A Scoping Review of Empirical Literature Associated With Health Behaviours in the Ambulance Worker Population

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ABSTRACT

Introduction: There is an increasing awareness that health behaviours, which form a part of our lifestyle, have a significant impact on our emotional and physical wellbeing. Ambulance workers are at an increased risk of poorer health outcomes. This poses the question whether lifestyle could play a role in emotional and physical health outcomes, which is understudied in this population, thus this paper reviews health behaviours in this population and assess the impact that this may have on their emotional and physical wellbeing.

Methodology: PRISMA Guidelines were adhered to, seven online bibliographic databases (MEDLINE, CINAHL, PsychARTICLES, PsychINFO, Web of Science, PUBMED and Google Scholar) and reference lists of eligible articles were searched. Papers were systematically extracted and selected by title, then by abstract utilising specific inclusion and exclusion criteria.

Findings: The papers included in this review (n= 6) represent a range lifestyle factors (physical activity, smoking, alcohol use and sleep) that potentially impact wellbeing outcomes (weight/body mass index and post-traumatic stress symptoms) of ambulance workers across the western world. Various limitations are discussed in light of the findings of this review.

Conclusion: Ambulance workers engage in negative health behaviours which have some bearing on their emotional and physical wellbeing. Suggestions for further research and practitioner recommendations are made in order to ameliorate the effect.

INTRODUCTION

There is an increasing awareness of the impact of our lifestyle on health outcomes (Dale, Brassington & King 2014; Reiner et al. 2013; Wang & Geng 2019). Lifestyle can be viewed as a collective term to capture various health behaviours, an 'unhealthy lifestyle' may be characterised by a poor diet, physical inactivity, smoking, alcohol use, drug use, stress and so on, a 'healthy lifestyle' being somewhat opposite; engagement in physical activity, maintaining a good diet, and the absence of addiction and/or stress (Farhud 2015). There is a consensus and an abundance of research which suggests that a 'healthy lifestyle' has a positive effect on our emotional and physical wellbeing (Biddle & Asare 2011; Dale, Brassington & King 2014; Reiner et al. 2013; Thorp et al 2011; Walsh 2011; Wang & Geng 2019). Health behaviours can impact all-cause mortality; it is reported in the United States (US) that 40% of deaths can be attributed to poor health behaviours such as physical inactivity, poor diet and/or alcohol misuse (Pirrallo, Levine & Dickison 2005). Similar conclusions have been drawn in the United Kingdom (UK); Kvaavik et al (2010) conducted a prospective cohort study to assess the role of lifestyle on mortality in 4886 individuals. Four 'poor' health behaviours were assessed (cigarette smoking, alcohol intake, physical inactivity, and low fruit and vegetable intake). Engagement in these behaviours was significantly associated with a higher risk of all-cause, cardiovascular disease and cancer mortality (Kavavik et al 2010).

Ambulance workers are repeatedly exposed to potentially traumatic events and suffering (Petrie et al 2018; Wild et al 2016). This exposure has been shown to heighten the risk of a stress reaction and the development of mental health issues including, but not limited to, symptoms of Post-Traumatic Stress Disorder (PTSD), anxiety and depression (Donnelly 2012). Amongst ambulance workers, epidemiological evidence has estimated prevalence

rates of 11% for PTSD, 15% for depression, 15% for anxiety and 27% for general psychological distress (Petrie 2018), compared to 15.7% of common mental disorders in the general population (McManus et al 2016). It is intuitive to suggest that there is a percentage of ambulance workers who do not reportedly experience emotional difficulties, and that not all exposure to trauma is negative (Jenner, 2007; Paton Smith & Violanti 2000). A plethora of individual and lifestyle factors may moderate these effects, but the specific mechanisms by which this occurs have not yet been fully explored or defined in the literature; ambulance personnel remain understudied (Kukowski, King & DeLongis, 2016).

In the United Kingdom (UK) there is an increasing demand for the National Health Service (NHS) with limited resources (McCann, Wankhade & Murphy, 2019; National Audit Office NAO, 2017). NHS ambulance trusts are encountering challenges with recruiting and, more importantly, retaining employees (NAO 2017). One of the most cited reasons for leaving the ambulance service is the stressful nature of the job (NAO 2017). Research on work-related stressors and exposure to trauma widely accepts that the role of an ambulance worker is inherently stressful and may contribute to the onset of mental and physical health issues (Cydulka et al 1997; Davis et al 2019). Whilst there is an abundance of awareness, support and intervention for an ambulance worker's response to emotional and physical stress (i.e. debriefing, trauma focused therapy, trauma informed approaches, physiotherapy, counselling and drug and alcohol screening), the provision of preventative interventions is limited (Donnelly 2015). The World Health Organisation (WHO) has identified that wider concern with health issues should be targeted at prevention (World Health Organisation 2002).

In summary, there is a growing evidence base to suggest that lifestyle may moderate the onset and exacerbation of mental and physical health issues in the general population

(Biddle & Asare 2011; Dale, Brassington & King 2014; Reiner et al 2013; Thorp et al 2011; Walsh 2011). Research shows that prevalence rates of mental health issues are higher in ambulance workers compared with the general population (McManus et al 2016; Petrie et al 2018). Thus, we propose that there is a gap in the literature that needs to be addressed; evidence related to lifestyle, health and wellbeing outcomes in the ambulance worker population is scarce, and an understanding of the implications that this may have on physical and mental health outcomes is limited. Due to the lack of epidemiological data, there is a lack of evidence-based 'preventative interventions' (Kukowski, King & De Longis 2016). Therefore, the scope of this paper is to review the existing evidence base on health behaviours in ambulance workers across the world and assess its applicability to the UK.

METHOD

Search Strategy

Wellbeing is a broad term associated with positive psychological health (i.e. life satisfaction), diagnosed mental health issues (i.e. anxiety, depression, post-traumatic stress disorder) and physical health (Petrie et al 2018). Similarly, lifestyle is a broad term associated with both positive and negative behaviours associated with the everyday functioning of a person (i.e. smoking, alcohol use, physical activity, diet). Key search terms were formulated encompassing the spectrum of words associated with 'wellbeing' and 'lifestyle'.

Emergency services across the world contain a structure or hierarchy of staff who work with varying levels of responsibility and remuneration to reflect this (Mahjan et al 2019; Shakeri et al 2019). Key search terms related to the target population were devised from the principal author's work-related experience and were reviewed by a second author.

A comprehensive search strategy (see Table 1.) was devised and utilised to identify relevant literature by searching the following seven online bibliographic databases;

MEDLINE, CINAHL, PsychARTICLES, PsychINFO, Web of Science, PUBMED, and Google Scholar.

Table 1. Key Search Terms

((smok* OR "Alcohol*" OR "Physical activity" OR "exercise" OR "trauma*" OR "social support" OR "support" OR "risk factor" OR "blood pressure" OR "Obesity" OR "Weight") AND (anxiety OR "stress" OR "depression" OR "PTSD" OR "Post traumatic stress symptoms" OR "PTSS" OR "burnout" OR "quality of life" OR "suicidality" OR "life satisfaction") AND (paramedic* OR "emergency worker*" OR "EMT" OR "Ambulance Attendant")) NOT (epithelial OR "mesenchymal" OR "Transmission")

In order to establish relevance, the following inclusion and exclusion criteria were applied (see Table 2.):

Table 2. Inclusion and Exclusion Criteria

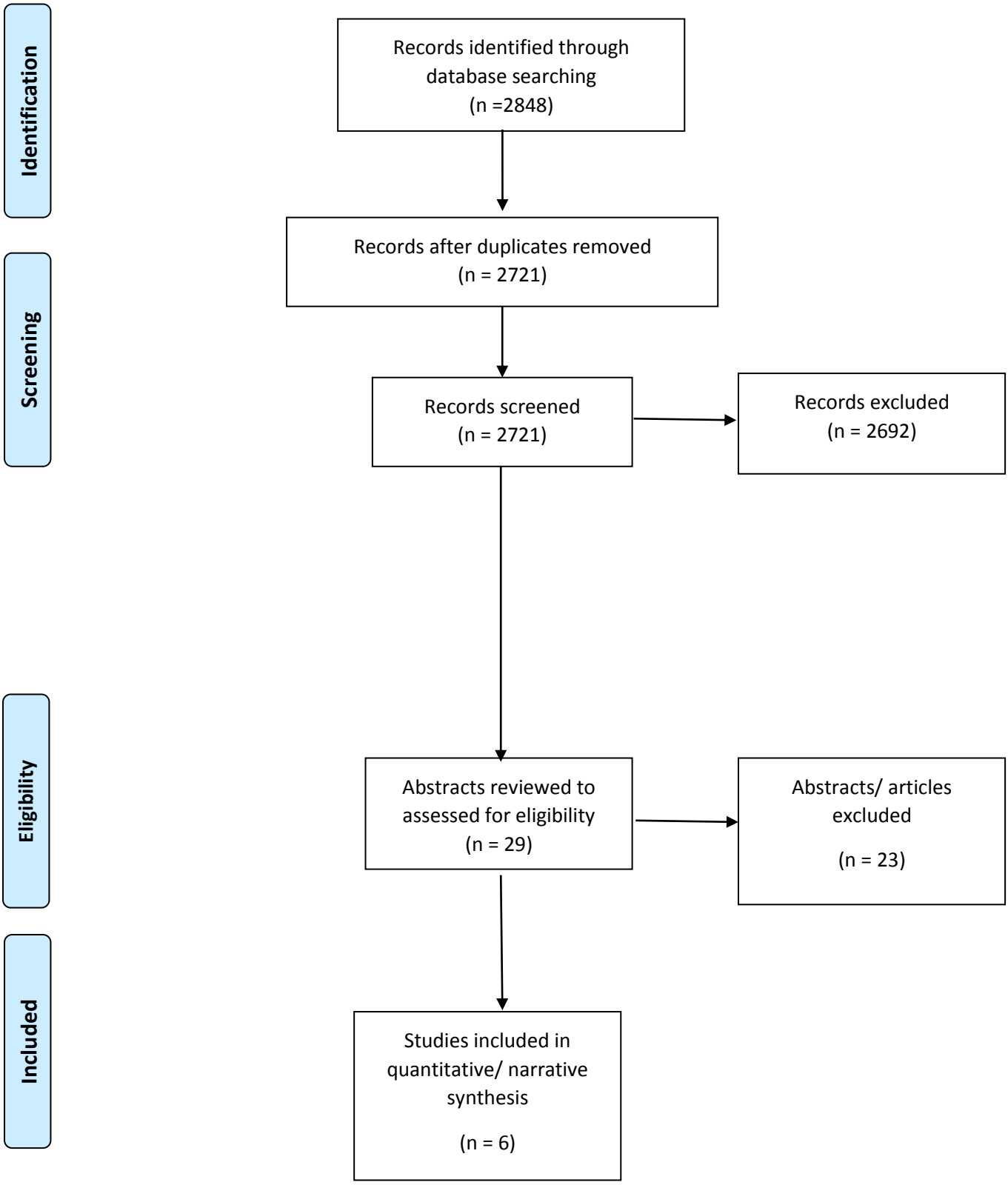
Inclusion criteria	**Exclusion Criteria**
Any year of publication	Volunteer workers
Qualified emergency service workers and/or pre-hospital carers working in the ambulance service (paramedics, emergency medical technician (EMT), emergency care assistant (ECA))	Other emergency worker personnel (nurses, doctors, firefighter and police)
Worldwide	Paper is an opinion piece
Empirical study	Qualitative methods
Quantitative methods utilising surveys,	Focused on patient care or patient related

questionnaires or self-report measures	outcomes
Published in English (due to restriction of authors' native language)	Reference to specific disasters or rescue workers (e.g. 9/11)
Measure of health behaviours (defined as: smoking, alcohol, sleep, physical activity/ inactivity)	Papers written in any other language that has not been translated into English
Full-text articles available	Paper is a review

Data extraction

The principal author conducted initial searches, filtering and reviewing which commenced in October, 2017 and concluded in November, 2019. The aforementioned online databases (MEDLINE, CINAHL, PsychARTICLES, PsychINFO, Web of Science, PUBMED, and Google Scholar) were searched. The total number of hits were 2848; duplicates were removed leaving 2721 hits. Titles were screened, and a total of 29 papers were established to be relevant to the review based on inclusion and exclusion criteria. Full abstracts were further screened for eligibility against the inclusion and exclusion criteria. The final papers (n= 6) were read in full and hand searched to identify additional relevant papers; 0 were eligible for the review. Data was extracted from the final papers and a quality assessment was undertaken with the principle and second author (See Figure 1. for Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow chart).

Figure 1. PRISMA 2009 Flow Diagram



Quality review

A quality review was conducted utilising Timmer, Sutherland & Hilsden's (2003) criteria: 18 quality indicators were used from their criteria and agreed between all authors (Timmer, Sutherland & Hilsden 2003). Each quality indicator was awarded as follows (unless otherwise specified) in line with Timmer, Sutherland and Hilsden's (2003) scoring; 2 points for full detail, 1 point for partial detail and 0 points for insufficient or no detail. The above scoring criteria was applied to assess these aspects of each article: *description of objective, appropriate design* (i.e. prospective cohort design, retrospective cohort design, cross-sectional, case control, case report/series, scored, 4, 3, 3, 3, 1 respectively), *participant characteristics described, appropriate participant sample, control group, method of participant selection, outcome measures used* (validated self-report materials, or objective measures), *accountability of confounding variables, adequate sample size, appropriate reporting of statistical tests, reporting and analyses, attrition reported, and results supporting conclusions.* The total score that could be obtained was 28. The second author also reviewed the papers and scoring was agreed with zero discrepancies. Quality scoring ranged from 18/28 to 23/28, it was agreed with both reviewers that any score between 18-20 was adequate and 20> was good.

A descriptive analysis was undertaken of the final papers in the review (n= 6). A meta-analysis was not feasible due to the variability of measurement outcomes in each study. It is worth noting that the studies included in this review each had different aims and objectives not necessarily consistent with the aims of this review. It could be argued that our findings are somewhat serendipitous and reflective of the research field, being that there is limited evidence on the health behaviours of those who work in the emergency services. Hereon, whilst 'ambulance worker' is the main term used referring to the target population,

there may be some variations i.e. ‘emergency medical technical (EMT)’, or ‘emergency personnel’.

RESULTS

Characteristics of research

The papers included in this review (*n*= 6) represent a range lifestyle factors that impact wellbeing outcomes of ambulance workers across the western world (Betlehem et al 2013; Hegg-Deloye et al 2014; Kukowski, King & De Longis 2016; Pirrallo, Levine & Dickison 2005; Studnek et al 2010; Wild et al 2016). The following table displays the main characteristics of the reviewed papers (see Table 3.).

Table 3. Characteristics Table

Author and Location	**Participant Demographics**	**Measures**	**Outcomes** **Physical health = PH** **Mental health = MH**	**Variables of relevance**
Betlehem et al (2013) Hungary	*n*= 364; recruited from the Hungarian National Ambulance Service (HNAS), Hungary	Literature based questionnaire on self-perceived health status defined as self-rated health, self-rated physical fitness, limitation of daily activities by health problems and chronic health problems	PH	Thirteen variables, five of which were relevant to this review and related to 'lifestyle' (self-rated health, self-rated fitness, limitation in daily activities, leisure time and addictions)
Hegg-Deloye et	*n*= 295 paramedics, *n*= 283 controls;	18-item self-report questionnaire to collect data on, age, height, body	PH	Nine variables, three of which related to lifestyle and are included in this review (BMI, tobacco consumption and

al (2014) Canada	recruited from any paramedic/ ambulance worker living in province of Quebec, Canada and controls included office workers, university staff, self-employed people, marketers, sales people and research centre staff	weight in the first year of employment, current age, height, body weight, tobacco consumption and current date; Pittsburgh Sleep Quality Index (PSQI); Job content questionnaire and effort reward model; Three Factor eating questionnaire		sleep)
Kukowski, King and De Longis	*n*= 87; recruited from Canadian metropolitan areas	Sleep measured by one tool from the PQSI; PTSD Checklist Civilian Version (PCL-C); Maslach burnout	MH	Three variables; sleep, PTSD symptoms and burnout relevant

(2016) Canada		inventory (MBI)		
Pirrallo, Levine and Dickison (2005) USA	*n*= 1919; recruited from Health Behaviour Risk Survey	Health behavioural risk surgery (HBRS); Motor vehicle occupant safety survey (MVOSS)	PH	Four risk factor variables of interest (alcohol consumption, cigarette smoking, moderate and vigorous physical activity)
Studneck et al (2010) USA	*n*= 30,560; recruited from national registry of Emergency Medical Technicians	Utilised validated items from the behavioural risk factor surveillance system (BRFSS);	PH	Seven variables, five of which were relevant to this review (existing heath conditions, general health, BMI, physical activity outside of work and cigarette smoking patterns)

Wild et al (2016) England	*n*= 453 initially and *n*= 386 in follow-up; recruited from London Ambulance Service (LAS), England	Trained psychologists administered the Structured Clinical Interview for the DSM-IV; Life Events Checklist; subscale of Eysenck's personality questionnaire; The anxiety sensitivity inventory; The anxiety sensitivity inventory; Connor-Davison resilience questionnaire; Attitude to emotional expression questionnaire; The depressive attributions questionnaire; The PT cognitions inventory; The responses to intrusions questionnaire; Sub scale from COPE questionnaire; The	PH and MH	Seventeen variables in total, four of which were relevant to this review (alcohol use, self-reported weight changes, self-reported smoking status and insomnia severity)

		crisis support scale. Completed at follow up: Alcohol Use Disorders Identification Test (AUDIT); self-reported days off work by participants; self-report weight changes; self-reported smoking status; Insomnia severity index; The quality of life enjoyment and satisfaction questionnaire		

Body Mass Index (BMI)

Of the six reviewed papers, three provided some insight into weight and ambulance workers (Hegg-Deloye et al 2014; Studnek et al 2010; Wild et al 2016;). The findings were consistent across all the reviewed papers. Self-reported data on weight was converted into Body Mass Index (BMI) by the researchers in two of the three papers (Hegg-Deloye et al 2014; Studnek et al 2010). Hegg-Deloye et al's (2014) retrospective study of 295 paramedics, and Studnek et al's (2010) cross-sectional study of 30,560 registered emergency medical technicians, established a significant association ($p<.0001$) between gender and BMI. It was highlighted that men reported a higher BMI than women (Hegg-Deloye et al 2014; Studnek et al 2010). Hegg-Deloye et al (2014) included a control group where a significant interaction between time and occupation was established, being that paramedics were more likely to gain weight during the course of their employment than any other occupation. With regards to associations between mental health and weight, Wild et al (2016) conducted a prospective cohort study with 453 newly recruited paramedics and found a relationship between weight gain and PTSD.

Physical activity

Three of the six papers in this review explored physical activity (Betlehem et al 2013; Pirrallo, Levine & Dickison 2005; Studnek et al 2010). In two of the three studies, associations between gender and physical activity were explored, and findings in both studies were consistent (Pirrallo, Levine & Dickison 2005; Studnek et al 2010). In an attempt to objectively represent physical activity, Studnek et al (2010) utilised the Centre for Disease Control (CDC) guidelines on physical activity to offset results of participant's self-reported physical activity. It was found that males were more likely than females to report meeting the CDC recommendations. Similarly, in Pirrallo et al's (2010) cross-sectional study of 1919

emergency medical technicians, it was reported that women were less likely to participate in vigorous activity.

Betlehem et al (2013) was the most recent study to report on an aspect physical activity. The cross-sectional study of 364 participants, recruited from the Hungarian National Ambulance Service, established that those who participated in any type of sports or physical activity reported significantly better self-perceived health than those who did not (Betlehem et al 2013).

Smoking

Four papers reported on cigarette or tobacco use. Two papers contributed to the research field from a demographic perspective (Pirrallo, Levine & Dickison 2005; Studnek et al 2010) and the other two explored the impact of smoking (Hegg-Deloye et al 2014; Wild et al 2016). Self-report measures were used in all papers to capture participant data. With regards to gender, it was established that females EMTs were significantly more likely to smoke than male EMTs (p=0.0188) (Pirrallo, Levine & Dickison 2005). Furthermore, it was found that that those ambulance workers who were meeting physical activity guidelines were less likely to smoke (Studnek 2010). There was also evidence that those who self-reported as obese were less likely to smoke (Studnek 2010).

The remaining papers conducted multivariate analysis to establish the impact of smoking on health (Hegg-Deloye et al 2014; Wild et al 2016). One paper indicated that tobacco use had a significant impact on BMI, where those who smoked fewer cigarettes had a lower chance of gaining weight (Hegg-Deloye et al 2014). This contradicts Studnek et al's (2010) findings. Furthermore, relating to mental health outcomes, Wild et al (2016) reported that those who developed PTSD were more likely to smoke.

Sleep

Of the six papers, two assessed sleep in ambulance workers (Hegg-Deloye et al 2014; Kukowski, King & De Longis 2016). Kukowski, King and De Longis' (2016) cross-sectional study of 87 Canadian paramedics utilised three validated measures to assess sleep, post-traumatic stress symptoms (PTSS) and burnout. Regression models revealed that lower sleep quality was associated with PTSS when burnout was high (Kukowski, King & De Longis 2016); highlighting that PTSS could play a damaging role in paramedic health in the sense of impact on sleep quality. Conversely, Hegg-Deloye et al (2014) briefly reported that there were no significant effects of sleep on BMI.

Alcohol

In this review, two papers explored alcohol use in ambulance personnel (Pirrallo, Levine & Dickison 2005; Wild et al 2016). Pirrallo, Levine and Dickison (2005) conducted a range of analysis on 'risk taking behaviours', one of which was alcohol consumption. Comparisons were made between the career level of ambulance workers (either basic level EMT or paramedic) and gender which was against a control group (US National Estimates) (Pirrallo, Levine & Dickison 2005). When comparing EMT level, basic level EMTs were found to drink less than their paramedic counterparts, however, once demographic differences were controlled for in analysis, no differences were reported. Significant differences were established between genders, whereby male EMTs were increasingly likely to drink more alcohol than females ($p<0.0001$). When compared with US national estimates, alcohol consumption was not lower than, and did not exceed that of other similar adults (the control group) (Pirrallo, Levine & Dickison 2005). Alcohol consumption was assessed by validated questionnaire in Wild et al's (2016) study, the Alcohol Use Disorders Identification

Test (AUDIT) (Babor et al 2001). It was reported that a significant reduction in the AUDIT score was reported at the 2-year follow up in paramedics.

DISCUSSION

In line with the aforementioned aim of this paper, we reviewed ambulance workers' engagement in various health behaviours and have presented findings to illustrate the associations and impact that these have on emotional and physical wellbeing. Overall, we can observe that ambulance workers are more likely to gain weight throughout their employment, that physical activity differs between genders, that engagement with smoking has a negative impact on emotional and physical health, and that alcohol intake was no higher in this occupational group than the general population. The significance of individual lifestyle choices and engagement in certain behaviours is important within the ambulance services due to their exposure to emotionally and physically strenuous activities (Petrie et al 2018).

The literature suggests that males reported higher BMI (Hegg-Deloye et al 2014; Studnek et al 2010); this contradicts existing epidemiological data for the general population which suggests that obesity is higher amongst women (Arroyo-Johnson & Mincey 2016). There was further evidence to suggest increasing BMI may be problematic for ambulance workers (Hegg-Deloye et al 2014). These findings suggest occupation specific factors may impact the lifestyle, subsequently BMI of this population, thus the evidence suggests that weight is a variable that could be monitored in ambulance workers as weight is a contributing factor to all-cause mortality. This mirrors the findings reported by Studnek et al (2010) where those who were identified as obese were more likely to report existing health conditions.

Arguably one of the biggest influencers of weight gain is physical inactivity or a sedentary lifestyle; physical activity is associated with weight loss (Thorp et al 2011). The findings in this review were consistent with this idea; physical activity improves self-reported

health (Betlehem et al 2013). The papers in this review reported evidence that male ambulance workers were more likely to engage in physical activity (Pirrallo, Levine & Dickison 2005; Studnek et al 2010). Given the current evidence base that would suggest physical activity ameliorates weight gain it is intuitive to suggest that this finding refutes the earlier point that males are more likely to be obese (Hegg-Deloye et al 2014). However, we were unable to establish a control for the level of exercise and there is an evidence base to suggest that, generally, physical activity is lower amongst ambulance workers which would explain the above finding related to BMI (Barret 2016). Further, there is increasing recognition that BMI and weight are complex variables with many influencing factors rather than physical activity alone (Wang & Geng 2019). To illustrate, research outside of this review has explored the role of Social Cognitive Theory (Bandura 2011) in physical activity where it has been found that self-efficacy and self-regulation play an important role in physical activity participation (Mailey et al 2016). It has been established that prioritisation and planning are key to improve self-efficacy (SE) and self-regulation (SR) (Mailey et al 2016). Although there may be external factors acting as barriers to physical activity such as time and financial constraints (Betlehem et al 2013). It could be inferred that for this occupational group SE and SR could be difficult to establish and maintain due to organisational stressors i.e. shift work and overtime and potential personal or family commitments which may deplete these internal resources.

Like physical inactivity, it is generally accepted that smoking is a maladaptive health behaviour (Pirrallo, Levine & Dickison 2005). Overall, the consensus in this review is that smoking was reported and associated with poorer mental and physical health outcomes in this population (Hegg-Deloye et al 2014; Pirrallo, Levine & Dickison 2005; Studnek et al 2010; Wild et al 2016;). In the context of this review, we were unable to establish whether this was occupation specific; however, given that the abundance of research that suggests the negative

impacts of smoking, this is not surprising. In addition, it is noteworthy that smoking prevalence remains high in populations with mental health issues (Burki 2016), thus may be inferred, due to the higher prevalence of mental health issues in ambulance workers, that smoking may be higher in this occupation. This was also reported in Wild et al's (2016) study, however the correlations between smoking and PTSD should be taken with caution as causality cannot be assumed. Whilst the findings in our review are somewhat supportive of the notions in existing research, the diversity of the ways in which smoking was assessed in the reviewed studies, makes it difficult to draw firm conclusions nor can we identify whether this is an occupation-specific behaviour. Nevertheless, it is important to focus and tailor interventions, as suggested by Taylor, McNeill, Girling et al (2014), whose systematic review reported that smoking cessation was associated with reductions in depression, anxiety and stress.

Similarly, evidence varied regarding the impact of sleep on psychological and physical wellbeing. Although it is widely accepted that sleep deprivation has a negative impact on emotional and physical wellbeing and functioning (Orzeł-Gryglewska 2010), the findings in this review were not conclusive; this could be attributable to the fact that the papers were assessing the impact of sleep on different variables (PTSS and BMI). Given that shift work is a frequently cited occupational stressor for ambulance workers it is surprising that the assessment of the variable in this study yielded inconclusive findings, yet is likely to again to be explained by limitations of this review with the specified inclusion and exclusion criteria. Further, the review identifies that alcohol use was not a problematic health behaviour per se; it was reported that alcohol use in this occupation group was not any higher than in the general population. Furthermore, in one prospective study levels of alcohol consumption *decreased* (Wild et al 2016). However, that is not to say that the level of consumption in the general population was in line with recommendations.

LIMITATIONS

This review is restricted in drawing firm conclusions due to limitations of the studies included in the review (see Table 4.). The papers in this review were limited to research based in Westernised countries. Emergency services operate all over the world, providing a varying quality of service and this limitation has implications for the external validity of the findings. Additionally, the small number of reviewed papers limits the reliability of the data and prevents the possibility of conducting of a meta-analysis to draw clearer conclusions about the impact or role of lifestyle on ambulance workers' wellbeing. However, this is reflective of the research field, which in itself is sparse and understudied (Kukowski, King & De Longis 2016).

Table 4. Limitations of Reviewed Studies

Limitation	Studies
Reliance of self-report data, this raises risk of response set bias and social desirability (Field 2013) which is reportedly more pronounced in recalling negative health behaviours (Perry et al 1995).	Betlehem et al (2013), Hegg-Deloye et al (2014)
BMI was utilised as a health indicator in the reviewed studies, calculated from self-reported height and weight. However, there are caveats with BMI as a measure (Gorber et al 2007). A systematic review of 64 studies that measured BMI and self-reported height and weight established that overall, data trends illustrate under-reporting of weight, and over reporting of height. Given these are the two variables utilised to calculate BMI, the	Hegg-Deloye et al 2014, Studnek et al 2010, Wild et al 2016

utility of BMI as a reliable measure is open to criticism (Gorber et al 2007).	
Self-report on physical activity was frequently measured by closed questions and variables often dichotomised (e.g. 'yes, no'), this fails to account for individual differences and findings may not be representative. The notion of being physically active differs among individuals and being asked 'are you physically active?' is not a straightforward question. A person may not regard themselves as 'physically active' due to societal biases on how 'physical activity' may be defined.	Hegg-Deloye et al 2014, Pirrallo, Levine and Dickison 2005, Studnek et al 2010
A range of methods were utilised to collect the self-reported data in the reviewed studies; online, telephone, re-certification registers and self-report with monitoring each posing their own limitations due to reliance on participants' accuracy, interpretation and self-awareness.	Pirrallo, Levine and Dickison 2005, Hegg-Deloye et al 2014, Studnek et al 2010, Wild et al 2016
Although the sample of studies included in this review are primarily from western countries, to apply this to a specific nation's ambulance service is naïve in approach. There is diversity not only within different countries and communities but also within services (Mahjan et al 2019; Shakeri et al 2019).	Betlehem et al (2013), Pirrallo, Levine and Dickison 2005, Hegg-Deloye et al 2014, Studnek et al 2010,

	Kukowski, King & De Longis 2016, Wild et al 2016

RECOMMENDATIONS FOR FUTURE RESEARCH

Recommendations for future research and practice were raised in the papers reviewed. It has been reported that there is no single method to ameliorate the impacts of emotional and physically demanding working (Betlehem et al 2013). Although findings appeared not to be occupation specific, there is a general consensus among the reviewed papers that preventative interventions specific to this occupational group should be offered (Betlehem et al 2013; Hegg-Deloye et al 2014; Kukowski, King & De Longis 2016; Pirrallo, Levine & Dickison 2005; Studnek et al 2010; Wild et al 2016). A range of interventions were suggested: lifestyle interventions (Betlehem et al 2013), interventions to prevent maladaptive eating behaviours at work (Hegg-Deloye et al 2014), interventions that foster a sense of personal accomplishment to improve sleep quality and overall health (Kukowksi, King, De Longis 2016), behavioural risk reduction programmes (Pirrallo, Levine & Dickison 2005), resilience focused interventions (Wild et al 2016) and interventions that improve diet and increase physical activity with recommendations of an on-the-job fitness centre and monetary incentives (Hegg-Deloye et al 2014).

Based on this review, several lines of enquiry for future research are warranted ahead of any intervention development to support ambulance workers' wellbeing. Given that evidence from this review is limited, future researchers and practitioners may wish to a) further explore health behaviours and lifestyle in ambulance workers through use of validated

measures related to lifestyle factors and/or b) assess and examine the role and impact of health behaviours and lifestyle in ambulance workers. From a methodological perspective, whilst questionnaires as a means of data collection are a time effective method and can collect useful epidemiological data, surveys are not necessarily the best method to capture the complexities of behaviours (Field 2013). In the future, mixed methods, including use of objective measures, could be utilised to capture and address the complexities and barriers to constructive health behaviours. Finally, should interventions be tailored to this occupation, inter- and intra-national, cultural and organisational differences should be considered when applying findings.

CONCLUSION

This review provides a summary of health behaviours within the ambulance worker population in the western world in line with PRISMA guidelines. It can be seen from the review that ambulance workers engage with both positive and negative health behaviours (i.e. physical activity, smoking, alcohol intake) and the impact that this has on emotional and physical wellbeing varies. Further research is warranted as to assess where there are differences between the general population and this occupation; dependent on findings, this would provide further rationale towards the development and provision of a dedicated, evidence-based, occupation-specific intervention.

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Table 1. Key Search Terms

((smok* OR "Alcohol*" OR "Physical activity" OR "exercise" OR "trauma*" OR "social support" OR "support" OR "risk factor" OR "blood pressure" OR "Obesity" OR "Weight") AND (anxiety OR "stress" OR "depression" OR "PTSD" OR "Post traumatic stress symptoms" OR "PTSS" OR "burnout" OR "quality of life" OR "suicidality" OR "life satisfaction") AND (paramedic* OR "emergency worker*" OR "EMT" OR "Ambulance Attendant")) NOT (epithelial OR "mesenchymal" OR "Transmission")

Table 2. Inclusion and Exclusion Criteria

Inclusion criteria	**Exclusion Criteria**
Any year of publication	Volunteer workers
Qualified emergency service workers and/or pre-hospital carers working in the ambulance service (paramedics, emergency medical technician (EMT), emergency care assistant (ECA))	Other emergency worker personnel (nurses, doctors, firefighter and police)
Worldwide	Paper is an opinion piece
Empirical study	Qualitative methods
Quantitative methods utilising surveys, questionnaires or self-report measures	Focused on patient care or patient related outcomes
Published in English (due to restriction of authors' native language)	Reference to specific disasters or rescue workers (e.g. 9/11)
Measure of health behaviours (defined as: smoking, alcohol, sleep, physical activity/ inactivity)	Papers written in any other language that has not been translated into English
Full-text articles available	Paper is a review

Figure 1. PRISMA 2009 Flow Diagram

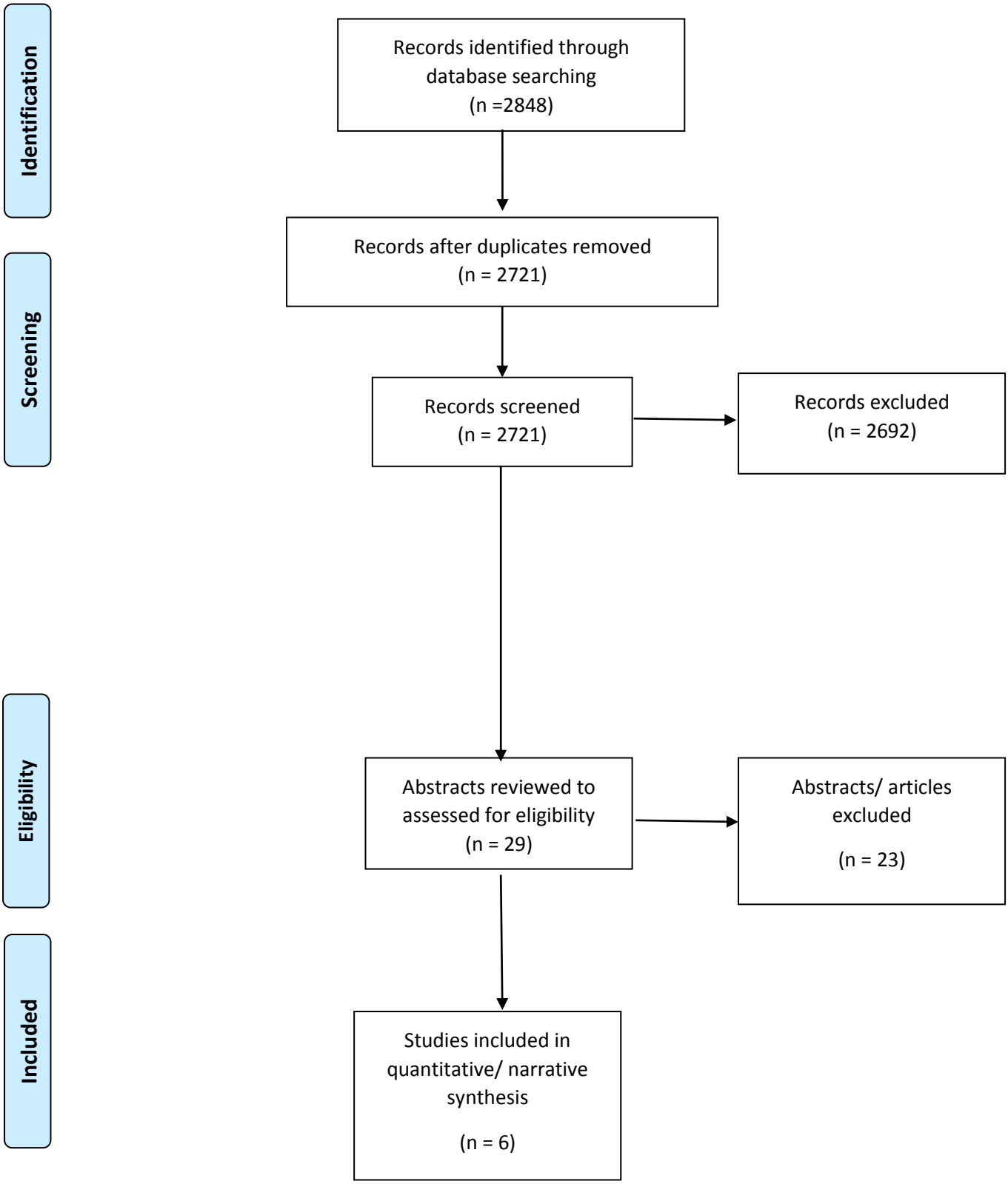

Table 3. Characteristics Table

Author and Location	**Participant Demographics**	**Measures**	**Outcomes** **Physical health = PH** **Mental health = MH**	**Variables of relevance**
Betlehem et al (2013) Hungary	*n*= 364; recruited from the Hungarian National Ambulance Service (HNAS), Hungary	Literature based questionnaire on self-perceived health status defined as self-rated health, self-rated physical fitness, limitation of daily activities by health problems and chronic health problems	PH	Thirteen variables, five of which were relevant to this review and related to 'lifestyle' (self-rated health, self-rated fitness, limitation in daily activities, leisure time and addictions)
Hegg-Deloye et	*n*= 295 paramedics, *n*= 283 controls;	18-item self-report questionnaire to collect data on, age, height, body	PH	Nine variables, three of which related to lifestyle and are included in this review (BMI, tobacco consumption and

al (2014) Canada	recruited from any paramedic/ ambulance worker living in province of Quebec, Canada and controls included office workers, university staff, self-employed people, marketers, sales people and research centre staff	weight in the first year of employment, current age, height, body weight, tobacco consumption and current date; Pittsburgh Sleep Quality Index (PSQI); Job content questionnaire and effort reward model; Three Factor eating questionnaire		sleep)
Kukowski, King and De Longis	*n*= 87; recruited from Canadian metropolitan areas	Sleep measured by one tool from the PQSI; PTSD Checklist Civilian Version (PCL-C); Maslach burnout	MH	Three variables; sleep, PTSD symptoms and burnout relevant

(2016) Canada		inventory (MBI)		
Pirrallo, Levine and Dickison (2005) USA	*n*= 1919; recruited from Health Behaviour Risk Survey	Health behavioural risk surgery (HBRS); Motor vehicle occupant safety survey (MVOSS)	PH	Four risk factor variables of interest (alcohol consumption, cigarette smoking, moderate and vigorous physical activity)
Studneck et al (2010) USA	*n*= 30,560; recruited from national registry of Emergency Medical Technicians	Utilised validated items from the behavioural risk factor surveillance system (BRFSS);	PH	Seven variables, five of which were relevant to this review (existing heath conditions, general health, BMI, physical activity outside of work and cigarette smoking patterns)

Wild et al (2016) England	*n*= 453 initially and *n*= 386 in follow-up; recruited from London Ambulance Service (LAS), England	Trained psychologists administered the Structured Clinical Interview for the DSM-IV; Life Events Checklist; subscale of Eysenck's personality questionnaire; The anxiety sensitivity inventory; The anxiety sensitivity inventory; Connor-Davison resilience questionnaire; Attitude to emotional expression questionnaire; The depressive attributions questionnaire; The PT cognitions inventory; The responses to intrusions questionnaire; Sub scale from COPE questionnaire; The crisis support scale.	PH and MH	Seventeen variables in total, four of which were relevant to this review (alcohol use, self-reported weight changes, self-reported smoking status and insomnia severity)

		Completed at follow up: Alcohol Use Disorders Identification Test (AUDIT); self-reported days off work by participants; self-report weight changes; self-reported smoking status; Insomnia severity index; The quality of life enjoyment and satisfaction questionnaire		

Table 4. Limitations of Reviewed Studies

Limitation	Studies
Reliance of self-report data, this raises risk of response set bias and social desirability (Field 2013) which is reportedly more pronounced in recalling negative health behaviours (Perry et al 1995).	Betlehem et al (2013), Hegg-Deloye et al (2014)
BMI was utilised as a health indicator in the reviewed studies, calculated from self-reported height and weight. However, there are caveats with BMI as a measure (Gorber et al 2007). A systematic review of 64 studies that measured BMI and self-reported height and weight established that overall, data trends illustrate under-reporting of weight, and over reporting of height. Given these are the two variables utilised to calculate BMI, the utility of BMI as a reliable measure is open to criticism (Gorber et al 2007).	Hegg-Deloye et al 2014, Studnek ey al 2010, Wild et al 2016
Self-report on physical activity was frequently measured by closed questions and variables often dichotomised (e.g. 'yes, no'), this fails to account for individual differences and findings may not be representative. The notion of being physically active differs among individuals and being asked 'are you physically active?' is not a straightforward question. A person may not regard themselves as 'physically active' due to societal biases on how 'physical activity' may be defined.	Hegg-Deloye et al 2014, Pirrallo, Levine and Dickison 2005, Studnek et al 2010

A range of methods were utilised to collect the self-reported data in the reviewed studies; online, telephone, re-certification registers and self-report with monitoring each posing their own limitations due to reliance on participants' accuracy, interpretation and self-awareness.	Pirrallo, Levine and Dickison 2005, Hegg-Deloye et al 2014, Studnek et al 2010, Wild et al 2016
Although the sample of studies included in this review are primarily from western countries, to apply this to a specific nation's ambulance service is naïve in approach. There is diversity not only within different countries and communities but also within services (Mahjan et al 2019; Shakeri et al 2019).	Betlehem et al (2013), Pirrallo, Levine and Dickison 2005, Hegg-Deloye et al 2014, Studnek et al 2010, Kukowski, King & De Longis 2016, Wild et al 2016