are more physically demanding than those performed by normal officers (Irving et al., 2019; Strader et al., 2020), further increasing the risk. Therefore, we suggest that firearms officers should participate in enhanced and targeted physical training to increase resilience to injury alongside occupational preparedness.

Wellbeing in the firearms officers was lower than that in the overall UK population of 63.2 (Office for National Statistics, 2019). Previously identified factors affecting mental health, such as job role, operation trauma, and working hours/workload, (Demou et al., 2020), are commonly experienced by specialist police officers and are likely to result in the lower levels of wellbeing reported in the current study. It is possible that wellbeing scores are lower than that reported. Gabarino et al (2013) identified that a culture of hiding mental health issues is prevalent in police forces, with a stigma attached to reporting mental health and wellbeing issues (Demou et al., 2020), however, further investigation of officer wellbeing would be needed to fully understand if this is the case in specialist units. Physical activity has been shown to affect wellbeing in police cohorts (Schilling et al., 2019). In the current study, an association was observed between PA intensity and wellbeing, with those officers who engaged in low intensity PA reporting significantly lower WHO-5 scores, and this was evident in both male and female officers. Furthermore, injured officers reported significantly lower WHO-5 scores than the non-injured officers. As far as we know, this is the first time a specific measure of mental wellbeing has been related to injuries in police officers. While further examination of this is required as it cannot be determined in the current study if the lower WHO-5 score was as a result of, or the cause of injury, it is important for police force organisations to understand and identify the effect of changes in wellbeing in officers and the occupational impact this may produce. As physical activity can act as a ‘stress-buffer’ (Gerber & Puhse, 2009; von Haaren, Ottenbacher, Muenez, Neumann, Boes, Ebner-Priemer, 2016), this further supports the idea that specialist police units should undertake additional physical training due to the wellbeing and injury reduction benefits that it may confer on the officers.

This report has some limitations which represent opportunities for improvement. Physical activity was assessed using questionnaires which are susceptible to recall bias (inaccurate recall of activities due to dependence on memory). Wrist-worn PA monitors are now available at low cost which provides objective measures of PA. This is particularly useful in older age groups who might have problems recalling activity they carried out. Similarly, officers were able to report their own injuries on the online survey and this may result in reporting bias as officers may have under or over-stated the type and severity of injuries or recall bias as the survey asked for information covering the previous 12-month period. While a high response rate was achieved, the female sample size was comparatively small and this may impact on the analysis of injury rates and wellbeing responses, especially when comparing against male colleagues. However, the proportion of male and female respondents accurately reflects the actual composition of the firearms unit.

Conclusions

Over a 12-month period, 96 UK police firearms officers reported 30 work-related injuries equating to 31% of the total unit workforce and an injury rate of 31 injuries per 100 person years. Absenteeism due to injury was limited, with half of all firearms officers taking no time off for recovery. Twenty-nine percent of injuries were classified as severe and the mechanism of the more severe injuries was linked to occupational demands such as manual handling of equipment and protective equipment. Physical activity provided a protective mechanism, with officers who exercised four or more times per week reporting less injuries, while low PA levels were associated with lower WHO-5 scores of wellbeing. These findings suggest that UK police firearms officers are at a high risk of occupational injury and that physical activity may play an important role in reducing injury and improve wellbeing in police firearms officers. This should prompt organisational management to review current procedures to protect officers. Further research is required to identify appropriate PA guidance to prevent injury occurrence and improve physical and mental health.

Declaration of Interests: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Table 1 - Participant characteristics

Characteristics	
Sex (%)	
Male	92 (n = 88)
Female	8 (n = 8)
Age (Years) (Mean ± SD)	40.0 ± 5.9
Chest pain when exercising (%)	
Yes	4.1 (n = 4)
No	95.9 (n = 92)
Chest pain when NOT exercising (%)	
Yes	3.1 (n = 3)
No	96.9 (n = 93)
Fainting or dizzying spells (%)	
Yes	7.3 (n = 7)
No	92.7 (n = 89)
High blood pressure (%)	
Yes	8.3 (n = 8)
No	91.7 (n = 88)
Smoking Status (%)	
Yes	1 (n = 1)
No	99 (n = 95)
Alcohol (%)	
Less than once per week	25 (n = 24)
1 – 2 times per week	60.5 (n = 58)
Several times per week or daily	14.5 (n = 14)
Reason not to exercise (%)	
Yes	2.1 (n = 2)
No	97.9 (n = 94)
Joint problem made worse by exercise (%)	
Yes	39 (n = 38)
No	61 (n = 58)
Sleep (Hours per night)	
Total	6.8 ± 1
Male	6.7 ± 0.95
Female	7.4 ± 0.91

Table 2 – Physical activity levels of police officers

	PA sessions (mean number per week ± SD)	Duration (mean minutes ± SD)	Activity level (Frequency)		
			Low	Moderate	Vigorous
Total	3.8 ± 1.4	44.0 ± 16.0	13	57	26
Female	4.5 ± 1.3	51.3 ± 16.4	0	4	4
Male	3.7 ± 1.4	43.4 ± 15.9	13	53	22

Table 3 – Wellbeing scores of police officers

	WHO-5 (mean score)	WHO-5 mean score by activity level and sex		
		Low	Moderate	Vigorous
Total	57.2	43.4*	60.6	56.4
Female	61	43.4*	64	58
Male	56.8	43.4*	60.4	56.2

* indicates significantly different than moderate or vigorous PA levels (p < 0.05)

Table 4: Injury data of firearms officers

Injury Location	Frequency n (%)	Injury Type	Frequency n (%)	Injury Mode	Frequency n (%)
Lower Back	8 (21%)	**Muscle Strain**	15 (38%)	**Bending**	8 (21%)
Knee	8 (21%)	**Swelling**	5 (13%)	**Overuse**	8 (21%)
Upper Back/Spine	6 (16%)	**Trapped Nerve**	3 (8%)	**Training**	4 (10%)
Shoulder	4 (12%)	**Ruptured Muscle**	2 (5%)	**Arrest**	3 (8%)
Hip	3 (9%)	**Ligament Damage**	2 (5%)	**Vehicle Use**	3 (8%)
Leg	3 (9%)	**Prolapsed Disc**	2 (5%)	**Equipment Overload**	3 (8%)
Neck	2 (6%)	**Inflammation**	2 (5%)	**Lifting**	3 (8%)
Head	1 (3%)	**Joint Damage**	2 (5%)	**Forcing Entry**	2 (5%)
Hand	1 (3%)	**Pain**	1 (3%)	**Impact**	2 (5%)
Chest	1 (3%)	**Detached Muscle**	1 (3%)	**Assault**	1 (3%)
Arm	1 (3%)	**Bruising**	1 (3%)	**RTC**	1 (3%)
		Cut	1 (3%)		

Table 5: Work absenteeism frequency due to work-related injury.

Length of Absence	Frequency
None	15 (50%)
<1 Week	2 (7%)
1 Week	3 (10%)
2 Weeks	3 (10%)
3 Weeks	1 (3%)
4 Weeks	1 (3%)
4 Months	1 (3%)
5 Months	1 (3%)
6 Months	3 (10%)