General Dental Council

Mental Health and Wellbeing in Dentistry: A Rapid Evidence Assessment.

Commissioned by the General Dental Council

Anastasios Plessas[1], Martha Paisi[1,2], Marie Bryce[1], Lorna Burns[1], Timothy O' Brien[1], Robert Witton[1,2], Yaniv Hanoch[3]

[1]University of Plymouth, Faculty of Health

[2]Peninsula Dental Social Enterprise

[3]University of Southampton, Business School

June 2021

UNIVERSITY OF PLYMOUTH

Peninsula Dental Social Enterprise

UNIVERSITY OF Southampton

Abbreviations	
BDA	British Dental Association
BDS	Bachelor of Dental Surgery (undergraduate)
CDS	Community Dental Service
CPD	Continuing Professional Development
DCP	Dental Care Professional
DCT	Dental Core Trainee
DPL	Dental Protection Limited (dental indemnifier)
DHT	Dental Hygiene and Therapy
GDC	General Dental Council
GDP	General Dental Practitioner
NHS	National Health Service
REA	Rapid Evidence Assessment
UDA	Units of Dental Activity
WHO	World Health Organisation

Table of Contents

Published: 3 June 2021

ISBN: 978-1-911654-07-0

1 Acknowledgements

This research has been commissioned by the General Dental Council (GDC). The views and opinions expressed in this publication are those of the authors and do not necessarily reflect those of the GDC.

The authors would like to thank the members of the Expert Reference Group for their contribution and who gave of their time and expertise voluntarily in the following stages of the project:

- Review of the project protocol.
- Review of the lists of included and excluded studies.
- Discussion of project implications for policy, practice, and education.

Expert Reference Group membership

- Fiona Ellwood BEM (Patron and Executive Director of the Society of British Dental Nurses Mentor)
- Professor Jenny Gallagher MBE (Dean for International Affairs at the Faculty of Dentistry, Oral & Craniofacial Sciences at King College London)
- Dr. Marina Harris (Senior Lecturer and Periodontology Lead in the University of Portsmouth Dental Academy)
- Dr. Suzy Jordache
- Roz McMullan (Chair of Probing Stress in Dentistry in Northern Ireland ((NI)) and previously, President of the British Dental Association, 2019)
- Professor Tim Newton (Professor of Psychology as Applied to Dentistry at King's Collage London)
- Dr. Sandra White (Former Director of Dental Public Health at Public Health England)
- Professor John Whitworth (Professor of Endodontology and Director of Student Progress and Support at Newcastle University)

2 Executive summary

Background

The General Dental Council (GDC) regulates registered dentists and dental care professionals and the training and professional development they undertake. Its overarching regulatory objective is to protect the public and ensure that registrants can meet the required professional standards. The GDC's remit means that it is important to understand as much as possible about the mental health and wellbeing challenges that dental professionals experience and implications for the services they provide. This rapid evidence assessment commissioned by the GDC is designed to collate and synthesise the available evidence to answer the following research questions (RQ). The RQ's were:

RQ(i): What is the prevalence of mental health and wellbeing issues amongst registered members of the dental team and dental professions students in the UK, what are the contributing factors and impacts and how these have changed over the past 14 years?

RQ(ii): What techniques and preventive methods/interventions have been used and evaluated to improve or tackle mental health issues among dental team members and dental professions students in countries of very high human development over the past 14 years?

RQ(iii): What techniques and preventive methods/interventions have been used and evaluated to improve or tackle mental health issues amongst other registered health professionals?

Methodology

A review protocol was set a priori and reviewed by an Expert Reference Group (ERG) whose members were invited to contribute voluntarily on the basis of their topic expertise. ERG members provided input at three points, framing the review protocol (the approach taken to the review), reviewing selected references, and reviewing and discussing key findings and implications. The reporting of the findings conforms to PRISMA guidelines (Moher et al., 2009). For RQ(i) and RQ(ii), Varker's rapid evidence assessment methodology was utilised to systematically search and synthesise the identified evidence (Varker et al., 2015). For RQ(iii), an umbrella review methodology was followed (Aromataris et al., 2015). An experienced information specialist conducted the literature searches. The searching date range was set to be 2006 (when the GDC opened the Dental Care Professionals (DCPs) register) to date. Relevance screening and data extraction were performed by two independent reviewers. Critical appraisal was performed for RQ(ii) and RQ(iii) independently

by two reviewers using validated tools appropriate for the type of included studies (Armijo-Olivo et al., 2012; Shea et al., 2017). A 'best evidence threshold approach' was employed for RQ(iii), according to which only systematic reviews of high and moderate-quality were included in the evidence synthesis (Meline, 2006).

RQ(i) Prevalence and impacts

Thirty-two studies met the inclusion criteria. Eighteen studies focussed on dentists, in which general dental practitioners (GDPs) were the most common sample population. Thirteen recruited dental professions students (dental (BDS) and dental hygiene and therapy (DHT) students only) and two a mixture of dentists and DCPs.

Prevalence

Prevalence data measured by validated tools were identified for anxiety, burnout, depression, psychological health, resilience, stress and wellbeing. There was a variety of tools used among the studies, which made direct comparisons problematic.

Dentists

GDPs were found to experience higher levels of anxiety than dentists in other fields of dentistry, such as community, hospital, armed forces and public health dentists (Collin et al., 2019). Studies showed high levels of burnout among dentists, with GDPs being the most severely affected (Denton et al., 2008; Collin et al., 2019). An increase in the proportion of dentists showing signs of burnout through the years was noted (Kay and Lowe, 2008; Denton et al., 2008; Collin et al., 2019). Data for depression amongst dentists was presented only in one study (Brown et al., 2010). Figures for psychological health varied among the studies, showing that almost half of the dentists surveyed suffered from psychological ill-health, with GDPs and community dentists reporting poorer psychological health than those in other fields of practice (Gorter and Freeman, 2011; Collin et al., 2019). High levels of stress have been reported among dentists (Kemp and Edwards, 2014; Collin et al., 2019), with GDPs and community dentists as well as dentists working in England (Kemp and Edwards, 2014; Collin et al., 2019) displaying higher levels of stress. Although Kay and Lowe (2008) found that the majority of dentists experienced positive wellbeing, the results of Collin et al. (2019) indicated that dentists experience poorer wellbeing than the general population, with GDPs again scoring the lowest in wellbeing among dentists in other fields of practice. Only one small scale study assessed resilience (e.g. ability to maintain or regain mental health despite experiencing adversity or severe stress) among dental core trainees (DCTs), where the majority of the participants had normal levels of resilience, and only a minority showed high resilience (Adam and Mannion, 2020).

DCPs

A survey of dental care team members in Northern Ireland showed that 20% of the DCPs suffered from psychological ill-health (Gorter and Freeman, 2011). However, further information about the composition of the DCPs group was not provided. During the COVID-19 pandemic, almost a quarter of dental nurses in a dental teaching hospital in London reported severe symptoms of generalised anxiety (Mahendran et al., 2020).

Students

BDS and DHT students appear to suffer from moderate levels of anxiety and depression during their undergraduate training (Harris et al., 2017a; Harris et al., 2018; Knipe et al., 2018). A considerable proportion of BDS students, however, have been identified as suffering from burnout, with fifth-year students being more affected than their peers in earlier years of training (Collin et al., 2020; Gorter et al., 2008). Among studies recruiting BDS students, almost half of the respondents were found to suffer from psychological ill-health (Collin et al., 2020; Gorter et al., 2008; Lewis and Cardwell, 2019). Stress levels varied among BDS students in different studies (Birks et al., 2009; Pau et al., 2007; Turner et al., 2015), with two studies reporting that half of the student respondents experienced high levels of stress (Gorter et al., 2008; Collin et al., 2020). Stress levels amongst DHT students ranged between normal and mild (Harris et al., 2017a; Harris et al., 2018). BDS and DHT students in England were found to have average wellbeing scores in three studies (Harris et al., 2017a; Harris et al., 2018; Lewis and Cardwell, 2019), whilst in one study, the majority of the BDS students were found to have lower wellbeing scores than the general population (Knipe et al., 2018).

Stressors

Stressors identified in the literature were categorised as business-led stressors, clinical situations-led stressors, COVID-19 pandemic-led stressors, society and person-led stressors, regulation-led stressors and working environment-led stressors. Comparing quantitative data between an early study by Kay and Lowe (2008) and a recent one by Colin et al. (2019) indicated that fear of litigation has increased in recent years (79% vs 54%) (Kay and Lowe, 2008; Collin et al., 2019). Furthermore, regulation has only been identified as a source of stress in the dental literature in the last six years (Chapman et al., 2015a; Bretherton et al., 2016; Collin et al., 2019; Larbie et al., 2017), with regulation-related stressors scoring the highest among other sources of stress (Collin et al., 2019).

Examinations, fear of falling behind or failing the course or year, and inconsistency of feedback between clinical tutors were considered as stressors by both BDS and DHT

students (Collin et al., 2020; Harris et al., 2017a). Whilst finances and student debt have been associated with higher levels of stress among BDS students and DCTs (Boyles and Ahmed, 2017; Jenkins et al., 2019; Turner et al., 2015).

Impact

Studies showed that poor mental health and wellbeing might lead dentists to suffer sleep disturbances, social problems, and substance misuse, which in turn can negatively influence patient confidence towards the dental profession (Larbie et al., 2017). Few studies have reported on the self-perceived impact of mental health and wellbeing issues on patient care and safety. Dentists experiencing poor mental health and wellbeing have reported that they feel less clinically confident (Larbie et al., 2017) and encounter increasing difficulties in making clinical decisions and forming a diagnosis (Chipchase et al., 2017; Hill et al., 2010). Dentists have also observed a decline in professional standards and the quality of patient care they can offer (Larbie et al., 2017). Dentists faced with anxiety sometimes had to modify their decision making by abandoning, delaying, deferring or avoiding the provision of a specific treatment, whilst some admitted that they were practising defensive dentistry (Chipchase et al., 2017), which resulted in increased referrals (Chapman et al., 2015a; Chipchase et al., 2017). In one survey, responding dentists claimed that emotional exhaustion had contributed to an irreversible clinical error (DPL, 2019). However, empirical studies are required to confirm associations between poor mental health and wellbeing and dentists' performance and any possible public safety implications.

Poor mental health and wellbeing can also have a negative impact on workforce sustainability. Dentists facing mental health and wellbeing difficulties may consider exiting the profession (changing profession), retraining, immigrating, or not recommending dentistry as a career to others or taking early retirement (DPL, 2015; DPL, 2019; Hill et al., 2010). Dentists and BDS students suffering from poor mental health have also been found to display suicidal thoughts (Kay and Lowe, 2008; Hill et al., 2010; Lewis and Cardwell, 2019; Knipe et al., 2018; Larbie et al., 2017).

RQ(ii) Interventions in the dental sector

Out of 21 studies read in full-text, six met the inclusion criteria. All studies used quasi-experimental designs. The Effective Public Health Practice Project (EPHPP) Quality Assessment Tool for Quantitative Studies was used to evaluate the quality of the identified studies (Armijo-Olivo et al., 2012). Two were judged as of moderate quality (Aboalshamat et al., 2020; Metz et al., 2020) and the rest of weak quality (Adams, 2017; Chapman et al., 2017; Gonzalez and Quezada, 2016; Newton et al., 2006).

Counselling

Three of the studies evaluated counselling and psychological services offered to dental students and general dental practitioners, who voluntarily accessed the service (Adams, 2017; Gonzalez and Quezada, 2016; Newton et al., 2006). The counselling services were not standardised and were tailored to an individual's needs. Individualised counselling appeared to be useful for dentists, and students exhibiting high-stress levels or established poor mental health. However, the evidence suggests that these services are more likely to be accessed if they are confidential, and they take into account the nuances of the dental environment (Adams, 2017; Newton et al., 2006).

Psychoeducational interventions

The remaining three studies assessed the effectiveness of psychoeducational interventions, utilising a cognitive-behavioural approach to improve the participants' mental health and wellbeing (Chapman et al., 2017; Aboalshamat et al., 2020; Metz et al., 2020). Two were delivered as part of the undergraduate dental curriculum and the third as a CPD activity for primary care dentists. Although the studies did not assess the same outcome measures, significant improvements were observed in the participants' mental health and wellbeing.

RQ(iii) Interventions in the wider health sector

Out of 67 systematic reviews which were read in full-text, 19 met the review selection criteria. The AMSTAR-2 checklist was used to assess the methodological quality of the eligible systematic reviews (Shea et al., 2017). Following critical appraisal, 15 reviews were excluded as they were considered of low (n=9) or critically low (n=6) quality, and four reviews were included in the umbrella review synthesis. Of these, one was found to be of high (Panagioti et al., 2017) and three of moderate quality (Alkhawaldeh et al., 2020; Li et al., 2019; Venegas et al., 2019). Two of the reviews were focussed on physicians (Panagioti et al., 2017; Venegas et al., 2019) and the other two on nurses (Alkhawaldeh et al., 2020; Li et al., 2019).

The included systematic reviews identified three broad categories of interventions: healthcare-worker directed, organisation directed and lifestyle interventions. The interventions varied considerably in their characteristics across the board in all reviews, including content, duration, intensity, and follow up.

Organisation directed interventions

Organisation directed interventions were delivered predominantly as workload interventions and in few studies as multifaceted interventions and were associated with moderate significant reductions in burnout (Panagioti et al., 2017).

Healthcare-worker directed interventions

Healthcare-worker directed interventions comprise of psychoeducational interventions and mindfulness-based interventions. These interventions led to small, but statistically significant reductions in burnout of physicians (Panagioti et al., 2017). Another systematic review reported that these types of interventions led to significant improvements in resilience, but the results for anxiety, burnout, and depression were not conclusive (Venegas et al., 2019). In contrast, cognitive-behavioural educational intervention in another review led to significant reductions in nurses' occupational stress (Alkhawaldeh et al., 2020).

Lifestyle interventions

Finally, equivocal results were reported in two reviews regarding the effectiveness of lifestyle interventions (massage, yoga and aromatherapy) in stress reduction (Alkhawaldeh et al., 2020; Li et al., 2019). The majority of the included studies in these reviews, reported that massage treatments can be effective in reducing nurses' stress levels in the short term, whilst the same positive conclusions could not be drawn in favour of yoga and aromatherapy interventions.

Implications

The implications arising from this rapid evidence assessment are summarised below.

- There are gaps in the literature in areas such as DCP's mental health and wellbeing and the impact of poor mental health and wellbeing on dentists' performance and patient safety.
- There is a paucity of research and evaluation on interventions to improve dentists' and DCPs' mental health and wellbeing, with only two studies recruiting GDPs and four recruiting dental students.
- There is a need for robust studies to evaluate the effectiveness of psychoeducational and/or organisation directed interventions. Examples of such interventions can be adapted from other healthcare professions to fit in with the distinct nature and characteristics of dental education and dental practice.
- There are challenges in generalising findings from other healthcare sectors. Although the evidence advocated organisation directed interventions as being more effective in

improving healthcare workers' mental health and wellbeing, the reported interventions could be difficult to directly apply within the UK dental sector due for instance to the distinct characteristics of the organisation of dental practices and services.

- The case of early recognition and response is clear. Raising awareness and facilitating early recognition of poor mental health as well as effectively responding to these early signs should take place as early as a dental professionals' initial education and continue throughout their professional lives.
- Sharing learning about coping mechanisms, stress management, and building resilience ought to become part of contemporary educational activities both in pre-clinical training and continuing professional development level.
- Shifting the culture in dentistry from a blame culture to safety culture is timely.

Conclusions

This rapid evidence assessment indicates that dentists face mental health and wellbeing challenges during their professional lives, with GDPs being the most adversely affected than dentists in other fields of practice. Litigation and regulation on dentists' mental health and wellbeing were noted as key stressors. However, there was limited evidence on mental health and wellbeing of DCPs.

The review findings point towards the importance of better understanding and responding to mental health issues. This will require, on an ongoing basis, the ability to consistently measure the mental health and wellbeing of UK dental team members. Further, the present work supports the increased recognition of the contribution of "latent" or "system-related" factors, related to the organisation and delivery of healthcare, in ensuring patient safety, through safeguarding of mental wellbeing for the staff involved in the delivery of care.

We hope that this review contributes to a developing evidence base that will inform how the dental sector responds in order to prevent and address professionals' mental health issues at every stage in their career journey - from education, through into the workplace and through continuing professional development.

3 Introduction

The General Dental Council (GDC) exists to protect, promote, and maintain the health and safety of those receiving dental care in the United Kingdom (UK). This involves setting standards for UK and non-UK trained dentists working within the jurisdiction of the GDC. The GDC regulates dentists and dental care professionals at all stages of their training and subsequent professional development. Its overarching regulatory objective is to protect the public and ensure that registrants can meet the required professional standards and deliver quality care for patients.

Mental health and wellbeing in the workplace are important for everyone, not least health professionals. Recognising the increasing mental health and wellbeing challenges faced by its registrants, the GDC commissioned this rapid evidence assessment to identify these challenges and determine directions towards interventions that could help prevent or mitigate them, supporting the workforce and laying the foundations for safe patient care. This work is intended to support the GDC in fulfilling its remit by gaining a deeper understanding of the existing evidence base relevant to these issues and guiding future strategy.

3.1 Aims and objectives

This rapid evidence assessment is aiming to support the GDC by collating and synthesising the available evidence to:

(i) identify the state-of-the-art evidence with regards to UK registrants' (dentists and dental care professionals) mental health and wellbeing status (i.e. prevalence, reasons/stressors, risk profiles and impact);

(ii) identify techniques and preventive methods used to improve or address mental health issues among dental professionals and other healthcare workers, and identify the gaps in our current knowledge.

3.2 Review questions

To meet the project objectives this a rapid evidence assessment (REA) sets out to answer three review questions (RQ):

RQ(i): What is the prevalence of mental health and wellbeing issues amongst registered members of the dental team and dental professions students in the UK, what are the contributing factors and impacts and how these have changed over the past 14 years?

RQ(ii): What techniques and preventive methods/interventions have been used and evaluated to improve or tackle mental health issues among dental team members and dental professions students in countries of very high human development over the past 14 years?

RQ(iii): What techniques and preventive methods/interventions have been used and evaluated to improve or tackle mental health issues amongst other registered health professionals?

Phenomenon of interest

The phenomenon of interest for this REA is **mental health and wellbeing**. According to the World Health Organisation (WHO), mental health is 'a state of wellbeing in which every individual realises their own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to their community' (WHO., 2004). Mental health, thus, is fundamental to wellbeing and the ability to lead a functional life as an individual within the community.

A person's wellbeing is composed of several factors such as physical, economic, social, emotional and psychological/mental wellbeing, life satisfaction, domain-specific satisfaction and engaging activities and work (Centers for Disease Control and Prevention, 2018). This report focuses on the **psychological/mental aspect of wellbeing.**

3.3 Review methodology

Review framework

The methods employed are described in full detail in the project protocol set *a priori* and reviewed by an ERG with topic expertise (see appendix 1). Varker's rapid evidence assessment (REA) methodology (Varker et al., 2015) was followed to systematically search and synthesise the evidence for research questions RQ(i) and RQ(ii), conforming to Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) guidelines (Moher et al., 2009). To answer RQ(iii), an umbrella review methodology (overview of systematic reviews) was adopted (Aromataris et al., 2015). The reporting for this review adhered to the PRISMA framework (Moher et al., 2009).

Study selection

A literature search strategy was developed for all research questions and executed by an experienced information specialist (LB). In 2006 the General Dental Council opened the dental care professional (DCP) register set out in the Dentists Act 1984, Section 36B. This date parameter (2006) was applied to all searches to provide consistency among the reviews and allow for a generous representation of contemporary literature, whilst also being discerning about the relevance of earlier literature. In contrast to traditional systematic reviews, such concessions to the exhaustivity of scope, are not atypical in REAs and are made to suit the shorter given time and resources (Varker et al., 2015).

The database searches were supplemented by backward citation searching against the included studies. The search results for each research question were imported in the Endnote X9 software (LB). Following deduplication, the references were exported to the Rayyan Systematic Review Application (LB) (Ouzzani et al., 2016). Title and abstract, and full-text screening were performed against prespecified selection criteria by one reviewer (AP) for RQ(i) and RQ(ii), and two independent reviewers (AP and MP) for RQ(iii). The selection criteria differed for each question and are described in detail in the REA protocol (see Appendix 1). Any uncertainty for inclusion of studies was resolved by discussion between the two reviewers (AP and MP). The ERG reviewed the list of included studies to ensure that no relevant citations had been missed.

Critical appraisal

Critical appraisal was performed for RQ(ii) and RQ(iii) independently by two reviewers (AP and MP) using validated critical appraisal tools appropriate for the type of included studies. For RQ(ii), the Effective Public Health Practice Project (EPHPP) Quality Assessment Tool for Quantitative Studies was used to evaluate the quality of the identified quantitative studies. The AMSTAR-2 checklist was used to assess the systematic reviews' methodological quality, which considered for inclusion in the umbrella review (RQ(iii)). A ‘best evidence threshold approach’ was employed for RQ(iii) according to which only systematic reviews of high and moderate quality were included in the evidence synthesis.

Data extraction and synthesis

Data extraction was carried by a single reviewer (AP) and verified by the second reviewer (MP) using pilot-tested data extraction forms. Any disagreement was resolved with discussion. A third reviewer (MB) was consulted when consensus could not be reached. Data were synthesised narratively and in a tabular format.

4 Prevalence and impacts

RQ(i): What is the prevalence of mental health and wellbeing issues amongst registered members of the dental team and dental professions students in the UK, what are the contributing factors and impacts and how these have changed over the past 14 years?

4.1 Study selection

4.1.1 Search strategy

A search strategy combining terms related to mental health and wellbeing, terms related to dentistry and UK related terms was developed. The following databases were searched: MEDLINE, Embase CINAHL, DOSS, Scopus, and PsycINFO. The EThOS database was also searched for theses relevant to the topic of this review. Grey literature searches, to identify additional relevant material not published in academic journals, were undertaken by searching the websites of UK regulatory bodies, government departments and professional bodies (see Appendix 3).

The search strategy for each database can be seen in Appendix 2. The searches were supplemented by backward citation searching against the included studies.

4.1.2 Selection criteria

Population: The population of interest was UK registered members of the dental team, both dentists (generalists and specialists) and DCPs (i.e. dental nurses, clinical dental technicians, dental hygienists, dental technicians, dental therapists, orthodontic therapists), and dental professions students. Dental professions students is used as an umbrella term which includes students or trainees studying towards a qualification which will lead to professional registration with the GDC (i.e. dental students, dental hygiene students, dental hygiene and therapy students, orthodontic therapy students, dental technology students, clinical dental technology students, and trainee dental nurses). Studies recruiting solely non-registered or non-clinical members of the UK dental team (i.e. reception staff, practice/service managers etc.) were excluded. Studies recruiting solely health professionals other than the ones mentioned above were also excluded.

Outcome: Studies and reports reporting data on the following elements were considered for inclusion:

- Prevalence of mental health disorders/conditions (such as depression) measured by validated scales/instruments or medical diagnosis.
- Prevalence of mental health issues (such as burnout) measured by validated scales/instruments).
- Prevalence of stress and psychological wellbeing issues measured by validated scales/instruments.
- Sources of stress and poor mental health and wellbeing.
- Impact of poor mental health and wellbeing on the dental professional and their clinical practice. These may include but are not limited to: clinical performance and decision making, early retirement, change in profession, suicide, alcohol and drug issues which would impair performance or fitness to practise etc..

Dental professionals or students' physical health (e.g. physical illness etc.) or physical wellbeing (e.g. musculoskeletal disorders, etc.) were not within this REA scope.

4.1.3 Search results

As shown in the RQ(i) PRISMA flowchart (Appendix 4), the search strategy yielded 2,373 results. Following the removal of duplicates, 1,448 articles were retained for title and abstract screening (AP). Forty-four (44) studies and reports were selected to be read in full-text (AP), as they were potentially relevant to the research question. Of those 32 met the review selection criteria and were included in the REA. An inter-rater reliability process was followed at this stage (Varker et al., 2015), whereby a random selection of 20% of articles was reviewed by a second independent reviewer (MP). A 100% interrater agreement was achieved. Reasons for excluding the full-text papers was agreed between the two reviewers and recorded. A list of the excluded studies with reasons for exclusion is provided in Appendix 5.

Of the 32 included studies, 26 were peer-review papers, two were research reports published by the BDA (Kemp and Edwards, 2014; Larbie et al., 2017), three were research summaries published in blogs by Dental Protection (DPL) (DPL, 2015; DPL, 2018; DPL, 2020) and one was a report published by Dental Protection (DPL, 2019). Due to time and resource restrictions, no attempt was made to access the primary data of the DPL surveys. The majority of the studies were surveys (n=25). Six studies used qualitative methodology, with four using semi-structured interviews (Chapman et al., 2015a; Chapman et al., 2015b; Harris et al., 2017b; Hill et al., 2010), one study used focus groups (Bretherton et al., 2016)

and one utilised both interviews and focus groups (Larbie et al., 2017). One study carried out a secondary analysis of previously published survey data (Toon et al., 2019).

4.1.4 Critical appraisal

Since we aimed to map the existing literature by identifying and providing a descriptive overview of the prevalence, typology, sources and impacts of mental health and wellbeing issues in dentistry, no formal critical appraisal was conducted (Grant and Booth, 2009).

4.2 Professional groups

Eighteen (18) studies recruited dentists, thirteen (13) recruited dental professions students (BDS and DHT students only) and two (2) a mixture of dentists and DCPs. The population characteristics for each study are presented in Appendix 6.

4.2.1 Dentists

In eight studies the sample population consisted of dentists working across multiple sectors (i.e. general dental practice, community, hospital etc.) (Bretherton et al., 2016; Larbie et al., 2017; Chipchase et al., 2017; Collin et al., 2019; Denton et al., 2008; Kay and Lowe, 2008; Chapman et al., 2015a; Chapman et al., 2015b). GDPs were the most common sample population in these studies. Of the remaining studies recruiting dentists, two recruited retired dentists (Hill et al., 2010; Brown et al., 2010), one dental core trainees (DCTs) only (Adam and Mannion, 2020), one salaried primary care dentists only (Kemp and Edwards, 2014), one general dental practitioners (GDPs) only (Toon et al., 2019), and three did not specify the dentists' working characteristics (DPL, 2015; DPL, 2018; DPL, 2020).

The number of participants in the surveys varied between 38 (Adam and Mannion, 2020) and 2,053 participants (Collin et al., 2019), whilst the number of participants in qualitative studies was between 13 (Bretherton et al., 2016) to 29 participants (Larbie et al., 2017). The majority of studies were carried out across the UK, while five studies were carried out in England (Adam and Mannion, 2020; Bretherton et al., 2016; Chapman et al., 2015a; Chapman et al., 2015b; Chipchase et al., 2017) and one in Northern Ireland (Gorter and Freeman, 2011).

4.2.2 Dental professions students

Nine studies recruited BDS dental students (Birks et al., 2009; Collin et al., 2020; Gorter et al., 2008; Jenkins et al., 2019; Knipe et al., 2018; Lewis and Cardwell, 2019; Lewis and

Cardwell, 2020; Pau et al., 2007; Turner et al., 2015). In one study, the majority of the sample population was BDS students (n=108), but a small proportion of dental core trainees (DCTs, n=22) was also included (Boyles and Ahmed, 2017). Two studies recruited dental hygiene and therapy (DHT) students (Harris et al., 2018; Harris et al., 2017b) and one a mixture of DHT students and BDS outreach dental students (Harris et al., 2017a). All the studies but one (Harris et al., 2017b) employed a cross-sectional survey design. The number of students participating in the surveys varied between 42 (Harris et al., 2018) up to 412 students (Collin et al., 2020). The majority of studies were carried out exclusively in England (n=13), with only 1 study recruiting students from across the UK (Collin et al., 2020).

4.2.3 Dental care professionals (DCPs)

Two studies recruited a mixture of dentists and DCPs (Gorter and Freeman, 2011; Mahendran et al., 2020). Gorter and Freeman (2011) in a survey of dental care teams in Northern Ireland, recruited 71 dentists (64 GDPs and seven specialist dentists) and 64 DCPs, with 36% of those being dental nurses. However, the authors did not provide any further information about the composition of the DCP group in terms of their professional roles (i.e. the relative numbers of dental hygienists, dental nurses etc.). (Gorter and Freeman, 2011). Mahendran et al. (2020) distributed a survey to staff working in Guy's Hospital's dental department, in which out of the 120 participants, half (n=60) were dental nurses, eight worked as dental technicians, and the rest predominantly worked as dentists of different seniority.

4.3 Prevalence and typology

Eighteen (18) studies measured different mental health and wellbeing issues among dentists (n=9), dental care professionals (n=2) and dental students (n=9). Prevalence data measured using validated tools were identified for anxiety, burnout, depression, psychological health, resilience, stress and wellbeing. A variety of tools were used within these studies, which made direct comparisons problematic. The tools used to assess mental health and wellbeing in the above studies are summarised in Appendix 7, where a description of each tool is provided.

4.3.1 Anxiety

Anxiety is a feeling of unease, worry or fear. Generalised Anxiety Disorder, which is one common type of anxiety disorder, is estimated to impact 5.9% of adults in England (Stansfeld et al., 2014).

Brown et al. (2010) found that out of 189 dentists who took early retirement due to ill health, 20% suffered from anxiety, as this was assessed by the Hospital Anxiety and Depression (HADS) scale. When it comes to practising dentists, Chipchase et al. (2017) suggested that dentists face moderate levels of anxiety provoked by clinical situations (mean DACS-R: 5.39 (SD=1.92), on a range scale of 0-11. While in a study by Colin et al. (2019), GDPs and community dentists scored significantly higher on an anxiety scale than dentists in other fields of practice such as hospital, academia, armed forces and public health.

Mahendran et al. (2020) assessed the anxiety levels of 120 members of the dental department within Guy's Hospital in London during the beginning of the COVID-19 pandemic using the Generalised Anxiety Disorder assessment (GAD-7). Close to a sixth (16.7%) of all respondents and nearly a quarter (23%) of dental nurses displayed severe symptoms of generalised anxiety, while about half (53.3%) of the respondents displayed some signs (Mahendran et al., 2020). The mean GAD-7 score for all the participants was 8.15, where a score of 10 or higher represents a cut point for identifying cases of severe anxiety. Dental nurses appeared to be the most affected (10.35), followed by speciality training registrars (9.75) and dental core trainees (8.5). Staff grade dentists (4.75), consultants (4.71), administrative staff (4.27) and dental technicians (3.25), however, showed milder symptoms of anxiety (Mahendran et al., 2020).

Knipe et al. (2018) found that out of the 344 dental students in Bristol surveyed, 39% experienced moderate anxiety and 17.5% severe anxiety. However, the anxiety levels for DHT students in Portsmouth and their BDS peers were found to be within the normal range (Harris et al., 2017a). In a subsequent study by the same authors, DHT students showed mild symptoms of anxiety (Harris et al., 2018).

4.3.2 Burnout

Burnout was assessed using primarily the Maslach Burnout Inventory, which evaluates the three domains of burnout, namely emotional exhaustion (EE), depersonalisation (DP) and personal accomplishment (PA). High scores on EE and DP and low scores on PA are indicative of burnout (Denton et al., 2008). Few investigators used the Oldenburg Burnout inventory, which assesses burnout on two dimensions: exhaustion and disengagement (Collin et al., 2020; Collin et al., 2019).

A recent large scale survey showed that UK dentists across different sectors experience high levels of burnout (Collin et al., 2019). Burnout was most prevalent in GDPs (87.72%), followed by community dentists (83.34%), hospital dentists (75.27%), dental academics (65.22%) and armed forces and public health dentists (59.32%) (Collin et al., 2019).

Similarly, levels of emotional exhaustion have also been found to be higher in GDPs compared to dentists working in other sectors (community, hospital or public health) (Denton et al., 2008). In earlier studies, 8% (Denton et al., 2008) and 16% (Gorter and Freeman, 2011) of the participant dentists had scores in the 'high' categories for both EE, DP and in the 'low' category of PA, an indication of severe risk of burnout. A further 6.7% (Denton et al., 2008) and 10% (Gorter and Freeman, 2011) of the dentists respectively had high levels of emotional exhaustion and depersonalisation, which are deemed to be the core elements of burnout. The mean scores for each of the burnout domains (EE, DP, PA) were also similar between the two above studies (EE:25.1 vs 29.08, DP: 8.6 vs 9.59 and PA:33.9 vs 33.70) (Denton et al., 2008; Gorter and Freeman, 2011). Although direct comparisons between the recent and earlier surveys are difficult to be drawn, as the measures for burnout used were different, it appears that the risk of burnout in dentists may have significantly escalated in recent years.

Limited evidence from a survey in dental teams in Northern Ireland suggested that burnout levels between dentists and DCPs are comparable (EE: 28.08 vs 20.07, DP 9.59 vs 7.33 and PA 33.70 vs 32.08), with GDPs scoring worse in all domains. A positive correlation between age and emotional exhaustion was shown to exist for both dentists and DCPs (Gorter and Freeman, 2011).

Denton et al. (2008) and Toon et al. (2019) explored the impact of different dentist and working characteristics on burnout. Dentists with additional qualifications appear to experience less emotional exhaustion and depersonalisation and scored higher in personal accomplishment (Denton et al., 2008). The same was found for dentists who work in bigger teams and interact with colleagues (Denton et al., 2008; Toon et al., 2019), whilst dentists who work in isolation seem to be at higher risk of burnout (Toon et al., 2019). A lack of personal accomplishment and higher burnout levels (EE and DP) was related to long working hours and a greater time spent working in NHS practice (Denton et al., 2008).

Toon et al. (2019) conducted a secondary structural analysis of a set of primary survey data based on the responses of 1513 GDP respondents. They examined the association between four subdimensions of stress (productivity stress, work-content stress, patient led stress and regulatory stress) and levels of burnout. According to the results of this analysis, each dimension of stress was shown to have a significant correlation with high burnout levels. The effect of the position of a GDP in the practice and type of work undertaken on these associations was also assessed. Productivity stress, caused by a constant attempt to catch up with treatment targets, showed a statistically significant association with burnout, with higher levels of NHS work increasing the strength of this association, meaning that those

who do more NHS work are more likely to suffer from burnout. (Toon et al., 2019). A positive correlation was also identified between patient-led stress and regulatory stress (related to regulation and legislation at personal and organisational level) with high burnout levels. Regulatory stress affected significantly more practice owners than the rest of the GDP population. However, that was not the case for patient related stress where the most significantly affected GDP population were corporate associates (Toon et al., 2019).

Looking at the dental student population across the UK, a recent study reported that over half (57.8%) of the BDS participants were deemed to be experiencing burnout (Collin et al., 2020). An earlier smaller-scale survey of dental students in Manchester and Belfast showed that 31% and 59% of the students demonstrated high levels of emotional exhaustion, 22% and 27% demonstrated high levels of depersonalisation and 16% and 41% showed lower levels of personal accomplishment respectively (Gorter et al., 2008). Collin et al. (2020) demonstrated that gender did not influence the presence or severity of burnout but observed that students exhibited higher levels of burnout as the course went on. Namely, first and second-year students had significantly lower burnout levels than fifth-year students, who scored highest in the burnout (OBI) scale (Collin et al., 2020).

4.3.3 Depression

Depression is a common mental health problem that causes people to experience low mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy, and poor concentration (Stansfeld et al., 2014). 3.3% of adults in England, Scotland and Wales estimated to experience depression (Stansfeld et al., 2014).

Data for depression (measured by validated measures) amongst dentists was presented only in one study by Brown et al. (2010), in which 10% of retired dentists due to ill health were found to suffer from depression, as assessed by the Hospital Anxiety and Depression Scale (HADS). Lewis and Cardwell (2019) in a multi-professional student survey, BDS students (n=191) had a mean score of 12.26 in the Beck's Depression Inventory-II, which falls under the 'minimal depression' range (0-13) of the scale. Similarly, in a study by Harris et al. (2017) the mean scores for depression fell into the 'normal range' (0-9) for BDS (4.94) and DHT (7.26) students, as this was indicated by the DASS-21 scale. In a later study, by the same author, using the same tool, DTH student scores felt into the 'mild depression' range (10-13) with a mean score of 11.57 (Harris et al., 2018). On the other hand, Knipe et al. (2018), found that 35.4% of the dental students exhibited moderate symptoms of depression, whilst 3.1% appeared to experience severe depression, as assessed by the nine-item Patient Health Questionnaire (PHQ-9).

4.3.4 Psychological health

Gorter et al. (2011) assessed the psychological health of dental care team members in Northern Ireland using the General Health Questionnaire (GHQ-12). Using a score >3 for caseness of mental ill-health, 29% of the dentists and 20% of the DCPs were characterised as cases. Nearly 3% of all respondents had unfavourable scores on all 12 GHQ items. No difference was identified in caseness between those working in single-handed practices and those working in group practices (Gorter and Freeman, 2011). More recently, two-thirds of dentists (68%) surveyed across the UK showed high levels of psychological distress, as this measured by the CORE-OM scale, with GDPs and community dentists scoring significantly higher than those in other fields of practice (Collin et al., 2019).

A 2020 UK wide survey amongst BDA dental student members, suggested that half of the respondents (50.2%) indicated presence of psychological distress, as indicated by their CORE-OM scale scores (Collin et al., 2020). Although female students and final year students scored higher compared to male students and first years respectively, these differences were not statistically significant. Another UK-wide study, recruiting students from different professional programmes demonstrated that being a dental student and exhibiting signs of neuroticism were predictive of increased GHG-12 scores. In a smaller-scale study conducting in Bristol, the mean GHQ-12 Likert score of dental students (15.22) was significantly higher than that of the UK general population (11.06), with nearly half of the respondents (48.8%) displaying scores suggestive of potential psychiatric disorder (Lewis and Cardwell, 2019). These figures are in line with findings from earlier survey data on dental students in Manchester and Belfast where 47% and 49% of the participants were classified as cases of psychological ill-health (Gorter et al., 2008).

4.3.5 Resilience

Resilience is defined as the ability to maintain or regain mental health despite experiencing adversity or severe stress (Adam and Mannion, 2020). One small scale study assessed the resilience of dental core trainees in England (Yorkshire and Humber) (Adam and Mannion, 2020). Resilience was assessed by the Brief Resilience Scale (BRS). Out of the 38 participants, the majority (n=23) had normal resilience levels, 11 had low, and only a minority (n=4) demonstrated high resilience (Adam and Mannion, 2020). Resilience has not been assessed in any of the other populations of interest (dentists, DCPs or dental students).

4.3.6 Stress

Stress is described as the state that occurs when a person encounters events perceived as endangering or threatening to their ability to cope and deal with the situation (Chapman et al., 2015a). Collin et al. (2019) based on a survey of 2053 dentists working in different sectors, but primarily as GDPs, across the UK, found that 54.9% of the respondents experience high job stress and 43.8% reported that they could not cope with the level of stress in their job. GDPs exhibited the highest levels of stress (M = 4.16, SD = 1.62), followed by community dentists (M = 4.07, SD = 1.54). Both were significantly higher than hospital dentists (M = 3.35, SD = 1.42) and dentists working in another field of practice (i.e. hospital, armed forces or public health) (M = 3.17, SD = 1.74) (Collin et al., 2019). Similarly, amongst community dentists, a survey conducted by the BDA in 2013, showed that 37% of the respondents experienced high job stress (Kemp and Edwards, 2014). Providers in England were more likely than those in other UK countries to report high job stress levels (40% vs 27% for salaried dentists in Wales, Scotland and Northern Ireland combined) (Kemp and Edwards, 2014).

In two studies, around half of the responding dental students reported high levels of stress, 56% across the UK (Collin et al., 2020), 50% in Belfast and 47% in Manchester (Gorter et al., 2008). In four studies, dental students were shown to experience moderate levels of stress on average, as shown by their mean Perceived Stress Scale (PSS-10) scores ranging between 16.2 up to 20.72, where scores close to 0 indicate no stress and scores closer to 40 show extreme stress (Birks et al., 2009; Collin et al., 2020; Pau et al., 2007; Turner et al., 2015). The PSS-10 mean scores were similar across the studies. In two studies final year dental students scored higher than first years (Collin et al., 2020; Turner et al., 2015), with that difference being statistically significantly different only in one study (Turner et al., 2015). However, in both studies, female students exhibited statistically significantly higher stress levels than their male peers (Collin et al., 2020; Turner et al., 2015). Perceived stress in first-year dental students appeared to increase during the course of the year, and it was negatively associated with students' emotional intelligence (Birks et al., 2009). Stress levels amongst dental hygiene and therapy students ranged between normal and mild, as indicated by the students' DASS-21 mean scores (Harris et al., 2017a; Harris et al., 2018).

4.3.7 Wellbeing

The available data suggests a potential deterioration of dentists' wellbeing between 2005 and 2019 (Collin et al., 2019; Kay and Lowe, 2008). However, due to the different measures

used in these studies, this observation is made with caution. Kay and Lowe (2008) surveying 545 BDA members, with GDPs comprising the majority of the sample (94%), found that over half of the participants (57%) mostly had feelings of positive wellbeing, 42% fell under the average wellbeing scores and only 1% experienced mainly negative emotions and poor wellbeing. In contrast, a 2019 study found that dentists scored lower on life satisfaction, life worthwhileness and happiness compared to the average general population scores for these domains. GDPs exhibited significantly lower scores than dentists in other fields of practice, indicating poorer wellbeing (Collin et al., 2019).

BDS and DHT students in England were found to have average wellbeing scores in three studies (Harris et al., 2017a; Harris et al., 2018; Lewis and Cardwell, 2019), whilst in one study, 80.3% of the BDS students were found to have lower wellbeing scores than the national average (Knipe et al., 2018). A multi-professional, UK-wide student study, showed that being a dental student and exhibiting personality traits of neuroticism and perfectionism were predictive of lower wellbeing scores, as this assessed by the Warwick Edinburgh Mental Well Being Scale (WEMHWBS) (Lewis and Cardwell, 2020). DHT students in Portsmouth, were shown to have significantly higher wellbeing scores than final year outreach dental students in four out of the six domains of the Psychological Well Being-Short scale (PWB-S): namely, personal growth (5.89 vs 4.22), purpose in life (8.51 vs 4.85), positive relations with others (7.87 vs 5.52) and self-acceptance (9.92 vs 5.23) (Harris et al., 2017a).

4.4 Stressors and dentists

A mixture of research methods has been employed to investigate the sources of stress and poor mental health and wellbeing, including quantitative surveys, surveys with open-ended questions and qualitative (interview and focus groups) studies. This section presents the stressors identified in the literature, categorised into common types according to source. These are business-led stressors, clinical situations-led stressors, COVID-19 pandemic-led stressors, society and person-led stressors, regulation-led stressors and working environment-led stressors.

4.4.1 Business-led stressors

These factors are related to the business of dentistry and running a practice or service delivery. Financial viability (Bretherton et al., 2016; Gorter and Freeman, 2011; Larbie et al., 2017; Kemp and Edwards, 2014) and staffing issues such as performance, relationships and covering absence (Bretherton et al., 2016; Chipchase et al., 2017; Hill et al., 2010; Kay and

Lowe, 2008) were the most frequently reported stressors among the studies reviewed. These were followed by management duties, governance and paperwork (Collin et al., 2019; Kay and Lowe, 2008; Kemp and Edwards, 2014), maintenance of equipment, facilities and materials (Kemp and Edwards, 2014; Larbie et al., 2017), job security (Kemp and Edwards, 2014; Larbie et al., 2017) and competition with other providers (Larbie et al., 2017)

4.4.2 Clinical situations-led stressors

A sense of loss or lack of control over clinical work (Bretherton et al., 2016; Chapman et al., 2015a; Chipchase et al., 2017; Collin et al., 2019; Kemp and Edwards, 2014) and working out of one's comfort zone (Bretherton et al., 2016) seems to contribute to dentists' anxiety and stress in clinical situations. Treating anxious patients (Bretherton et al., 2016; Chapman et al., 2015a; Chipchase et al., 2017; Hill et al., 2010; Kemp and Edwards, 2014), children (Bretherton et al., 2016; Chapman et al., 2015a; Chipchase et al., 2017) or patients with additional needs (Chapman et al., 2015a), performing difficult or complex treatments (Bretherton et al., 2016; Chapman et al., 2015a; Chipchase et al., 2017; Kemp and Edwards, 2014) and dealing with a medical emergency (Chapman et al., 2015a; Chipchase et al., 2017) have been frequently quoted as being stressful. The risk of clinical mistakes and clinical complications is also perceived as stressful (Chipchase et al., 2017; Collin et al., 2019; Gorter and Freeman, 2011). Community dentists often have to deal with inappropriate referrals, whilst they feel that the buck stops with them as they have limited options for onwards referral, which increase the stress related to their role (Chapman et al., 2015a; Kemp and Edwards, 2014).

4.4.3 COVID-19 pandemic-led stressors

Mahendran et al. (2020) surveyed members of the dental team of the dental department of Guy's Hospital towards the beginning of the pandemic (April 2020), achieving a 96% response rate. Over half (55%) of the respondents' reported high levels of anxiety around redeployment to other departments. A thematic analysis of the respondents' answers revealed that their top three concerns were health, financial security and wellbeing of their friends and family; personal health; and the unknown nature of the disease. These were followed by worries around job security, general uncertainty, social and mental health due to the COVID related restrictions and inability to socialise, and personal protection against the virus at work. These concerns are in line with concerns raised by 484 DPL dentist members, in a DPL survey conducted in May 2020, in which anxieties around the health of family and friends were the most prevalent, followed by financial worries and loss of income (58%),

adapting to new guidance (50%), concern for patient health (43%), lack of adequate PPE (38%), personal health (34%) and job security (27%) (DPL, 2020).

4.4.4 Patient-led stressors

The fear of patient complaints (Bretherton et al., 2016; Chapman et al., 2015a; Kemp and Edwards, 2014; Larbie et al., 2017) and the subsequent repercussions such as litigation (Bretherton et al., 2016; Chapman et al., 2015a; Chipchase et al., 2017; Collin et al., 2019; DPL, 2018; Kay and Lowe, 2008; Kemp and Edwards, 2014; Larbie et al., 2017) and a GDC investigation (DPL, 2015) have been associated with high levels of stress. Treating patients after they have complained has been considered particularly stressful (Bretherton et al., 2016). Meeting patient (Chapman et al., 2015a; Chipchase et al., 2017; Kay and Lowe, 2008; Kemp and Edwards, 2014; Larbie et al., 2017) or carer expectations (Chapman et al., 2015a; Kemp and Edwards, 2014), dealing with challenging (Bretherton et al., 2016; Chipchase et al., 2017; Collin et al., 2019) and dissatisfied patients (Collin et al., 2019; Gorter and Freeman, 2011) were prevalent stressors among the included studies. Establishing effective communication and rapport with the patient (Bretherton et al., 2016; Chipchase et al., 2017), gaining valid consent (Chipchase et al., 2017) as well treating uncooperative patients (Chapman et al., 2015a; Hill et al., 2010) and patients who do not take responsibility of their own oral health (Bretherton et al., 2016) appear to be emotionally challenging for the practising dentists.

4.4.5 Society and person-led stressors

Two studies reported on factors occurring outside the working environment, which can exacerbate dentists stress or ill mental health. These were social and relationship breakdowns, bereavement, social pressure, social media (Larbie et al., 2017), negative media publicity and negative public perception of dentists (Collin et al., 2019).

Perfectionism and a constant drive for success, sometimes fuelled by the influence of social media (Larbie et al., 2017), feed into dentists' stress and anxieties leading to poor mental health and wellbeing (Bretherton et al., 2016; Chapman et al., 2015a; Larbie et al., 2017). The study by Chapman et al. (2015) revealed two sides of perfectionism. Perfectionism can act as a powerful intrinsic motivator for high clinical standards and a significant stressor when personal and professional standards of performance are not met. Similarly, a clinician's perception of their skills and competence can have an adverse effect on their mental health (Kemp and Edwards, 2014), on the grounds of lack of recognition and feeling undervalued (Gorter and Freeman, 2011; Kemp and Edwards, 2014). Finally, the stigma of

not coping seems to exacerbate an already compromised state of mental health and wellbeing (Larbie et al., 2017).

4.4.6 Regulation-led stressors

Regulators including the NHS, the CQC and the GDC were reported as sources of stress and poorer mental health and wellbeing for dentists (Bretherton et al., 2016; Chapman et al., 2015a; Collin et al., 2019; Larbie et al., 2017) with one study reporting that regulatory stress is associated with higher risk of burnout amongst GDPs (Toon et al., 2019).

NHS dentistry has been frequently associated with increased stress amongst dental practitioners with the UDA system in particular leading GDPs to feel like working on an ‘‘NHS treadmill’’ (Bretherton et al., 2016; Chapman et al., 2015a; Chipchase et al., 2017; Collin et al., 2019; Larbie et al., 2017). NHS rules and regulations are perceived to be confusing and burdensome, and they have been described as limiting clinicians decision making and creating ethical clinical dilemmas (Chapman et al., 2015a; Chipchase et al., 2017). NHS commissioning, bureaucracy, lack of funding, threat of clawback and uncertainty around NHS dentistry's future also comprise some of the dentists’ worries associated with NHS dentistry (Bretherton et al., 2016; Kemp and Edwards, 2014; Larbie et al., 2017).

Regulation from the CQC and the GDC was mentioned as a stressor in three recent studies (Bretherton et al., 2016; Chapman et al., 2015a; Collin et al., 2019). A recent large scale survey suggested that dentists appear to practise under constant fear of persecution (Collin et al., 2019). Fear of litigation and receiving a solicitor’s letter was a commonly reported stressor amongst the included studies (Bretherton et al., 2016; Chapman et al., 2015a; Chipchase et al., 2017; Collin et al., 2019; DPL, 2018; Kay and Lowe, 2008; Kemp and Edwards, 2014; Larbie et al., 2017). In a qualitative study by Bretherton et al. (2016), dentists reported that an ultimate stressor was the obligation to carry on treating patients who have taken legal action against them, as expected by the GDC standards. Qualitative analysis of Collin et al. (2019) survey data, revealed that dentists practise under constant fear of persecution by the GDC. Participants felt that the GDC is working against them without supporting them, and the system is designed to put the clinician at fault at all times.

4.4.7 Working environment-led stressors

Time management, time pressures (such as running late) and heavy workload are prevalent working environment-related stressors (Chapman et al., 2015a; Chipchase et al., 2017; Collin et al., 2019; Gorter and Freeman, 2011; Hill et al., 2010; Kemp and Edwards, 2014;

Larbie et al., 2017). In an attempt to reach treatment targets, dentists reported that they sometimes have to work long hours, work quickly and take no breaks (Chipchase et al., 2017; Collin et al., 2019; Kemp and Edwards, 2014; Larbie et al., 2017). The working relationship with colleagues and members of staff can become challenging, but social support provided by colleagues and team member can also have a moderating effect on stress (Collin et al., 2019; Kemp and Edwards, 2014; Larbie et al., 2017; Chapman et al., 2015a). Equally, feeling isolated and lack of networking can impact negatively on dentists' mental health and wellbeing (Chapman et al., 2015a; Chipchase et al., 2017; Kemp and Edwards, 2014; Larbie et al., 2017). Community dentists more often than dentists in general dental practice, work on their own with the consequent reduction in social and clinical support (Chapman et al., 2015a; Kemp and Edwards, 2014). Finally, a lack of support and poor management can also hinder a dentist's wellbeing at work, affecting GDPs, community and hospital dentists alike (Collin et al., 2019; Kemp and Edwards, 2014).

4.5 Stressors and dental professions students

Collin et al. (2020), in a national survey across all the UK dental schools, identified the ten most often occurring stressors during BDS training. These were: examinations and grades (72.3%), fear of failing the course or the year (66.1%), fear of keeping up with the workload (43.8%), lack of time to complete clinical requirements (40.5%), inconsistency of feedback between tutors (40.1%), expectation of dental school and what the reality is like (33.3%), patients being late or not showing up (30.5%), financial responsibilities (32.2%), lack of time for relaxation (30.5%) and lack of confidence to be a successful dental student (30.1%). Finances and student debt have been associated with higher levels of stress among dental students and DCTs (Boyles and Ahmed, 2017; Jenkins et al., 2019; Turner et al., 2015), while parental or family contribution to student expenses has been shown to alleviate this stress (Boyles and Ahmed, 2017). Additionally, students with greater family responsibilities have been found to experience significantly higher levels of stress (Turner et al., 2015). Similarly with BDS students, Harris et al. (2017) suggested that the main stressors faced by DHT students during their training were examinations, fear of falling behind or failing the course or year, and inconsistency of feedback between clinical tutors.

4.6 Stressors and DCPs

Only two studies recruited DCPs alongside dentists (Gorter and Freeman, 2011; Mahendran et al., 2020), where the results on stressor factors were reported collectively, without allowing a description of stressor more applicable to DCPs professional groups. However, Gorter and Freeman (2011) suggested that dentists compared with DCPs had significantly

higher mean stress scores for time pressure, risk of mistakes, dissatisfied patients, financial worries, difficult patients, being undervalued and total job demands.

4.7 Impacts

4.7.1 Impact on patient confidence, patient care and safety

Only few empirical studies have studied the impact of mental health and wellbeing issues on patient care and safety to date. A BDA qualitative research suggested that few of the participating dentists were facing social problems and problems with substance misuse and addiction as a result of their poor mental health (Larbie et al., 2017), which can bring the individual practitioner's reputation in jeopardy and negatively influence patient confidence towards the dental profession. In another qualitative study by Bretherton et al. (2016), sleep disturbances were reported as a direct result of stressors encountered in daily clinical practice. Sleep disruption and fatigue during the working day were also reported as a result of depression in a sample of dentists who took premature retirement due to ill health (Hill et al., 2010). Sleep loss and fatigue have been shown to impair healthcare professionals' performance, compromising the quality of care provided and increasing the risk of clinical errors (Owens, 2007).

Interestingly, in a study among Irish dentists, 26% of the responding dentists claimed that emotional exhaustion had contributed to an irreversible clinical error. 42% of those reported that this related to technical mistakes during procedures, while 32% claimed it was down to lack of concentration (DPL, 2019). Dentists experiencing poor mental health and wellbeing have reported that they feel less clinically confident (Larbie et al., 2017) and encounter increasing difficulties in making clinical decisions and forming a diagnosis (Chipchase et al., 2017; Hill et al., 2010). They have also observed a decline in professional standards and the quality of patient care they can offer (Larbie et al., 2017). Dentists faced with anxiety sometimes had to modify their decision making by abandoning, delaying, deferring or avoiding the provision of a specific treatment, whilst some admitted that they were practising defensive dentistry (Chipchase et al., 2017) which resulted in increased referrals (Chapman et al., 2015a; Chipchase et al., 2017). Similarly, in a large scale survey (1100 DPL members), 64% of the respondents felt that the fear of being sued led them to make more referrals, whilst 74% felt that this fear was affecting the services they believed they were able to offer (DPL, 2018).

4.7.2 Impact on the dental workforce

According to a recent report published by Dental Protection (DPL, 2019), one in three dentists has considered leaving the profession for reasons of personal wellbeing. This is also the case for dentists who have undergone a GDC investigation, where 94% felt that the process had an impact on their stress and 33% considered leaving the profession because of the experience (DPL, 2015). Similarly, dentists who participated in a BDA qualitative research, also reported that poor mental health and wellbeing have made them consider changing profession, retraining, immigrating, exiting the profession and not recommending it to others, or taking early retirement (Larbie et al., 2017).

Two studies with dentists who retired due to ill health suggested that mental and behavioural disorders such as depression, anxiety, and stress were important in their decision to retire prematurely. The proportion of dentists who retired due to mental health disorder was 28% in one study (Brown et al., 2010) and 43% in another (Hill et al., 2010). The mean retirement age in the study by Brown et al. (2010) was 51.5 years with a mean of 27.5 years of working experience. Hill et al., (2010) estimated that the probability of a dentist aged <50 years, having dependants and retiring with a mental health problem obtaining work after ill health retirement was 54%, whilst the estimated probability of a dentist aged 50-54 or older returning to work, having dependants and who retired with a mental health problem, was 36 % and 37% respectively. Finally, the probability of a dentist older than 55 years of age returning to work, with no dependents and retired with an illness other than a mental health problem, was estimated as low as 15% (Hill et al., 2010). These figures of retirement represent a considerable loss from the UK dental workforce, with the loss of potential trainers and skilled practitioners, arguably at the top of their experience.

The impact of suicide ideation and committing suicide induced by poor mental health has also been identified in the literature (Larbie et al., 2017). Within the dental literature, out of 23 dentists who retired prematurely, 10 had suicidal thoughts (Hill et al., 2010). An earlier study among 545 BDA members showed that 12% (56 dentists) had thought about committing suicide and of those 18 had considered this in the past year, whilst seven had attempted suicide at least once (Kay and Lowe, 2008). Putting these figures into perspective, within the UK general population, a suicide rate of 11 deaths per 100,000 population was recorded by the Office for National Statistics in 2019 (ONS, 2019). A more recent large scale survey of 2053 dentists found that 17.6% of the respondents had seriously thought about committing suicide, and of those 57.7% did so in the last 12 months, which equates to nearly 10% of respondents (Collin et al., 2019). Those categorised as

experiencing high job stress, psychological distress and burnout were more likely to report that they had thought about suicide in the last 12 months (Collin et al., 2019).

4.7.3 Impact on dental professions students and DCPs

There is only limited data about the impact of poor mental health and wellbeing on dental and DHT students. In a survey conducted among Cardiff University BDS students, over half of the participants reported that poor mental health and wellbeing led to a loss of motivation and to a lesser extent to fatigue, inability to focus, and a drop in academic performance (Jenkins et al., 2019). Similarly, in a qualitative study, most DHT students perceived stress as affecting their performance negatively, whilst a small minority of students described the physiological symptoms as enhancing their performance (Harris et al., 2017b). However, Turner et al. (2015) did not find an association between perceived stress and examination performance among first and final year BDS students in London. Two studies investigated the prevalence of suicidal thoughts amongst dental students. 16% of the students reported suicidal thoughts at any point of their life (Knipe et al., 2018) and an equal proportion in the last 12 months (Lewis and Cardwell, 2019), with 1% reporting persistent (daily over two weeks) suicidal thoughts (Knipe et al., 2018). Seven per cent of the respondents in the study by Knipe et al. (2018) reported self-harming in the past year, with 2% self-harming with suicidal intent, in contrast to 4.9% of students admitting to having attempted to take their life in a study by Lewis and Cardwell (2019). None of the included studies reported on the impact of poor mental health and wellbeing on DCPs.

4.8 Change over the past 14 years

In recent years, dentists' mental health and wellbeing appears to have deteriorated with a greater proportion of practitioners exhibiting signs of burnout, suicide ideation and poorer wellbeing, with GDPs being the most adversely affected. Due to the different measures used in the included studies, caution must be applied when making comparisons, but the elevated levels as described in the previous sections are nonetheless concerning.

Comparing quantitative data between an early study by Kay and Lowe (2008) and a recent one by Colin et al. (2019), it can be seen that fear of litigation has increased in recent years (79% vs 54%). Furthermore, regulation only recently emerged as a source of stress among the profession with the results from the Work Stress in Dentistry (WSID) measure employed by Collin et al. (2019), suggesting that regulation related stressors scored the highest among other sources of stress. In more detail, Kay and Lowe (2008) indicated that the most

common stressors experienced by BDA dentist members in 2005, were patient demands (75%), practice management/staff issues (56%), fear of complaints and litigation (54%), paperwork (54%), working relations within the practice (34%), clinical governance (34%) and out of hours work (26%). In contrast, the top ten stressors as reported by Collin et al. (2019) were the threat of complaints and litigation (79%), dissatisfied patients (75.1%), risk of making a mistake (74.9%), red tape and bureaucracy (74.5%), concern about the GDC (72.8%), NHS targets (72.4%), running behind schedule (64.9%), NHS work (63.2%), working quickly to see as many patients as possible (62.9%) and difficult patients (61.2%). Noteworthily, the data in Kay and Lowe (2008) study were collected before substantial structural and contractual changes in England and Wales were introduced in 2006, which may be the reason why the NHS and remuneration was not quoted as stressors in their study. Equally, the higher levels of stress and burnout reported by Colin et al. (2019) may be a reflection of how the landscape of dentistry has changed since the previous research was undertaken.

5 Mental health and wellbeing interventions in the dental sector

RQ(ii): What techniques and preventive methods/interventions have been used and evaluated to improve or tackle mental health issues among dental team members and dental professions students in countries of very high human development over the past 14 years?

5.1 Study selection

5.1.1 Search strategy

An experienced information specialist (LB) developed a search strategy combining terms related to mental health and wellbeing and terms related to dentistry. The following online databases were searched on the 22nd of October 2020: MEDLINE, Embase CINAHL, DOSS, Scopus, and PsycINFO. The search strategy for each database can be seen in Appendix 8. The searches were supplemented by backward citation searching against the included studies.

5.1.2 Selection criteria

Population: Studies recruiting dentists, dental care professionals (as outlined in RQi population section), and dental professions students were considered for inclusion. Studies recruiting non-clinical members of the dental team or non-dental health professionals were excluded.

Setting: Studies conducted in a dental setting of very high development countries, as indicated by the Human Development Index (HDI) (United Nations Development Programme, 2020) were considered for inclusion. A list of the countries of very high human development can be accessed here.

Intervention: Studies evaluating the effectiveness of interventions implemented to improve mental health and wellbeing either quantitatively or qualitatively were considered for inclusion. Studies presenting self-reported coping strategies or interventions whose effect has not been evaluated were excluded.

Comparison: Comparator groups could include different interventions implemented to improve dental team members' mental health and wellbeing or no intervention.

Outcome: Outcomes of interest included but were not limited to:

- Prevalence of mental health disorders/conditions (such as depression) measured by validated scales/instruments or medical diagnosis.
- Prevalence of mental health issues (such as burnout) measured by validated scales/instruments).
- Prevalence of stress and psychological wellbeing issues measured by validated scales/instruments.
- Experiences (if qualitative outcomes are reported) as a measure of evaluation of the intervention.

5.1.3 Search results

As shown in the RQ(ii) PRISMA flowchart (Appendix 9), the search strategy yielded 6,271 results. Following the removal of duplicates, 3,652 articles were retained for title and abstract screening (AP). Twenty-one studies, were selected to be read in full-text, as they were potentially relevant to the research question. Of those, six met the review selection criteria and were included in the REA. An inter-rater reliability process was followed at this stage (Varker et al., 2015), whereby a random selection of 20% of articles was screened by a second independent reviewer (MP). A 100 % interrater agreement was achieved. Reasons for excluding the full-text papers were agreed between the two reviewers and recorded. A list of the excluded studies with reasons for exclusion is provided in Appendix 10.

5.1.4 Study characteristics

All studies used quasi-experimental designs. Four studies employed a one-group pretest-posttest design, where the participants served as their own controls (Adams, 2017; Gonzalez and Quezada, 2016; Metz et al., 2020; Newton et al., 2006). Two studies employed a between-group design. In one study, the control group received no intervention (Aboalshamat et al., 2020). In the other, the two groups received two different modes of delivery of the intervention (Chapman et al., 2017). Two studies were conducted in England (Chapman et al., 2017; Newton et al., 2006) and recruited primary dental care practitioners, two were conducted in the US (Adam and Mannion, 2020; Metz et al., 2020), one in Saudi Arabia (Aboalshamat et al., 2020)and one in Chile (Gonzalez and Quezada, 2016). All non-

UK studies recruited dental students. The study samples overall were low and ranged from 5 to 103 participants. The study characteristics are presented in more detail in Appendix 11.

Type of interventions

Three of the studies evaluated counselling and psychological services offered to dental students (Adams, 2017; Gonzalez and Quezada, 2016) and general dental practitioners (Newton et al., 2006). The participants in these studies voluntarily accessed the service, and they agreed to participate in the research. All counselling services described in the studies were not standardised, but they were tailored to the individual's needs. In one of these papers, a psychoeducational outreach programme was also offered to dental students as group voluntary sessions. These sessions aimed to raise the students' knowledge and awareness of psychological wellbeing and stress management practices and encourage them to use the counselling service should they need it (Adams, 2017). The rest of the studies assessed the effectiveness of psychoeducational interventions utilising a cognitive-behavioural approach to improve the participants' mental health and wellbeing. Two were delivered as part of the undergraduate dental curriculum (Aboalshamat et al., 2020; Metz et al., 2020) and the third as a CPD activity for primary care dentists (Chapman et al., 2017).

Outcome measures

A summary of the outcome measures used in the identified studies alongside a short description of the tools used is given in Appendix 7. None of the studies used the same validated tool to measure aspects of mental health and wellbeing. Three studies measured psychological and general wellbeing (Aboalshamat et al., 2020; Adams, 2017; Gonzalez and Quezada, 2016), two measured psychological distress (Adam and Mannion, 2020; Newton et al., 2006), one measured depression and anxiety (Aboalshamat et al., 2020), one measured burnout (Chapman et al., 2017), one measured resilience (Aboalshamat et al., 2020) and one measured impostorism (Metz et al., 2020). Two of the studies used tools specifically designed for dental populations (Chapman et al., 2017; Gonzalez and Quezada, 2016).

5.1.5 Critical appraisal

The Effective Public Health Practice Project (EPHPP) Quality Assessment Tool for Quantitative Studies (Armijo-Olivo et al., 2012) was used to evaluate the quality of the identified quantitative studies. The critical appraisal was conducted independently by two reviewers (AP and MP) who achieved a 95.3% agreement. Consensus was reached by discussion and the involvement of a third reviewer (MB). Due to the limited number of

eligible studies (n=6), we deviated from the review protocol and included all identified studies regardless of methodological quality. As regards to the methodological quality of the studies, two were judged as of moderate quality (Aboalshamat et al., 2020; Metz et al., 2020) and the rest of weak quality (Adams, 2017; Chapman et al., 2017; Gonzalez and Quezada, 2016; Newton et al., 2006). The results of the critical appraisal are presented in Appendix 12.

5.2 Description and effect of interventions

5.2.1 Counselling

In a very small-scale study (5 participants) in Chile, dental students were offered eight 45-minute weekly therapy sessions which were underpinned by the cognitive-behavioural paradigm of psychotherapy (Gonzalez and Quezada, 2016). These sessions aimed to educate the participants about symptomatology and help them acquire a more efficacious manner of coping with dental environment-related problems. After attending the eight sessions, all five participants reduced their perceived stress, as shown by their scores in the Dental Environment Stress (DES) questionnaire (Gonzalez and Quezada, 2016). Two of the participants initially had dysfunctional psychological health scores, as assessed by the OQ-45.2 questionnaire, but their scores were deemed normal by the end of the therapy. The rest of the participants retained their scores within the normal range. Additionally, all participants reported that the intervention helped them improve their coping skills (Gonzalez and Quezada, 2016).

Similarly, a US Dental School in Iowa, offered counselling by a full-time psychologist, in an in-house counselling office embedded within the school (Adams, 2017). Fifty-five students attended 251 counselling appointments, with an average of 4.5 appointments per students. A positive relationship was found between the number of counselling appointments and overall functioning and psychological wellbeing as assessed by the CCAPS-34 scale (Adams, 2017). Within the same dental school, lunchbreak outreach educational group sessions were offered, which students could voluntarily attend. These sessions were designed to increase student knowledge, awareness, and self-efficacy regarding psychological stress management practices to promote personal and professional growth and development. This educational programme's evaluation data showed a moderate increase in awareness, knowledge, and coping skills, but not an increase in willingness to engage in counselling (Adams, 2017). Interestingly, some of the students reported an

increased willingness to seek counselling when the office was relocated to a more confidential setting in the building (Adams, 2017).

One UK-based study by Newton et al. (2006) evaluated the Dental Practitioner Support Service (DPSS) in Kent, whose goal was to help dentists facing high levels of stress. This service included an initial assessment by a counsellor, followed by a maximum of six one-hour counselling sessions in a personalised, problem-focused programme. The programme sessions covered areas including personal issues such as high expectations of self, low self-esteem, unresolved traumatic experiences; home/work balance; practice issues such as paperwork and patient complaints; interpersonal stress within the practice; and concern regarding the ubiquity of stress among NHS dentists. The counsellors adopted various techniques included counselling and therapeutic approaches, teaching and role play, and the identification of information and resources. Of the 20 GDPs initially recruited, 16 participated in the study, and 9 completed a one-month follow-up. A statistically and clinically meaningful decrease in psychological health and distress as measured by the General Health Questionnaire (14.8 vs 9.38) was observed. Participants found the service acceptable and rated their progress in dealing and coping with their stress as good (Newton et al., 2006).

5.2.2 Psychoeducational interventions

A second UK based study examined the effect of a cognitive behavioural therapy (CBT) based bibliotherapy CPD psychoeducational programme on GDPs mental health, wellbeing and decision making (Chapman et al., 2017). Bibliotherapy is a standard method of delivering self-help CBT. Bibliotherapy books provide psychoeducation and facilitate the development of CBT related skills using instruction, exercises and reflection. CBT-based bibliotherapy can also be delivered in a guided form, in which a therapist supports the reader as they work through the materials (Chapman et al., 2017). The study had two arms and compared these two modes of delivery (self-help vs guided self-help CBT). Both arms received a self-help CBT package specially designed for dentists, which was written to tackle stress by building resilience. The second arm received an additional three-hour workshop that would enhance understanding of why the exercises were helpful and encourage the participants to try them on at least one occasion (Chapman et al., 2017). Twenty dentists were allocated in each arm of the study based on their willingness to participate in the face to face workshop. The results of the study revealed that depression (DASS-21, 6.29 vs 9.93), and stress (DASS-21, 12.86 vs 17.93), were significantly reduced at six weeks compared to the baseline, with the reductions maintained at six months (DASS-21, 7.44 vs

0.93 and 13.29 vs 17.93, respectively). Anxiety was significantly reduced at six weeks (DASS-21, 5.43 vs 7.57), but it relapsed back to baseline levels in six months. Significant improvements in the participants' burnout scores was also observed. In particular, emotional exhaustion was significantly reduced at six weeks (MBI, 2.67 vs 3.03) with the reduction maintained at six months (MBI, 2.66 vs 3.03), whilst personal achievement was significantly improved at six weeks (MBI, 0.5 vs 0.68), but this was not maintained at 6 months. The authors also observed an improvement in dentists' decision making with a significant reduction in hypervigilance at six weeks compared to baseline values (MDMQ, 0.96 vs 1.10, p=0.026), which was maintained at six months (MDMQ, 0.94 vs 1.10, P=0.029). Notably, there was no significant difference in any of the outcome measures across mode of delivery (self-help vs guided self-help). The participating dentists were overwhelmingly positive in their evaluation of the project and reported that they used most of its contents (Chapman et al., 2017).

Aboalshamat et al. (2020) introduced a life coaching programme delivered by five senior dental students who had received intensive coaching training by an expert coach. Students in the life coaching intervention group (44 female students) attended five one-on-one standardised 15-minute phone coaching sessions at the beginning of each week, whilst the control group (44 female students) received no coaching or other intervention during that time. All participants in both groups were asked to select a goal they wanted to achieve by the end of the intervention period (5 weeks). The results showed that there were significant differences between the groups in depression (DASS-21), stress (DASS-21), and self-acceptance (PWB-S). However, there was no statistically significant difference observed for anxiety (DASS-21, P=0.212), resilience (RS-14, P=0.872) and the other components of the psychological wellbeing scale (PWB-S: autonomy, environmental mastery, positive relations with others, purpose in life, and personal growth) (Aboalshamat et al., 2020).

Finally, Metz et al. (2020) assessed the impact of a psychoeducational intervention on dental students' impostorism. Individuals who suffer from impostor phenomenon thoughts are susceptible to feelings of inadequacy despite external evidence to the contrary (Metz et al., 2020). A hundred and three first-year dental students were recruited and were shown an 'Impostor Video'. The video's content included taped confessions from former dental students regarding their impostor thoughts and an explanation of the basic traits of the condition. The video elaborated on the impostor cycle and identified six specific coping mechanisms for impostor thoughts. The coping mechanisms presented in the video focused on preventing procrastination through study schedules and reducing the time spent on nonessential tasks. After the video, students were provided with small, double-sided reminder cards. One side of the card contained a custom-designed graphic of the impostor

cycle, while the other side contained reminders of the six proposed coping mechanisms. The goal of this resource was to provide a tangible reminder of the video content. The prevalence of the students' impostor thoughts before they received the intervention and at the end of the semester was assessed using the Clance IP Scale (CISP). There was a statistically significant decrease in impostor thoughts following the intervention. The percentage of students exhibiting intense impostor experiences decreased from 13.6% to 4.9%. Additionally, a greater percentage of students had few impostor characteristics, from 5.8% at the beginning of the semester to 10.7% at the end of the semester. Females exhibited significantly higher scores than males, but there was no statistically significant impact of age or ethnicity on results. The majority of students indicated that the video was successful in spreading awareness of the impostor phenomenon, and they recommended repeated exposures to the video throughout their course (Metz et al., 2020).

6 Mental health and wellbeing interventions in the wider health sector

RQ(iii): What techniques and preventive methods/interventions have been used and evaluated to improve or tackle mental health issues amongst other registered health professionals?

6.1 Study selection

6.1.1 Search strategy

An information specialist (LB) developed an appropriate search strategy combining terms related to mental health and wellbeing, terms related to healthcare professionals and terms related to systematic reviews. The following databases were searched: MEDLINE, Embase, CINAHL and PsycINFO. The search strategy for each database can be seen in Appendix 13.

6.1.2 Selection criteria

Population: The WHO classification for health professionals was used to define the population of interest (WHO, 2006), according to which health professionals study, advise on or provide preventive, curative, rehabilitative, and promotional health services based on an extensive body of theoretical and factual knowledge in diagnosing and treating disease and other health problems. Health professionals who are directly (face to face) involved in patient healthcare delivery (diagnosis and treatment of disease) as underpinned by the WHO definitions, who are subject to professional registration as stipulated by the Professional Standards Authority comprised the population of interest for this umbrella review. An exhaustive list of professional groups considered for inclusion and exclusion can be found in the review protocol (see Appendix 1).

Intervention: Interventions aiming to improve mental health and wellbeing. These interventions may include but are not limited organisational change interventions, lifestyle interventions, stress management interventions or training programmes.

Comparison: Comparator groups may include different interventions or strategies implemented to improve healthcare workers' mental health and wellbeing or no intervention.

Outcome: Outcomes included but were not limited to:

- Prevalence of mental health disorders/conditions (such as depression) measured by validated scales/instruments or medical diagnosis.
- Prevalence of mental health issues (such as burnout) measured by validated scales/instruments).
- Prevalence of stress and psychological wellbeing issues measured by validated scales/instruments.
- Experiences, if qualitative outcomes are reported

6.1.3 Search results

As shown in the RQ(iii) PRISMA flowchart (see Appendix 14), the search strategy yielded 2,610 results. Following the removal of duplicates, 1,749 articles were retained for title and abstract screening. Two reviewers independently screened the titles and abstracts of the identified papers (MP and AP). Almost perfect agreement (98.4%) was achieved at this stage, and consensus was reached upon discussion. The full text of the selected papers was also screened for eligibility independently by the two reviewers (MP and AP) against the prespecified selection criteria (90.3% agreement) and consensus was reached upon discussion. Sixty-seven (67) systematic reviews were read in full-text, and 19 met the review selection criteria. Reasons for excluding the full-text papers were discussed and agreed upon between the two reviewers and recorded. A list of the excluded studies with reasons for exclusion is provided in Appendix 15

6.1.4 Critical appraisal

The appraisal was conducted independently by the two reviewers (AP and MP) who achieved 91.7% agreement and achieved consensus upon discussion. The AMSTAR-2 checklist was used, which measures 16 items and rates each review quality as high, moderate, low, or critically low (Shea et al., 2017). A 'best evidence threshold approach' was employed at this stage and informed the inclusion and exclusion of the identified eligible systematic reviews (Meline, 2006). A list of the excluded studies with reasons for exclusion based on quality and the critical appraisal results are presented in Appendix 16, whilst the decisions made about the quality of the included systematic reviews using the AMSTAR-2 tool after consensus was reached, are in Appendix 17.

6.1.5 Characteristics of included reviews

The systematic reviews were published between 2017 and 2020 and included between 9 to 19 primary studies (48 in total). Two studies were included in two reviews. Of the included studies, 36 were conducted in countries of very high human development (US=19, Australia=6, Canada=2, UK=1, Argentina=1, Belgium=1, Germany=1, Israel=1, Korea=1, Malaysia=1, Spain=1, Turkey=1), 9 in counties of high human development (Iran=7, Armenia=1, Taiwan=1) and one study in India which is considered to be a country of medium human development as indicated by the Human Development Index (HDI) (United Nations Development Programme, 2020). The population of interest in the included reviews were physicians in two reviews (Panagioti et al., 2017; Venegas et al., 2019) and nurses in the other two reviews (Alkhawaldeh et al., 2020; Li et al., 2019). The outcomes of interest were stress in two reviews (Alkhawaldeh et al., 2020; Li et al., 2019), burnout in two reviews (Panagioti et al., 2017; Venegas et al., 2019), and anxiety, depression and resilience in one review (Venegas et al., 2019). The tools used for each outcome of interest can be seen in the table of review characteristics (Appendix 18). Two of the reviews also provided meta-analysis data (Panagioti et al., 2017; Venegas et al., 2019). The review characteristics are presented in a tabular format in Appendix 18.

6.2 Description and effectiveness of interventions

The included systematic reviews identified three broad categories of interventions: organisation directed interventions, healthcare-worker directed interventions and lifestyle interventions. The interventions varied considerably in their characteristics across the board in all reviews, including content, duration, intensity and follow up, making direct comparisons difficult.

6.2.1 Organisation directed interventions

Regarding the organisation-directed interventions, only Panagioti et al. (2017) in a high-quality systematic review and meta-analysis, summarised the evidence of such interventions. This review assessed the evidence from 19 studies, including 1550 physicians. Out of these 19 studies, seven were classified as organisation directed interventions, with five employing simple workload interventions focusing on shifts rescheduling and workload reduction and only two employing more complex, multifaceted interventions incorporating discussion meetings to enhance teamwork and leadership, structural changes, quality improvement and elements of physician-directed interventions

such as communication skills training and mindfulness. Organisation directed interventions were associated with moderate statistically significant reductions in burnout (SMD = −0.45; 95% CI, −0.62 to −0.28; I2 = 8%).

6.2.2 Healthcare-worker directed interventions

The rest of the studies (n=12) in the review by Panagioti et al. (2017) were classified as physician-directed interventions, with five assessing educational interventions, including stress recognition, communication skills, coping skills, reflection skills and cognitive and behavioural skills training, and three assessing mindfulness-based interventions. These interventions were associated with small albeit significant reductions in burnout (SMD = −0.18; 95%CI,−0.32 to −0.03; I2 = 11%). However, the effects of organisation directed interventions were significantly larger than the effects of physician-directed interventions, with the multifaceted interventions being the most effective in reducing burnout (Panagioti et al., 2017).

The effect of physician-directed interventions on physicians' burnout was also summarised by a moderate quality meta-analysis conducted by Venegas et al. (2019). This review also looked at other outcome measures such as resilience (2 studies), depression and anxiety. However, a meta-analysis was not conducted for these measures. The interventions were either educational (n=6) incorporating psychosocial skills, cognitive-behavioural skills, coping skills, stress management and resilience training or mindfulness-based interventions (n=3). Of the latter, in two studies, mindfulness practice was complemented by communication and reflection skills training. Six of the included studies in this review reported on burnout, with two being randomised controlled trials and four observational studies. The randomised controlled trials showed no statistically significant differences for any of the three burnout subscales contrary to the observational studies which demonstrated significant reduction in emotional exhaustion [pooled SMD -0.67 (95% CI -0.84 to -0.5) P= 0.81; I2 = 0%] and depersonalisation [pooled MD -2.42 (95% CI -3.80 to -1.04) P= 0.76; I2 = 0%], and a significant improvement in personal accomplishment [pooled MD 2.47 (95% CI 1.13 to 3.81) P= 0.55; I2 = 0%]. As regards to resilience, two randomised controlled trials reported significant improvements in resilience, but the authors were unable to provide a pooled estimate for resilience due to high clinical and methodological heterogeneity (I2 = 79%). Similarly, due to insufficient data, meta-analysis for anxiety and depression could not be conducted. Of the studies that assessed these outcome measures, the results were mixed. Two randomised controlled trials demonstrated no statistically significant difference in depression. Another randomised trial suggested a statistically significant improvement for

anxiety, and one observational study showed significant improvements in depression and anxiety (Venegas et al., 2019).

Alkhawaldeh et al. (2020) in a systematic review of moderate quality, on stress management interventions for intensive and critical care nurses, out of the 12 included studies, accounting for 592 nurses, six were classified as cognitive-behavioural educational interventions, three as mindfulness-based interventions and three as lifestyle interventions. The cognitive-behavioural educational interventions included emotional regulation training, neuro-linguistic programming, resilience training, emotional intelligence training, assertiveness training, coping skills training and time management training. Statistically significant reduction in stress was observed in all six studies that support that cognitive-behavioural educational intervention effectively reduced occupational stress immediately after the intervention and up to 2 to 8 weeks post-intervention delivery. The mindfulness training intervention employed mindfulness techniques, cognitive behavioural therapy and meditation. The duration of these interventions was 5 to 10 minutes a day and led to a significant reduction of stress levels immediately after the intervention. The difference remained significant at one and at four weeks follow-up assessments (Alkhawaldeh et al., 2020).

6.2.3 Lifestyle interventions

Three of the studies included in the systematic review by Alkhawaldeh et al. (2020) assessed the effect of massage, yoga, and aromatherapy on nurses' stress levels. Receiving a general Swedish massage twice a week for four weeks was effective in reducing occupational stress immediately and two weeks post-intervention among nurses in one study, whilst yoga and aromatherapy were not found to provide any significant reduction in stress levels (Alkhawaldeh et al., 2020).

The effect of lifestyle interventions, such as aromatherapy and massage, on nurses' stress levels was also assessed in another systematic review which included ten studies, accounting for 628 nurses (Li et al., 2019). Aromatherapy interventions were delivered in four studies as an aromatic mouthwash, an essential oil skin rub, an inhalation solution placed in an essential oil nebulising diffuser, or an essential oil bottle to be hanged in front of the nurses' right chest. The mouthwash and skin rub intervention seemed to be effective immediately after the intervention, but their long-term effect was not investigated. For the inhalation methods, a 5-minute exposure to the essential oil through a diffuser during staff huddles was not found effective, whilst carrying a bottle of essential oil showed some effectiveness after the second day of wear. The results of the massage and aromatherapy massage interventions were mixed. The massage sessions' duration varied from a 10-

minute massage by a massage chair to a 90-minute full-body massage by a therapist. The interventions' duration also varied considerably from a one-off session to weekly sessions up to 12 weeks. Five of the studies had no control group, and in one study, the control intervention was a 10-minute coffee break. Out of the six studies, four indicated a significant reduction in nurses stress levels, whilst two found no significant difference (Li et al., 2019).

7 Implications

This rapid evidence assessment aimed to identify and summarise evidence published in the past 14 years on the mental health and wellbeing of UK dental team members and interventions to improve it. The breadth of the research identified is primarily related to dentists and dental students.

7.1 Prevalence

Evidence indicates that mental health issues may arise as early as the undergraduate years. A limited number of studies showed that final-year BDS students exhibit higher levels of stress than earlier years, whilst few showed that students experienced signs of burnout during their training. These studies were conducted mainly in single institutions which limits the generalisability of the findings. Longitudinal studies monitoring students' mental health and wellbeing as they progress through their degree course and enter the profession could bring light to the changes over time.

GDPs outnumbered dentists from different fields of practice, which is not surprising as GDPs comprise the majority of the UK's dental workforce. Due to insufficient data from the included studies and the heterogeneous outcome measures used, comparisons among different fields of practice, dentists' working characteristics and country of practice could not be made. However, what became evident from this synthesis is that in recent years, dentists' mental health and wellbeing has deteriorated with a greater proportion of practitioners exhibiting signs of burnout, suicide ideation and poorer wellbeing (Collin et al., 2019). This observation is in line with the findings of a recent rapid review, in which the authors concluded that UK dentists are currently at higher risk of suffering from burnout than they were two decades ago (Salazar et al., 2019). According to the studies we reviewed, GDPs appeared to be the most adversely affected group compared to dentists working in other fields of practice, which could be attributed to the fact that general dental practice is sensitive to policy changes in a way that other areas of dentistry are not.

On the other hand, research including dental care professionals (DCPs) and trainees was scarce, indicating a gap in the evidence base on their mental health and wellbeing. Future research studies should actively recruit dental team members of these underrepresented professionals.

7.2 Stressors

In this REA we identified and provided a descriptive overview of the factors that are perceived as stressors by dental professionals and dental professions students, as these appear in the dental literature. Interestingly, the existing evidence suggests that the fear of litigation among dentists has increased in recent years, while regulatory stress appeared as a stressor in the literature only within the past six years. Namely, dentists identified regulation and fear of litigation as the most stressful aspects of practising dentistry in the UK (Collin et al., 2019; Toon et al., 2019), whilst a qualitative study carried out by the British Dental Association (BDA), suggested that working conditions, working environment, regulatory bodies and the NHS were the most significant factors impacting dentists' mental health and wellbeing (Larbie et al., 2017). Although the COVID-19 pandemic's impact was not the focus of this review, two studies were identified reporting the additional stressors that the profession is dealing with, on the face of the uncertainties related to the current unprecedented times, namely health of friends and family, financial viability and personal protection (Mahendran et al., 2020; DPL, 2020).

It is important to note that stress is widely viewed as a transaction. According to the transactional model of stress proposed by Lazarus and Folkman (1984), stress occurs where there is an imbalance between the individual's perceived demands (stressors) and the perceived resources to meet those demands. This is an ongoing and dynamic 'balancing process', where the individual's appraisal of a stressor determines how they respond. There are three stages of appraisal described in this model: primary, secondary and reappraisal (Lazarus and Folkman, 1987). Primary appraisal consists of the judgment that the demand is irrelevant, benign-positive, or stressful; secondary appraisal refers to a judgment concerning what might and can be done; and reappraisal is when the appraisal is changed based on new information from the environment and/or the person (Lazarus and Folkman, 1987). Therefore, it becomes apparent that there is a complex interplay between the individual, the potential stressor(s) and the environment or systems in which the individual operates (Lazarus and Folkman, 1987; Michie, 2002). A recent model described by Salazar et al. (2019) depicts this complex interplay between different determinants of dentists' mental health and wellbeing including personal factors, professional career level, professional and social relationships, job specification, workplace characteristics, dental healthcare systems and regulation. Readers are referred to the original publication to view the model (Salazar et al., 2019).

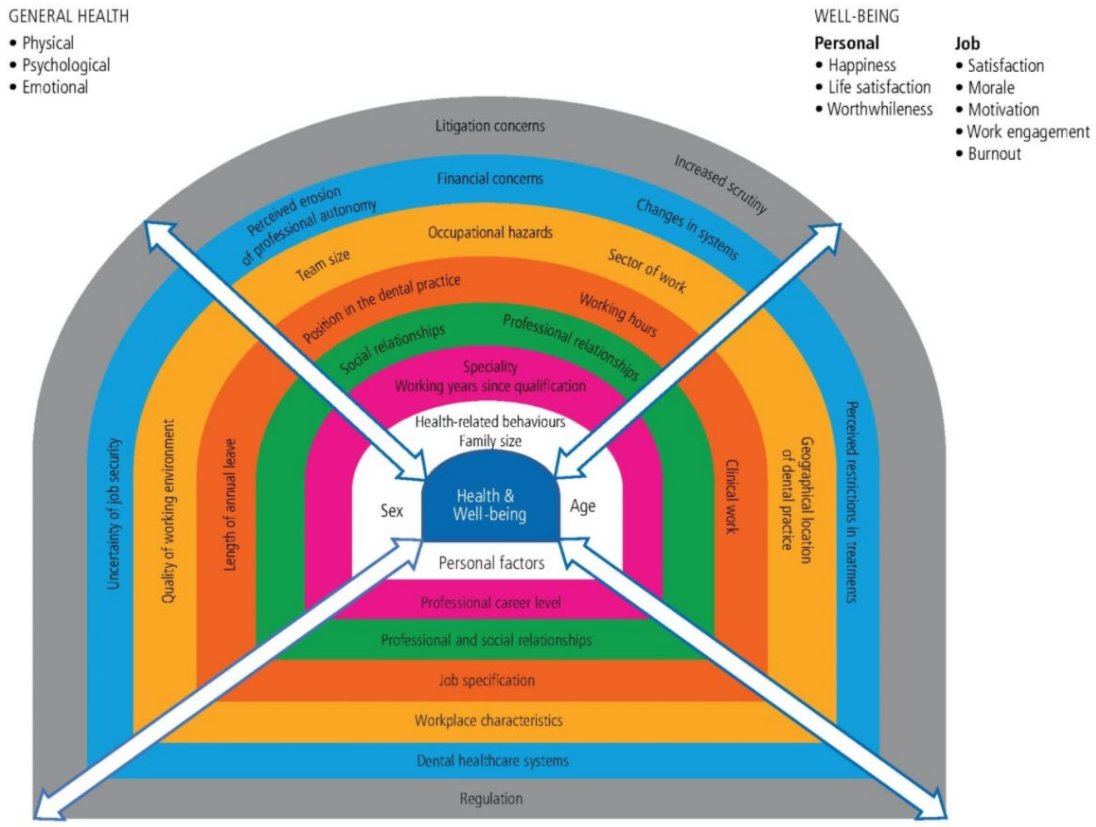


Fig 1. Determinants of dentists' health and wellbeing

Reprinted by permission from Springer Nature: Nature, British Dental Journal, "*Key determinants of health and wellbeing of dentists within the UK: a rapid review of over two decades of research.*" Salazar FBC, Sipiyaruk K, White S, Gallagher JE. COPYRIGHT 2019

7.3 Impacts

Evidence indicated that poor mental health and wellbeing can a negative impact on workforce sustainability. Dentists also perceived that poor mental health and wellbeing affects their performance. However, the relationship between stress and poor mental health with dentists' performance and patient safety remains a poorly researched area. Although little empirical data exists on the impact of stress on dentists' clinical performance (Plessas et al., 2018), research in other health fields does provide some insight. Excessive stress in surgeons has been found to impair surgical technical performance as well as non-technical skills such as leadership and communication (Arora et al., 2010). Likewise, depression and burnout have been reported to predict poor work performance and absenteeism amongst the nursing profession (Dyrbye et al., 2019).The need to explore this niche area of research in dentistry is compounded further by the fact that there will be a considerable number of young

dentists already suffering from stress entering what is considered a stressful profession, as the studies related to dental students indicated.

7.4 Interventions

A relatively recent qualitative study conducted by the BDA explored dentists' opinions on measures and strategies to improve their mental health and wellbeing. These are summarised below in descending order with the most frequent suggestions appearing first: better regulation and governance, education and awareness of risks, private and confidential dentist focused support, networking opportunities, peer support, helpline, student support, occupational health services and counselling (Larbie et al., 2017). At the time of producing this report, a single signposting document bringing together all the wellbeing resources available to UK dental teams and students was published (Cameron et al., 2021), which can be accessed here.

A paucity of research, evaluating interventions to improve dentists' and dental care professionals' mental health and wellbeing was noted, with only two studies recruiting GDPs and four recruiting dental students. Notably, the majority of the above studies were of weak methodological quality. Therefore, there is an urgent need for further adequately powered and methodologically robust dental studies, which will implement psychoeducational and/or organisation directed interventions and evaluate their effectiveness both at undergraduate and practice level. Examples of such interventions can be borrowed from other healthcare professions and adapted to fit in with the distinct nature and characteristics of dental education and practice.

When it comes to preventing mental health and wellbeing issues in the workplace, three levels of intervention can be employed: primary prevention, secondary prevention and tertiary prevention (Cooper and Cartwright, 1997). Each level of intervention places separate but related responsibilities on both the individual and the system or environment they operate (i.e. practice, service, organisation, healthcare system). The available evidence identified in this REA will be discussed in turn as regards to these levels.

7.4.1 Primary prevention

Primary prevention is concerned with taking action to modify or eliminate sources of stress inherent in the work environment and thus reduce their negative impact on the individual (Cooper and Cartwright, 1997). Organisation directed interventions therefore fit within primary prevention. The evidence from the broader healthcare literature advocated

organisation directed interventions as being more effective in improving healthcare workers' mental health and wellbeing. Most of these interventions aimed to lessen workload pressures by reducing or changing shift patterns, while a minority employed multifaceted interventions including structural changes, quality improvement and psychoeducational training. Such interventions are currently not widely in use in dental education and practice. Leadership and innovation is required to design primary level interventions which can be implemented in the UK dental sector, with its distinct organisational and service characteristics.

Some stressors mapped in this REA can be controlled by the individual, while others will require a systems-level approach to be modified or eliminated. For example, workload pressures imposed by the need to catch up with UDA targets was ranked as a frequently occurring stressor among GDPs (Chipchase et al., 2017; Collin et al., 2019; Larbie et al., 2017). At a practice or service level, purposefully incorporating short breaks or time away from clinics within the work schedule or staff rotas may decrease the stress related to the heavy workload dentists are facing. On the other hand, at policy level, moving away from a target-based dentist remuneration system may positively impact GDPs' mental health and wellbeing.

Primary prevention strategies are often a vehicle for cultural change (Cooper and Cartwright, 1997). In light of the impact of regulation and litigation on dentists' mental health and wellbeing, shifting the culture in dentistry from a blame culture to a safety culture is timely (GDC, 2019; NHS, 2019). 'Safety culture' relates to the extent to which organisations or systems prioritise and support improvements in safety (Halligan and Zecevic, 2011). Interestingly, dentists have reported that they practise under fear of regulatory action and litigation, and this fear constitutes a significant stressor during their practising lives. It has been supported that a punitive approach to error encourages a blame culture and an increase in malpractice litigation, which may lead to defensive behaviours and in turn, potentially hinder patient safety (Catino, 2009). A prerequisite for a fair and just safety culture is that all the relevant stakeholders (members of the profession, regulators, litigation system) can identify the dividing line between unacceptable behaviours that merit sanctions and other actions for which regulatory action does not help promote safety.

7.4.2 Secondary prevention

Secondary prevention is concerned with the prompt detection and management of experienced stress and mental health and wellbeing issues by increasing awareness and improving the individual's coping skills (Cooper and Cartwright, 1997). Contrary to primary

prevention where the interventions are aiming to address the 'demands' of the transactional equation of stress described earlier, secondary prevention aims to extend the individual's 'resources.' Psychoeducational interventions sit at the secondary prevention level and serve a useful function in helping individuals to recognise the symptoms of poor mental health and wellbeing, and to overcome the negativity and the stigma associated with it. These interventions address the consequences rather than the sources of stress by improving the adaptability of the individual to the workplace environment, and the organisation or system's structure and culture.

Evidence from the wider health sector suggests that psychoeducational interventions, as healthcare-worker directed interventions, have a small but statistically significant effect in reducing healthcare professionals' burnout and stress levels (Alkhawaldeh et al., 2020; Panagioti et al., 2017; Venegas et al., 2019). These results are in line with findings in the dental literature with a bibliotherapy CBT CPD programme designed for GDPs being deemed successful in reducing practitioners' burnout and improving their decision making (Chapman et al., 2017). As eluded above future studies employing psychoeducational activities are warranted. These may include communication and coping skills training, emotional intelligence training, stress management training, resilience training, mindfulness-based practice, or combination.

The case for consistent monitoring of mental health and wellbeing of dental team members and trainees to facilitate early recognition and response is clear. Raising awareness and facilitating early recognition of poor mental health as well as effectively responding to these early signs should take place as early as a dental professionals' training and continue throughout their professional lives. Learning about coping mechanism, stress management, and building resilience ought to become part of contemporary educational activities both in undergraduate education and in continuing professional development activities.

7.4.3 Tertiary prevention

Tertiary prevention is concerned with the treatment, rehabilitation and recovery process of those individuals who have suffered or are suffering from psychological ill health and they typically involve the provision of counselling services (Cooper and Cartwright, 1997). Our REA results suggested that individualised counselling is useful for dentists, and students exhibiting high levels of stress or established poor mental health (Newton et al., 2006). However, these services are more likely to be accessed and used if they are confidential and they take into account the nuances of the dental environment (Adams, 2017; Larbie et al., 2017).

Currently while there is a considerable activity at the secondary and tertiary level in dentistry, primary or organisation level strategies are lacking. Although secondary and tertiary level interventions have a useful role to play in the prevention and rehabilitation of mental health and wellbeing issues, their long-term effectiveness as stand-alone interventions may be questionable, unless attempts are also made to address the sources of stress alongside the organisational and systems structures and culture through primary level prevention. To achieve this, the collective attention and collaboration of UK policymakers, regulators and relevant stakeholders is warranted.

8 Conclusions

This rapid evidence assessment indicates that dentists face mental health and wellbeing challenges during their professional lives, with GDPs being the most adversely affected than dentists in other fields of practice. Litigation and regulation on dentists' mental health and wellbeing were noted as key stressors. However, there was limited evidence on mental health and wellbeing of DCPs.

The review findings point towards the importance of better understanding and responding to mental health issues. This will require, on an ongoing basis, the ability to consistently measure the mental health and wellbeing of UK dental team members. Further, the present work supports the increased recognition of the contribution of "latent" or "system-related" factors, related to the organisation and delivery of healthcare, in ensuring patient safety, through safeguarding of mental wellbeing for the staff involved in the delivery of care.

We hope that this review contributes to a developing evidence base that will inform how the dental sector responds in order to prevent and address professionals' mental health issues at every stage in their career journey - from education, through into the workplace and through continuing professional development.

9 Technical Appendix

9.1 Appendix 1: Protocol

Mental Health and Wellbeing: A Rapid Evidence Assessment.

Review Protocol

Anastasios Plessas[1], Martha Paisi[1,2], Marie Bryce[1], Lorna Burns[1], Timothy O' Brien[1], Robert Witton[1,2], Yaniv Hanoch[3]

[1]University of Plymouth, Faculty of Health

[2]Peninsula Dental Social Enterprise

[3]University of Southampton, Business School

Review questions

To meet the project objectives given in the proposal document, this project will consist of:

- a rapid evidence assessment (REA) to answer the questions:

RQ(i): What is the prevalence of mental health and wellbeing issues amongst registered members of the dental team and dental professions students in the UK, what are the contributing factors and impacts and how these have changed over the past 14 years?

RQ(ii): What techniques and preventive methods/interventions have been used and evaluated to improve or tackle mental health issues among dental team members and dental professions students in countries of very high human development over the past 14 years?

- an umbrella review (overview of systematic reviews) to answer the question:

RQ(iii): What techniques and preventive methods/interventions have been used and evaluated to improve or tackle mental health issues amongst other registered health professionals?

Phenomenon of interest

The phenomenon of interest for this piece of work is **mental health and wellbeing**. According to the WHO, mental health is 'a state of wellbeing in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community' (Galderisi et. al., 2015). This definition suggests that mental health is fundamental to wellbeing and the ability to lead a functional life as an individual within the community.

There exist different aspects of wellbeing including physical, economic, social, emotional and psychological/mental wellbeing, life satisfaction, domain-specific satisfaction and engaging activities and work (Centers for Disease Control and Prevention, 2018). In line with the GDC's quotation request, this project will focus on the **psychological/mental aspect of wellbeing.**

Time period to be covered

In 2006 the General Dental Council opened the dental care professional (DCP) register[1], whilst in July 2008 it became compulsory for dental nurses together with other previously unregistered dental care professional (DCP) groups working in the UK to register with the GDC involving payment of an annual registration fee and verification of qualifications (Turner et al., 2012). Although this date parameter for the literature searching may seem to be more relevant to RQ(i), it will be applied to all searches. This will give consistency among the reviews and allow for a generous representation of contemporary literature, whilst also being discerning about the relevance of earlier literature. Pragmatic decisions as limiting the timeframe of searches is not unusual in REAs. In contrast to traditional systematic reviews, such concessions to the exhaustivity of scope, are not atypical in REAs, and are made in order to suit the shorter given time and resources (Varker et al.,2005).

[1] As set out in the Dentists Act 1984, Section 36B

Rapid evidence assessment methodology

Varker's rapid evidence assessment (REA) methodology (Varker et al., 2015) will be followed to systematically search, synthesise evidence and provide summaries of the literature conforming to Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) guidelines (Moher et al., 2009).

RQi Methods:

RQ(i): What is the prevalence of mental health and wellbeing issues amongst registered members of the dental team and dental professions students in the UK, what are the contributing factors and impacts and how these have changed over the past 14 years?

Literature search strategy

An experienced information specialist (LB) will develop a search strategy combining terms related to mental health and wellbeing, terms related to dentistry and UK related terms. The following databases will be searched: MEDLINE, Embase CINAHL, DOSS, Scopus, and PsycINFO. An example of the search strategy in Embase (Ovid) can be seen in Protocol appendix I.

Grey literature such as reports published by UK regulatory bodies, government departments and professional bodies will be identified. A list of the organisations whose websites will be searched for relevant reports can be found in Protocol appendix II. The EThOS database will also be searched for theses relevant to the topic of this review. The searches will be supplemented with citation searches of included studies/reports.

Evidence selection criteria

As we expect to include both quantitative and qualitative studies the presentation of the inclusion and exclusion criteria will follow the PICo (Population, Phenomena of Interest, Context) framework (Aromataris et al., 2015).

Population:

The population of interest is UK registered members of the dental team, and dental professions students. The registered members of the dental team in the UK are comprised of:

- Dentists (generalists and specialists)
- Dental nurses
- Clinical dental technician
- Dental hygienist
- Dental technician
- Dental therapist
- Orthodontic therapist

The term dental professions students is used as an umbrella term which includes students or trainees studying towards a qualification which will lead to a professional registration with the GDC (i.e. dental students, dental hygiene students, dental hygiene and therapy students,

orthodontic therapy students, dental technology students, clinical dental technology students, and trainee dental nurses).

Studies and reports recruiting or reporting data on any of the above groups will be included in the REA RQi search and synthesis. Studies recruiting solely non-registered or non-clinical members of the UK dental team (i.e. reception staff, practice/service managers etc.) will not be included. Studies recruiting solely other health professionals than the ones mentioned above will also be excluded.

Phenomena of interest

Studies and reports reporting data on the following elements will be considered for inclusion:

- Prevalence of mental health disorders/conditions (such as depression) measured by validated scales/instruments or medical diagnosis
- Prevalence of mental health issues (such as burnout) measured by validated scales/instruments)
- Prevalence of stress and psychological wellbeing issues measured by validated scales/instruments
- Sources of stress and poor mental health and wellbeing
- Impact of poor mental health and wellbeing on the registrant and their clinical practice. (These may include but not limited to: clinical performance and decision making, early retirement, change in profession, suicide, alcohol and drug issues which would impair performance or fitness to practise etc.).

Registrants' or students' physical health (e.g. physical illness etc.) or physical wellbeing (e.g. musculoskeletal disorders, etc.) are not within the scope of this REA.

Context:

Studies and reports reporting data collected in a UK dental setting will be considered for inclusion. The dental setting may include educational settings (i.e. dental schools) and clinical settings, either in primary or secondary care (i.e dental practice, community services, hospital services etc.). Studies or reports referring to non-dental settings or dental settings not located within the UK will be excluded.

Type of studies

Primary quantitative studies (surveys, case control studies, cohort studies, controlled studies, RCTs etc), primary qualitative studies, mixed methods studies and official UK reports will be considered for inclusion. Editorials, letters to the editor, opinion pieces, and simulation experimental studies assessing intra-operative stress will be excluded. If any reviews or systematic reviews are identified, the reference list will be screened for relevant articles. Their results may be considered in the discussion section but they will not be included in the data extraction or evidence synthesis.

Language

Only studies and report in English language will be included.

Study selection step 1: screening of titles/abstracts

The search results will be imported in the Endnote X9 software (LB). Following deduplication, the references will be exported to the Rayyan Systematic Review Application (LB) (Ouzzani et al., 2016).

A single reviewer (AP) will apply the selection criteria to all references using the information available in the title and abstract. If the relevance of the article is unclear based on the title and abstract, the full-text version of the paper will be obtained. Where relevance is unclear, only papers that are readily available in full text (i.e. freely available or available through the Plymouth University Library interface PRIMO) will be further assessed (Varker et al., 2015). Any uncertainty for inclusion of studies at this stage will be resolved by discussion between the first and second reviewer (AP and MP).

Study selection step 2: screening of full paper

A single reviewer (AP) will read the full-text version of the eligible papers and decide whether each paper should be included or excluded based on the pre-defined criteria described in Table 1. An inter-rater reliability process will be followed at this stage (Varker et al., 2015), whereby a random selection of 20% of articles will be checked by a second independent reviewer (MP). If an inter-rater agreement rate of less than 95% is found regarding inclusion/exclusion of full –text papers, the second reviewer will conduct an independent review of all full-text papers. Discrepancies between the two reviewers will be resolved through discussion. If consensus cannot be reached, a third reviewer (MB) will be consulted. Reasons for excluding the full text papers will be recorded. The study selection process will be reported using a PRISMA flowchart.

Critical appraisal

For this research question no formal critical appraisal will be performed. Due to the strict timeframe and location limits employed in the search, we will include all the studies and reports addressing this question and meeting the eligibility criteria specified above.

Data extraction

The data of included studies will be extracted by a single reviewer (AP) and verified by the second reviewer (MP). Should any disagreement arise, this will be resolved with discussion. If consensus cannot be reached, a third reviewer (MB) will be consulted. An example of the data collection form we intend to use, and which has been pilot tested on an elligibe paper can be found in Protocol appendix III.

Data synthesis

The synthesis of the results will be undertaken by AP and verified by MP. MB will be consulted where necessary. The QSR NVivo 12 software will be used to code the articles and facilitate the data collation and synthesis. The results will be presented in a tabular and/or graphical format which will facilitate visualisation of trends within the data. The data will also be synthesised narratively, where necessary, highlighting noteworthy observations and trends. The prevalence data, reasons for poor MHWB and stressors identified in the dental literature will be presented as a time series (per year of publications identified). This will allow the researchers to ascertain whether any changes in time have occurred. The framework used by Salazar et al. (2019) will be adopted for the taxonomy of sources of mental health and wellbeing issues identified in the included studies. Where possible, the results will be compared across subgroups. The subgroups comparisons will be developed

inductively, based on the classifications used in the identified studies and reports. The subgroups may be defined by the following characteristics (not exhaustive list): professional group, professional role, type of practice, employement status, working pattern, etc.

RQii Methods

RQ(ii): What techniques and preventive methods/interventions have been used and evaluated to improve or tackle mental health issues among dental team members and dental professions students in countries of very high human development over the past 14 years?

Literature search strategy

An experienced information specialist (LB) will develop a search strategy combining terms related to mental health and wellbeing, terms related to dentistry and terms related to intervention and methods for improving mental health and wellbeing. The latter terms have been identified from a scoping search of the wider literature on mental health and wellbeing workplace interventions. The following databases will be searched: MEDLINE, Embase CINAHL, DOSS, Scopus, and PsycINFO. An example of the search strategy in Embase (Ovid) can be seen in Protocol appendix IV.The EThOS database will also be searched for theses relevant to the topic of this review. The searches will be supplemented with citation searches of included studies/reports.

Evidence selection criteria

Population

Studies recruiting dentists, dental care professionals (as outlined in RQi population section), and dental professions students will be considered for inclusion. Studies recruiting non clinical members of the dental team or non-dental health professionals will be excluded.

Setting

Studies conducted in a dental setting of countries of very high development as indicated by the Human Development Index (HDI) (United Nations Development Programme, 2020), will be considered for inclusion. The dental setting may include educational settings (i.e. dental schools) and clinical settings, either in primary or secondary care (i.e dental practice, community services, hospital services etc.). A list of the countries of very high human development can be accessed here.

Intervention

Studies evaluating the effectiveness of interventions/strategies implemented to improve mental health and wellbeing either quantitatively or qualitatively will be considered for inclusions. The REA will adopt a broad, inclusive approach to the selection of intervention studies. Interventions aiming to improve mental health and wellbeing may include but are not limited to organisational change interventions, lifestyle interventions, stress management interventions or training programmes. Studies presenting self reported coping strategies or interventions whose effect has not been evaluated will not be considered for inclusion.

Comparison

Comparator groups may include different interventions or strategies implemented to improve mental health and wellbeing of dental team members.

Outcomes

Outcomes may include but are not limited to:

- Prevalence of mental health disorders/conditions (such as depression) measured by validated scales/instruments or medical diagnosis
- Prevalence of mental health issues (such as burnout) measured by validated scales/instruments)
- Prevalence of stress and psychological wellbeing issues measured by validated scales/instruments
- Experiences (if qualitative outcomes are reported) as a measure of evaluation of the intervention

Type of studies

Primary quantitative studies (surveys, case control studies, cohort studies, controlled studies, RCTs etc), primary qualitative studies, mixed methods studies will be considered for inclusion. Editorials, letters to the editor, opinion pieces, and reviews will be excluded. If any relevant reviews or systematic reviews are identified, their reference lists will be screened for relevant primary studies which meet the specified REA eligibility criteria.

Methodological quality

Given the limited resources, a best evidence approach will be used to inform decisions for study inclusion and exclusion. Quantitative studies of high and moderate quality (strong and moderate global rating) as assessed by the EPHPP tool and qualitative studies of high and moderate quality (+++ & ++ global rating) as assessed by the NICE Quality Appraisal Checklist-Qualitative Studies will be considered for inclusion. Quantitative studies of low quality (weak global rating) as assessed by the EPHPP tool and qualitative studies of low quality (+ global rating) as assessed by the NICE Quality Appraisal Checklist-Qualitative Studies will be excluded. Please see bellow 'critical appraisal'.

Language

Only papers in English language will be included.

Study selection step 1: screening of titles/abstracts

The search results will be imported in the Endnote X9 software (LB). Following deduplication, the references will be exported to the Rayyan Systematic Review Application (LB) (Ouzzani et al., 2016).

A single reviewer (AP) will apply the selection criteria to all references using the information available in the title and abstract. If the relevance of the article is unclear based on the title and abstract, the full-text version of the paper will be obtained. Where relevance is unclear, only papers that are readily available in full text (i.e. freely available or available through the Plymouth University Library interface PRIMO) will be further assessed (Varker et al., 2015). Any uncertainty for inclusion of studies at this stage will be resolved by discussion between the first and second reviewer (AP and MP).

Study selection step 2: screening of full paper

A single reviewer (AP) will read the full-text version of the eligible papers and decide whether each paper should be included or excluded based on the pre-defined criteria described in Table 1. An inter-rater reliability process will be followed at this stage (Varker et al., 2015), whereby a random selection of 20% of articles will be checked by a second independent reviewer (MP). If an inter-rater agreement rate of less than 95% is found regarding inclusion/exclusion of full –text papers, the second reviewer will conduct an independent review of all full-text papers. Discrepancies between the two reviewers will be resolved through discussion. If consensus cannot be reached, a third reviewer (MB) will be consulted. Reasons for excluding the full text papers will be recorded. The study selection process will be reported using a PRISMA flowchart.

Critical appraisal

Given the limited resources, a best evidence approach will be used to inform decisions for study inclusion and exclusion (for RQii studies). There are two approaches in selecting studies based on quality: the threshold approach and the quality-weighing approach (Meline, 2006) . For the present work, the threshold approach will be used, which sets a priory a minimum level of quality that prospective should meet to be included. Quantitative studies of high and moderate quality will only be included, while low quality studies will be excluded. Quality of quantitative studies will be assessed by the Effective Public Health Practice Project (EFHPP) quality assessment tool for quantitative studies (Armijo-Olivo et al., 2012). Similarly, only qualitative studies of high and moderate quality (+++ & ++) as assessed by the NICE Quality Appraisal Checklist-Qualitative Studies will be included, whils studies of low quality (+) will be excluded (UK National Institute for Health and Care Excellence, 2012). The critical appraisal will be carried out independently by the two reviewers (AP and MP). Should any disagreement arise, this will be resolved with discussion. If consensus cannot be reached, a third reviewer (MB) will be consulted.

Data extraction

The data of included studies will be extracted by a single reviewer (AP) and verified by the second reviewer (MP). Should any disagreement arise, this will be resolved with discussion. If consensus cannot be reached, a third reviewer (MB) will be consulted. An example of the data collection form we intend to use, and which has been pilot tested on an eligible paper can be found in Protocol appendix V.

Data synthesis

The synthesis of the results will be undertaken by AP and verified by MP. MB will be consulted where necessary. The interventions methods or strategies to improve mental health and wellbeing identified will be categorised in the synthesis as organisational change interventions, lifestyle interventions, stress management interventions or training programmes. This categorisation may be modified and will be informed by the findings of the included studies.

The QSR NVivo 12 software will be used to code the articles and facilitate the data collation and synthesis. For quantitative intervention studies, a summary of evidence table will be presented, if appropriate, which will provide a clear indication of the type of intervention, the number of studies which evaluated its effectiveness and the size and direction of effect. If enough intervention studies are found, an attempt to summarise the effect sizes will be made, if appropriate. A visual summary of results will also be provided. This will follow a simple, visual 'traffic light' indicator, where green indicates the intervention is beneficial

(effective), amber that there is no difference in the investigated comparison and red that the results suggest the intervention is detrimental or less effective than the comparator. Similarly, for the summary presentation of qualitative findings, if any, visual indicators will be used so that beneficial or facilitative experiences/themes are highlighted in green, while those that are inhibitory are highlighted in red. Where possible, the results will be compared across subgroups (e.g. GDPs vs community dentists or dentists and DCPs).

Umbrella review methodology

RQ(iii): What techniques and preventive methods/interventions have been used and evaluated to improve or tackle mental health issues amongst other registered health professionals?

To answer RQ(iii), an umbrella review methodology will be adopted (Aromataris et al,.2015). The aim of this review will be to identify, appraise and summarise the findings of systematic reviews assessing the effectiveness of strategies/intervention to improve mental health and wellbeing amongst healthcare professionals (e.g. nurses, doctors, etc). The reporting for this review will adhere to the PRISMA framework (Moher et al., 2009).

Literature search strategy

The information specialist (LB) will develop an appropriate search strategy combining terms related to mental health and wellbeing, terms related to healthcare professionals and terms related to systematic reviews. The following databases will be searched: MEDLINE, Embase, CINAHL and PsycINFO. An example of the search strategy on Embase (Ovid) can be seen in Protocol appendix VI. Following testing of the search strategy, and in order to increase the specificity of the results, the strategy employs title terms, author keywords, subject headings and major subject headings for the exploded mental health terms.

Evidence selection criteria

The inclusion and exclusion criteria are presented below following the PICOs framework.

Population

The WHO classification for health professionals is used to define the population of interest (World Health Organisation, 2006). According to WHO, health professionals study: study, advise on or provide preventive, curative, rehabilitative and promotional health services based on an extensive body of theoretical and factual knowledge in diagnosis and treatment of disease and other health problems. **Health professionals** who are directly (face to face) involved in patient healthcare delivery (diagnosis and treatment of disease) as underpinned by the WHO definitions, who are subject to professional registration as stipulated by the professional standards authority will comprise the population of interest for this umbrella review.

The following groups will be included:

- Art therapists
- Audiologist
- Chiropractors
- Dieticians
- Generalist medical practitioners

- Midwifery professionals
- Nursing professionals
- Occupational therapists
- Optometrists and opthalmic opticians
- Osteopaths
- Paramedics
- Pharmacists
- Physiotherapists
- Podiatrists and chiropodists
- Practitioner and clinical phycologists
- Prosthetists and orthotists
- Radiographers
- Specialist medical practitioners
- Speech and language therapists

The following groups will be excluded:

- Biomedical and clinical scientists
- Complementary medicine professionals
- Environmental and occupational health and hygiene professionals
- Health associate professionals not subject to professional registration
- Health management and support personnel
- Health professions students
- Non-clinical professionals
- Operating department practitioners
- Personal Care workers
- Public health specialists
- Social workers

Intervention

Interventions aiming to improve mental health and wellbeing. These interventions may include but are not limited organisational change interventions, lifestyle interventions, stress management interventions or training programmes.

Comparison

Comparator groups may include different interventions or strategies implemented to improve mental health and wellbeing of dental team members.

Outcomes

Outcomes may include but are not limited to:

- Prevalence of mental health disorders/conditions (such as depression) measured by validated scales/instruments or medical diagnosis
- Prevalence of mental health issues (such as burnout) measured by validated scales/instruments)
- Prevalence of stress and psychological wellbeing issues measured by validated scales/instruments
- Experiences (if qualitative outcomes are reported) as a measure of evaluation of the intervention.

Types of studies

Since an umbrella review methodology is employed only systematic reviews and/or meta-analysis studies will be considered for inclusion. Editorials, letters to the editor, opinion pieces, reviews and primary studies (quantitative/qualitative) will be excluded.

Methodological quality

Given the limited resources, a best evidence approach will be used to inform decisions for study inclusion and exclusion. Systematic reviews of high and moderate quality as assessed by the AMSTAR-2 tool will be considered for inclusion. Systematic reviews of low quality as assessed by the AMSTAR-2 tool will be excluded.

Language

Only papers in English language will be included.

Study selection

Search results will be collated and deduplicated in EndNote X9 software (LB). They will then be transferred to Rayyan Systematic Review Web Application for screening (LB) (Ouzzani et al., 2016). Two reviewers will independently screen the titles and abstracts of the identified papers (MP and AP). The full text of selected papers will be reviewed for inclusion by two independent researchers (MP and AP) against the pre-specified criteria as described in Table 1. Any disagreement between the two reviewers will be resolved through discussion or the involvement of the third reviewer (MB) if consensus cannot be reached. Reasons for excluding the full text papers will be recorded.

Critical appraisal

As described above, a 'best evidence threshold approach' will inform the decision for inclusion/exclusion of the identified systematic reviews. Only systematic reviews of high and moderate quality as assessed by the AMSTAR-2 Checklist will be included, while systematic reviews of low quality will be excluded (Shea et al., 2017). The critical appraisal will be carried out independently by the two reviewers (AP and MP). Should any disagreement arise, this will be resolved with discussion. If consensus cannot be reached, a third reviewer (MB) will be consulted.

Data extraction

The data will be extracted by a single reviewer (AP) and verified by the second reviewer (MP). Should any disagreement arise, this will be resolved with discussion and/or the involvement of a third reviewer (MB). An example of the data collection form we intend to use, and which has been pilot tested on an eligible paper, can be found in Protocol appendix VII.

Data synthesis

The type of studies and their effect will be synthesised narratively and in a tabular format. The interventions methods or strategies to improve mental health and well-being identified will be categorised as organisational change interventions, lifestyle interventions, stress management interventions or training programmes. This categorisation may be modified and will be informed by the findings of the included reviews.

Extraction and presentation of findings and results will be limited to those presented by the included systematic reviews and meta-analyses. Primary research study level data will not be reported (Aromataris et al., 2015). An illustration of the overlap of original/primary research studies in each of the included systematic reviews will be presented. For example, if one study has been included in multiple syntheses, this will be indicated clearly. Where appropriate, the overall effect estimates, or other similar numerical data extracted from the included systematic reviews will be presented in a tabular format. If appropriate, an attempt to summarise the effect sizes will be made.

For quantitative findings, a summary of evidence table will be presented that names the intervention, identifies the included research synthesis and provides a clear and simple indication of the results for the reader. This summary of evidence table will follow a simple, visual traffic light indicator, where green indicates the intervention is beneficial (effective), amber that there is no difference in the investigated comparison and red that the results suggest the intervention is detrimental or less effective than the comparator. Similarly, for the summary presentation of qualitative findings, if any, visual indicators will be used so that beneficial or facilitative experiences/themes are highlighted in green, while those that are inhibitory are highlighted in red (Aromataris et al,.2015).

Protocol references

Anonymous (2007) DCP registration: one year on. (2007). Vital, 4(2), 10–10. https://doi.org/10.1038/vital590

Armijo-Olivo, S., Stiles, C.R., Hagen, N.A., Biondo, P.D., Cummings, G.G. (2012) Assessment of study quality for systematic reviews: a comparison of the Cochrane Collaboration Risk of Bias Tool and the Effective Public Health Practice Project Quality Assessment tool: methodological research. *Journal of Evaluation in Clinical Practice*. 18(1):12-8. (https://merst.ca/ephpp/)

Aromataris E, Fernandez R, Godfrey CM, Holly C, Khalil H, Tungpunkom P. (2015) Summarizing systematic reviews: methodological development, conduct and reporting of an umbrella review approach. Internation Journal of Evidence Based Healthcare. 13(3):132-140.

British Dental Association (2020) ‘‘Dental Contract Reform Across The UK.’’ Available at: https://bda.org/contractreform [Accessed 22 August 2020].

Centers for Disease Control and Prevention (2018) “Well-Being Concepts.” Available at: www.cdc.gov/hrqol/wellbeing.htm. [Accessed 22 August 2020].Galderisi S, Heinz A, Kastrup M, Beezhold J, Sartorius N. (2015) Toward a new definition of mental health. World Psychiatry. 14(2):231-233Harris R, Burnside G, Ashcroft A, Grieveson B. (2009) Job satisfaction of dental practitioners before and after a change in incentives and governance: a longitudinal study. British Dental Journal. 207: 74–75

Meline, T. (2006). Selecting Studies for Systemic Review: Inclusion and Exclusion Criteria. *Contemporary Issues in Communication Science and Disorders*, 33:21-27.

Moher D, Liberati A, Tetzlaff J, Altman DG; PRISMA Group. (2009) Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Medicine. 2009;6(7):e1000097.Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. (2016) Rayyan-a web and mobile app for systematic reviews. *Systematic Reviews*. 5(1):210.

Salazar FBC, Sipiyaruk K, White S, Gallagher JE. (2019) Key determinants of health and wellbeing of dentists within the UK: a rapid review of over two decades of research. British Dental Journal. 227(2):127-136.

Shea BJ, Reeves BC, Wells G, Thuku M, Hamel C, Moran J, Moher D, Tugwell P, Welch V, Kristjansson E, Henry DA. (2017) AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. *British Medical Journal* 21;358:j4008. (https://amstar.ca/Amstar_Checklist.php)

Turner, S., Ross, M. K., & Ibbetson, R. J. (2012). The impact of General Dental Council registration and continuing professional development on UK dental care professionals: (1) dental nurses. British Dental Journal, 213(2), E2–E2.

UK National Institute for Health and Care Excellence (2012) NICE Quality Appraisal Checklist-Qualitative Studies, 3rd ed, (https://www.nice.org.uk/process/pmg4/chapter/appendix-h-quality-appraisal-checklist-qualitative-studies)

United Nations Development Programme, 2020. | Human Development Reports. [online] Hdr.undp.org. Available at: http://hdr.undp.org/en/composite/HDI [Accessed 4 September 2020].

Varker T, Forbes D, Dell L, et al. (2015) Rapid evidence assessment: increasing the transparency of an emerging methodology. *Journal of Evaluation in Clinical Practice*. 21(6):1199-1204

World Health Organisation (2006) Classification of health workforce statistics, World Health Organization, Geneva. Available at: https://www.who.int/hrh/statistics/Health_workers_classification.pdf?ua=1 [Accessed 9 October 2020].

Protocol appendix I: Embase (Ovid) search strategy for rapid evidence assessment

RQ(i)
Embase <1974 to 2020 October 12>
Search history sorted by search number ascending

#	Query	Results
1	exp mental health/	162072
2	exp mental disease/	2215412
3	wellbeing/	66197
4	psychological wellbeing/	19427
5	mental stress/	83527
6	job stress/	9383
7	burnout/	18431
8	professional burnout/	925
9	((mental or psychological) adj3 (health or ill* or well-being or wellbeing)).ab,kw,ti.	255196
10	((mental or psychological or job* or work* or occupational) adj3 (stress* or distress)).ab,kw,ti.	70623
11	(burnout or burn-out).ab,kw,ti.	17064
12	anxiety disorder/	71768
13	mood disorder/	43863
14	depression/	371610
15	addiction/	47722
16	(depression or depressive or suicid*).ab,kw,ti.	608707
17	(anxiety or mood).ab,kw,ti.	369623
18	addict*.ab,kw,ti.	96566
19	((substance or drug or alcohol) adj1 (misus* or use* or abuse*)).ab,kw,ti.	249269
20	or/1-19	2851157
21	exp dental personnel/	33117
22	"dentist*".ab,kw,ti.	71802
23	"Dental hygienist*".ab,kw,ti.	2528
24	"Dental therapist*".ab,kw,ti.	352
25	"dental technician*".ab,kw,ti.	1128
26	"Orthodontic therap*".ab,kw,ti.	1245
27	"Dental nurse*".ab,kw,ti.	422
28	"oral surgeon*".ab,kw,ti.	1128
29	periodontist*.ab,kw,ti.	797
30	endodontist*.ab,kw,ti.	2840
31	orthodontist*.ab,kw,ti.	5952
32	"dental team".ab,kw,ti.	1060
33	(dental adj3 staff).ab,kw,ti.	687
34	"dental professional*".ab,kw,ti.	2491
35	"dental practitioner*".ab,kw,ti.	4847

#	Query	Results
36	"dental assistant*".ab,kw,ti.	1042
37	(dental adj3 (trainee or training)).ab,kw,ti.	1343
38	(dental adj3 (speciality or specialist)).ab,kw,ti.	381
39	(dental adj3 student*).ab,kw,ti.	7629
40	or/21-39	108101
41	20 and 40	6942
42	limit 41 to yr="2006 -Current"	4213
43	United Kingdom/	387309
44	Great Britain/	4215
45	Ireland/	35012
46	Northern Ireland/	1531
47	(national health service* or NHS*).ab,ad,in,ti.	360984
48	(gb or "g.b." or britain* or (british* not "british columbia")).ab,ad,in,ti.	183537
49	(UK or "U.K." or United Kingdom*).ab,ad,in,ti.	2720536
50	(England* not "new England").ab,ad,in,ti.	94418
51	(Ireland or Irish or Scotland or Scottish or ((Wales or "South Wales") not "new South Wales") or Welsh).ab,ad,in,ti.	478403
52	(bath or "bath's" or ((birmingham not alabama*) or ("birmingham's" not alabama*) or bradford or "bradford's" or brighton or "brighton's" or bristol or "bristol's" or carlisle* or "carlisle's" or (cambridge not (massachusetts* or boston* or harvard*)) or ("cambridge's" not (massachusetts* or boston* or harvard*)) or (canterbury not zealand*) or ("canterbury's" not zealand*) or chelmsford or "chelmsford's" or chester or "chester's" or chichester or "chichester's" or coventry or "coventry's" or derby or "derby's" or (durham not (carolina* or nc)) or ("durham's" not (carolina* or nc)) or ely or "ely's" or exeter or "exeter's" or gloucester or "gloucester's" or hereford or "hereford's" or hull or "hull's" or lancaster or "lancaster's" or leeds* or leicester or "leicester's" or (lincoln not nebraska*) or ("lincoln's" not nebraska*) or (liverpool not (new south wales* or nsw)) or ("liverpool's" not (new south wales* or nsw)) or ((london not (ontario* or ont or toronto*)) or ("london's" not (ontario* or ont or toronto*)) or manchester or "manchester's" or (newcastle not (new south wales* or nsw)) or ("newcastle's" not (new south wales* or nsw)) or norwich or "norwich's" or nottingham or "nottingham's" or oxford or "oxford's" or peterborough or "peterborough's" or plymouth or "plymouth's" or portsmouth or "portsmouth's" or preston or "preston's" or ripon or "ripon's" or salford or "salford's" or salisbury or "salisbury's" or sheffield or "sheffield's" or southampton or "southampton's" or st albans or stoke or "stoke's" or sunderland or "sunderland's" or truro or "truro's" or wakefield or "wakefield's" or wells or westminster or "westminster's" or winchester or "winchester's" or wolverhampton or "wolverhampton's" or (worcester not (massachusetts* or boston* or harvard*)) or ("worcester's" not (massachusetts* or boston* or harvard*)) or (york not ("new york*" or ny or ontario* or ont or toronto*)) or ("york's" not ("new york*" or ny or ontario* or ont or toronto*))))).ab,ad,in,ti.	2487227
53	(bangor or "bangor's" or cardiff or "cardiff's" or newport or "newport's" or st asaph or "st asaph's" or st davids or swansea or "swansea's").ab,ad,in,ti.	101775
54	(aberdeen or "aberdeen's" or dundee or "dundee's" or edinburgh or "edinburgh's" or glasgow or "glasgow's" or inverness or (perth not australia*) or ("perth's" not australia*) or stirling or "stirling's").ab,ad,in,ti.	343032
55	(armagh or "armagh's" or belfast or "belfast's" or lisburn or "lisburn's" or londonderry or "londonderry's" or derry or "derry's" or newry or "newry's").ab,ad,in,ti.	46369
56	43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55	3873168
57	(exp "arctic and antarctic"/ or exp oceanic regions/ or exp western hemisphere/ or exp africa/ or exp asia/ or exp "australia and new zealand"/) not (united kingdom/ or	3162164

#	Query	Results
	europe/)	
58	56 not 57	3656563
59	42 and 58	543

Protocol appendix II: list of organisations' websites to be searched.

Name of organisation	**Website address**
British Association of Clinical Dental Technlology (BACDT)	https://www.bacdt.org.uk/
British Association of Dental Nurses (BADN)	https://www.badn.org.uk/
British Association of Private Dentistry (BAPD)	https://www.bapd.org.uk/
British Association for the Study of Community Dentistry	http://www.bascd.org/
British Dental Association (BDA)	https://bda.org/
British Society of Dental Hygiene and Therapy (BSDHT)	http://www.bsdht.org.uk/
COPEND	https://www.copdend.org/
Dental Defence Union (DDU)	https://www.theddu.com/
Dental Protection Limited (DPL)	https://www.dentalprotection.org/
Dental Technologists Association (DTA)	https://www.dta-uk.org/
Faculty of Dental Surgery (FDS) RCSEd	https://www.rcsed.ac.uk/faculties/faculty-of-dental-surgery
Faculty of Dental Surgery (FDS) RCSEng	https://www.rcseng.ac.uk/
Faculty of Dental Surgery (FDS) RCSI	https://facultyofdentistry.ie/
Faculty of Dental Surgery (FDS) RCPSGla	https://rcpsg.ac.uk/dental-surgery/home
Faculty of General Dental Practice (FGDP)	https://www.fgdp.org.uk/
Health and Safety Executive (HSE)	https://www.hse.gov.uk/
King's Fund	https://www.kingsfund.org.uk/
Medical & Dental Defence Union of Scotland (MDDUS)	https://www.mddus.com/
NHS England	https://www.england.nhs.uk/
NHS Northern Ireland	http://online.hscni.net/
NHS Scotland	https://www.scot.nhs.uk/

Name of organisation	Website address
NHS Wales	https://www.wales.nhs.uk/
Practitioner health	https://www.practitionerhealth.nhs.uk
Society of British Dental Nurses	https://sbdn.org.uk/

Protocol appendix III: rapid evidence assessment data collection form for RQi

Study ID	
Citation	
Year	
Country/City	
Study Type (survey, controlled trial etc)	
N of participants (N in subgroups) and professional background	
Characteristics of participants (age range, ethnicity etc)	
Instrument/tool used to measure MHWB issues	
Type of MHWB issues identified and prevalence	
Sources of MHWB issues/stressors	
Impact of low MHWB	
Comments	

Protocol appendix IV: Embase(Ovid) search strategy for RQii

RQ(ii)
Embase <1974 to 2020 October 12>
Search history sorted by search number ascending

#	Query	Results
1	exp mental health/	162072
2	exp mental disease/	2215412
3	wellbeing/	66197
4	psychological wellbeing/	19427
5	mental stress/	83527
6	job stress/	9383
7	burnout/	18431
8	professional burnout/	925
9	((mental or psychological) adj3 (health or ill* or well-being or wellbeing)).ab,kw,ti.	255196
10	((mental or psychological or job* or work* or occupational) adj3 (stress* or distress)).ab,kw,ti.	70623
11	(burnout or burn-out).ab,kw,ti.	17064
12	anxiety disorder/	71768
13	mood disorder/	43863
14	depression/	371610
15	addiction/	47722
16	(depression or depressive or suicid*).ab,kw,ti.	608707
17	(anxiety or mood).ab,kw,ti.	369623
18	addict*.ab,kw,ti.	96566
19	((substance or drug or alcohol) adj1 (misus* or use* or abuse*)).ab,kw,ti.	249269
20	or/1-19	2851157
21	exp *dental personnel/	18101
22	"dentist*".kw,ti.	31593
23	"Dental hygienist*".kw,ti.	1202
24	"Dental therapist*".kw,ti.	169
25	"dental technician*".kw,ti.	552
26	"Orthodontic therap*".kw,ti.	336
27	"Dental nurse*".kw,ti.	164
28	"oral surgeon*".kw,ti.	155
29	periodontist*.kw,ti.	124
30	endodontist*.kw,ti.	135
31	orthodontist*.kw,ti.	674
32	"dental team".kw,ti.	228
33	(dental adj3 staff).kw,ti.	161

#	Query	Results
34	"dental professional*".kw,ti.	453
35	"dental practitioner*".kw,ti.	1239
36	"dental assistant*".kw,ti.	655
37	(dental adj3 (trainee or training)).kw,ti.	494
38	(dental adj3 (speciality or specialist)).kw,ti.	80
39	(dental adj3 (student* or graduate* or undergraduate*)).kw,ti.	4351
40	or/21-39	50508
41	20 and 40	2782
42	limit 41 to yr="2006 -Current"	1461

Protocol appendix V: rapid evidence assessment data collection form for RQii

Study ID	
Citation	
Year	
Country	
Study Type (survey, controlled trial etc)	
N of participants (N in subgroups) and professional background	
Characteristics of participants (age range, ethnicity etc)	
Instrument/tool used to measure MHWB issues	
Type of intervention(s)/strategy/ technique	
Tool(s) used to assess outcome	
Effect of Intervention	
Qualitative results (Positive/facilitators)	
Qualitative Results (Negative/Barriers)	
Comments	

Protocol appendix VI: Embase(Ovid) search strategy for umbrella review

RQ(iii)
Embase <1974 to 2020 October 29>
Search history sorted by search number ascending

#	Query	Results
1	exp *mental health/	46133
2	exp *mental disease/	1377887
3	wellbeing/	10618
4	psychological wellbeing/	4458
5	mental stress/	33305
6	job stress/	9472
7	burnout/	18594
8	professional burnout/	944
9	(mental* or psychological* or psychosocial or well-being or wellbeing or stress*).kw,ti.	693774
10	(burnout or burn-out).kw,ti.	10623
11	or/1-10	1957954
12	exp *health care personnel/	521270
13	(Doctor* or Physician* or Psychiatrist* or Surgeon* or General Practitioner* or Medical practitioner* or Medical Specialist* or An?esthetist* or Audiologist* or Cardiologist* or Dermatologist* or Endocrinologist* or Geriatrician* or Gastroenterologist* or Hepatologist* or H?ematologist* or Ophthalmologist* or Gyn?ecologist* or Oncologist* or Obstetrician* or P?ediatrician* or Pathologist* or Radiologist* or Radiographer* or Rheumatologist* or Urologist* or Arts Therapist* or Chiropodist* or Podiatrist* or Chiropractor* or Dentist* or Dietician* or Nurse* or Midwife* or Occupational therapist* or Optician* or Optometrist* or Orthoptist* or Osteopath* or Paramedic* or Pharmacist* or Physiotherapist* or Practitioner Psychologist* or Clinical Psychologist* or Speech therapist* or language therapist*).kw,ti.	464143
14	(health* adj (profession* or staff or worker* or employee*)).kw,ti.	31605
15	or/12-14	812598
16	(meta-analysis or systematic review*).ti.	243548
17	"systematic review"/	269327
18	meta analysis/	200395
19	or/16-18	411972
20	11 and 15 and 19	962
21	20 not (conference abstract or conference paper).pt.	826
22	limit 20 to yr="2006 -Current"	789
23	limit 22 to english language	771

Protocol appendix VII: umbrella review data collection form

Study ID	
Citation	
Year of publication	
Population (professions included)	
Number of databases searched	
Date range for searching	
Number of participants and characteristics if given as a total/average	
Countries of origin (primary studies) if given	
Number of studies in review	
Interventions/strategies identified	
Number of studies per intervention	
Appraisal tool used	
MHWB Outcomes reported and tools used	
Effect estimates of interventions	
Statistical heterogeneity	
Meta-analysis performed? Overall effect estimate	
Was critical appraisal taken into account in meta-analysis? And How?	
Comments	

9.2 Appendix 2: RQ(i) search strategy for online database searching

EMBASE <1974 TO 2020 OCTOBER 22>

#	Query	**Results**
1	exp mental health/	163161
2	exp mental disease/	2222830
3	wellbeing/	66593
4	psychological wellbeing/	19596
5	mental stress/	83766
6	job stress/	9434
7	burnout/	18538
8	professional burnout/	940
9	((mental or psychological) adj3 (health or ill* or well-being or wellbeing)).ab,kw,ti.	256882
10	((mental or psychological or job* or work* or occupational) adj3 (stress* or distress)).ab,kw,ti.	70969
11	(burnout or burn-out).ab,kw,ti.	17189
12	anxiety disorder/	72030
13	mood disorder/	43991
14	depression/	372828
15	addiction/	47787
16	(depression or depressive or suicid*).ab,kw,ti.	611216
17	(anxiety or mood).ab,kw,ti.	371440
18	addict*.ab,kw,ti.	96866
19	((substance or drug or alcohol) adj1 (misus* or use* or abuse*)).ab,kw,ti.	250214
20	or/1-19	2861160
21	exp dental personnel/	33204
22	"dentist*".ab,kw,ti.	72006
23	"Dental hygienist*".ab,kw,ti.	2535
24	"Dental therapist*".ab,kw,ti.	353
25	"dental technician*".ab,kw,ti.	1130
26	"Orthodontic therap*".ab,kw,ti.	1249
27	"Dental nurse*".ab,kw,ti.	423
28	"oral surgeon*".ab,kw,ti.	1130
29	periodontist*.ab,kw,ti.	800
30	endodontist*.ab,kw,ti.	2845
31	orthodontist*.ab,kw,ti.	5963
32	"dental team".ab,kw,ti.	1061
33	(dental adj3 staff).ab,kw,ti.	691
34	"dental professional*".ab,kw,ti.	2508
35	"dental practitioner*".ab,kw,ti.	4863
36	"dental assistant*".ab,kw,ti.	1043
37	(dental adj3 (trainee or training)).ab,kw,ti.	1346
38	(dental adj3 (speciality or specialist)).ab,kw,ti.	385

#	Query	Results
39	(dental adj3 student*).ab,kw,ti.	7705
40	or/21-39	108391
41	20 and 40	6967
42	limit 41 to yr="2006 -Current"	4238
43	United Kingdom/	387680
44	Great Britain/	4228
45	Ireland/	35080
46	Northern Ireland/	1541
47	(national health service* or NHS*).ab,ad,in,ti.	362366
48	(gb or "g.b." or britain* or (british* not "british columbia")).ab,ad,in,ti.	183929
49	(UK or "U.K." or United Kingdom*).ab,ad,in,ti.	2727728
50	(England* not "new England").ab,ad,in,ti.	94720
51	(Ireland or Irish or Scotland or Scottish or ((Wales or "South Wales") not "new South Wales") or Welsh).ab,ad,in,ti.	479705
52	(bath or "bath's" or ((birmingham not alabama*) or ("birmingham's" not alabama*) or bradford or "bradford's" or brighton or "brighton's" or bristol or "bristol's" or carlisle* or "carlisle's" or (cambridge not (massachusetts* or boston* or harvard*)) or ("cambridge's" not (massachusetts* or boston* or harvard*)) or (canterbury not zealand*) or ("canterbury's" not zealand*) or chelmsford or "chelmsford's" or chester or "chester's" or chichester or "chichester's" or coventry or "coventry's" or derby or "derby's" or (durham not (carolina* or nc)) or ("durham's" not (carolina* or nc)) or ely or "ely's" or exeter or "exeter's" or gloucester or "gloucester's" or hereford or "hereford's" or hull or "hull's" or lancaster or "lancaster's" or leeds* or leicester or "leicester's" or (lincoln not nebraska*) or ("lincoln's" not nebraska*) or (liverpool not (new south wales* or nsw)) or ("liverpool's" not (new south wales* or nsw)) or ((london not (ontario* or ont or toronto*)) or ("london's" not (ontario* or ont or toronto*)) or manchester or "manchester's" or (newcastle not (new south wales* or nsw)) or ("newcastle's" not (new south wales* or nsw)) or norwich or "norwich's" or nottingham or "nottingham's" or oxford or "oxford's" or peterborough or "peterborough's" or plymouth or "plymouth's" or portsmouth or "portsmouth's" or preston or "preston's" or ripon or "ripon's" or salford or "salford's" or salisbury or "salisbury's" or sheffield or "sheffield's" or southampton or "southampton's" or st albans or stoke or "stoke's" or sunderland or "sunderland's" or truro or "truro's" or wakefield or "wakefield's" or wells or westminster or "westminster's" or winchester or "winchester's" or wolverhampton or "wolverhampton's" or (worcester not (massachusetts* or boston* or harvard*)) or ("worcester's" not (massachusetts* or boston* or harvard*)) or (york not ("new york*" or ny or ontario* or ont or toronto*)) or ("york's" not ("new york*" or ny or ontario* or ont or toronto*))))).ab,ad,in,ti.	2494344
53	(bangor or "bangor's" or cardiff or "cardiff's" or newport or "newport's" or st asaph or "st asaph's" or st davids or swansea or "swansea's").ab,ad,in,ti.	102063
54	(aberdeen or "aberdeen's" or dundee or "dundee's" or edinburgh or "edinburgh's" or glasgow or "glasgow's" or inverness or (perth not australia*) or ("perth's" not australia*) or stirling or "stirling's").ab,ad,in,ti.	344016
55	(armagh or "armagh's" or belfast or "belfast's" or lisburn or "lisburn's" or londonderry or "londonderry's" or derry or "derry's" or newry or "newry's").ab,ad,in,ti.	46516
56	43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55	3883443
57	(exp "arctic and antarctic"/ or exp oceanic regions/ or exp western hemisphere/ or exp africa/ or exp asia/ or exp "australia and new zealand"/) not (united kingdom/ or europe/)	3172852
58	56 not 57	3665876
59	42 and 58	546

OVID MEDLINE(R) AND EPUB AHEAD OF PRINT, IN-PROCESS & OTHER NON-INDEXED CITATIONS, DAILY AND VERSIONS(R) <1946 TO OCTOBER 22, 2020>

#	Query	Results
1	exp mental health/	39637
2	exp mental disorders/	1251900
3	stress, psychological/	121682
4	occupational stress/	1766
5	burnout, psychological/	562
6	burnout, professional/	12283
7	((mental or psychological) adj3 (health or ill* or well-being or wellbeing)).ab,kw,ti.	194230
8	((mental or psychological or job* or work* or occupational) adj3 (stress* or distress)).ab,kw,ti.	52851
9	(burnout or burn-out).ab,kw,ti.	12839
10	anxiety/ or anxiety disorders/	111203
11	mood disorders/	14425
12	depression/ or depressive disorder/	185363
13	Substance-Related Disorders/	96124
14	(depression or depressive or suicid*).ab,kw,ti.	447023
15	(anxiety or mood).ab,kw,ti.	253483
16	addict*.ab,kw,ti.	65959
17	((substance or drug or alcohol) adj1 (misus* or use* or abuse*)).ab,kw,ti.	176245
18	or/1-17	1906183
19	exp Dentists/ or Dental Staff/	21092
20	"dentist*".ab,kw,ti.	75892
21	"Dental hygienist*".ab,kw,ti.	2675
22	"Dental therapist*".ab,kw,ti.	365
23	"dental technician*".ab,kw,ti.	1182
24	"Orthodontic therap*".ab,kw,ti.	1372
25	"Dental nurse*".ab,kw,ti.	445
26	"oral surgeon*".ab,kw,ti.	1025
27	periodontist*.ab,kw,ti.	841
28	endodontist*.ab,kw,ti.	759
29	orthodontist*.ab,kw,ti.	4057
30	"dental team".ab,kw,ti.	1032
31	(dental adj3 staff).ab,kw,ti.	649
32	"dental professional*".ab,kw,ti.	2460
33	"dental practitioner*".ab,kw,ti.	4822
34	"dental assistant*".ab,kw,ti.	1406
35	(dental adj3 (trainee or training)).ab,kw,ti.	1391
36	(dental adj3 (speciality or specialist)).ab,kw,ti.	353
37	(dental adj3 student*).ab,kw,ti.	7345
38	or/19-37	104787
39	18 and 38	5304

#	Query	Results
40	limit 39 to yr="2006 -Current"	2781
41	exp United Kingdom/	367452
42	Great Britain/	230750
43	Ireland/	18068
44	Northern Ireland/	4906
45	(national health service* or NHS*).ab,in,ti.	203237
46	(gb or "g.b." or britain* or (british* not "british columbia")).ab,in,ti.	98255
47	(UK or "U.K." or United Kingdom*).ab,in,ti.	1468512
48	(England* not "new England").ab,in,ti.	110184
49	(Ireland or Irish or Scotland or Scottish or ((Wales or "South Wales") not "new South Wales") or Welsh).ab,in,ti.	244664
50	(bath or "bath's" or ((birmingham not alabama*) or ("birmingham's" not alabama*) or bradford or "bradford's" or brighton or "brighton's" or bristol or "bristol's" or carlisle* or "carlisle's" or (cambridge not (massachusetts* or boston* or harvard*)) or ("cambridge's" not (massachusetts* or boston* or harvard*)) or (canterbury not zealand*) or ("canterbury's" not zealand*) or chelmsford or "chelmsford's" or chester or "chester's" or chichester or "chichester's" or coventry or "coventry's" or derby or "derby's" or (durham not (carolina* or nc)) or ("durham's" not (carolina* or nc)) or ely or "ely's" or exeter or "exeter's" or gloucester or "gloucester's" or hereford or "hereford's" or hull or "hull's" or lancaster or "lancaster's" or leeds* or leicester or "leicester's" or (lincoln not nebraska*) or ("lincoln's" not nebraska*) or (liverpool not (new south wales* or nsw)) or ("liverpool's" not (new south wales* or nsw)) or ((london not (ontario* or ont or toronto*)) or ("london's" not (ontario* or ont or toronto*)) or manchester or "manchester's" or (newcastle not (new south wales* or nsw)) or ("newcastle's" not (new south wales* or nsw)) or norwich or "norwich's" or nottingham or "nottingham's" or oxford or "oxford's" or peterborough or "peterborough's" or plymouth or "plymouth's" or portsmouth or "portsmouth's" or preston or "preston's" or ripon or "ripon's" or salford or "salford's" or salisbury or "salisbury's" or sheffield or "sheffield's" or southampton or "southampton's" or st albans or stoke or "stoke's" or sunderland or "sunderland's" or truro or "truro's" or wakefield or "wakefield's" or wells or westminster or "westminster's" or winchester or "winchester's" or wolverhampton or "wolverhampton's" or (worcester not (massachusetts* or boston* or harvard*)) or ("worcester's" not (massachusetts* or boston* or harvard*)) or (york not ("new york*" or ny or ontario* or ont or toronto*)) or ("york's" not ("new york*" or ny or ontario* or ont or toronto*))))).ab,in,ti.	1435936
51	(bangor or "bangor's" or cardiff or "cardiff's" or newport or "newport's" or st asaph or "st asaph's" or st davids or swansea or "swansea's").ab,in,ti.	56733
52	(aberdeen or "aberdeen's" or dundee or "dundee's" or edinburgh or "edinburgh's" or glasgow or "glasgow's" or inverness or (perth not australia*) or ("perth's" not australia*) or stirling or "stirling's").ab,in,ti.	213102
53	(armagh or "armagh's" or belfast or "belfast's" or lisburn or "lisburn's" or londonderry or "londonderry's" or derry or "derry's" or newry or "newry's").ab,in,ti.	26812
54	41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53	2295764
55	(exp africa/ or exp americas/ or exp antarctic regions/ or exp arctic regions/ or exp asia/ or exp oceania/) not (exp United Kingdom/ or europe/)	2908965
56	54 not 55	2188298
57	40 and 56	381

DATABASE - CINAHL PLUS WITH FULL TEXT; DENTISTRY & ORAL SCIENCES SOURCE

Query	results
ti (((mental or psychological) n3 (health or ill* or well-being or wellbeing)) or ab (((mental or psychological) n3 (health or ill* or well-being or wellbeing)) or ti (((mental or psychological or job* or work* or occupational) n3 (stress* or distress))) or ab (((mental or psychological or job or work* or occupational) n3 (stress* or distress))) or ti (burnout or burn-out) or ab (burnout burn-out) or ti (depression or depressive or suicid* or anxiety or mood or addict*) or ab (depression or depressive or suicid* or anxiety or mood or addict*) or ti ((substance or drug or alcohol) n1 (misus* or use* or abuse*)) or ab ((substance or drug or alcohol) n1 (misus* or use or abuse*))	442,339
(su "mental health")	88,535
su "psychological well-being" or su "well-being"	25,492
(su "anxiety") or (su "anxiety disorders")	61,440
(su "depression")	125,550
(su "burnout, professional")	11,087
(su "psychological burnout")	3,807
(su "burnout")	11,212
(su "stress, occupational")	17,007
(su "job stress")	10,197
su "addiction"	1,790
s1 or s2 or s3 or s4 or s5 or s6 or s7 or s8 or s9 or s10 or s11	542,767
ti (dental n1 (professional* or hygienist* or therapist* or assistant* or technician* or nurse* or team or staff or practitioner* or student*)) or ab (dental n1 (professional* or hygienist* or therapist* or assistant* or technician* or nurse* or team or staff or practitioner* or student*)) or ti (dental n3 (trainee* or training or speciality or specialist*)) or ab (dental n3 (trainee* or training or speciality or specialist*)) or ti ((oral n1 surgeon*) or endodontist* or orthodontist* or periodontist* or (orthodontic n1 therap*)) or ab ((oral n1 surgeon*) or endodontist* or orthodontist* or periodontist* or (orthodontic n1 therap*))	42,157
su "dentists" or su "dental personnel"	28,080
s13 or s14	64,109
s12 and s15	2,924
((su "united kingdom") or (su" england") or (su "scotland") or (su "wales") or (su "northern ireland") or (su "ireland")) or (af ("united kingdom" or uk or "u.k." britain or british or england or english or scotland or scottish or ireland or irish or wales or welsh or "national health service" or nhs)) or (ti ("united kingdom" or uk or "u.k." britain or british or england or english or scotland or scottish or ireland or irish or wales or welsh or "national health service" or nhs)) or (ab ("united kingdom" or uk or "u.k." britain or british or england or scotland or scottish or ireland or irish or wales or welsh or "national health service" or nhs))	853,397
(ti (bath or birmingham or bradford or brighton or bristol or carlisle or cambridge or canterbury or chelmsford or chester or chichester or coventry or derby or durham or ely or exeter or gloucester or hereford or hull or lancaster or liverpool or leicester or london or manchester or newcastle or norwich or nottingham or oxford or peterborough or plymouth or portsmouth or preston or ripon or salford or salisbury or sheffield or southampton or "st albans" or stoke or sunderland or truro or wakefield or wells or westminster or winchester or wolverhampton or worcester or york or bangor or cardiff or newport or st asaph or st davids or swansea or aberdeen or dundee or edinburgh or glasgow or inverness or perth or stirling or armagh or or belfast or lisburn or londonderry or derry or newry)) or (ab (bath or birmingham or bradford or brighton or bristol or carlisle or cambridge or canterbury or chelmsford or chester or chichester or coventry or derby or durham or ely or exeter or gloucester or hereford or hull or lancaster or liverpool or leicester or london or manchester or newcastle or norwich or nottingham or oxford or peterborough or plymouth or portsmouth or preston or ripon or salford or salisbury or sheffield or southampton or "st albans" or stoke or sunderland or truro or wakefield or wells or westminster or winchester or wolverhampton or worcester or york or bangor or cardiff or newport or st asaph or st davids or swansea or	1,228,813

Query	results
aberdeen or dundee or edinburgh or glasgow or inverness or perth or stirling or armagh or or belfast or lisburn or londonderry or derry or newry)) or (af (bath or birmingham or bradford or brighton or bristol or carlisle or cambridge or canterbury or chelmsford or chester or chichester or coventry or derby or durham or ely or exeter or gloucester or hereford or hull or lancaster or liverpool or leicester or london or manchester or newcastle or norwich or nottingham or oxford or peterborough or plymouth or portsmouth or preston or ripon or salford or salisbury or sheffield or southampton or "st albans" or stoke or sunderland or truro or wakefield or wells or westminster or winchester or wolverhampton or worcester or york or bangor or cardiff or newport or st asaph or st davids or swansea or aberdeen or dundee or edinburgh or glasgow or inverness or perth or stirling or armagh or or belfast or lisburn or londonderry or derry or newry))	
s17 or s18	1,639,056
(s17 or s18) and (s16 and s19)	1,075
(s17 or s18) and (s16 and s19) limited - published date: 20060101-20201231	944
database - cinahl plus with full text;dentistry & oral sciences source cinahl: 256 doss: 688	

SCOPUS

#	Query	Results
1	(TITLE-ABS-KEY ((mental OR psychological) PRE/3 (health OR ill* OR well-being OR wellbeing)) OR TITLE-ABS-KEY ((mental OR psychological OR job* OR work* OR occupational) PRE/3 (stress* OR distress)) OR TITLE-ABS-KEY (burnout OR burn-out) OR TITLE-ABS-KEY (depression OR depressive OR suicid* OR anxiety OR mood OR addict*) OR TITLE-ABS-KEY ((substance OR drug OR alcohol) PRE/1 (misus* OR use* OR abuse*))) "	1,978,691
2	TITLE-ABS-KEY (dentist*) OR TITLE-ABS-KEY (dental PRE/1 (professional* OR hygienist* OR therapist* OR assistant* OR technician* OR nurse* OR team OR staff OR practitioner* OR student*)) OR TITLE-ABS-KEY ((oral PRE/1 surgeon*) OR endodontist* OR orthodontist* OR periodontist* OR (orthodontic PRE/1 therap*))	211,717
3	#1 and #2	7,548
4	#3 AND PUBYEAR > 2005 AND (LIMIT-TO (AFFILCOUNTRY , "United Kingdom"))	452 results

APA PsycInfo®

#	Searched for	Databases
S8	(((MAINSUBJECT.EXACT("Mental Health") OR MAINSUBJECT.EXACT("Well Being") OR MAINSUBJECT.EXACT("Psychological Stress") OR (MAINSUBJECT.EXACT("Anxiety") OR MAINSUBJECT.EXACT("Anxiety Disorders")) OR MAINSUBJECT.EXACT("Depression (Emotion)") OR MAINSUBJECT.EXACT("Addiction") OR ti((mental OR psychological) PRE/3 (health OR ill* OR well-being OR wellbeing)) OR ab((mental OR psychological) PRE/3 (health OR ill* OR well-being OR wellbeing)) OR ti((mental OR psychological OR job* OR work* OR occupational) PRE/3 (stress* OR distress)) OR ab((mental OR psychological OR job* OR work* OR occupational) PRE/3 (stress* OR distress))) OR (ti(burnout OR burn-out OR depression OR depressive OR suicid* OR anxiety OR mood OR addict*) OR ab(burnout OR burn-out OR depression OR depressive OR suicid* OR anxiety OR mood OR addict*) OR ti((substance OR drug OR alcohol) PRE/1 (misus* OR use* OR abuse*)) OR ab((substance OR drug OR alcohol) PRE/1 (misus* OR use* OR abuse*)))) AND (ti(dental PRE/1 (professional* OR hygienist* OR therapist* OR assistant* OR technician* OR nurse* OR team OR staff OR practitioner* OR student*)) OR ab(dental PRE/1 (professional* OR hygienist* OR therapist* OR assistant* OR technician* OR nurse* OR team OR staff OR practitioner* OR student*)) OR ti((oral PRE/1 surgeon*) OR endodontist* OR orthodontist* OR periodontist* OR (orthodontic PRE/1 therap*)) OR ab((oral PRE/1 surgeon*) OR endodontist* OR orthodontist* OR periodontist* OR (orthodontic PRE/1 therap*)) OR MAINSUBJECT.EXACT.EXPLODE("Dentists") OR ti(dentist*) OR ab(dentist*)) AND pd(20060101-20201231)) AND (af("United Kingdom" OR UK OR "U.K." Britain OR British OR England OR Scotland OR Scottish OR Ireland OR Irish OR Wales OR Welsh OR "National Health Service" OR NHS) OR ti("United Kingdom" OR UK OR "U.K." Britain OR British OR England OR Scotland OR Scottish OR Ireland OR Irish OR Wales OR Welsh OR "National Health Service" OR NHS) OR ab("United Kingdom" OR UK OR "U.K." Britain OR British OR England OR Scotland OR Scottish OR Ireland OR Irish OR Wales OR Welsh OR "National Health Service" OR NHS) OR lo.Exact("Great Britain" OR "Ireland" OR "Wales" OR "England" OR "United Kingdom" OR "Scotland" OR "Northern Ireland"))	

APA PsycInfo® 48 results

9.3 Appendix 3:RQ(i) website searching results

Organisation	web address	Method of searching	Results
British Association of Clinical Dental Technlology (BACDT)	https://www.bacdt.org.uk/	Google: site limiter + ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress)	-
British Association of Dental Nurses (BADN)	https://www.badn.org.uk/	Google: site limiter + ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress)	-
British Association of Private Dentistry (BAPD)	https://www.bapd.org.uk/	Google: site limiter + ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress)	-
British Association for the Study of Community Dentistry	http://www.bascd.org/	Google: site limiter + ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress)	-
British Dental Association (BDA)	https://bda.org/	Google: site limiter + ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR	https://bda.org/stress https://bda.org/about-the-bda/campaigns/Documents/The%20Mental%20Health%20and%20Well-being%20of%20UK%20Dentists.pdf https://bda.org/news-centre/blog/the-dental-professions-mental-health-crisis

Organisation	web address	Method of searching	Results
		anxiety OR stress) first 10 pages of results screened	https://bda.org/news-centre/blog/the-long-term-impact-of-pandemics-on-healthcare-workers https://bda.org/news-centre/press-releases/bda-back-calls-for-action-on-stress-and-burnout-in-profession https://bda.org/news-centre/blog/coronavirus-mental-health-may-get-worse-with-reopening https://bda.org/news-centre/blog/Pages/Is-the-issue-of-stress-in-dentistry-is-finally-being-taken-seriously.aspx https://bda.org/news-centre/blog/Pages/Stress-in-dentistry-How-can-we-manage-it.aspx https://bda.org/about-the-bda/campaigns/stress/Documents/Final%20framework%20Probing%20Stress%20in%20Dentistry%20MEW%20%20SP%20Training%20Framework%202018.pdf https://bda.org/about-the-bda/campaigns/Documents/Sources%20of%20stress%20among%20salaried%20dentists.pdf https://bda.org/news-centre/blog/joining-up-the-dots Link to research: https://www.nature.com/articles/sj.bdj.2019.6
British Society of Dental Hygiene and Therapy (BSDHT)	http://www.bsdht.org.uk/	Google: site limiter + ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress)	http://www.bsdht.org.uk/dhcontact/are-you-feeling-burned-out http://www.bsdht.org.uk/dhcontact/9-in-10-dentists-fear-being-sued-by-patients
COPEND	https://www.copdend.org/	Google: site limiter + ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR	-

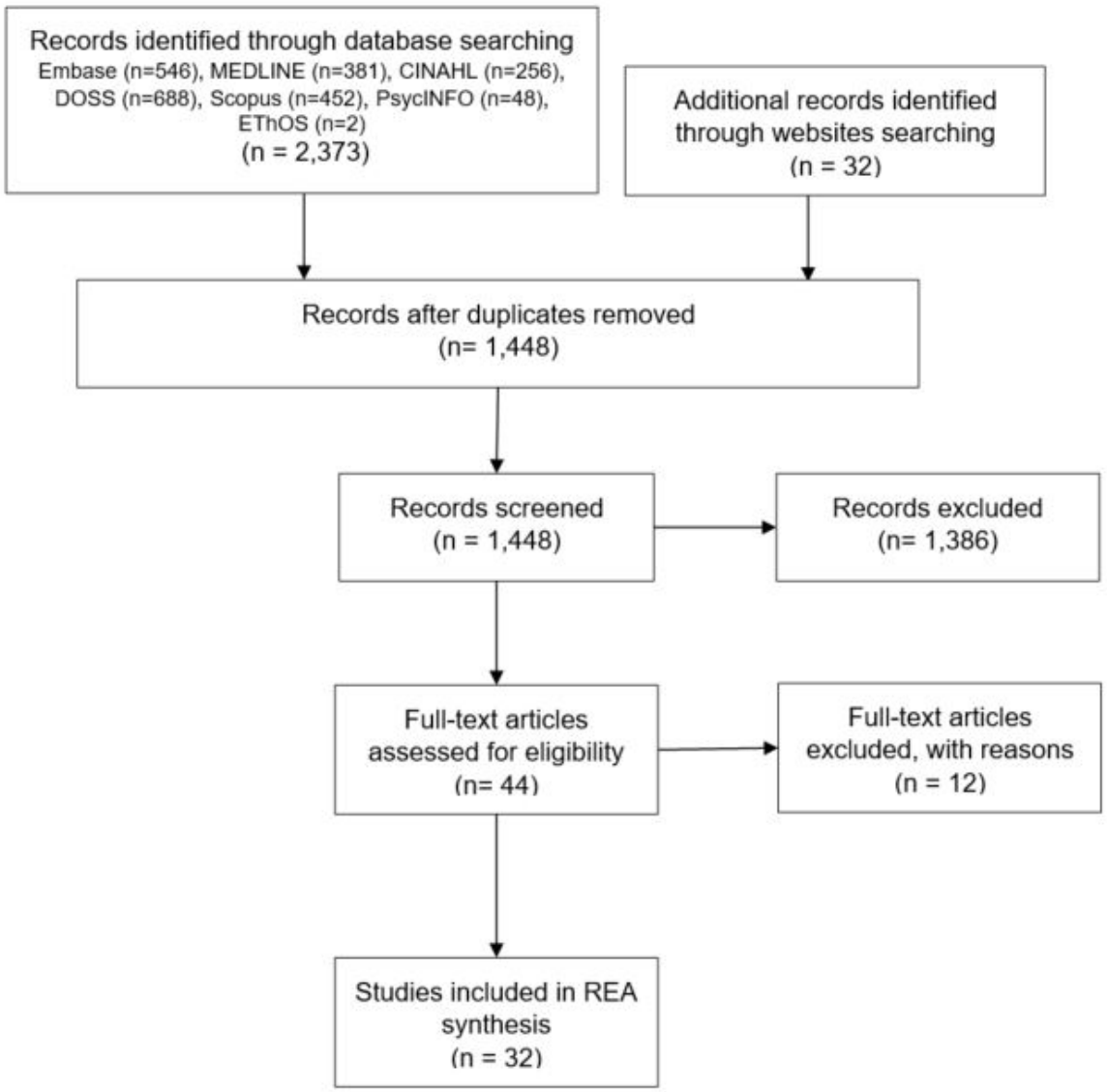
Organisation	web address	Method of searching	Results
		anxiety OR stress)	
Dental Defence Union (DDU)	https://www.theddu.com/	Google: site limiter + ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress)	-
Dental Protection Limited (DPL)	https://www.dentalprotection.org/	Google: site limiter + ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress) first 10 pages of results screened	https://www.dentalprotection.org/uk/articles/half-of-dentists-in-the-uk-have-considered-leaving-dentistry-for-reasons-of-personal-wellbeing https://www.dentalprotection.org/ireland/about/media-centre/2019/11/06/urgent-action-needed-to-tackle-burnout-in-dentistry https://www.dentalprotection.org/docs/librariesprovider4/dpl-publications/ireland/1907310561-ire-dp-burnout-policy-paper.pdf https://www.dentalprotection.org/uk/articles/94-of-dentists-believe-gdc-investigations-increase-stress-and-anxiety https://www.dentalprotection.org/docs/librariesprovider4/dental-advice-booklets/dental-continuum-wellness-gen.pdf?sfvrsn=d44108ac_8 https://www.dentalprotection.org/uk/articles/covid-19-dental-protection-survey-reveals-top-5-worries-for-dentists https://www.dentalprotection.org/uk/articles/covid-19-half-of-uk-dentists-feel-pessimistic-about-the-future https://www.dentalprotection.org/uk/articles/depression-the-dental-student https://www.dentalprotection.org/australia/publications-resources/dentolegal-articles/articles/young-dental-experience-of-covid-19 https://www.dentalprotection.org/uk/articles/dental-protection-survey-reveals-9-in-10-dentists-fear-being-sued-by-patients https://www.dentalprotection.org/uk/articles/stress-free-foundation-trainee
Dental Technologists Association (DTA)	https://www.dta-uk.org/	Google: site limiter + ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR	-

Organisation	web address	Method of searching	Results
		anxiety OR stress)	
Faculty of Dental Surgery (FDS) RCSEd	https://www.rcsed.ac.uk/faculties/faculty-of-dental-surgery	Google: site limiter + Dentists AND ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress)	-
Faculty of Dental Surgery (FDS) RCSEng	https://www.rcseng.ac.uk/	Google: site limiter + Dentists AND ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress)	https://www.rcseng.ac.uk/education-and-exams/courses/search/stress-in-dentistry/-/media/0101e6eac8194e748b2fa6bf15f1cd41.ashx
Faculty of Dental Surgery (FDS) RCSI	https://facultyofdentistry.ie/	Google: site limiter + ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress)	-
Faculty of Dental Surgery (FDS) RCPSGla	https://rcpsg.ac.uk/dental-surgery/home	Google: site limiter + Dentists ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress)	-
Faculty of General Dental Practice	https://www.fgdp.org.uk/	Google: site limiter + ("mental health" OR psychological OR burnout OR wellbeing OR well-	https://www.fgdp.org.uk/event/health-and-wellbeing-dentistry-fgdpuk-prodental-cpd-webinar

Organisation	web address	Method of searching	Results
(FGDP)		being OR depression OR anxiety OR stress)	
Health and Safety Executive (HSE)	https://www.hse.gov.uk/	Google: site limiter + Dentists ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress)	-
King's Fund	https://www.kingsfund.org.uk/	Google: site limiter + Dentists ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress)	-
Medical & Dental Defence Union of Scotland (MDDUS)	https://www.mddus.com/	Google: site limiter + ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress)	https://www.mddus.com/resources/publications-library/soundbite/soundbite-issue-12/under-pressure https://www.mddus.com/resources/resource-library/news-digest/2015/april/dentists-feeling-dissatisfied-with-life https://www.mddus.com/resources/resource-library/risk-alerts/2019/june/burnout-is-also-a-patient-safety-issue https://www.mddus.com/resources/publications-library/insight/summer-2015/surviving-the-slow-burn
NHS England	https://www.england.nhs.uk/	Google: site limiter + Dentists ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress)	-
NHS Northern Ireland	http://online.hscni.net/	Google: site limiter + Dentists ("mental health" OR psychological OR	-

Organisation	web address	Method of searching	Results
		burnout OR wellbeing OR well-being OR depression OR anxiety OR stress)	
NHS Scotland	https://www.scot.nhs.uk/	Google: site limiter + Dentists ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress)	-
NHS Wales	https://www.wales.nhs.uk/	Google: site limiter + Dentists ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress)	-
Practitioner health	https://www.practitionerhealth.nhs.uk	Google: site limiter + ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress) first 10 pages screened	https://www.practitionerhealth.nhs.uk/dentists https://www.practitionerhealth.nhs.uk/media/content/files/PHP-report-web%20version%20final(1).pdf
Society of British Dental Nurses (SBDN)	www.sbdn.org.uk	Google: site limiter + ("mental health" OR psychological OR burnout OR wellbeing OR well-being OR depression OR anxiety OR stress) first 10 pages screened	-

9.4 Appendix 4: RQ(i) PRISMA flowchart



9.5 Appendix 5: RQ(i) list of excluded studies

Citation	Reason
(2015). "Stress: TABOO. A 'practice that is prohibited or restricted by social or religious custom'." British Dental Journal 219(1): 4-5.	Opinion piece
(2019). "recent Survey of Dentists on Sources of Stress." Dental Town 20(6): 38-43.	Opinion piece- Blog
Adam, N. and C. Mannion (2019). "Resilience of dental core trainees in oral and maxillofacial surgery." British Journal of Oral & Maxillofacial Surgery 57(10): e63-e64.	Conference paper – Full study which has been included in full text
Botelho, M., et al. (2018). "An analysis of clinical transition stresses experienced by dental students: A qualitative methods approach." European Journal of Dental Education 22(3): e564-e572.	Non-UK (China)
Chapman, H. R., et al. (2015). "Understanding emotionally relevant situations in primary dental practice. 3. Emerging narratives." British Dental Journal 219(10): 491-496.	No data on prevalence of MHWB issues, stressors or impact
Gerreth, K., et al. (2019). "Self-Evaluation of Anxiety in Dental Students." BioMed Research International: 1-7.	Non-UK (Poland)
Kulkarni, S., et al. (2016). "Stress and professional burnout among newly graduated dentists." Journal of International Society of Preventive & Community Dentistry 6(6): 535-341.	Non-UK (Saudi Arabia)
Meltzer, H., et al. (2008). "Patterns of suicide by occupation in England and Wales: 2001-2005." British Journal of Psychiatry 193(1): 73-76.	Secondary Data
Monrouxe, L. V., et al. (2015). "Professionalism dilemmas, moral distress and the healthcare student: Insights from two online UK-wide questionnaire studies." BMJ Open 5(5): e007518.	Moral distress and professionalism (no data on MHWB)
Nangle, M. R., et al. (2019). "An empirical study of how emotion dysregulation and social cognition relate to occupational burnout in dentistry." British Dental Journal 227(4): 285-290.	Non-UK (Australia)
Colonio Salazar, F. B., et al. (2019). "Key determinants of health and wellbeing of dentists within the UK: a rapid review of over two decades of research." British Dental Journal 227(2): 127-136.	Review – Checked references for citations
Walley, S. (2013). "Exhaustion crossover between dentist and dental nurse." Dental Nursing 9(8): 436-437.	Non-UK (Finland)

9.6 Appendix 6: RQ(i) table of study characteristics

Author (Year)	Country/City	Study Type	Professional group (n)	Characteristics of participants	Tool used to measure MHWB issues	Type of MHWB issues identified and prevalence
Adam, and Mannion (2020).	England, Yorkshire and Humber	Survey	DCTs (38)	M=17, F=21 m(age)= 25.4 y	**Brief Resilience Scale (BRS)**	Low Resilience= 11 trainees Normal Resilience= 23 trainees High Resilience = 4 trainees
Birks et al. (2009).	England, London	Survey	Y1 BDS students (68)	M=24(35.3%), F= 44 (64.7%) Mean Age= 20.44(3.42)	**Perceived Stress Scale.**	PS (autumn) (N=25),=16.3 (14.0-18.6) PS(summer) (N=25), = 19.4 (17.1-21.8)
Boyles and Ahmed (2017)	England Birmingham	survey	BDS students (130) DCTs (22)	M=48 F=82	no instrument was used	not evaluated
Bretherton et al. (2016)	England- Nottinghan & Hull	Qualitative - Focus Groups Two 2 h long	GDPs (10) CDS (1) Armed Forces (1) DCT (1)	M= 7 F=6 Mean year of qualification: Focus Group 1 1999 (1983-2012) Focus Group 2 1987 (1978-2007)	no instrument was used	not evaluated
Brown et al. (2010)	UK- does not specify	Survey	Retired dentists (189)	M=161 F=28 170 retired GDPs, 108 NHS dentists, rest mixed. 70% practice owners Mean working years 27.4	**HADS (Hospital Anxiety and Depression Scale) questionnaire**	the data from the completed HADS questions indicated that 20% were anxious and 10% depressed
Chapman et al. (2015)	England, Lincoln	Qualitative - Semi structured interviews	GDP (17) CDS (3) From GDPs:	M=9, F=11 Mean Year f qualification 1993 (Range	n/a	n/a

Author (Year)	Country/City	Study Type	Professional group (n)	Characteristics of participants	Tool used to measure MHWB issues	Type of MHWB issues identified and prevalence
			principal (5) associates (1) CDT (1) Type of practice: Private (5) Mixed (4) NHS (8)	1966-2011) Mean Years in practice 17.26 (DF 13.23: range 1-46)		
Chapman et al. (2015)	England, Lincoln	Qualitative - Semi structured interviews	Dentists (20) GDP (17) CDS (3) From GDPs: Principal (6) Associates (5) DCT (1) Type of practice: Private (5) Mixed (4) NHS (8)	M=9, F=11 Mean Year of qualification 1993 (Range 1966-2011) Mean Years in practice 17.26 (DF 13.23: range 1-46)	n/a	n/a
Chipchase et al. (2017)	England-Nottinghamshire and Lincolnshire.	Cross-sectional study/ survey	Dentists (187) GDP (167) CDS (9) Armed Forces=5 Type of practice: Private (55) Mixed (21) NHS (108) Armed Forces (2)	M=107, F=79 Mean Year f qualification 1993 (SE 0.89) Mean Years in practice 17.1 (SE 0.91)	**The Maslach Burnout Inventory-Human Services Survey (MBI-HS)** **Dentists Anxieties in Clinical Situation Scale (DACSS)**	**Burnout: Maslach Burnout Inventory** EE: Mean 2.44 (SD 1.42) DP:Mean 1.30 (SD 1.06) PA:Mean 4.83 (SD 0.74) **Dentists Anxiety in Clinical Situations Scale-R:** Mean 5.39 (SD 1.92)
Collin et al. (2020)	UK (all UK dental schools)	Survey	BDA BDS student members (412)	M= 103, F=307, Prefer not to say =2	**Dental Environment Stress**	56% of respondents reported high stress. The mean score was 19.83,scoring at the top end of the moderate stress range. Fifth-

Author (Year)	Country/City	Study Type	Professional group (n)	Characteristics of participants	Tool used to measure MHWB issues	Type of MHWB issues identified and prevalence
				he majority of respondents were female, under 23 years of age, were White British and in their fifth year of study.	**questionnaire (DES)** **The Perceived Stress Scale (PSS)**. **Clinical Outcomes in Routine Evaluation (CORE)** **Burnout The Oldenburg Burnout Inventory for students (OLBI-S)**	year students exhibited higher mean scores (M = 20.72, SD = 7.04) than first-years (M = 17.34, SD = 7.79); 50.2% of the sample indicated presence of psychological distress. Burnout 57.8% of the students were deemed to be experiencing burnout
Collin et al. (2019)	UK	Survey	dentists (2053) GDPs (661) CDS (192) University (46) Hospital (93) Armed forces/public health (59)	M=905, F=1,139	**A single-item measure of stres**s (used in the UK Health and Safety Executive (HSE) national survey) **Work Stress in Dentistry (WSID) measure** **Burnout: The Oldenburg Burnout Inventory (OLBI)** **Clinical Outcomes**	**54.9%** reported currently experiencing high job stress 43.8% said they could not cope with the level of stress in their job. **Burnout:** Post-hoc tests showed that GDPs and community dentists showed significantly higher levels of burnout than dental academics, hospital dentists, and those in another field of practice (all p's ≤0.02). **Burnout (%)** GDP 87.72% CDS 83.34% University 65.22%

Author (Year)	Country/City	Study Type	Professional group (n)	Characteristics of participants	Tool used to measure MHWB issues	Type of MHWB issues identified and prevalence
					in Routine Evaluation (CORE **Office of National Statistics Wellbeing Questionnaire (ONS-4)**	Hopital 75.27% Armed forces and Public health: 59.32% 68% showing levels of psychological distress. Mean Distress (CORE): GDP 1.93 CDS 1.89 University 1.50 Hopital 1.69 Armed forces and Public health: 1.51 Wellbeing: Life Satisfaction Mean 5.7 Worthwile Mean 6.2 Happy yesterday 5.7 Anxious Yesterday 5.0
Denton, et al. (2008)	UK	Survey	Dentists (335) GDPs (267) CDS (21) Hospital (27) Other (20)	M= 214, F =121 Mean Qualification years 18.6 SD 11 (range 1-43)	**Maslach Burnout Inventory**	**MBI** **EE:** (MEAN 25.1, SD 4.9) Low score 66 (19.9%) Moderate Score 126 (38.0%) High Score 140 (42.2%) **DP:**(MEAN 8.6 SD 4.9) Low score 121 (36.8%) Moderate score 144 (43.8%) High score 64 (19.5%) **PA:** (MEAN 33.9 SD 5.5) Low score (high burnout) 106 (31.9%) Moderate score 154 (46.4%) High score (low burnout) 72 (21.7%)

Author (Year)	Country/City	Study Type	Professional group (n)	Characteristics of participants	Tool used to measure MHWB issues	Type of MHWB issues identified and prevalence
Gorter et al. (2008)	England (Manchester) and N.Ireland (Belfast)	Survey	Y5 BDS students (54) Manchester (32) Belfast (22)	Manchester: M=18, F=15 Belfats M=7, F=15	**Burnout** **The Maslach Burnout Inventory (MBI)** **The General Health Questionnaire (GHQ) 12-** **Dental environment stress (DES) questionnaire** (.	**MBI mean scores (SD)** **Manchester:** EE (emotional exhaustion) 21.25 (10.58) DP depersonalisation) 8.09 (7.12) PA(personal accomplishment) 35.00 (5.73) **Belfast:** EE (emotional exhaustion) 28.13 (10.62) DP depersonalisation) 9.13 (4.32) PA(personal accomplishment) 31.31 (7.03) **n(%)with High MBI scores** EE > 26: Manchester 10 (31%), Belfast 13 (59%) DP>12: Manchester 12(22%), Belfast 6 (27%) PA<32: Manchester 5 (16%), Belfast 9(41%) **GHQ 12 MEAN (sd)** Manchester 1.24 (0.55) Belfast 1.14 (0.49) **Cases of ill psycological health (score>3), n (%)** Manchester 15 (47%) Belfast 13(49%) **Dental Environment Stress (short version): high scorers (>38), n (%)** Manchester 15 (47%) Belfast 11(50%)
Gorter and Freeman (2011)	Northern Ireland	Survey	Dentists (71) DCPs (64) GDPs (64) specialist dentists	Dentists M= 34 , F = 37 DCPs - 64 females , no	**Maslach Burnout Inventory (MBI)** **General Health Questionnaire**	**Mean MBI (SD)** **Emotional Exhaustion EE** Dentists 28.08 (11.67) DCPS 20.07 (11.93)

Author (Year)	Country/City	Study Type	Professional group (n)	Characteristics of participants	Tool used to measure MHWB issues	Type of MHWB issues identified and prevalence
			(7)	males	**(GHQ-12)**	**Depersonalisation (DP)** Dentists 9.59 (5.90) DCPS 7.33 (5.92) **Personal Accomplishment (PA)** Dentists 33.70 (6.47) DCPS 32.08 (8.52) The mean **GHQ-12 score** for all respondents was 1.05 (SD = 0.51) on a scale range from 0 to 3.
Harris et al. (2017)	England, Portsmouth	Survey	DHT students (58) Y5 BDS students (68)	The mean age for DHDTS was 25 years, with a range of 19 to 38 years. The mean age for DS was 23 years, with a range of 21 to 32 years.	**Dental Environment Stress questionnaire (DES)** **Depression Anxiety Stress Scales (DASS21); Psychological Well-Being (PWB-S)**	**DASS-21** **Depression** DHDTs 7.26 (8.01) DS 4.94 (6.50) **Anxiety** DHDTs 8.0 (7.73) DS 5.14 (5.53) **Stress** DHDTs12.20 (8.99) DS 7.79 (6.57) **PWB-S** **Autonomy** DHDTs 55.80 (7.85) DS 53.83 (5.75) **Environmental mastery** DHDTs 57.22 (7.24) DS 54.20 (4.52) **Personal growth** DHDTs 64.73 (5.89) DS 55.13 (4.22) **Positive relations with others**

Author (Year)	Country/City	Study Type	Professional group (n)	Characteristics of participants	Tool used to measure MHWB issues	Type of MHWB issues identified and prevalence
						DHDTs 59.50 (7.87) DS 55.03 (5.52) **Purpose in life** DHDTs 61.62 (8.51) DS 49.58 (4.85) **Self-acceptance** DHDTs 57.01 (9.92)) DS 53.05 (5.23)
Harris et al. (2018)	England, Portsmouth	Survey	DHT students (42)	The mean age for the UK was 26 (5.1) years, with a range of 19- 39 years.	**Dental Environment Stress questionnaire (DES)** **Depression Anxiety Stress Scales (DASS- 21)** **Psychological WellBeing (PWB-S)**	**DASS-21** **Depression** DHDTs 11.57 (9.18) **Anxiety** DHDTs 10.78 (8.85) **Stress** DHDTs 17.43 (8.07) PWB-S **Autonomy** DHDTs 36.97 (7.26) **Environmental mastery** DHDTs 37.78 (6.25) **Personal growth** DHDTs 44.36 (5.07) **Positive relations with others** DHDTs 40.73 (8.45) **Purpose in life** DHDTs 43.41 (6.59)

Author (Year)	Country/City	Study Type	Professional group (n)	Characteristics of participants	Tool used to measure MHWB issues	Type of MHWB issues identified and prevalence
						Self-acceptance DHDTs 39.68 (7.72)
Harris et al. (2017)	England, Portsmouth	Qualitative - Semi structured interviews	DHT students (8)	n/a	n/a	n/a
Hill et al. (2010)	UK	Qualitative - Semi structured interviews	Retired Dentists (23) GDPs (8), Community (1), Other (4)	M=19, F-4 Age Range 39-59	n/a	n/a
Jenkins et al. (2019)	Wales , Cardiff University	Survey	BDS students (109)	M= 30, F=79 Age range 18-25	n/a	68% Feeling of stress and anxiety 24% emotional distress 14% depression
Kay and Lowe (2008)	UK	Survey	GDPs (512) Other (33) Practice owners (338)	M=360 (66% of respondents), F= 185	Well Being – 14 item measure	57% of respondents mostly had feelings of positive well-being (a score of 43-56), and only 1% experienced mainly negative feelings (a score of 14 or less). The remaining 42% scored between 15 and 42 (6% 15-28 and 36% 29-42).
Kemp and Edwards (2014)	UK	Survey	CDS dentists (499)	n/a	n/a	n/a
Knipe et al. (2018)	England, Bristol	Survey	BDS students (223)	M=52, F =171 Median age (IQI): 21 (20,23)	**Patient Health Questionnaire (PHQ-9**) **Generalised Anxiety Disorder Assessment (GAD-7)**; **Warwick–Edinburgh Mental**	**Depression (PHQ-9 score)** ≥10 - 79 (35.4%) ≥20 - 7 (3.1%) **Anxiety (GAD-7 score)** ≥10 - 87 (39.0%) ≥15 - 39 (17.5%) **Suicidal thoughts**- 4 (1.8%) Self harm (regardless of intent)- 17(7.6%) Self harm with intent- 5 (2.2%)

Author (Year)	Country/City	Study Type	Professional group (n)	Characteristics of participants	Tool used to measure MHWB issues	Type of MHWB issues identified and prevalence
					Wellbeing Scale (WEMWBS).	**Wellbeing (WEMWBS score)** Below national average (23.63)- 179 (80.3%)
Larbie et al. (2017)	UK	Qualitative study (interview and focus group)	Interviews: Dentists (23) GDP (16) CDS (2) Hospital (2) Public Health (1) Other 2 Focus groups: Dentists (29) GDP (17) CDS (4) Hospital (1) Public Health (1) Other (4) Missing (2)	Interviews: M=17, F=6 England (17) Scotland (5) Wales (1) Focus groups: M=11, F=18 England (22) Scotland (5) Wales (1) N. Ireland (1)	n/a	n/a
Lewis and Cardwell (2019)	England, Bristol and London	Survey	BDS students (191)	M=32, F=107 Median Age=21 (Range 18-38)	**Warwick–Edinburgh Mental Well-being Scale (WEMWBS** **General Health Questionnaire (GHQ-12)**. **Beck Depression Inventory-II.** 19:	**WellBeing (WEMWBS)** Mean scores (SD)- 45.41 (9.68) **GHQ-12** Mean Likert Scoring (SD)- 15.67 (6.19) Mean Bimodal Scoring (SD) 4.35 (3.47) Threshold Scoring (potential psyciatric disorder)- 48.8% **(BDI-II)** Mean (SD): 12.26 (9.60)

Author (Year)	Country/City	Study Type	Professional group (n)	Characteristics of participants	Tool used to measure MHWB issues	Type of MHWB issues identified and prevalence
Lewis and Cardwell (2020)	England, Bristol and London	Survey	BDS students (191)	Not given	n/a	n/a
Mahendran et al. (2020)	England, London	Survey	Dental Hospital staff (120) Consultants (7) Staff Grade dentists (14) DCT (11) StR (4) Dental nurses (60) Dental technicians (80 Administrative staff (11) Missing (5)	M=28, F=87 (missing= 5) Median Age (range) 35 (19-63)	Generalised Anxiety Disorder assessment (GAD-7)	16.7% of respondents displayed severe symptoms of generalised anxiety, while about half (53.3%) displayed some symptoms. **Mean GAD-7** Sample 8.15 Dental nurses 10.35 StR 9.75 DCT 8.5 Staff Grade dentist 4.75 Consultant 4.71 Administrative staff 4.27 Dental technician 3.25%
Pau et al. (2007)	England	Survey	Y1 BDS students (52)	M=18, F=34 Age ≤21: 40 Age ≥22: 12	**Perceived Stress Scale (PSS-10)**	Mean **PSS-10** (95% CI) PS = 16.2 (14.8-17.7)
Toon et al. (2019)	UK	Secondary analysis of BDA Survey	GDPs (1513) Practice owners (453) Associates (752) Corporate Associates (308)	M=714, F=799 Age <25, n=42 Age 25-34, n=402 Age 35-44, n=418 Age 55-64, n=230 Age ≥65, n=30	**Oldenburg Burnout Inventory (OLBI)**	not presented
Turner et al. (2015)	England, London	Survey	BDS students (228)	Total: M=92, F136 Y1: M=46, F=61	P**erceived Stress Scale (PSS-10)**,	Mean **PSS** score (SD) Y1: 17.48 (6.17) Y5: 20.16 (7.58)

Author (Year)	Country/City	Study Type	Professional group (n)	Characteristics of participants	Tool used to measure MHWB issues	Type of MHWB issues identified and prevalence
			Y1 (107) Y5 (121)	Y5 M=46, F=75		

9.7 Appendix 7: Tools used to measure mental health and wellbeing in dental studies

Outcome Measure/Tool	Description of tool	Number of studies	Citations
Anxiety			
Dentists Anxieties in Clinical Situation Scale (DACSS)	It consists of 20 frequently experienced stressful situations. Dentists are asked to rate their anxiety for each situation on an 11-point Likert scale anchored 0 (not at all) & 10 (the most intense emotion you can experience). For each item they are asked, 'Does the anxiety ever change something about the way you work?' and are asked to indicate yes or no (Y/N). The scale has 2 subscales; the DACSS-R which rated anxiety and the DACSS-C which reported change in decision-making.	2	Chapman et al. (2017), Chipchase et al. (2017)
Depression, Anxiety and Stress Scale (DASS-21)	It is used to measure the levels of depression, anxiety, and stress. It contains 21 questions with subscales for each of the three domains. Each question has four answers, ranging from 0 "Did not apply to me at all" to 3 "Applied to me very much, or most of the time." The score in each subscale ranges from 0 to 21, and the lower the score, the lower the level of psychological distress.	3	Aboalshamat, et al. (2020), Harris et al. (2017), Harris et al. (2018)
Generalised Anxiety Disorder Assessment (GAD-7)	It is a seven-item instrument that is used to measure or assess the severity of generalised anxiety disorder (GAD). Each item asks the individual to rate the severity of his or her symptoms over the past two weeks. Response options include "not at all", "several days", "more than half the days" and "nearly every day".	1	Knipe et al. (2018), Mahendran et al. (2020)
Hospital Anxiety and Depression Scale (HADS)	It consists of 14 items and has two measures, one for anxiety and one for depression. Scores on both scales can range between 0 and 21. A higher score indicates a more severe condition. A score of 7 or less is considered 'normal', a score between 8 and 10 'mild', a score between 11 and 15 'moderate', and a score greater or equal to 16 'severe'. Moderate and severe scores indicate 'caseness', that is individuals who would be considered anxious or depressed.	1	Brown et al. (2010)
Burnout			
Malshach Burnout Inventory (BMI)	It contains 22 statements which relate to each of the three burnout domains, emotional exhaustion (EE), depersonalisation (DP) and personal accomplishment (PA). Respondents are asked to use a seven-point Likert scale to indicate the frequency with which they experience the feeling described by the statement, ranging from 0 (never) to 6 (every day). Summing the appropriate items derives scores for each of the three domains. Indicative of burnout are high scores on EE and DP and low scores on PA. No summative burnout score is made.	5	Chapman et al. (2017), Chipchase et al. (2017), Denton et al. (2008), Gorter et al. (2008), Gorter & Freeman (2011)
Oldenburg Burnout	It assesses burnout on two dimensions: exhaustion and disengagement. Eight questions cover	2	Collin et al. (2019), Collin et al. (2020)

Outcome Measure/Tool	Description of tool	Number of studies	Citations
Inventory (OBI)	the exhaustion dimension, which examines physical and cognitive aspects of exhaustion in addition to affective aspects as measured in the MBI. Eight questions examine the disengagement dimension, which covers the concept of depersonalisation and negative attitudes towards work and work engagement more generally.		
	Depression		
Beck Depression Inventory-II (BDI-II)	It consists of 21 items. Each item includes four statements scored from 0 to 3, and respondents select one statement from each item which best describes the way they have been feeling during the past two weeks. Scores are summed to give a range from 0 to 63, with higher scores indicating greater severity of depression. Scores may also be categorised into the following ranges: 0–13: minimal depression; 14–19: mild depression; 20–28: moderate depression; and 29–63: severe depression.	1	Lewis and Cardwell (2019)
Depression, Anxiety and Stress Scale (DASS-21)	It is used to measure the levels of depression, anxiety, and stress. It contains 21 questions with subscales for each of the three domains. Each question has four answers, ranging from 0 “Did not apply to me at all” to 3 “Applied to me very much, or most of the time.” The score in each subscale ranges from 0 to 21, and the lower the score, the lower the level of psychological distress.	3	Aboalshamat et al. (2020), Harris et al. (2017), Harris et al. (2018)
Hospital Anxiety and Depression Scale (HADS)	It consists of 14 items and has two measures, one for anxiety and one for depression. Scores on both scales can range between 0 and 21. A higher score indicates a more severe condition. A score of 7 or less is considered ‘normal’, a score between 8 and 10 ‘mild’, a score between 11 and 15 ‘moderate’, and a score greater or equal to 16 ‘severe’. Moderate and severe scores indicate ‘caseness’, that is individuals who would be considered anxious or depressed.	1	Brown et al. (2010)
Patient Health Questionnaire (PHQ-9)	Is a nine-item questionnaire designed to screen for depression. The standard cut-off score for screening to identify possible major depression is 10 or above.	1	Knipe et al. (2018)
	Impostor Syndrome		
Clance Impostor Phenomenon Scale (CIPS)	It consists of 20 Likert-scale questions, with responses ranging from (1) not at all true to (5) very true. A total score ranges from 20 to 100. The higher the score, the more frequently and seriously the Impostor Phenomenon interferes in a person’s life.	1	Metz et al. (2020)
	Resilience		
Brief Resilience Scale (BRS)	It is a six-item questionnaire with half of the items being positively worded and the other half negatively worded. Scores range from 1 to 5. Scores below 3 suggest low resilience and those above 4.3 suggest high resilience; intermediate scores are considered normal.	1	Adam and Mannion (2020)

Outcome Measure/Tool	Description of tool	Number of studies	Citations
Resilience scale RS-14	It is a seven-point Likert scale. Total scores range from 14 to 98, and the higher the score, the greater the resilience.	1	Aboalshamat et al. (2020)
	Psychological health and Wellbeing		
Clinical Outcomes in Routine Evaluation (CORE)	It is a self-report measure of psychological distress designed to be administered before and after counselling or psychotherapy. The client is asked to respond to questions about how they have been feeling over the last week, using a 5-point scale ranging from 'not at all' to 'most or all of the time'. It covers four dimensions: subjective wellbeing, problems/symptoms, life functioning and risk/harm.	3	Collin et al. (2019), Collin et al. (2020), Newton et al. (2006)
Counselling Centre Assessment of Psychological Symptoms - 34 (CCAPS-34)	It is a 34-item, standardized, multidimensional assessment tool designed to be administered before and after counselling or psychotherapy. It provides a brief measurement tool targeting symptoms and presenting problems that most commonly affect students in university settings. Items on the CCAPS-34 are scored along a 5-point, Likert-type rating scale.	1	Adams (2017)
General Health Questionnaire (GHQ-12)	It consists of 12 items, each assessing the severity of a mental problem over the past few weeks using a 4-point scale (from 0 to 3). It is comprised of 6 positive and 6 negative items to assess positive and negative mental health. The score can range from 0 to 36, with higher scores indicating worse conditions. A bimodal scoring can also be used, ranging from 0 to 12, in which case a cut-off point of >3 is a determinant for psychological ill health.	4	Gorter et al. (2008), Gorter & Freeman (2011), Lewis and Cardwell (2019), Newton et al. (2006)
General well-being Questionnaire	It comprises of a set of 14 statements describing positive and negative feelings of wellbeing. Respondents are asked to indicate how often during the past year they had experienced the feelings described in each statement, using a 4point scale (1 = hardly ever to 4 = most of the time). A score of 14 corresponds to very negative wellbeing, whilst a score of 56 indicates very positive wellbeing.	1	Kay and Lowe (2008)
Office of National Statistics Wellbeing Questionnaire (ONS-4)	The questions relate to evaluative, eudemonic and the experience of personal wellbeing, and items include 'Overall, how satisfied are you with your life nowadays?', 'Overall to what extent do you feel the things you do in your life are worthwhile?', 'Overall, how happy did you feel yesterday?' and 'Overall, how anxious did you feel yesterday?' Questions are scored from 0–10, 'not at all' to 'completely'.	1	Collin et al. (2019)
Outcome Questionnaire–45.2 (OQ 45.2)	It comprises of 45 items associated with a person's quality of life, designed to measure repeatedly changes during and after counselling or psychotherapy. It yields a total score in which higher scores indicate lower levels of general wellbeing. Its cut-off point is 73, therefore scores under 73 belong to the normal population and those above 73 belong to the dysfunctional population. It also provides information on three sub-scales: anxiety-depressive symptomatology	1	Gonzalez & Quezada (2016)

Outcome Measure/Tool	Description of tool	Number of studies	Citations
	(DS), interpersonal relations (IR), and social relations (SR), whose cut-off points are 43, 16 and 14, respectively. Scores above these values imply significant interference in the life of the individual.		
Outcome Rating Scale (ORS)	It is a four-item measure designed to assess overall counselling or psychotherapy outcomes. The items assess individual, interpersonal, social, and overall wellbeing.	1	Adams (2017)
Psychological Well-Being Scale–Short (PWB-S)	It is an 18-item seven-point Likert-type scale with responses ranging from 1, "strongly disagree," to 7, "strongly agree." It measures six psychological fields of wellbeing: autonomy, environmental mastery, self-acceptance, positive relations with others, purpose in life, and personal growth. Each one of the domains is calculated by sum field's questions. PWB-S is not represented as one total score. Lower scores reflect low levels of psychological wellbeing.	3	Aboalshamat et al. (2020), Harris et al. (2017), Harris et al. (2018)
Warwick Edinburgh Mental Well Being Scale (WEMHWBS)	The scale consists of 14 positively phrased 5-point Likert items scored from 1 (none of the time) to 5 (all of the time), giving a minimum score of 14 and a maximum score of 70. A higher score indicates higher levels of wellbeing.	2	Knipe et al. (2018), Lewis and Cardwell (2019)
Stress			
Dental Environment Stress questionnaire (DES)	The DES questionnaire assesses sources of stress associated with undergraduate course work and training in dental students. The DES can be used in two versions, the 38-item full version or the 16-item short version. Each item is scored in a four-point Likert scale, with scores ranging from one (not stressful) to four (very stressful). Higher scores on this scale indicate greater levels of stress. It includes six areas: academic load; pre-clinical and clinical practice; treatment of patients; faculty and administration; interpersonal relations and others. However, these domains may be adapted to each dental school's needs and characteristics.	5	Collin et al. (2020), Gonzalez & Quezada (2016) Gorter et al. (2008), Harris et al. (2017), Harris et al. (2018)
Depression, Anxiety and Stress Scale (DASS-21)	It is used to measure the levels of depression, anxiety, and stress. It contains 21 questions with subscales for each of the three domains. Each question has four answers, ranging from 0 "Did not apply to me at all" to 3 "Applied to me very much, or most of the time." The score in each subscale ranges from 0 to 21, and the lower the score, the lower the level of psychological distress.	3	Aboalshamat et al. (2020), Harris et al. (2017), Harris et al. (2018)
Perceived Stress Scale (PSS-10)	This 10-item scale measures the degree to which individuals appraise their life as stressful. Four of the items are reversed score and the scale has a 5-point Likert response format. The total score is calculated by summing responses. The possible range of scores is 0, indicating no perception of stress, to 40, indicating high perception of stress.	4	Birks et al. (2009), Collin et al. (2020), Pau et al. (2007), Turner et al. (2015)
Single Item	It has been utilised by the UK Health and Safety Executive (HSE) and a variety of large-scale	2	Collin et al. (2019),

Outcome Measure/Tool	Description of tool	Number of studies	Citations
(Likert Scale)	national surveys. Respondents are asked to indicate how stressed they are in relation to the question, 'In general, how do you find your job?' on a Likert-type scale (1–5) ranging from 'not at all stressed' to 'extremely stressed.'		
Work Stress in Dentistry (WSID)	This measure comprises of 29 items, looking at working environment including work pressure (keeping to appointment schedules, too much work), work content (working with colleagues, equipment malfunction), contact with patients (anxious patients, dissatisfied patients), regulation (threat of complaints, red-tape/ bureaucracy) and financial factors (earning enough money for lifestyle needs, seeing more patients then you want to for income reasons). Respondents are asked to indicate how stressed they are in relation to each question on a Likert-type scale (1–5) ranging from 'not at all stressed' to 'extremely stressed.'	1	Collin et al. (2019)
Work Stress Inventory (WSI)	This scale comprises a number of sources of stress and respondents are asked to indicate which source of stress they have experienced in their work life recently. Higher scores on this scale indicate higher amounts of stress.	1	Newton et al. (2006)

9.8 Appendix 8: RQ(ii) search strategy for online database searching

EMBASE <1974 TO 2020 OCTOBER 23>

#	Searches	Results
1	exp mental health/	163391
2	exp mental disease/	2225243
3	wellbeing/	66589
4	psychological wellbeing/	19653
5	mental stress/	83838
6	job stress/	9460
7	burnout/	18551
8	professional burnout/	942
9	((mental or psychological) adj3 (health or ill* or well-being or wellbeing)).ab,kw,ti.	257150
10	((mental or psychological or job* or work* or occupational) adj3 (stress* or distress)).ab,kw,ti.	71040
11	(burnout or burn-out).ab,kw,ti.	17197
12	anxiety disorder/	72193
13	mood disorder/	44044
14	depression/	373545
15	addiction/	47784
16	(depression or depressive or suicid*).ab,kw,ti.	611863
17	(anxiety or mood).ab,kw,ti.	371899
18	addict*.ab,kw,ti.	96950
19	((substance or drug or alcohol) adj1 (misus* or use* or abuse*)).ab,kw,ti.	250422
20	or/1-19	2864098
21	exp *dental personnel/	18142
22	"dentist*".kw,ti.	31692
23	"Dental hygienist*".kw,ti.	1206
24	"Dental therapist*".kw,ti.	170
25	"dental technician*".kw,ti.	554
26	"Orthodontic therap*".kw,ti.	337
27	"Dental nurse*".kw,ti.	164
28	"oral surgeon*".kw,ti.	155
29	periodontist*.kw,ti.	124
30	endodontist*.kw,ti.	136
31	orthodontist*.kw,ti.	677
32	"dental team".kw,ti.	228
33	(dental adj3 staff).kw,ti.	162
34	"dental professional*".kw,ti.	457
35	"dental practitioner*".kw,ti.	1245
36	"dental assistant*".kw,ti.	655
37	(dental adj3 (trainee or training)).kw,ti.	494
38	(dental adj3 (speciality or specialist)).kw,ti.	80
39	(dental adj3 (student* or graduate* or undergraduate*)).kw,ti.	4411
40	or/21-39	50688

#	Searches	Results
41	20 and 40	2800
42	limit 41 to yr="2006 -Current"	1479
43	Conference abstract.pt.	3894134
44	Conference paper.pt.	762961
45	Editorial.pt.	671781
46	Letter.pt.	1147091
47	Letter/	1083890
48	Note.pt.	822060
49	or/43-48	7302246
50	42 not 49	1365
51	limit 50 to english language	1299

OVID MEDLINE(R) AND EPUB AHEAD OF PRINT, IN-PROCESS & OTHER NON-INDEXED CITATIONS, DAILY AND VERSIONS(R) <1946 TO OCTOBER 22, 2020>

#	Searches	Results
1	exp mental health/	39637
2	exp mental disorders/	1251900
3	stress, psychological/	121682
4	occupational stress/	1766
5	burnout, psychological/	562
6	burnout, professional/	12283
7	((mental or psychological) adj3 (health or ill* or well-being or wellbeing)).ab,kw,ti.	194230
8	((mental or psychological or job* or work* or occupational) adj3 (stress* or distress)).ab,kw,ti.	52851
9	(burnout or burn-out).ab,kw,ti.	12839
10	anxiety/ or anxiety disorders/	111203
11	mood disorders/	14425
12	depression/ or depressive disorder/	185363
13	Substance-Related Disorders/	96124
14	(depression or depressive or suicid*).ab,kw,ti.	447023
15	(anxiety or mood).ab,kw,ti.	253483
16	addict*.ab,kw,ti.	65959
17	((substance or drug or alcohol) adj1 (misus* or use* or abuse*)).ab,kw,ti.	176245
18	or/1-17	1906183
19	exp Dentists/ or Dental Staff/	21092
20	"dentist*".kw,ti.	39567
21	"Dental hygienist*".kw,ti.	1406
22	"Dental therapist*".kw,ti.	178
23	"dental technician*".kw,ti.	673
24	"Orthodontic therap*".kw,ti.	449
25	"Dental nurse*".kw,ti.	200
26	"oral surgeon*".kw,ti.	220
27	periodontist*.kw,ti.	150
28	endodontist*.kw,ti.	146
29	orthodontist*.kw,ti.	826
30	"dental team".kw,ti.	237
31	(dental adj3 staff).kw,ti.	151
32	(dental adj3 professional*).kw,ti.	740
33	"dental practitioner*".kw,ti.	1282
34	"dental assistant*".kw,ti.	1034
35	(dental adj3 (trainee or training)).kw,ti.	603
36	(dental adj3 (speciality or specialist)).kw,ti.	89
37	(dental adj3 (student* or graduate* or undergraduate*)).kw,ti.	4212
38	or/19-37	62247
39	18 and 38	2628
40	limit 39 to yr="2006 -Current"	1151

#	Searches	Results
41	(congress or editorial or letter).pt.	1713466
42	40 not 41	1106
43	limit 42 to english language	1059

DATABASE - CINAHL PLUS WITH FULL TEXT; DENTISTRY & ORAL SCIENCES SOURCE

#	Database	Results
1	TI (((mental or psychological) N3 (health or ill* or well-being or wellbeing)) OR AB (((mental or psychological) N3 (health or ill* or well-being or wellbeing)) OR TI (((mental or psychological or job* or work* or occupational) N3 (stress* or distress))) OR AB (((mental or psychological or job* or work* or occupational) N3 (stress* or distress))) OR TI (burnout or burn-out) OR AB (burnout or burn-out) OR TI (depression or depressive or suicid* or anxiety or mood or addict*) OR AB (depression or depressive or suicid* or anxiety or mood or addict*) OR TI ((substance or drug or alcohol) N1 (misus* or use* or abuse*)) OR AB ((substance or drug or alcohol) N1 (misus* or use* or abuse*))	442,403
2	(SU "Mental Health")	88,552
3	SU "Psychological Well-Being" or SU "well-being"	25,496
4	(SU "Anxiety") OR (SU "Anxiety Disorders")	61,449
5	(SU "Depression")	125,573
6	(SU "Burnout, Professional")	11,089
7	(SU "Psychological Burnout")	3,808
8	(SU "Burnout")	11,214
9	(SU "Stress, Occupational")	17,010
10	(SU "Job stress")	10,198
11	SU "addiction"	1,790
12	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11	542,838
13	TI (dental N3 (professional* or hygienist* or therapist* or assistant* or technician* or nurse* or team or staff or practitioner* or student* or graduate* or undergraduate*)) OR TI (dental N3 (trainee* or training or speciality or specialist*)) OR TI ((oral N1 surgeon*) or endodontist* or orthodontist* or periodontist* or (orthodontic N1 therap*))	12,362
14	SU "dentists" OR SU "DENTAL personnel"	28,083
15	S13 OR S14	38,648
16	S12 AND S15	2,105
17	S12 AND S15	2,105
18	S12 AND S15	1,854

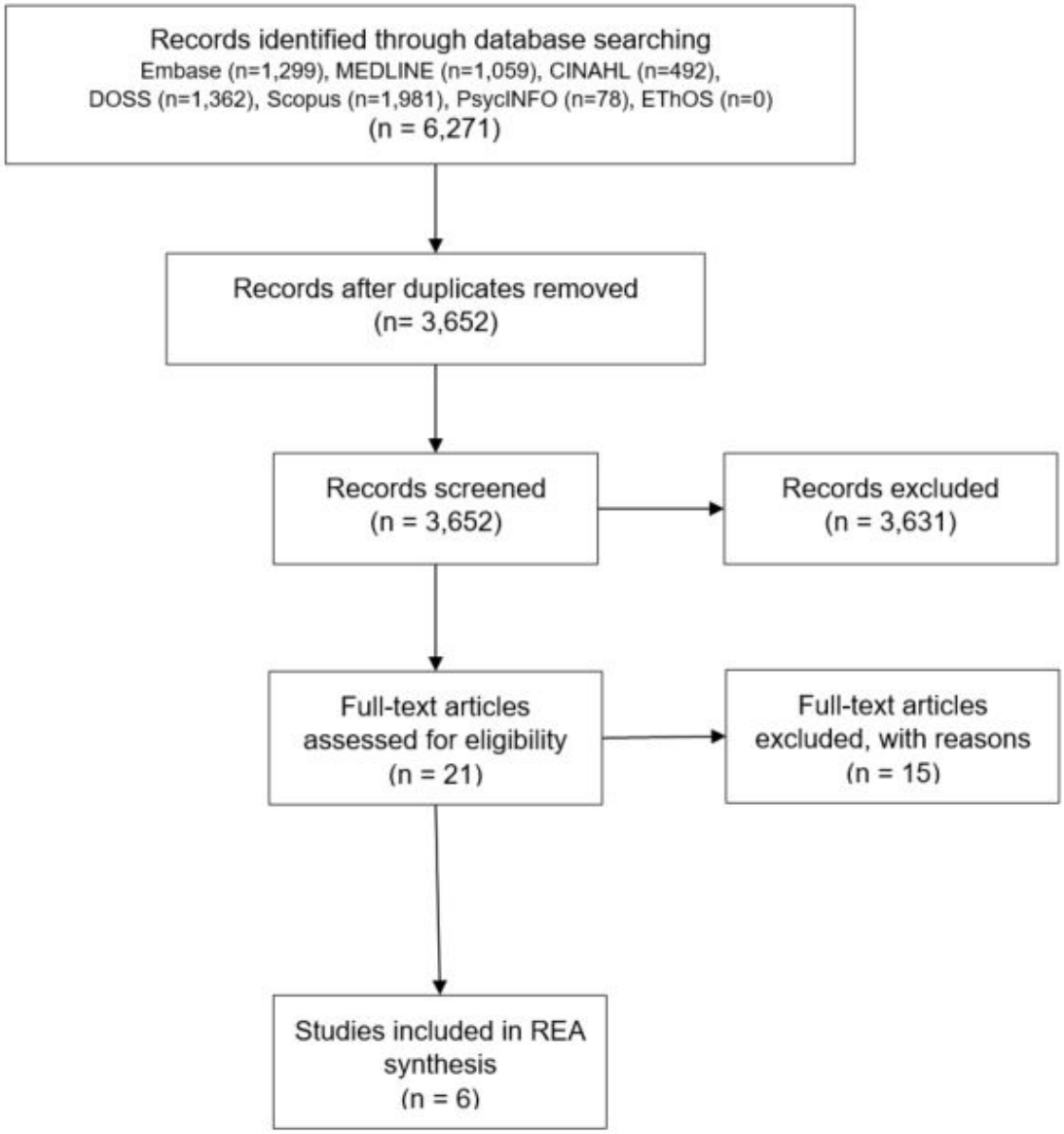
Database - CINAHL Plus with Full Text; Dentistry & Oral Sciences Source
CINAHL: 492
DOSS: 1362

SCOPUS SEARCH HISTORY

#	Search terms	Results
1	(TITLE-ABS-KEY ((mental OR psychological) PRE/3 (health OR ill* OR well-being OR wellbeing)) OR TITLE-ABS-KEY ((mental OR psychological OR job* OR work* OR occupational) PRE/3 (stress* OR distress)) OR TITLE-ABS-KEY (burnout OR burn-out) OR TITLE-ABS-KEY (depression OR depressive OR suicid* OR anxiety OR mood OR addict*) OR TITLE-ABS-KEY ((substance OR drug OR alcohol) PRE/1 (misus* OR use* OR abuse*)))	1,979,209
2	TITLE (dentist*) OR TITLE (dental PRE/3 (professional* OR hygienist* OR therapist* OR assistant* OR technician* OR nurse* OR team OR staff OR practitioner* OR student*)) OR TITLE ((oral PRE/1 surgeon*) OR endodontist* OR orthodontist* OR periodontist* OR (orthodontic PRE/1 therap*)) OR KEY (dentist*) OR KEY (dental PRE/3 (professional* OR hygienist* OR therapist* OR assistant* OR technician* OR nurse* OR team OR staff OR practitioner* OR student*)) OR KEY ((oral PRE/1 surgeon*) OR endodontist* OR orthodontist* OR periodontist* OR (orthodontic PRE/1 therap*))	149,489
3	AND PUBYEAR > 2005 AND LANGUAGE (english) AND (EXCLUDE (DOCTYPE , "le") OR EXCLUDE (DOCTYPE , "cp") OR EXCLUDE (DOCTYPE , "ed") OR EXCLUDE (DOCTYPE , "no"))	1981

APA PsycInfo®
((MAINSUBJECT.EXACT("MENTAL HEALTH") OR MAINSUBJECT.EXACT("WELL BEING") OR MAINSUBJECT.EXACT("PSYCHOLOGICAL STRESS") OR (MAINSUBJECT.EXACT("ANXIETY") OR MAINSUBJECT.EXACT("ANXIETY DISORDERS")) OR MAINSUBJECT.EXACT("DEPRESSION (EMOTION)") OR MAINSUBJECT.EXACT("ADDICTION") OR TI((MENTAL OR PSYCHOLOGICAL) PRE/3 (HEALTH OR ILL* OR WELL-BEING OR WELLBEING)) OR AB((MENTAL OR PSYCHOLOGICAL) PRE/3 (HEALTH OR ILL* OR WELL-BEING OR WELLBEING)) OR TI((MENTAL OR PSYCHOLOGICAL OR JOB* OR WORK* OR OCCUPATIONAL) PRE/3 (STRESS* OR DISTRESS)) OR AB((MENTAL OR PSYCHOLOGICAL OR JOB* OR WORK* OR OCCUPATIONAL) PRE/3 (STRESS* OR DISTRESS))) OR (TI(BURNOUT OR BURN-OUT OR DEPRESSION OR DEPRESSIVE OR SUICID* OR ANXIETY OR MOOD OR ADDICT*) OR AB(BURNOUT OR BURN-OUT OR DEPRESSION OR DEPRESSIVE OR SUICID* OR ANXIETY OR MOOD OR ADDICT*) OR TI((SUBSTANCE OR DRUG OR ALCOHOL) PRE/1 (MISUS* OR USE* OR ABUSE*)) OR AB((SUBSTANCE OR DRUG OR ALCOHOL) PRE/1 (MISUS* OR USE* OR ABUSE*)))) AND (TI(DENTAL PRE/1 (PROFESSIONAL* OR HYGIENIST* OR THERAPIST* OR ASSISTANT* OR TECHNICIAN* OR NURSE* OR TEAM OR STAFF OR PRACTITIONER* OR STUDENT*)) OR TI((ORAL PRE/1 SURGEON*) OR ENDODONTIST* OR ORTHODONTIST* OR PERIODONTIST* OR (ORTHODONTIC PRE/1 THERAP*)) OR MAINSUBJECT.EXACT.EXPLODE("DENTISTS") OR TI(DENTIST*))LIMITS APPLIED 78 RESULTS
DATABASES:
APA PSYCINFO®
NARROWED BY:
ENTERED DATE: 2006 - 2020;
LANGUAGE: ENGLISH

9.9 Appendix 9: RQ(ii) PRISMA flowchart



9.10 Appendix 10: RQ(ii) list of excluded studies

Citation	Reason
(2019). "ADA, Alliance of ADA promoting ways to banish burnout https://www.ada.org/en/publications/ada-news/2019-archive/may/ada-promoting-ways-to-banish-burnout American Dental Association News 50(10): 1-8.	No outcome data available
Aboalshamat, K., et al. (2015). "The impact of a self-development coaching programme on medical and dental students' psychological health and academic performance: a randomised controlled trial." BMC medical education 15: 134.	Dental outcome data are not presented separately
Baesso Cavalca, A. M., et al. (2019). "The effect of acupuncture on exam anxiety in medical students: a randomized crossover study." Revista Internacional de Acupuntura 13(2): 43-48.	Not Very High Human Development Country (Brazil)
Braun, S. E., et al. (2019). "Brief Yoga Intervention for Dental and Dental Hygiene Students: A Feasibility and Acceptability Study." Journal of evidence-based integrative medicine 24: 2515690X19855303.	Measures state mindfulness
Braun, S. E., et al. (2019). "Brief Yoga Intervention for Dental and Dental Hygiene Students: A Feasibility and Acceptability Study." Journal of evidence-based integrative medicine 24: 2515690X19855303.	No full text available
Brondani, M. A., et al. (2014). "Tackling stress management, addiction, and suicide prevention in a predoctoral dental curriculum." Journal of dental education 78(9): 1286-1293.	No outcome data available
Brooks, S. K., et al. (2013). "Doctors and dentists with mental ill health and addictions: Outcomes of treatment from the Practitioner Health Programme." Journal of Mental Health 22(3): 237-245.	Dental outcome data are not presented separately
Colley, J. M., et al. (2018). "Teaching stress management in undergraduate dental education: are we doing enough?" British Dental Journal 224(6): 405-407.	Opinion piece, no outcome data
Dilbone, D. A., et al. (2018). "Influence of Preparatory Workshops on Dental Students' Academic Performance and Stress on Their First Operative Dentistry Psychomotor Exam." Journal of dental education 82(6): 608-613.	Non validated outcome measures
Karpenko, A. E., et al. (2020). "Virtual online learning communities reducing dental student stress and anxiety." Journal of dental education.	Non validated outcome measures
Kinser, P., et al. (2016). " “Awareness is the first step”: An interprofessional course on mindfulness & mindful-movement for healthcare professionals and students." Complementary Therapies in Clinical Practice	Dental outcome data are not presented separately
Lopez, N., et al. (2010). "Does peer mentoring work? Dental students assess its benefits as an adaptive coping strategy." Journal of dental education 74(11): 1197-1205.	Non validated outcome measures
Moss, S. B. and N. W. Gaughf (2006). "Dentist impairment: risk factors, signs, prevention, and treatment." Texas dental journal 123(4): 350-355.	No full text available
Singh, M., et al. (2020). "Mindful awareness for female dental students through yoga, motivational video, and a combination of two on stress reduction." Journal of family medicine and primary care 9(4): 2028-2032.	Not Very High Human Development Country (India)
Walden, K. (2019). "A Conversation About Well Being: Treating the Impaired Dentist." Journal of the Indiana Dental Association 98(3): 26-28.	No full text available

9.11 Appendix 11: RQ(ii) table of study characteristics

Author (Date)	Aboalshamat et al. (2020)	Adams (2017)	Chapman, et al. (2017)	Gonzalez & Quezada (2016)	Metz et al. (2020)	Newton et al. (2006)
Country/City	Saudi Arabia	US (Iowa)	UK (England)	Chile	USA (Louisville)	UK (England)
Study Type	Quasi-experimental, two groups	Quasi-experimental, one group	Quasi-experimental, two groups	Quasi-experimental, one group	Quasi-experimental, one group	Quasi-experimental, one group
N of participants/ professional groups	88 dental students 44 in coaching programme 44 in control group	55 dental students	40 primary care dentists 20 participants for the guided self-help CBT programme 20 participants for the self-help CBT programme	5 dental students	103 first year dental students	20 primary care dentists
Characteristics of participants	M=0, F=88 mean age 21.84 (SD:1.50) Age range 19-24	M=18, F=37 Age Range 21-55	**Guided self help CBT** M=6, F=11 GDS=15, CDS=0, Armed Forces=2 Principal=4, Associate=10, DF1=1, Salaried=2 Qualified: 1998.71 (SD 12.61) (Range 1976-2012) Practising Years: 20.82(SD 11.06)(1-37) **Self-help CBT**		M=48, F=55 Age groups: ≤21(6%), 22-25 (72%), >25 (22%)	No d

Author (Date)	Aboalshamat et al. (2020)	Adams (2017)	Chapman, et al. (2017)	Gonzalez & Quezada (2016)	Metz et al. (2020)	Newton et al. (2006)
			M=6, F=12 GDS=15, CDS=2, Armed Forces=1 Principal=3, Associate=7, DF1=5, Salaried=3 Qualified: 1990.88 (SD 10.23) (Range 1975-2012) Practising Years: 13.44(SD 12.09)(Range: 1-38)			
Instrument/tool used to measure MHWB issues	Depression and Anxiety Stress Scale (DASS-21) Resilience scale RS-14 Psychological Well-Being Scale–Short (PWB-S)	Counselling Centre Assessment of Psychological Symptoms-34 (CCAPS-34) Outcome Rating Scale (ORS)	The Maslach Burnout Inventory (MBI) Dentists Anxieties in Clinical Situation Scale (DACSS).	Outcome Questionnaire (OQ-45.2) Dental Environment Stress questionnaire (DES)	Clance Impostor Phenomenon Scale (CIPS)	Clinical Outcomes in Routine Evaluation (CORE) General Health Questionnaire. The Work Stress Inventory
Type of interventions	a life coaching programme. Five one-on-one weekly standardised 15-minute phone coaching sessions delivered by five senior dental students who had received intensive coaching training by an expert	Individual Intervention: In-house counselling office embedded within the school to provide psychological services to dental students Group Intervention: outreach health promotion	Self Help CBT Bibliotherapy CPD Programme + 3h Guided workshop	Counselling. The theory of the treatment was based on the cognitive-behavioural paradigm, taking as the basis stress training by inoculation and the general guidelines for anxiety treatment.	Impostor Video—The video elaborated on the impostor cycle and identified 6 specific coping mechanisms for impostor thoughts. Reminder Cards—At the conclusion of the video, students were provided with	Counselling (up to 6 one-hour sessions) provided by the Kent Dental Practitioners Support Service (DPSS). – Interventions were tailored to meet the individual needs of general dental practitioners within

Author (Date)	Aboalshamat et al. (2020)	Adams (2017)	Chapman, et al. (2017)	Gonzalez & Quezada (2016)	Metz et al. (2020)	Newton et al. (2006)
	coach.	programmes designed to increase student knowledge, awareness, and self-efficacy regarding psychological stress management practices that promote personal and professional growth and development Attendance was voluntary with no limit on the number of programs students could attend.			small, double-sided reminder cards. One side of the card contained a custom-designed graphic of the impostor cycle, while the other side contained reminders of the 6 proposed coping mechanisms	the framework of the six hours and they were not standardised. The techniques adopted by the consultants were various including counselling and therapeutic approaches, teaching and role play, and the identification of information and resources.
Comparator	The participants in the control group received no coaching or intervention during this time.	Participants acted as their own control	Self-help CBT Bibliotherapy CPD Programme	Participants acted as their own control	Participants acted as their own control	Participants acted as their own control
Effect of interventions	The results showed that there were significant differences in the depression, stress, self-acceptance, and goal approach measurements. Conversely, the other measurements showed no significant differences.	A positive relationship was found between number of counselling appointments and increased overall functioning.	DASS(Depression) was significantly reduced at 6 weeks with the reduction maintained at 6 months. At 6 weeks there was a clinically and statistically significant reduction in depression, anxiety and stress levels (DASS-21), a statistically significant reduction in burnout	After attending 8 sessions, all 5 participants reduced their perceived stress in the dental environment. Two of the 5 participants initially had dysfunctional scores according to the questionnaire OQ-45.2 and by the end had normal scores.	There was a statistically significant decrease in impostor thoughts following the coping skills intervention from 63.44 ± 14.92 to 59.12 ± 14.56 ($P < 0.05$); an improvement of 4.32 ± 9.85. the percentage of students exhibiting intense impostor experiences	General Health Questionnaire (General distress)-Mean(SD) Pre 14.8 (5.4) - Post 9.38 (3.29), Z=-2.18, P=0.003 Clinical Outcomes in Research & Evaluation Total Score Mean(SD) Pre 1.00(0.45)- Post 0.79(0.47), Z=-0.85, P=0.40

Author (Date)	Aboalshamat et al. (2020)	Adams (2017)	Chapman, et al. (2017)	Gonzalez & Quezada (2016)	Metz et al. (2020)	Newton et al. (2006)
			(emotional exhaustion) and hypervigilant decision-making, and an increase in personal achievement. The improvements in depression, stress, emotional exhaustion and hypervigilant decision-making were maintained at 6 months.		decreased from 13.6% to 4.9%. Additionally, a greater percentage of students had few impostor characteristics, from 5.8% at the beginning of the semester to 10.7% at the end of the semester.	The Work Stress Inventory, Mean(SD) Pre 99.94 (22.92)-Post 90.67 (19.22), Z=-1.24, P=0.21 Respondents' views of treatment using the Treatment Evaluation Inventory Total (Score Range 19-95)-Scored 73.9 (11.75) Progress (Score Range 11-55), Scored 38.08(8.72) Acceptability (Score Range 8-40), Scored 35.85 (4.56)

9.12 Appendix 12: RQ(ii) critical appraisal results

	Aboalshamat et al. (2020)	Adams (2017)	Chapman et al. (2017)	Gonzalez & Quezada (2016)	Metz et al. (2020).	Newton et al. (2006)
Selection Bias	Moderate	Weak	Weak	Weak	Strong	Weak
Study Design	Moderate	Weak	Moderate	Weak	Moderate	Moderate
Confounders	Strong	Weak	Strong	Weak	Strong	Weak
Blinding	Weak	Weak	Weak	Weak	Weak	Weak
Data Collection Method	Strong	Strong	Strong	Strong	Strong	Strong
Withdrawals and Dropouts	Strong	Weak	Moderate	Strong	Strong	Weak
Global Rating	Moderate	Weak	Weak	Weak	Moderate	Weak

9.13 Appendix 13: RQ(iii) search strategy for online database searching

EMBASE <1974 TO 2020 OCTOBER 29>

#	Searches	Results
1	exp *mental health/	46613
2	exp *mental disease/	1377887
3	*wellbeing/	10618
4	*psychological wellbeing/	4458
5	*mental stress/	33305
6	job stress/	9472
7	burnout/	18594
8	professional burnout/	944
9	(mental* or psychological* or psychosocial or well-being or wellbeing or stress*).kw,ti.	693774
10	(burnout or burn-out).kw,ti.	10623
11	or/1-10	1957954
12	exp *health care personnel/	521270
13	(Doctor* or Physician* or Psychiatrist* or Surgeon* or General Practitioner* or Medical practitioner* or Medical Specialist* or An?esthetist* or Audiologist* or Cardiologist* or Dermatologist* or Endocrinologist* or Geriatrician* or Gastroenterologist* or Hepatologist* or H?ematologist* or Ophthalmologist* or Gyn?ecologist* or Oncologist* or Obstetrician* or P?ediatrician* or Pathologist* or Radiologist* or Radiographer* or Rheumatologist* or Urologist* or Arts Therapist* or Chiropodist* or Podiatrist* or Chiropractor* or Dentist* or Dietician* or Nurse* or Midwife* or Occupational therapist* or Optician* or Optometrist* or Orthoptist* or Osteopath* or Paramedic* or Pharmacist* or Physiotherapist* or Practitioner Psychologist* or Clinical Psychologist* or Speech therapist* or language therapist*).kw,ti.	464143
14	(health* adj (profession* or personnel or staff or worker* or employee*)).kw,ti.	31605
15	or/12-14	812598
16	(meta-analysis or systematic review*).ti.	243548
17	"systematic review"/	269327
18	meta analysis/	200395
19	or/16-18	411972
20	11 and 15 and 19	962
21	20 not (conference abstract or conference paper).pt.	826
22	limit 21 to yr="2006 -Current"	789
23	limit 22 to english language	771

OVID MEDLINE(R) AND EPUB AHEAD OF PRINT, IN-PROCESS & OTHER NON-INDEXED CITATIONS, DAILY AND VERSIONS(R) <1946 TO OCTOBER 30, 2020>

#	Searches	Results
1	exp *mental health/	23407
2	exp *mental disorders/	1050283
3	*stress, psychological/	76053
4	occupational stress/	1792
5	burnout, psychological/	568
6	burnout, professional/	12320
7	(mental* or psychological* or psychosocial or well-being or wellbeing or stress*).kw,ti.	510249
8	(burnout or burn-out).kw,ti.	7940
9	or/6-8	520995
10	exp *health Personnel/	381502
11	(Doctor* or Physician* or Psychiatrist* or Surgeon* or General Practitioner* or Medical practitioner* or Medical Specialist* or An?esthetist* or Audiologist* or Cardiologist* or Dermatologist* or Endocrinologist* or Geriatrician* or Gastroenterologist* or Hepatologist* or H?ematologist* or Ophthalmologist* or Gyn?ecologist* or Oncologist* or Obstetrician* or P?ediatrician* or Pathologist* or Radiologist* or Radiographer* or Rheumatologist* or Urologist* or Arts Therapist* or Chiropodist* or Podiatrist* or Chiropractor* or Dentist* or Dietician* or Nurse* or Midwife* or Occupational therapist* or Optician* or Optometrist* or Orthoptist* or Osteopath* or Paramedic* or Pharmacist* or Physiotherapist* or Practitioner Psychologist* or Clinical Psychologist* or Speech therapist* or language therapist*).kw,ti.	428143
12	(health* adj (profession* or personnel or staff or worker* or employee*)).kw,ti.	25515
13	or/10-12	681381
14	(meta-analysis or systematic review*).ti.	197333
15	"systematic review"/	137942
16	meta analysis/	121631
17	or/14-16	259810
18	9 and 13 and 17	587
19	18 not congress.pt.	587
20	limit 19 to yr="2006 -Current"	561
21	limit 20 to english language	550

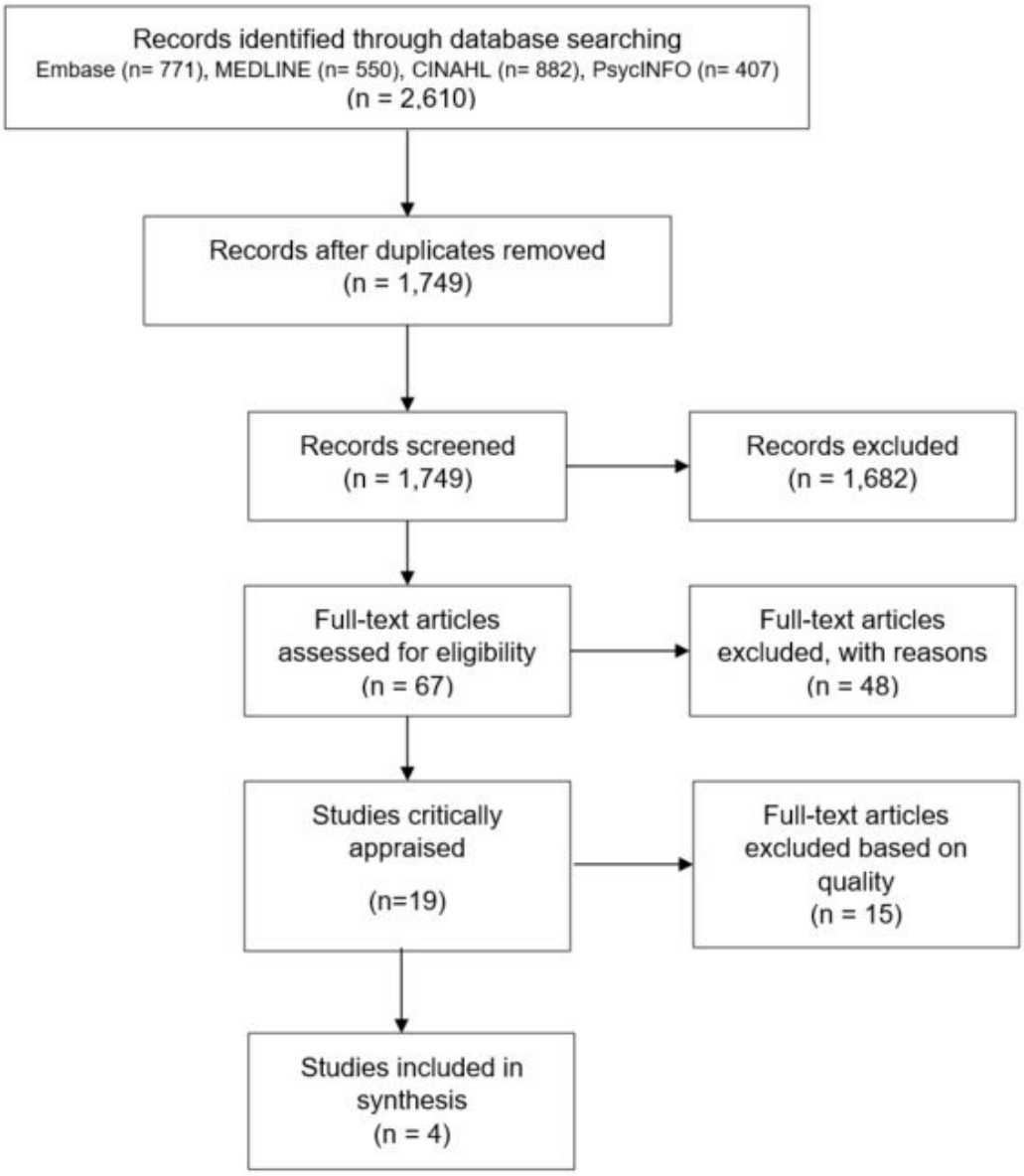
Database - CINAHL Plus with Full Text;

#	QUERY	RESULTS
1	TI (mental* or psychological* or psychosocial or well-being or wellbeing or stress* or burnout or burn-out)	177,381
2	(MM "Mental health+")	22,548
3	(MM "Mental Disorders+")	430,578
4	(MH "Burnout, Professional")	11,126
5	(MH "Burnout, Psychological")	3,627
6	(MH "Stress, Occupational")	17,040
7	S1 OR S2 OR S3 OR S4 OR S5 OR S6	580,741
8	(MM "Health Personnel+")	351,592
9	TI ((health* W1 (profession* or personnel or staff or worker* or employee*)))	21,867
10	TI (Doctor* or Physician* or Psychiatrist* or Surgeon* or (General N1 Practitioner*) or (Medical N1 practitioner*) or (Medical N1 Specialist*) or An?esthetist* or Audiologist* or Cardiologist* or Dermatologist* or Endocrinologist* or Geriatrician* or Gastroenterologist* or Hepatologist* or H?ematologist* or Ophthalmologist* or Gyn?ecologist* or Oncologist* or Obstetrician* or P?ediatrician* or Pathologist* or Radiologist* or Radiographer* or Rheumatologist* or Urologist* or (Arts N1 Therapist*) or Chiropodist* or Podiatrist* or Chiropractor* or Dentist* or Dietician* or Nurse* or Midwife* or (Occupational N1 therapist*) or Optician* or Optometrist* or Orthoptist* or Osteopath* or Paramedic* or Pharmacist* or Physiotherapist* or (Practitioner N1 Psychologist*) or (Clinical N1 Psychologist*) or (Speech N1 therapist*) or (language N1 therapist*))	319,205
11	S8 OR S9 OR S10	578,612
12	PT systematic review or meta-analysis	104,947
13	TI systematic review or meta-analysis	96,889
14	SU "systematic review" or "meta-analysis"	112,663
15	S12 OR S13 OR S14	164,698
16	S7 AND S11 AND S15	1,013
18	S7 AND S11 AND S15 Limiters - Published Date: 20060101-20201231 Plus English Language	882

APA PsycInfo®

	Query	Results
s7	(ti(mental* or psychological* or psychosocial or well-being or wellbeing or stress* or burnout or burn-out) or mjmainsubject.exact.explode("mental health") or mainsubject.exact("occupational stress") or mjmainsubject.exact.explode("mental disorders")) and (mjmainsubject.exact.explode("health personnel") or ti((health* pre/1 (profession* or personnel or staff or worker* or employee*))) or su((health* pre/1 (profession* or personnel or staff or worker* or employee*))) or ti(doctor* or physician* or psychiatrist* or surgeon* or (general pre/1 practitioner*) or (medical pre/1 practitioner*) or (medical pre/1 specialist*) or an?esthetist* or audiologist* or cardiologist* or dermatologist* or endocrinologist* or geriatrician* or gastroenterologist* or hepatologist* or h?ematologist* or ophthalmologist* or gyn?ecologist* or oncologist* or obstetrician* or p?ediatrician* or pathologist* or radiologist* or radiographer* or rheumatologist* or urologist* or (arts pre/1 therapist*) or chiropodist* or podiatrist* or chiropractor* or dentist* or dietician* or nurse* or midwife* or (occupational pre/1 therapist*) or optician* or optometrist* or orthoptist* or osteopath* or paramedic* or pharmacist* or physiotherapist* or (practitioner pre/1 psychologist*) or (clinical pre/1 psychologist*) or (speech pre/1 therapist*) or (language pre/1 therapist*))) and (mainsubject.exact("systematic review") or ti("systematic review" or meta-analysis)) and (la.exact("eng") and pd(20060101-20201231))	407

9.14 Appendix 14: RQ(iii) PRISMA flowchart



9.15 Appendix 15: RQ(iii) list of excluded studies

Citation	Reason
Anderson GS, Di Nota PM, Groll D, Carleton RN. Peer support and crisis-focused psychological interventions designed to mitigate post-traumatic stress injuries among public safety and frontline healthcare personnel: A systematic review. International Journal of Environmental Research and Public Health. 2020;17(20):1-20.	
Anton NE, Bean EA, Hammonds SC, Stefanidis D. Application of Mental Skills Training in Surgery: A Review of Its Effectiveness and Proposed Next Steps. Journal of Laparoendoscopic & Advanced Surgical Techniques. 2017;27(5):459-69.	The systematic review population under consideration includes groups that are excluded in the umbrella review according to the REA protocol (e.g students, social workers, non-clinical staff).
Audouard-Marzin Y, Kopp-Bigault C, Scouarnec P, Walter M. General practitioners training about suicide prevention and risk: A systematic review of literature. Presse Medicale. 2019;48(7):767-79.	
Bercier ML. Interventions that help the helpers: A systematic review and meta-analysis of interventions targeting compassion fatigue, secondary traumatic stress and vicarious traumatization in mental health workers 2014.	
Bercier ML, Maynard BR. Interventions for Secondary Traumatic Stress With Mental Health Workers: A Systematic Review. Research on Social Work Practice. 2015;25(1):81-9.	
Bischoff LL, Otto A-K, Hold C, Wollesen B. The effect of physical activity interventions on occupational stress for health personnel: A systematic review. International Journal of Nursing Studies. 2019;97:94-104.	
Bresesti I, Folgori L, De Bartolo P. Interventions to reduce occupational stress and burn out within neonatal intensive care units: A systematic review. Occupational and Environmental Medicine. 2020;77(8):515-9.	
Burton A, Burgess C, Dean S, Koutsopoulou GZ, Hugh-Jones S. How effective are mindfulness-based interventions for reducing stress among healthcare professionals? A systematic review and meta-analysis. Stress and Health: Journal of the International Society for the Investigation of Stress. 2017;33(1):3-13.	
Cabarkapa S, Nadjidai SE, Murgier J, Ng CH. The psychological impact of COVID-19 and other viral epidemics on frontline healthcare workers and ways to address it: A rapid systematic review. Brain, Behavior, and Immunity - Health. 2020;8:100144.	
Chemali Z, Ezzeddine FL, Gelaye B, Dossett ML, Salameh J, Bizri M, et al. Burnout among healthcare providers in the complex environment of the Middle East: a systematic review. BMC Public Health. 2019;19(1):N.PAG-N.PAG.	
Cocchiara RA, Dorelli B, Gholamalishahi S, Longo W, Musumeci E, Mannocci A, et al. Tai chi and workplace wellness for health care workers: A systematic review. International Journal of Environmental Research and Public Health. 2020;17(1):343.	
Cocchiara RA, Peruzzo M, Mannocci A, Ottolenghi L, Villari P, Polimeni A, et al. The use of yoga to manage stress and burnout	

Citation	Reason
in healthcare workers: A systematic review. Journal of Clinical Medicine. 2019;8(3):284. Dijxhoorn AFQ, Brom L, van der Linden YM, Leget C, Raijmakers NJH. Prevalence of burnout in healthcare professionals providing palliative care and the effect of interventions to reduce symptoms: A systematic literature review. Palliative Medicine. 2020. Drissi N, Ouhbi S, Marques G, de la Torre Diez I, Ghogho M, Janati Idrissi MA. A Systematic Literature Review on e-Mental Health Solutions to Assist Health Care Workers During COVID-19. Telemedicine journal and e-health : the official journal of the American Telemedicine Association. 2020. Fibbins H, Ward PB, Watkins A, Curtis J, Rosenbaum S. Improving the health of mental health staff through exercise interventions: a systematic review. Journal of Mental Health. 2018;27(2):184-91. Gilmartin H, Goyal A, Hamati MC, Mann J, Saint S, Chopra V. Brief Mindfulness Practices for Healthcare Providers - A Systematic Literature Review. American Journal of Medicine. 2017;130(10):1219.e1-.e17. Hill RC, Dempster M, Donnelly M, McCorry NK. Improving the wellbeing of staff who work in palliative care settings: A systematic review of psychosocial interventions. Palliative Medicine. 2016;30(9):825-33. Klein A, Taieb O, Xavier S, Baubet T, Reyre A. The benefits of mindfulness-based interventions on burnout among health professionals: A systematic review. Explore: The Journal of Science & Healing. 2020;16(1):35-43. Kriakous SA, Elliott KA, Lamers C, Owen R. The Effectiveness of Mindfulness-Based Stress Reduction on the Psychological Functioning of Healthcare Professionals: a Systematic Review. Mindfulness. 2020:1-28. Lomas T, Medina JC, Ivtzan I, Rupprecht S, Eiroa-Orosa FJ. A systematic review and meta-analysis of the impact of mindfulness-based interventions on the well-being of healthcare professionals. Mindfulness. 2019;10(7):1193-216. Lomas T, Medina JC, Ivtzan I, Rupprecht S, Eiroa-Orosa FJ. A systematic review of the impact of mindfulness on the well-being of healthcare professionals. Journal of Clinical Psychology. 2018;74(3):319-55. Luken M, Sammons A. Systematic review of mindfulness practice for reducing job burnout. American Journal of Occupational Therapy. 2016;70(2):7002250020p1-p10. Muller AE, Hafstad EV, Himmels JPW, Smedslund G, Flottorp S, Stensland SO, et al. The mental health impact of the covid-19 pandemic on healthcare workers, and interventions to help them: A rapid systematic review. Psychiatry Research. 2020;293:113441.	

Citation	Reason
Patterson PD, Runyon MS, Higgins JS, Weaver MD, Teasley EM, Kroemer AJ, et al. Shorter Versus Longer Shift Durations to Mitigate Fatigue and Fatigue-Related Risks in Emergency Medical Services Personnel and Related Shift Workers: A Systematic Review. Prehospital emergency care : official journal of the National Association of EMS Physicians and the National Association of State EMS Directors. 2018;22:28-36. Phillips CS, Becker H. Systematic Review: Expressive arts interventions to address psychosocial stress in healthcare workers. Journal of Advanced Nursing (John Wiley & Sons, Inc). 2019;75(11):2285-98. Rudaz M, Twohig MP, Ong CW, Levin ME. Mindfulness and acceptance-based trainings for fostering self-care and reducing stress in mental health professionals: A systematic review. Journal of Contextual Behavioral Science. 2017;6(4):380-90. Ruotsalainen J, Serra C, Marine A, Verbeek J. Systematic review of interventions for reducing occupational stress in health care workers. Scandinavian Journal of Work, Environment and Health, Supplement. 2008;34(3):169-78. Ruotsalainen JH, Verbeek JH, Marine A, Serra C. Preventing occupational stress in healthcare workers. Cochrane Database of Systematic Reviews. 2014;2014(12):CD002892. Spinelli C, Wisener M, Khoury B. Mindfulness training for healthcare professionals and trainees: A meta-analysis of randomized controlled trials. Journal of Psychosomatic Research. 2019;120:29-38. Westermann C, Kozak A, Harling M, Nienhaus A. Burnout intervention studies for inpatient elderly care nursing staff: Systematic literature review. International Journal of Nursing Studies. 2014;51(1):63-71. Zanatta F, Maffoni M, Giardini A. Resilience in palliative healthcare professionals: a systematic review. Supportive Care in Cancer. 2020;28(3):971-8.	
Brand SL, Coon JT, Fleming LE, Carroll L, Bethel A, Wyatt K. Whole-system approaches to improving the health and wellbeing of healthcare workers: A systematic review. PLoS ONE. 2017;12(12):e0188418. DeChant PF, Acs A, Rhee KB, Boulanger TS, Snowdon JL, Tutty MA, et al. Effect of Organization-Directed Workplace Interventions on Physician Burnout: A Systematic Review. Mayo Clinic Proceedings: Innovations, Quality and Outcomes. 2019;3(4):384-408. Gilbody S, Cahill J, Barkham M, Richards D, Bee P, Glanville J. Can we improve the morale of staff working in psychiatric units? A systematic review. Journal of Mental Health. 2006;15(1):7-17. Häggman-Laitila A, Romppanen J. Outcomes of interventions for nurse leaders' well-being at work: A quantitative systematic	Mixed outcome measures reported

Citation	Reason
review. Journal of Advanced Nursing. 2018;74(1):34-44. Stanulewicz N, Knox E, Narayanasamy M, Shivji N, Khunti K, Blake H. Effectiveness of lifestyle health promotion interventions for nurses: A systematic review. International Journal of Environmental Research and Public Health. 2020;17(1):17.	
Aryankhesal A, Mohammadibakhsh R, Hamidi Y, Alidoost S, Behzadifar M, Sohrabi R, et al. Interventions on reducing burnout in physicians and nurses: A systematic review. Journal of Medical Council of Islamic Republic of Iran. 2019;33(1):1-8. Facey AD, Tallentire V, Selzer RM, Rotstein L. Understanding and reducing work-related psychological distress in interns: a systematic review. Internal Medicine Journal. 2015;45(10):995-1004.	Uncertainty on validity of outcome measures reported
de Jong T, Wiezer N, de Weerd M, Nielsen K, Mattila-Holappa P, Mockałło Z. The impact of restructuring on employee well-being: a systematic review of longitudinal studies. Work & Stress. 2016;30(1):91-114. King A, Long L, Lisy K. Effectiveness of team nursing compared with total patient care on staff well being when organizing nursing work in acute care wards: a systematic review. JBI Database of Systematic Reviews & Implementation Reports. 2015;13(11):128-68.	Not evaluating an intervention aiming to improve MHWB, but rather the effect of change in care delivery on other outcomes including mental health and well being of workers
Dreison KC, Luther L, Bonfils KA, Sliter MT, McGrew JH, Salyers MP. Job burnout in mental health providers: A meta-analysis of 35 years of intervention research. Journal of Occupational Health Psychology. 2018;23(1):18-30. Melnyk BM, Kelly SA, Stephens J, Dhakal K, McGovern C, Tucker S, et al. Interventions to Improve Mental Health, Well-Being, Physical Health, and Lifestyle Behaviors in Physicians and Nurses: A Systematic Review. American Journal of Health Promotion. 2020;34(8):929-41. Petrie K, Crawford J, Baker STE, Dean K, Robinson J, Veness BG, et al. Interventions to reduce symptoms of common mental disorders and suicidal ideation in physicians: a systematic review and meta-analysis. The Lancet Psychiatry. 2019;6(3):225-34. Reeve A, Tickle A, Moghaddam N. Are acceptance and commitment therapy-based interventions effective for reducing burnout in direct-care staff? A systematic review and meta-analysis. Mental Health Review Journal. 2018;23(3):131-55. Schoonover KL, Hall-Flavin D, Whitford K, Lussier M, Essary A, Lapid MI. Impact of Poetry on Empathy and Professional Burnout of Health-Care Workers: A Systematic Review. Journal of Palliative Care. 2020;35(2):127-32.	No full text available
Addo MA, Stephen AI, Kirkpatrick P. Acute mental health/psychiatric nurses' experiences of clinical supervision in promoting	Review Protocol

Citation	Reason
their wellbeing in their workplace: a systematic review. JBI Library of Systematic Reviews. 2012;10(56):1-16.	
Marine A, Ruotsalainen J, Serra C, Verbeek J. Preventing occupational stress in healthcare workers. The Cochrane database of systematic reviews. 2006(4):CD002892.	Duplicate study- Review has been updated

9.16 Appendix 16: RQ(iii) list of excluded studies based on quality and critical appraisal results

Citation	Reason: Quality as assessed by AMSTAR-2 Checklist
Busireddy KR, Miller JA, Ellison K, Ren V, Qayyum R, Panda M. Efficacy of Interventions to Reduce Resident Physician Burnout: A Systematic Review. Journal of graduate medical education. 2017;9(3):294-301. Murray M, Murray L, Donnelly M. Systematic review of interventions to improve the psychological well-being of general practitioners. BMC Family Practice. 2016;17:1-14. Ruiz-Fernandez MD, Ortiz-Amo R, Ortega-Galan AM, Ibanez-Masero O, Rodriguez-Salvador MDM, Ramos-Pichardo JD. Mindfulness therapies on health professionals. International journal of mental health nursing. 2020;29(2):127-40. Scheepers RA, Emke H, Epstein RM, Lombarts KMJMH. The impact of mindfulness-based interventions on doctors' well-being and performance: A systematic review. Medical education. 2020;54(2):138-49. Suleiman-Martos N, Gomez-Urquiza JL, Aguayo-Estremera R, Cañadas-De La Fuente GA, De La Fuente-Solana EI, Albendín-García L. The effect of mindfulness training on burnout syndrome in nursing: A systematic review and meta-analysis. Journal of Advanced Nursing (John Wiley & Sons, Inc). 2020;76(5):1124-40. Wiederhold BK, Cipresso P, Pizzioli D, Wiederhold M, Riva G. Intervention for physician burnout: A systematic review. Open Medicine (Poland). 2018;13(1):253-63.	Critically Low
Alkhawaldeh JfMA, Soh KL, Mukhtar FBM, Ooi CP. Effectiveness of stress management interventional programme on occupational stress for nurses: A systematic review. Journal of Nursing Management (John Wiley & Sons, Inc). 2020;28(2):209-20. Clough BA, March S, Chan RJ, Casey LM, Phillips R, Ireland MJ. Psychosocial interventions for managing occupational stress and burnout among medical doctors: A systematic review. Systematic Reviews. 2017;6(1):144. De Simone S, Vargas M, Servillo G. Organizational strategies to reduce physician burnout: a systematic review and meta-analysis. Aging Clinical and Experimental Research. 2019. Duhoux A, Menear M, Charron M, Lavoie-Tremblay M, Alderson M. Interventions to promote or improve the mental health of primary care nurses: a systematic review. Journal of Nursing Management (John Wiley & Sons, Inc). 2017;25(8):597-607.	Low

Citation	Reason: Quality as assessed by AMSTAR-2 Checklist
Ghawadra SF, Abdullah KL, Choo WY, Phang CK. Mindfulness-based stress reduction for psychological distress among nurses: A systematic review. Journal of Clinical Nursing (John Wiley & Sons, Inc). 2019;28(21):3747-58. Huan-Fang L, Chia-Chi K, Tsair-Wei C, Yu-Rung W. A Meta-Analysis of the Effects of Coping Strategies on Reducing Nurse Burnout. Applied Nursing Research. 2016;31:100-10. Romppanen J, Häggman-Laitila A. Interventions for nurses' well-being at work: a quantitative systematic review. Journal of Advanced Nursing (John Wiley & Sons, Inc). 2017;73(7):1555-69. Stuber F, Seifried-Dubon T, Rieger MA, Gundel H, Ruhle S, Zipfel S, et al. The effectiveness of health-oriented leadership interventions for the improvement of mental health of employees in the health care sector: a systematic review. International archives of occupational and environmental health. 2020. West CP, Dyrbye LN, Erwin PJ, Shanafelt TD. Interventions to prevent and reduce physician burnout: a systematic review and meta-analysis. Lancet. 2016;388(10057):2272-81.	

	Alkhawaldeh et al. (2020)	*Busireddy et al. (2017)*	*Clough et al. (2017)*	*De Simone et al. (2019)*	*Duhoux et al. (2017)*	*Ghawadra et al. (2019)*	*Huan-Fang et al. (2016)*	*Murray et al. (2016)*	*Romppanen & Häggman-Laitila (2017)*	*Ruiz-Fernandez et al. (2020)*	*Scheepers et al. (2020)*	*Stuber et al. (2020)*	*Suleiman-Martos (2020)*	*West et al. (2016)*	*Wiederhold et al. (2018)*
Score	**Low**	**Critical Low**	**Low**	**Low**	**Low**	**Low**	**Low**	**Critical Low**	**Low**	**Critical Low**	**Critical Low**	**Low**	**Critical Low**	**Low**	**Critical Low**
Q1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Q2	Partial Yes	No	Partial Yes	No	No	No	Partial Yes	No	No	Partial Yes	No	Partial Yes	No	No	No
Q3	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No
Q4	Partial Yes	Partial Yes	Partial Yes	Partial Yes	No	No	Partial Yes	No	No	Partial Yes	Partial Yes	Partial Yes	Partial Yes	Partial Yes	Partial Yes
Q5	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Q6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Q7	No	No	No	No	No	No	No	Yes	No	Partial Yes	No	No	No	No	No
Q8	No	No	Yes	No	Yes	No	Yes	Yes	No	Partial Yes	Partial Yes	Yes	Yes	No	No
Q9a	Partial Yes	No	Partial Yes	Yes	Yes	Yes	Partial Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Q9b	Includes only RCTs	No	No	Includes only RCTs	Yes	Yes	Includes only RCTs	Partial Yes	Partial Yes	No	No	Yes	No	Yes	No
Q10	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Q11a	No meta-analysis	No	No meta-analysis	Yes	No meta-analysis	No meta-analysis	Yes	No meta-analysis	No meta-analysis	Yes	No meta-analysis	No meta-analysis	Yes	Yes	No meta-analysis
Q11b	No meta-analysis	No	No meta-analysis	No meta-analysis	No meta-analysis	No meta-analysis	No meta-analysis	No meta-analysis	No meta-analysis	No	No meta-analysis	No meta-analysis	No meta-analysis	Yes	No meta-analysis

	Alkhawaldeh et al. (2020)	*Busireddy et al. (2017)*	*Clough et al. (2017)*	*De Simone et al. (2019)*	*Duhoux et al. (2017)*	*Ghawadra et al. (2019)*	*Huan-Fang et al. (2016)*	*Murray et al. (2016)*	*Romppanen & Häggman-Laitila (2017)*	*Ruiz-Fernandez et al. (2020)*	*Scheepers et al. (2020)*	*Stuber et al. (2020)*	*Suleiman-Martos (2020)*	*West et al. (2016)*	*Wiederhold et al. (2018)*
Q12	No meta-analysis	No	No meta-analysis	No	No meta-analysis	No meta-analysis	No	No meta-analysis	No meta-analysis	Yes	No meta-analysis	No meta-analysis	No	No	No meta-analysis
Q13	No	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No	No
Q14	No	Yes	No	Yes	No	no	Yes	No	No	Yes	No	No	No	Yes	No
Q15	No meta-analysis	Yes	No meta-analysis	Yes	No meta-analysis	No meta-analysis	Yes	No meta-analysis	No meta-analysis	No	No meta-analysis	No meta-analysis	No	Yes	No meta-analysis
Q15	No	No	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Q1: Did the research questions and inclusion criteria for the review include the components of PICO?
Q2: Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?
Q3: Did the review authors explain their selection of the study designs for inclusion in the review?
Q4: Did the review authors use a comprehensive literature search strategy?
Q5: Did the review authors perform study selection in duplicate?
Q6: Did the review authors perform data extraction in duplicate?
Q7: Did the review authors provide a list of excluded studies and justify the exclusions?
Q8: Did the review authors describe the included studies in adequate detail?
Q9a: Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review? (for RCTS)
Q9b: Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review? (for NRSI)
Q10: Did the review authors report on the sources of funding for the studies included in the review?
Q11a: If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results? (for RCTs)
Q11b: If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results? (For NRSI)
Q12: If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?
Q13: Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review?
Q14: Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?

Q15: If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?
Q16: Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?

9.17 Appendix 17: RQ(iii) critical appraisal results

	Alkhawaldeh et al. (2020)	*Li et al. (2019).*	*Panagioti et al. (2017).*	*Venegas et al. (2019).*
Quality Overall (AMSTAR Score)	**Moderate**	**Moderate**	**High**	**Moderate**
Did the research questions and inclusion criteria for the review include the components of PICO?	Yes	Yes	Yes	Yes
Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?	Partial Yes	Partial Yes	Yes	Yes
Did the review authors explain their selection of the study designs for inclusion in the review?	No	No	Yes	No
Did the review authors use a comprehensive literature search strategy?	Partial Yes	Partial Yes	Partial Yes	Partial Yes
Did the review authors perform study selection in duplicate?	Yes	Yes	Yes	Yes
Did the review authors perform data extraction in duplicate?	Yes	Yes	Yes	Yes
Did the review authors provide a list of excluded studies and justify the exclusions?	Yes	No	Yes	No
Did the review authors describe the included studies in adequate detail?	No	Yes	Yes	Yes
Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review? (for RCTS)	Partial Yes	Yes	Yes	Yes
Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review? (for NRSI)	Partial Yes	Partial Yes	Partial Yes	Yes
Did the review authors report on the sources of funding for the studies included in the review?	No	No	No	Yes
If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results? (for RCTs)	No meta-analysis	No meta-analysis	Yes	Yes
If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results? (For NRSI)	No meta-analysis	No meta-analysis	Yes	Yes
If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	No meta-analysis	No meta-analysis	Yes	No
Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review?	Yes	Yes	Yes	Yes
Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	No	No	Yes	Yes
If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	No meta-analysis	No meta-analysis	Yes	No
Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	Yes	Yes	Yes	Yes

9.18 Appendix 18: RQ(iii) table of review characteristics

	Alkhawaldeh et al. (2020).	***Li, H., et al. (2019).***	***Panagioti, M., et al. (2017).***	***Venegas et al. (2019)***
Year of publication	2020	2019	2017	2019
Number of databases searched	6 (CINAHL, The Cochrane Library, PsycINFO, EBSCO, MEDLINE, and PubMed)	5 (PubMed, Web of Science, PsycINFO, Embase and the Cochrane Library)	5 (MEDLINE, Embase, CINAHL, Cochrane Register of Controlled Trials, and PsycINFO)	5 (Medline, EMBASE, PsychInfo, CINAHL and Cochrane Library)
Date range for searching	2009-2019	Inception-2017	Inception -2016	Inception - 2017
Number of studies in review	12	10	19	9
Appraisal tool used	Downs and Black quality checklist	Cochrane RCT RoB tool for RCTs Methodological Index for Non-Randomized studies (MINORS) checklist for non-randomised studies	Effective Practice and Organisation of Care (EPOC) risk of bias tool.	Cochrane Collaboration risk of bias tool for RCTs and the Cochrane Risk of Bias Assessment Tool for Non-Randomized Studies of Interventions (ACROBAT-NRSI)
Number of participants and characteristics if given as a total/average	592 participants The sample size of these studies ranged from 13 to 76 participants	The sample size of studies ranged from 14 to 120 participants	1550 participants mean [SD]age,40.3 [9.5] years) An equal proportion of men and women were recruited in the majority of studies.	The sample sizes ranged from 40 to 290 participants. Age range 31-50 y
Population (professions included)	Nurses (Intensive and critical care)	Nurses	Physicians (primary and secondary care)	Physicians (primary and secondary care)
MHWB outcomes reported and tools used	**Stress:** Expanded Nursing Stress Scale (ENSS) Perceived Stress Scale (PSS-12) Nursing Stress Scale (NSS) Occupational Stress Inventory (OSI), Work Stress Inventory (WSI),	**Stress:** Visual analog scale (VAS) The occupational stress Inventory (OSI) The job stress related symptom scale Perceived stress scale-14 (PSS-14) Stress level log sheet	**Burnout**: Maslach Burnout Inventory (MBI)	**Anxiety**: Smith Anxiety Scale (n=1) **Anxiety and depression**: Hospital and Anxiety Scale (HADS) **Burnout**: Maslach Burnout Inventory (MBI) (n=6) **Depression:** 2-item Primary Care Evaluation

	Alkhawaldeh et al. (2020).	*Li, H., et al. (2019).*	*Panagioti, M., et al. (2017).*	*Venegas et al. (2019)*
		Cooper's job stress Questionnaire The perceived occupational stress scale Cortisol levels in urine		of Mental Disorders 2-question approach described by Spitzer **Resilience:** Brief Resilient Coping Scale (n=1) Connor-Davidson Resilience Scale (n=1) **Stress:** Perceived Stress Scale Cooper Job Stress Questionnaire Simple Stress Scale General Health Questionnaire (GHQ-12)
Interventions identified	**<u>Healthcare worker-Directed</u>** **Cognitive-behavioural skills training** (emotional regulation training, neuro-linguistic programming, resilience training, emotional intelligence, assertiveness training, and time management) (n=6) **Mindfulness-based training** (n=3) **Lifestyle interventions** (massage, yoga, and aromatherapy) n=3	**<u>Healthcare worker Directed</u>** **Lifestyle Interventions** aromatherapy (n = 4), massage (n = 4) aromatherapy massage (n = 2)	**<u>Healthcare Worker Directed</u>** **Mindfulness based interventions** (n=3) **Educational cognitive and behavioural Interventions** (n=9) **<u>Organization directed interventions</u>** **Simple workload interventions** that focused on rescheduling hourly shifts and reducing workload. (n=5) **Multifaceted organization directed interventions** (n=2)	**<u>Healthcare Worker Directed</u>** **Educational Interventions** incorporating psychosocial skills, cognitive-behavioural skills, coping skills, stress management and resilience training (n=6) **Mindfulness based interventions** (n=3).
Effect estimate of interventions for	n/a	n/a	Main Meta-Analysis: Effectiveness of Interventions	Two RCTs reported no statistically significant

	Alkhawaldeh et al. (2020).	*Li, H., et al. (2019).*	*Panagioti, M., et al. (2017).*	*Venegas et al. (2019)*
burnout			in Reducing Burnout Interventions were associated with small, significant reductions in burnout (SMD = −0.29; 95% CI, −0.42 to −0.16; I2 = 30%; 95%CI, 0 to 60%) (Figure 2). The back-transformed emotional exhaustion score for the intervention group was 15.1 (95%CI, 13.9 to 16.5), compared with a control group score of 17.9 and assuming a standard deviation of 8.97 for the effect. Physician-directed interventions were associated with small significant reductions in burnout (SMD = −0.18; 95%CI,−0.32 to −0.03; I2 = 11%; 95% CI, 0 to 49%; back-transformed emotional exhaustion score = 16.2; 95% CI, 14.7 to 17.3 compared with a control group score of 17.9) Organization directed interventions were associated with medium significant reductions in burnout (SMD = −0.45; 95% CI, −0.62 to −0.28; I2 = 8%; 95% CI, 0 to 60%; back-transformed emotional exhaustion score = 13.9; 95% CI, 12.4 to 14.7 compared with a control group score of 17.9)	differences in the three subscales of burnout. The 4 observational studies reported significant improvements in the EE subscale for burnout. Two studies reported significant improvements for the DP and PA burnout subscales. Only the results for burnout could be meta-analysed. The RCT showed no statistically significant differences for all three burnout subscales. For the observational studies, all burnout subscales showed a statistically significant improvement. 4 studies contributed to random effects meta-analysis for emotional exhaustion [pooled SMD -0.67 (95% CI -0.84 to -0.5) p = 0.81; I2 = 0%]. For the depersonalization subscale, 3 studies contributed to meta-analysis [pooled MD -2.42 (95% CI -3.80 to -1.04) p = 0.76; I2 = 0%]. For the personal accomplishment subscale, the same 3 studies contributed to meta-analysis [pooled MD 2.47 (95% CI 1.13 to 3.81) p = 0.55; I2 = 0%].
Effect estimate of	n/a	n/a	n/a	

	Alkhawaldeh et al. (2020).	*Li, H., et al. (2019).*	*Panagioti, M., et al. (2017).*	*Venegas et al. (2019)*
interventions for anxiety or depression				No statistical significance was reported for depression in the two RCTs. One observational study reported significant improvements in depression and anxiety. One RCT measured anxiety, reporting a statistically significant improvement. For the secondary outcome measures (depression and anxiety) data was lacking to conduct a meta-analysis.
Effect estimate of interventions for stress	Cognitive behavioural skills training: teaching emotional intelligence items, is effective in reducing occupational stress and anxiety after 1 month of the intervention (in favour 2 studies). The mean ENSS score in the intervention group before intervention was 136.6 (SD = 24.6), which immediately decreased to 113.02 (SD = 16.2) after intervention (P = .001). The effect of the neuro-linguistic programming on occupational stress in critical care nurses in Iran. They reported that the mean ENSS score before the programme was 120.88 and 121.36 for the intervention and control groups, respectively. After 1 month of the	AROMATHERAPY(n=4) Aromatic mouthwash (once a day for 3 days)- statistically significant decrease in stress levels between the intervention and control group as measured by a VAS Essential oils through the skin reduced levels of self-perceived stress in 57.1% vs 21.4% (control)- no significant levels are given. Essential oil diffuser in huddle room (5mins)- no significant reduction in stress levels Wearing a lavender essentials oil bottle hung in front of nurses right chest (non-significant difference in 2 first days) MASSAGE (n=4)	n/a	n/a

	Alkhawaldeh et al. (2020).	***Li, H., et al. (2019).***	***Panagioti, M., et al. (2017).***	***Venegas et al. (2019)***
	intervention, the score means of occupational stress decreased to 64.53 in the intervention group, while that of control remained relatively unchanged (120.96) The effect of the resilience training on occupational stress in critical care nurses in Iran. The mean ENSS score in the intervention group before intervention was 149.33 (SD = 21.56), which decreased to 129.22 (SD = 22.67) after 2 weeks of the intervention (P = .001). Job stress awareness, assertiveness training, time management, and progressive muscle relaxation (PMR) were statistically effective in reducing the occupational stress in CCU nurses in India. SMIs based on educational programmes, which included six education sessions about stress-coping skill, physical methods for coping with stress, and physical practices for a healthier lifestyle, was statistically effective in reducing stress in nurses working in neonatal ICUs. The consensus across these	general Swedish massage twice a week for 4 weeks - significant reduction in occupational stress 15-min chair massages to participants once a week for 10 weeks by massage therapists -- significant reduction in stress massage sessions were conducted by a massage chair in a quiet room for 10 min and included the back, neck, shoulders, arms and hands. - significant reduction in stress in the short term. The results showed that massage intervention on the stress level of nurses was positive and statistically significant. 1 study found non-significant differences, but they measured urinary cortisol which may be a poor indicator of stress. AROMATHERAPY MASSAGE (n=2) full-body massage with aromatherapy treatment lasting 90 min, once a week for 6 weeks. - There is a positive effect on a statistical significant level of aromatherapy		

	Alkhawaldeh et al. (2020).	*Li, H., et al. (2019).*	*Panagioti, M., et al. (2017).*	*Venegas et al. (2019)*
	six included studies was that cognitive-behavioural interventions are effective in reducing occupational stress immediately after the intervention or 2 to 8 weeks of the intervention among critical care nurses. Of all the 12 included studies, 3 studies evaluated the effectiveness of MBI for management of occupational stress among intensive and/or critical care nurses. The effect of 5 minutes of mindfulness-based stress reduction (MBSR) prior to morning and night shifts on occupational stress in paediatric ICU nurses in the United States.They reported that there was significant reduction in occupational stress immediately and after 1 month of the intervention, measured by the NSS. Mindfulness-based cognitive therapy (MBCT) programme (5 to 10 minutes of independent daily practice) resulted in a significant reduction in stress level after 1 week of the intervention when measured using the PSS.	massage in reducing work-related stress (Cooper's Job stress Questionnaire) 15min chair massage sessions with aromatherapy spray atomised before treatment above the participant's head- 16 a week for 12 weeks- no significant reduction in stress levels (perceived occupational stress scale)		

	Alkhawaldeh et al. (2020).	*Li, H., et al. (2019).*	*Panagioti, M., et al. (2017).*	*Venegas et al. (2019)*
	Mindfulness meditation: mean ENSS score in the intervention group before intervention was 165.28 (SD = 21.35), which immediately decreased to 118.20 (SD = 17.52) after intervention (P = .001).1 Yoga: No Statistical significant difference: Bernstein and colleagues found that the stress scores were not statistically different between pre-intervention and post-intervention, the stress scores tended to be lower after yoga than before yoga. Aromatherapy: No statistically significant difference between control and aromatherapy groups. Swedish massage twice a week for 4 weeks was found effective in reducing occupational stress immediately and 2 weeks after intervention among ICU nurses.			
Effect estimate of interventions for resilience	n/a	n/a	n/a	Both RCTs included in the review reported significant improvements in resilience. Authors were unable to provide a pool estimate for resilience due to considerable clinical and methodological heterogeneity (I2 = 79%).

10 References

Aboalshamat K, Al-Zaidi D, Jawa D, et al. (2020) The effect of life coaching on psychological distress among dental students: interventional study. *BMC psychology* 8: 106.

Adam N and Mannion CJ. (2020) The 'R' word - do dental core trainees possess it? *British Journal of Oral and Maxillofacial Surgery*.

Adams DF. (2017) The Embedded Counseling Model: An Application to Dental Students. *Journal of dental education* 81: 29-35.

Alkhawaldeh JfMA, Soh KL, Mukhtar FBM, et al. (2020) Stress management interventions for intensive and critical care nurses: A systematic review. *Nursing in Critical Care* 25: 84-92.

Armijo-Olivo S, Stiles CR, Hagen NA, et al. (2012) Assessment of study quality for systematic reviews: a comparison of the Cochrane Collaboration Risk of Bias Tool and the Effective Public Health Practice Project Quality Assessment Tool: methodological research. *J Eval Clin Pract* 18: 12-18.

Aromataris E, Fernandez R, Godfrey CM, et al. (2015) Summarizing systematic reviews: methodological development, conduct and reporting of an umbrella review approach. *Int J Evid Based Healthc* 13: 132-140.

Arora S, Sevdalis N, Nestel D, et al. (2010) The impact of stress on surgical performance: a systematic review of the literature. *Surgery* 147: 318-330, 330.e311-316.

Birks Y, McKendree J and Watt I. (2009) Emotional intelligence and perceived stress in healthcare students: A multi-institutional, multi-professional survey. *BMC Medical Education* 9: 61.

Boyles JD and Ahmed B. (2017) Does student debt affect dental students' and dentists' stress levels? *British Dental Journal* 223: 601-606.

Bretherton R, Chapman HR and Chipchase S. (2016) A study to explore specific stressors and coping strategies in primary dental care practice. *British Dental Journal* 220: 471-478.

Brown J, Burke FJT, MacDonald EB, et al. (2010) Dental practitioners and ill health retirement: Causes, outcomes and re-employment. *British Dental Journal* 209: E7.

Cameron J, Hannon L, Keeton R, et al. (2021) Wellbeing Support for the Dental Team. Available at https://www.supportfordentalteams.org/wp-content/uploads/2021/01/Wellbeing-Support-for-the-Dental-Team.pdf.

Catino M. (2009) Blame culture and defensive medicine. *Cognition, Technology & Work* 11: 245.

Centers for Disease Control and Prevention. (2018) *Well-Being Concepts*. Available at: www.cdc.gov/hrqol/wellbeing.htm. .

Chapman HR, Chipchase SY and Bretherton R. (2015a) Understanding emotionally relevant situations in primary care dental practice: 1. Clinical situations and emotional responses. *British Dental Journal* 219: 401-409.

Chapman HR, Chipchase SY and Bretherton R. (2015b) Understanding emotionally relevant situations in primary dental practice. 2. Reported effects of emotionally charged situations. *British Dental Journal* 219: E8.

Chapman HR, Chipchase SY and Bretherton R. (2017) The evaluation of a continuing professional development package for primary care dentists designed to reduce stress, build resilience and improve clinical decision-making. *British Dental Journal* 223: 261-271.

Chipchase SY, Chapman HR and Bretherton R. (2017) A study to explore if dentists' anxiety affects their clinical decision-making. *British Dental Journal* 222: 277-290.

Collin V, O'Selmo E and Whitehead P. (2020) Stress, psychological distress, burnout and perfectionism in UK dental students. *British Dental Journal* 229: 605-614.

Collin V, Toon M, O'Selmo E, et al. (2019) A survey of stress, burnout and well-being in UK dentists. *British Dental Journal* 226: 40-49.

Cooper CL and Cartwright S. (1997) An intervention strategy for workplace stress. *J Psychosom Res* 43: 7-16.
Denton DA, Newton JT and Bower EJ. (2008) Occupational burnout and work engagement: A national survey of dentists in the United Kingdom. *British Dental Journal* 205: E13.
DPL. (2015) *94% of dentists believe GDC investigations increase stress and anxiety*. Available at: https://www.dentalprotection.org/uk/articles/94-of-dentists-believe-gdc-investigations-increase-stress-and-anxiety.
DPL. (2018) *Dental Protection survey reveals 9 in 10 dentists fear being sued by patients*. Available at: https://www.dentalprotection.org/uk/articles/dental-protection-survey-reveals-9-in-10-dentists-fear-being-sued-by-patients.
DPL. (2019) Breaking the burnout cycle.
DPL. (2020) *Covid-19: Dental Protection survey reveals top 5 worries for dentists*. Available at: https://www.dentalprotection.org/uk/articles/covid-19-dental-protection-survey-reveals-top-5-worries-for-dentists.
Dyrbye LN, Shanafelt TD, Johnson PO, et al. (2019) A cross-sectional study exploring the relationship between burnout, absenteeism, and job performance among American nurses. *BMC Nurs* 18: 57.
GDC. (2019) Right time Right place Right touch. Available at https://www.gdc-uk.org/about-us/our-organisation/our-corporate-strategy-and-business-plans.
Gonzalez G and Quezada VE. (2016) A brief cognitive-behavioral intervention for stress, anxiety and depressive symptoms in dental students. *Research in Psychotherapy: Psychopathology, Process and Outcome* 19: 68-78.
Gorter R, Freeman R, Hammen S, et al. (2008) Psychological stress and health in undergraduate dental students: fifth year outcomes compared with first year baseline results from five European dental schools. *European journal of dental education : official journal of the Association for Dental Education in Europe* 12: 61-68.
Gorter RC and Freeman R. (2011) Burnout and engagement in relation with job demands and resources among dental staff in Northern Ireland. *Community Dentistry and Oral Epidemiology* 39: 87-95.
Grant MJ and Booth A. (2009) A typology of reviews: an analysis of 14 review types and associated methodologies. *Health Info Libr J* 26: 91-108.
Halligan M and Zecevic A. (2011) Safety culture in healthcare: a review of concepts, dimensions, measures and progress. *BMJ Qual Saf* 20: 338-343.
Harris M, Wilson JC, Holmes S, et al. (2017a) Perceived stress and well-being among dental hygiene and dental therapy students. *British Dental Journal* 222: 101-106.
Harris M, Wilson JC, Hughes S, et al. (2018) Perceived stress and well- being in UK and Australian dental hygiene and dental therapy students. *European Journal of Dental Education* 22: e602-e611.
Harris M, Wilson JC, Hughes S, et al. (2017b) Does stress in a dental hygiene and dental therapy undergraduate programme contribute to a sense of well-being in the students? *British Dental Journal* 223: 22-26.
Hill KB, Burke FJT, Brown J, et al. (2010) Dental practitioners and ill health retirement: A qualitative investigation into the causes and effects. *British Dental Journal* 209: E8.
Jenkins S, Johnson I and Ginley J. (2019) Work, Stress and Play: Students' perceptions of factors impacting on their studies and well-being. *European Journal of Dental Education* 23: 349-354.
Kay EJ and Lowe JC. (2008) A survey of stress levels, self-perceived health and health-related behaviours of UK dental practitioners in 2005. *British Dental Journal* 204: E19.
Kemp M and Edwards H. (2014) Sources of Work-related Stress among Salaried Primary Care Dentists in the UK.
Knipe D, Maughan C, Gilbert J, et al. (2018) Mental health in medical, dentistry and veterinary students: Cross-sectional online survey. *BJPsych Open* 4: 441-446.
Larbie J, Kemp M and Whitehead P. (2017) The Mental Health and Well-being of UK Dentists: A Qualitative Study. British Dental Association. Available at

https://bda.org/about-the-bda/campaigns/Documents/The%20Mental%20Health%20and%20Well-being%20of%20UK%20Dentists.pdf.
Lazarus RS and Folkman S. (1987) Transactional theory and research on emotions and coping. *European Journal of Personality* 1: 141-169.
Lewis EG and Cardwell JM. (2019) A comparative study of mental health and wellbeing among UK students on professional degree programmes. *Journal of Further and Higher Education* 43: 1226-1238.
Lewis EG and Cardwell JM. (2020) The big five personality traits, perfectionism and their association with mental health among UK students on professional degree programmes. *BMC psychology* 8: 54.
Li H, Shi Y, Xing Z, et al. (2019) The effectiveness of aromatherapy and massage on stress management in nurses: A systematic review. *Journal of Clinical Nursing (John Wiley & Sons, Inc.)* 28: 372-385.
Mahendran K, Patel S and Sproat C. (2020) Psychosocial effects of the COVID-19 pandemic on staff in a dental teaching hospital. *British Dental Journal* 229: 127-132.
Meline T. (2006) Selecting Studies for Systemic Review: Inclusion and Exclusion Criteria. . *Contemporary Issues in Communication Science and Disorders*

33: 21-27.
Metz CJ, Ballard E and Metz MJ. (2020) The stress of success: An online module to help first-year dental students cope with the Impostor Phenomenon. *Journal of dental education* 84: 1016-1024.
Michie S. (2002) Causes and management of stress at work. *Occup Environ Med* 59: 67-72.
Moher D, Liberati A, Tetzlaff J, et al. (2009) Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med* 6: e1000097.
Newton JT, Allen CD, Coates J, et al. (2006) How to reduce the stress of general dental practice: The need for research into the effectiveness of multifaceted interventions. *British Dental Journal* 200: 437-440.
NHS. (2019) The NHS Patient Safety Strategy.Safer culture, safer systems, safer patients. Available at: https://www.england.nhs.uk/wp-content/uploads/2020/08/190708_Patient_Safety_Strategy_for_website_v4.pdf.
ONS. (2019) Suicides in England and Wales: 2019 registrations. Available at https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/suicidesintheunitedkingdom/2019registrations.
Owens JA. (2007) Sleep loss and fatigue in healthcare professionals. *J Perinat Neonatal Nurs* 21: 92-100; quiz 101-102.
Panagioti M, Panagopoulou E, Bower P, et al. (2017) Controlled interventions to reduce burnout in physicians a systematic review and meta-analysis. *JAMA Internal Medicine* 177: 195-205.
Pau A, Rowland ML, Naidoo S, et al. (2007) Emotional intelligence and perceived stress in dental undergraduates: a multinational survey. *Journal of dental education* 71: 197-204.
Plessas A, Delgado MB, Nasser M, et al. (2018) Impact of stress on dentists' clinical performance. A systematic review. *Community Dental Health* 35: 9-15.
Salazar FBC, Sipiyaruk K, White S, et al. (2019) Key determinants of health and wellbeing of dentists within the UK: a rapid review of over two decades of research. *Br Dent J* 227: 127-136.
Shea BJ, Reeves BC, Wells G, et al. (2017) AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. *BMJ* 358: j4008.
Stansfeld S, Clark C, Bebbington P, et al. (2014) Common mental disorders. Adult psychiatric morbidity survey. Health and Social Care Information Centre. Available at: https://files.digital.nhs.uk/pdf/t/6/adult_psychiatric_study_ch2_web.pdf.

Toon M, Collin V, Whitehead P, et al. (2019) An analysis of stress and burnout in UK general dental practitioners: subdimensions and causes. *British Dental Journal*.
Turner J, Bartlett D, Andiappan M, et al. (2015) Students' perceived stress and perception of barriers to effective study: Impact on academic performance in examinations. *British Dental Journal* 219: 453-458.
United Nations Development Programme. (2020) Human Development Reports. [online] Hdr.undp.org. Available at: http://hdr.undp.org/en/composite/HDI.
Varker T, Forbes D, Dell L, et al. (2015) Rapid evidence assessment: increasing the transparency of an emerging methodology. *J Eval Clin Pract* 21: 1199-1204.
Venegas CL, Nkangu MN, Duffy MC, et al. (2019) Interventions to improve resilience in physicians who have completed training: A systematic review. *PLoS ONE* 14: e0210512.
WHO. (2006) Classification of health workforce statistics, World Health Organization, Geneva. Available at: https://www.who.int/hrh/statistics/Health_workers_classification.pdf?ua=1.
WHO. (2004) Promoting mental health: concepts, emerging evidence, practice (Summary Report). Geneva. World Health Organization.