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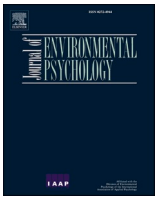

Swimming in nature: A scoping review of the mental health and wellbeing benefits of open water swimming

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ABSTRACT

Purpose: Open water swimming (also known as outdoor or wild swimming) is a popular blue activity which has become of recent interest in the mental health sphere. Moreover, it is an accessible and low-cost activity, requiring little to no specialist equipment other than access to an appropriate blue space. Subsequently, it could be an effective and accessible intervention that supports mental health and wellbeing worldwide. This scoping review aims to summarise the open water swimming literature.

Principal methods and results: A comprehensive search, extraction and charting of relevant literature was undertaken, identifying 14 studies exploring the mental health and wellbeing benefits of open water swimming. The findings were synthesised and summarised for both quantitative and qualitative literature, addressing all scoping review aims, whilst also assessing the quality of the literature.

Major conclusions: Open water swimming may lead to improvements in mood and wellbeing, reductions in mental distress symptomatology, and was experienced as a positive, enriching process for many. Blue spaces involve embodiment, mindful presence, community and much more, offering for some a therapeutic accretion which sustains mental health and wellbeing across a lifetime. More robust evidence is needed before open water swimming may become a viable mental health resource.

1. Introduction

Mental distress is a significant global issue which is estimated to affect around one billion people worldwide (Institute for Health Metrics and Evaluation, 2017; Lawrence et al., 2021). There is a shortage of funding and service provision, and estimates suggest around only 12% of people receive psychological treatment for their mental health problems, instead most commonly being treated with medication (McManus et al., 2016). As the mental health crisis is predicted to grow, innovative and accessible solutions are needed to help deliver a wider variety of interventions which are effective, timely and accessible (Department of Health, 2011; Ritchie & Roser, 2018).

There is a growing interest in the powerful effects that spending time in nature can have on both physical and mental health (Bowler et al., 2010; McCormick, 2017; Rugel et al., 2019). Early theories propose that natural environments provide a nurturing effect on people's physical, emotional, and psychological wellbeing through the innate and biological attraction that humans have with natural spaces (Biophilia Hypothesis; Wilson, 1984). Others suggest that concentration can be restored through spending time in nature (Attention Restoration Theory; Kaplan & Kaplan, 1989), or that time spent in unthreatening natural environments can reduce stress levels, due to improvements in physiological functions such as heart rate and blood pressure (Stress Reduction Theory; Ulrich et al., 1991). It has also been hypothesised that connecting to natural spaces may help to regulate human emotions through soothing and calming, supporting a transition from the sympathetic nervous system to the parasympathetic nervous system (Richardson et al., 2016). As well as benefits to individual people, Hartig (2021) suggests that interactions with nature can have the power to restore relational resources between people in small groups by reducing mental fatigue and stress, which allows individuals to spread their restoration to other people through a renewed capacity to provide support.

Recent research has postulated the mechanistic features of this relationship for both green (e.g., forests, parks etc.) and blue (water-based) spaces, which are recognised as distinct. Markeyvch and colleagues (2017) provide a framework to demonstrate how the many potential pathways by which green space can benefit health can be organised into three central domains: reducing harm (e.g. reducing

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exposure to environmental stressors such a air pollution, noise and heat), restoring capacities (e.g. attention restoration and psychophysiological stress recovery) and building capacities (e.g. encouraging physical activity and facilitating social cohesion). In short summary, this framework aims to bring together the variety of biopsychosocial pathways that have been previously proposed to help explain the benefits of greenspace, but aims to show how these differing theoretical and practical premises can complement one another rather than contradict. Importantly the domains contain the four general pathways (air quality, physical activity, social contacts and stress) that have been the focus of previous studies when testing for their relative contributions as mediators of the relationship between greenspace and health, and are often how the literature is divided from different disciplines (Hartig et al., 2014). This framework highlights how interdisciplinary exchange may benefit this field of work, as these pathways are not likely to be mutually exclusive and their interactions perhaps complex.

White et al. (2020) go on to propose a similar framework for blue space literature, building on the existing green space health and wellbeing models, with particular roots in the work of both Markeyvch and colleagues (2017) and Hartig et al. (2014). The framework includes three mechanisms via which health is influenced by engagement with blue spaces: mitigation (reducing harm to the environment), instoration (improving physical and mental health through nature connectedness) and restoration (recovery from stress, reduced anxiety and reduced attentional fatigue). The framework includes the concept of 'levels of exposure', and includes feedback loops and intermediate pathways to reflect how health outcomes and various interventions (societal, local or personal) may occur as a result of the exposure and ultimately affect future exposure. Importantly this framework provides additional outcome variables such as 'planetary health and wellbeing', to acknowledge the important link between planetary and human health (Whitmee et al., 2015) and the growing evidence that exposure to green and blue spaces may encourage pro environmental behaviours which improves planetary health alonside human health (Alcock et al., 2020).

The relationship between humans and nature has been defined by researchers as 'nature connectedness', which is a trait-like difference varying between individuals along a spectrum of subjective connection (Mayer & Frantz, 2004; Capaldi et al., 2014). What seems clear is that exposure to natural environments is an important aspect of human health. Nature connectedness is currently under a growing threat from urbanicity, which limits the time that both children and adults spend outdoors (Louv, 2005; MacKerron & Mourato, 2013; United Nations Population Division, 2002). Considering this in light of the benefits to exposure, 'green and blue prescribing' has roused recent recognition (Gascon et al., 2015) encompassing nonclinical, nature-based interventions in green or blue spaces that aim to alleviate distress and/or improve mental wellbeing. Emerging evidence suggests these are possible solutions to improving mental health in increasingly urban communities (Hunter et al., 2019; Leavell et al., 2019). Green space has been more widely recognised in previous research, with eco-therapy using 'green space' to support psychological functioning (Oliver, 2021).

Fewer studies have independently examined 'blue space' (Ashbullby et al., 2013; Papathanasopoulou et al., 2016) which tends to be incorporated within broader 'green space' research (Denton & Aranda, 2020). 'Blue space' is a location where water is the central feature, including natural (rivers, ponds, lakes, seas) and man-made (reservoirs, fountains) environments (Gascon et al., 2015, 2017; Thompson & Wilkie, 2021). Our understanding of the specific health and therapeutic benefits of blue environments is still evolving (Bell et al., 2015; Kearns et al., 2014; Lengen, 2015; Thomas, 2015; World Health Organization, 2018) but there is promising research to suggest that engaging with blue spaces can reduce self-reported stress and depression (de Bell et al., 2017; White et al., 2016), as well as being associated with indicators of eudemonic and hedonic wellbeing such as relaxation, calmness, and improved mood (Gunnell et al., 2014; Thompson & Wilkie, 2021). Whatsmore, combining blue prescribing with physical exercise (e.g., surfing, outdoor swimming) can lead to quality-adjusted-life-years, and reduced healthcare costs (Papathanasopoulou et al., 2016). Researchers suggest that 'blue activities' are unique due to their immersive nature, although the role 'immersion' plays is unclear (Britton & Foley, 2021). Despite increasing evidence for the benefits of blue activities (Britton, 2019; Evers, 2015) research is still limited (Costello et al., 2019).

Open water swimming (OWS; also referred to as outdoor, cold water or wild swimming) is a long-standing blue activity which has recently surged in popularity in response to Covid-19 due to its outdoor accessibility for both leisure and health during periods of lockdown (Lemmin-Woolfrey, 2021). OWS has become of increasing interest to mental health researchers (Atkinson, 2019), as emerging evidence suggests that OWS (frequently practised in cold water, location dependent) can lead to improvements in mood, energy, and libido (Collier et al., 2015; Gundle & Atkinson, 2020), whilst also reducing stress, depressive symptomatology, tension, fatigue, and memory problems (Huttunen et al., 2004; Nichols, 2014; Oliver, 2021). OWS has also been shown to provide a sense of personal achievement, routine, and community, becoming a place of refuge for many (van Tulleken et al., 2018; Denton & Aranda, 2020). For those who take part regularly, it offers a chance to build a more connected and confident relationship with one's own body (Throsby, 2013), whilst allowing a sense of presence which distances people from their everyday stresses (Moles, 2021; Wardley, 2017). Thus, OWS may offer a lifelong, low-cost resource for both physical and mental health (Britton & Foley, 2021; Ward, 2017) that is a simple, cheap, and effective option to support the mental health of populations worldwide.

1.1. Aims and objectives

Existing research into blue activities such as OWS largely focuses on the physiological benefits (Britton & Foley, 2021; Dugue & Leppanen, 2000). There are two recent systematic reviews, but these examine the therapeutic benefits of different types of 'blue therapy' (Britton et al., 2020) and 'blue activity' (Yen et al., 2021). To date no reviews have attempted to summarise the existing evidence on the mental health and wellbeing benefits specific to OWS, despite this being a unique, popular, and particularly accessible form of blue activity, therefore this is what the review aims to do.

Globally, many rivers and waterfronts today are polluted, adversely affecting habitats, wildlife, and biodiversity (Isaza et al., 2020; Sumpter, 1998). The degradation of ecosystems (along with climate change) have been associated with significant psychological burdens such as 'eco-anxiety' or 'eco-distress' (Pihkala, 2020). Although not a psychopathology, eco-distress (Marks et al. under review) can be associated with negative mental health (Ogunbode et al., 2021), so initiatives that are likely to improve ecosystems may have further benefits for human well-being. Furthermore, research clearly demonstrates the significance of human-nature relationships in terms of mental health impacts (Hartig, 2021). This review, by evidencing the mental health and wellbeing benefits of OWS, lends additional support to the importance of improving waterway safety and cleanliness, for multiple benefits to humans, plants and wildlife (Davey, 2021). Interventions supporting human and ecological health together are increasingly popular and important (Breed et al., 2020; Robinson & Breed, 2019). This review is the first to explore whether OWS may offer such multifaceted benefits.

1.2. Review questions

This scoping review examines the state of the current research into the mental health (MH) and wellbeing benefits of OWS. It will address the following questions:

1. What studies exist which aim to understand the MH and wellbeing benefits of OWS?
2. What is the current state of the evidence base for OWS?

Table 1.1
Inclusion and exclusion criteria.

Criteria	Inclusion	Exclusion
Population	Human participants, any age, gender or location.	Animal studies.
Interventions	A form of outdoor swimming or bathing	Indoor swimming in non-natural settings.
Comparisons	People who are not open-water swimmer groups, people who do other outdoor activities.	None.
Country Setting	Any country.	None.
Outcomes	Studies which analyse relationships between open-water swimming and mental health or wellbeing.	Studies focusing on the relationship between open-water swimming and physiological health only.
Setting	Studies with broad definitions of open-water swimming (including "bathing") in any natural environment.	Indoor swimming in non-natural settings.
Language	English or translated into English.	Not in English.
Study types and designs	Quantitative, qualitative, and mixed-methods research.	Studies without empirical data.

3. From the studies which aim to evaluate this, is there evidence of MH and wellbeing benefits of OWS?
   a. What quantitative evidence exists for mental health and wellbeing benefits of open water swimming?
   b. What qualitative evidence exists for the experiences of open water swimmers? If so, is there evidence for experiencing MH and wellbeing impacts alongside OWS?

2. Methods

OWS is defined in this study as any form of swimming-based activity ('bathing' included) that takes place in a natural body of water e.g., rivers, lakes, ponds, sea, reservoirs, lochs (Swim England, 2022). MH and wellbeing have been broadly defined in this study to try and include as many studies as possible. Studies measuring physiological markers such as fatigue and stress are only relevant if being studied in relation to wellbeing rather than physiology alone.

2.1. Eligibility criteria

To capture a wide range of evidence, all study designs and sources (including grey literature) which met the criteria outlined in Table 1.1 were included:

2.2. Search strategy

Four databases were searched for the purpose of this literature review (PubMed, PsychNet, Web of Science Core Collection, Embase), independently of each other. These collectively included articles on Clinical, Sports and Health Psychology, and grey literature. With mental health and wellbeing offering such a large array of possible search terms, the final set of chosen search terms (see Fig. 1.1) were decided upon through an extensive search of the current available literature as well as through a consultation with an academic librarian as recommended (Pollock et al., 2021).

The search followed three stages laid out in Joanna Briggs Institute (JBI) guidance (Briggs, 2015) with an initial search on chosen databases using the identified search terms, a second search including any newly identified key words or index terms from the initial search and a third search of the reference lists of all identified reports/articles. Firstly, titles and abstracts of all identified articles were screened by the main and second researcher. Relevant articles then underwent full text screening by both researchers using the database Covidence. Throughout the process, disputes were resolved in meetings between both researchers to reach consensus for each included article. The initial search on all four databases using the keyword search string and blocks (see Fig. 1.1) took place on the January 4, 2022, with screening from 4 to January 24, 2022. A second updated search of all four databases took place on November 22, 2022.

2.3. Data extraction and charting

An initial data extraction table and protocol was created. The protocol and table required amendments prior to data extraction, in response to growing understanding of the research field, capacity of the scoping review and guidelines for scoping review methodology. This is understood and encouraged in the scoping review literature, indicating a flexible and iterative approach to the review, as greater understanding of concepts emerges throughout the scoping process (Pollock et al., 2021). The data extraction table collected, charted, and summarised data including study information, sample characteristics, water characteristics, methodology and outcomes. Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines for scoping reviews were followed for data extraction, charting, and reporting (Tricco et al., 2018).

Additional summarised data included the benefits and barriers to OWS, and recommendations for future studies. Although not always reported in scoping reviews, quality assessment procedures were followed to allow critical appraisal of the literature and improve the reliability of conclusions drawn. Quality assessment was conducted by both researchers during data extraction using the Mixed Methods Appraisal Tool (MMAT; Hong et al., 2018) framework, which is applicable to quantitative and qualitative research. Conflicts in quality assessment were discussed until consensus was met.

2.4. Data synthesis

The most appropriate method of synthesising data in a scoping review is debated in the literature. Some suggest scoping reviews should remain purely descriptive in nature (perhaps including basic coding or frequency counting) to simply summarise an emerging area of research rather than synthesise findings to inform formal decision making (Lockwood et al., 2019; Pollock et al., 2021). However, if following a narrative approach, it is possible to utilise principles of thematic analysis, in the form of a thematic construction, to identify and summarise the main themes and findings (Mays et al., 2005; Thomas & Harden, 2008), particularly when the research questions lend themselves to this form of summary. This narrative approach suited the proposed review and so was used to synthesise the data, as advised by the JBI (Briggs, 2015).

Originally, this scoping review planned to summarise findings using a loose thematic framework to provide a narrative account of all findings (Arksey & O'Malley, 2005). However, as the researchers familiarised themselves with the nature of the qualitative research through the data extraction and charting process, there appeared to be repeating patterns

Search: [Title or Abstract]

"mental health" OR well-being OR wellbeing OR "mental well*" OR anxi* OR anxious* OR anxiety OR depress* OR "PTSD" OR "post-traumatic stress syndrome" OR "self-esteem" OR "mood" OR stress* OR "pain" OR "grief" OR "quality of life" OR "quality-of-life" OR "QOL" OR "eco-distress" OR "ecological distress" OR "eco-anxi*" OR "ecological anxi*" OR "ecoanxi*" OR "eco-depress*" OR "ecological depress*" OR "ecological grief" OR 'eco-grief' OR "eco-anger" OR "ecological anger" OR solastalgia

AND

"Open water swim*" OR "open-water swim*" OR "cold water swim*" OR "cold-water swim*" OR "cold water immersion" OR "cold-water immersion*" OR "sea swim*" OR "nature swim*" OR "wild swim*" OR "river swim*" OR "outdoor swim*" OR "winter swim*" OR "sea bath*" OR "river bath*" OR "blue exercise"

*Dependant on the database searches may be put in using speech quotations (if possible, on this database), and times where * may be used to substitute many possible endings to words e.g., depress* so that both depression is searched for and*

Fig. 1.1. Keyword Search String and Blocks as used on each database.

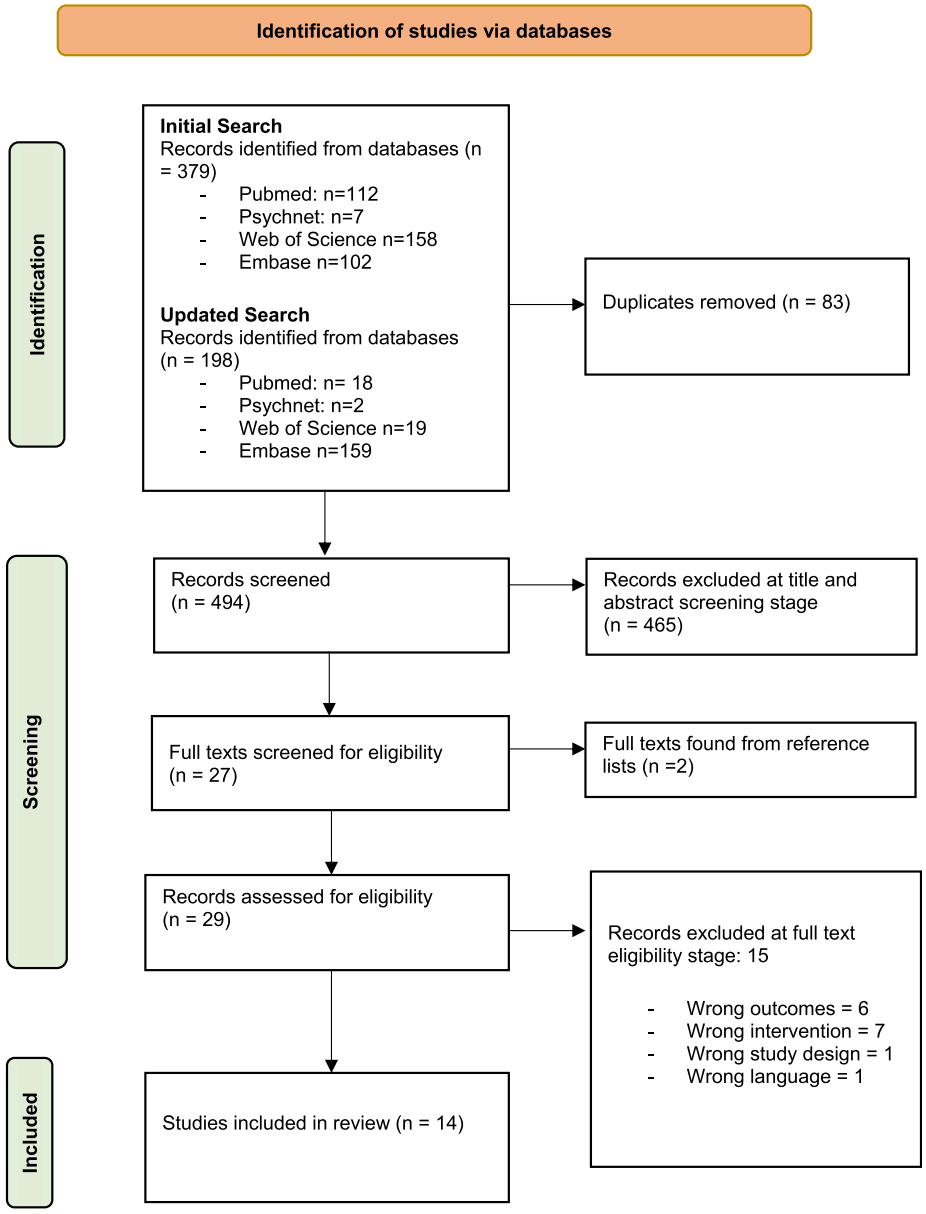

Fig. 1.2. PRISMA diagram for all articles from initial search terms to full inclusion (Page et al., 2021).

across the qualitative papers even though themes were labelled and described uniquely in every paper. This reflected differing ethnographic and phenomenological methodologies across extant research and made creating a clear summary difficult. In line with guidance on managing unclear data and using data charting as an iterative process (Briggs, 2015), the researchers reconsidered the data synthesis process and adapted the protocol to synthesise the qualitative findings through a thematic analysis, in addition to the descriptive numerical summary analysis (Levac et al., 2010). This was conducted across all seven studies to summarise and 'go beyond' the primary data, generating new explanations (Braun & Clarke, 2006; Thomas & Harden, 2008), enhancing the summary of the swimmers' experiences, and clearly answering review question two.

3. Results

There were 394 articles identified (83 duplicates removed), with 311 initially screened, of which 284 were excluded at the title and abstract screening stage. Of these, 27 underwent full text screening, with an additional 2 found from reference lists. A total of 14 met the full inclusion criteria (see Fig. 1.2 for a complete overview).

3.1. Review question one: what studies exist which aim to explore the MH and wellbeing benefits of OWS?

Quantitative (n = 5, 38%), qualitative (n = 8, 57%), and mixed-methods (n = 1, 7%) research examined the MH and wellbeing benefits of OWS. Quantitative research included a mixture of cross-sectional (n = 1, 20%), observational (n = 1, 20%) and non-Randomised Control Trials (RCT) intervention studies (n = 3, 60%). All quantitative studies aimed to determine if OWS was beneficial for MH and wellbeing, however the outcome measures differed across each paper, including both validated and non-validated measures. Qualitative research included ethnographic (n = 4, 50%) and phenomenological (n = 4, 50%) studies. The qualitative studies all aimed to understand experiences and impacts of OWS, using detailed forms of qualitative analysis. The mixed-method study (n = 1, 100%) was similar in both quantitative and qualitative aims.

Bodies of water reported on include the sea (n = 10; 71%), rivers (n = 1; 7%), lakes (n = 1; 7%) and lochs (n = 1; 7%) and a range of geographical locations including England (n = 5; 38%), Ireland (n = 4; 29%), Scotland (n = 1; 7%), Finland (n = 2; 14%), Australia (n = 1; 7%), and Italy (n = 1; 7%). Activities were described as swimming (n = 12; 86%), or swimming and water bathing (n = 2; 14%), with a mixture of regular (n = 10; 67%) and novice (n = 5; 33%) swimmer samples (one article describes 2 separate studies). The ages of participants (when reported) ranged from 18 years of age to late 80s, skewed towards older participants. Few studies reported ethnicity, and of those that did, participants were largely White. See Table 1.2 for a full breakdown of studies.

3.2. Review question two: what is the current state of the evidence base for OWS?

All studies were quality assessed using the MMAT (Hong et al., 2018; see Table S1.2). Most studies detailed clear research questions, but three qualitative reviews (Denton & Aranda, 2020; Foley, 2017; Moles, 2021) lacked clear aims, reducing study quality and MMAT scoring accuracy. For example, Foley (2017) provided rich data on swimmers' experiences, using apparently appropriate oral history methodology, but as it did not state aims, assessment of the appropriateness of the methodology for the outcomes was limited.

3.2.1. Quantitative research – summary

Quantitative research examined the potential relationship between OWS and MH/wellbeing in several different contexts and applications. However, this research body had a number of issues relating to research design, reporting of results and statistical analysis that made it vulnerable to risk of bias. For example, most studies did not state a target population, and many have used convenience sampling and control groups recruited by the exposure group. Demori et al. (2021) appeared to use an inappropriate method to answer their question; despite aiming to determine the effects of winter sea swimming on wellbeing outcomes, the study was cross-sectional and evaluated differences between swimmer and non-swimmer controls. Moreover, they used a non-validated measure of well being meaning their between-groups outcomes comparison was neither reliable nor comparable with other research, and their high dropout rate was inadequately discussed.

Lindeman et al. (2002) reported several study weaknesses (low statistical power, selection effects, and measure choices) affecting the reliability of reported results and conclusions and failed to provide completion rates. Huttunen et al. (2004) reported high dropout rates at the second time point (>20%), limiting conclusions due to incomplete data and raising questions about acceptability of their OWS intervention. Both Huttunen et al. (2004) and Lindeman et al. (2002) accounted for some but not all possible confounders.

3.2.2. Qualitative research – summary

The array of rich qualitative data on swimmers' experiences was limited by poor reporting in the form of a lack of detail in aims, collection methods, analyses and descriptions of the findings which made it difficult to ascertain how adequately these designs had addressed their research questions (Costello et al., 2019; Foley, 2015, 2017; Moles, 2021). Additionally, there was insufficient information about data sources, collection methods or methodologies for example in terms of the types of questions employed during interviews or even the style of interviews themselves. Qualitative research was most highly appraised when aims were clearly stated and the process of analysis was provided in detail (McDougall et al., 2022; Murray & Fox, 2021). Overall, although data from qualitative research was rich and varied, it was often limited by poor reporting, reducing confidence in data quality and analytic accuracy.

3.2.3. Mixed methods research – summary

Only one paper meeting the criteria took a mixed methods approach (Burlingham et al., 2022). It highlighted the value of combining quantitative and qualitative approaches for examining the acceptability of OWS as an intervention. Quantitative data on the attendance rates and continuation of OWS post-intervention was complemented by diary entries exploring motivating and demotivating factors about the intervention, which provided a more complete picture of acceptability. However, it also suffered from each part of the methodology being limited, with quantitative analysis of wellbeing measures (deemed 'secondary outcomes') being insufficiently thorough to draw meaningful conclusions and the use of a qualitative data collection method that is less conducive to rich and deep data.

3.3. Review question 3a: what quantitative evidence exists for MH and wellbeing benefits of OWS?

One cross-sectional, one longitudinal, three non-RCT and one mixed-method study explored the benefits of OWS. Each reported on in turn (see Table 1.3 for full detail).

Table 1.2
Study Characteristics and Quality Assessment.

Study Characteristics					Quality Assessment (MMAT)						
					All		Quant non RCT Quant Descriptive Qualitative Mixed Methods				
First author (year).	**Location**	**Sample** - Sample size (control) - Gender distribution - Age Range - Experience		**Design / Method**	**Are there clear research questions?**	**Do the collected data allow to address the research questions?**	Are the participants representative of the target population? Are the participants representative of the target population? Is the qualitative approach appropriate to answer the research question? Is there an adequate rationale for using mixed methods?	Are measurements appropriate regarding both outcome and intervention (or exposure)? Is the sampling strategy relevant to address the research question? Are the qualitative data collection methods adequate to address the research question? Are the different components of the study effectively integrated to answer the research question?	Are there complete outcome data? Are the measurements appropriate? Are the findings adequately derived from the data? Are the outputs of the qualitative and quantitative components adequately interpreted?	Are the confounders accounted for in the design and analysis? Is the risk of nonresponse bias low? Is the interpretation of results sufficiently substantiated by data? Are divergences and inconsistencies between quantitative and qualitative interpretations adequately addressed?	During the study period, is the intervention administered (or exposure occurred) as intended? Is the statistical analysis appropriate to answer the research question? Is there coherence between qualitative data sources, collection, analysis, and interpretation? Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?
Demori et al. (2021).	Italy Liguria	- 228 (121) - F(103); M(125) - 19-88 yrs. - Regular	- Sea - Nov-April - 8 to 14 °C - Swim/ bathe	Quantitative Cross sectional	✔	×	?	×	?	✔	✔
	-The paper's aim was to determine the effects of winter sea swimming on mental health outcomes but instead compared swimmers with non-swimmers at a single time point. -There is no target population stated so it is not possible to assess whether the sample is representative. -The main outcome measures of this piece were unvalidated meaning reliability and validity is unknown. They were subjective measures of psycho-physical health. -Researchers attempted to control for confounding variables by controlling for personality and socio-economic status differences between the two groups.										
Massey et al. (2020).	England Brighton	- 83 (22) - F(57); M(7) (swimmers) - 43 yrs. ± 10 - Novice	- Sea - 15 to 21◦ C - Swim	Quantitative Non RCT intervention	✔	✔	?	✔	×	×	✔
	-Target population is not stated and convenience sample raises risk of bias. -Wellbeing does appear to be representative of the UK population from the scores taken prior to the swim. -High attrition (76.5% retention) when accounting for the length of the follow-up period risks responder bias. -The researchers do not attempt to account for confounding factors either in design or analysis. In particular, potential confounders with the control group comprising friends and family of the swimmers group.										
Huttunen et al. (2004).	Finland	- 59 (23) - F(46); M(13) - 30-68 yrs. - Regular	- Winter - Swim	Quantitative Non RCT intervention	✔	✔	?	✔	×	?	?
	- No indication that sample is representative. - Confounding between-groups differences including swimmers group having higher levels of disease than control (50% versus 20% respectively). Aimed to match ages between groups but participants' average age was older than the general population of Finland. - Researchers controlled for other exercise and significant life events which reduces the risk that these influenced the outcome measures rather than the intervention. - Swimming group who completed both data points also completed winter swimming regularly. - Researchers did not detail what qualifies exposure. - High level of attrition which could potentially relate to the nature of the exposure condition which is not accounted for in the research. Unable to control for this as the control group was socially linked to the exposure group (composed of swimmers' friends and family).										

Lindeman et al. (2002).	Finland	- 36 (11) - F(26); M(10) - 47-65 yrs. - Regular	- Winter - Swim	Quantitative Non RCT intervention	✔	✖	✖	✔	?	?	✔
	- Low statistical power and selection effects (control group was recruited by swimmers group) raise the risk that results could be biased. - Sample not representative in age, also not in alexithymia prevalence in Finland. - No details of how many participants were originally recruited versus how many gave data at all 3 time points. - Some group-wise matching is done. Potential confounds of participants being friends not explored adequately. Small sample size and multiple independent variables means that there is high risk for type 1 error.										
van Tulleken et al. (2018).	England Portsmouth	- 1 - F (1) - 24 yrs. - Novice	- Lake - April-Sept - Cold - Swim	Single case study Observation-al	✔	✔	✔	✔	✔	✔	✖
	- The researchers did not offer any statistical analysis. - Reductions in depressive symptoms were based on diagnostic criteria rather than validated measures. Use of the latter may have allowed for a more robust research design, such as a single-case experimental design, that could reduce the risk of researcher bias during assessment of the participant.										
Costello et al. (2019).	Australia Perth	- 17 - F(7); M(10) - 55-80 yrs. - Regular	- Sea - all year - Swim	Qualitative focused Ethnography	✔	✔	✔	✖	?	✔	✔
	- Researchers provide few details on how they collected the data. - Researchers provide some details of data collection, coding and theme generation but it is somewhat limited, reducing confidence that findings are adequately derived from the data.										
Britton et al. (2021).	Ireland	Study 1: - 25 - 30-80 yrs. - Regular Study 2: - approx. 40 - 28-60+ yrs. - Novice	- Sea - all year - Swim	Qualitative Ethnographic with narrative interviews	✔	✔	✔	✔	?	✔	✔
	- Demographic data lacked detail. - There are some descriptions of inductive analysis but detail is limited. Would have benefitted from more information about the process of data analysis.										
Foley (2017).	Ireland	- 20 - F(12); M(8) - late 30s-late 80s yrs. - Regular	- Sea - all year - Swim	Qualitative Auto-ethnographic, oral history and visual research.	?	?	?	?	?	✔	✔
	- Research questions lack clarity and focus, and it is difficult to ascertain exactly what these are. This makes it hard to determine how well the collected data can answer the questions. - Oral history approach which links to the wish to hear the swimmers' voices seems appropriate, but without clear research question it is difficult to say how appropriate this choice was. - The methodology section is quite limited and does not fully explain how the data collection was conducted, such as, the questions used, the duration of interviews, who was interviewed, and how they were recruited. - Without a very clear description of the methods followed, it makes it difficult to ascertain where the findings came from and which data were used and how.										
Moles (2021).	England Devon	- Regular	-River (Mention of other sources) - all year - cold - Swim	Qualitative Ethnographic	?	?	✔	✔	?	✔	?
	- Research question is not clearly presented. - Little detail on the process of data collection and data sources. - No literature to support the analysis process. - At times reads more like autoethnography though this was not stated, perhaps the perspective of the researcher could have been better balanced with other participants.										

Denton et al. (2020).	England Brighton	- 6 - F(3); M(3) - 38-73 yrs. - Novice	- Sea - Swim/bath e	Qualitative Phenomenological	?	✔	✔	✔	✔	?	✔
	- It is clear what they are exploring, however this is not stated as an intention at the start as a research - The statements by the researcher are substantiated by data. However, analysis feels very detached from the participants considering this is a phenomenological analysis of embodied sensations looking at a small group of participants. Feels impersonal, at times feels that participants' 'voices' are lost in favour of theory application. One of the issues with this is the lack of history or social context of the participants.										
Foley (2015).	Ireland	- 20 - Regular	- Sea - all year - Swim	Qualitative Phenomenological	✔	?	✔	?	?	✔	✔
	- At times it lacks detail on how researchers came to their conclusions. For example, researchers suggest the participants' accounts imply that OWS is associated with wellbeing even though none of the participants mention this explicitly. Explorations of the researchers' reasoning would have been beneficial. - The lack of detail is perhaps a product of the lack of specificity of the research question, design, and use of multiple qualitative approaches. - They provide some detail of how data were collected but this is somewhat limited. What is stated appears to be appropriate. - Write up has long excerpts which at times feel unexplored or underdeveloped by analysis.										
Murray & Fox (2021).	Ireland	- 5 - F(4); M(1) - 'wide age range' - Regular	- Sea - all year - cold - Swim	Qualitative Phenomenological	✔	✔	✔	✔	✔	✔	✔
	- The researchers provide good detail of their research process and data analysis, making use of examples - Researchers set out to explore meaning ascribed to open water swimming and a phenomenological approach is well-suited for this. - It may have been beneficial to have more demographic data in order to get a better understanding of participants' positions but this did not prevent answering the research question.										
Burlingham et al. (2022)	England Devon	- 53 - F(47); M(5); Non-Binary(1) - Novice	- Sea Swimming - Cold water - July to December	Mixed Methods Convergent design	✔	✔	✔	✔	×	✔	×
	- Analysis of quantitative data was very limited. - Qualitative approach did not allow researchers to gather rich and deep data. - Despite methodological and analytical limitations, the research does provide insights into the acceptability of OWS as an intervention.										
McDougall et al. (2022)	Scotland	- 12 -F(7); M(5) - Regular	- Cold water - Primarily lochs, some sea	Qualitative (phenomenological)	✔	✔	✔	✔	✔	✔	✔
	- Researchers clearly stated aims which align well with chosen methodology. - Provided details of the research process and how the findings were drawn from the data, supported by examples.										

Table 1.3
Summary of quantitative studies main findings.

Author (date).	Measure Used	Study Design	MH/WB benefits (Y/N)	Main findings (in relation to MH and wellbeing)
Demori et al. (2021).	- A non-validated questionnaire encompassing sociodemographic characteristics and perceived psycho-physical and social health of participants - Single-Item Measure of Personality (SIMP) used to account for individual differences in outcomes	Cross-sectional Single time-point Winter bathing season (Nov-April)	Y	- Being a winter swimmer is a significant predictor of having a higher perception of psycho-physical wellbeing (operationalised as general stress index based on a principal component analysis) than controls. - Winter swimmers (WS) have a higher perception of their physical health in comparison with those who do not partake. Researchers suggest that this combination could enable WS to handle negative distress and transform it into positive stress leading to wellbeing.
van Tulleken et al. (2018).	- Symptom reduction against the DSM-5 and ICD-10 criteria for major depressive disorder and anxiety	Observational Weekly through Apr-Sept Follow up	Y	- Single case analysis of an individual with intractable depression. Following treatment in the form of regular open-water swimming (1-2 times per week), her depressive symptoms reduced to sub-clinical levels (DSM-5; ICD-10) after 3 months and she no-longer required medication after 4 months. - One year later she was free from symptoms and medication, and maintained regular OWS. - Researchers suggest that this could be an example of how adopting a new activity can facilitate lifestyle modifications

(*continued on next page*)

Table 1.3 (*continued*)

Author (date).	Measure Used	Study Design	MH/WB benefits (Y/N)	Main findings (in relation to MH and wellbeing)
				conducive to good mental health as demonstrated by previous research. - Participant's account provides insights into the experience of taking part in open-water swimming.
Huttunen et al. (2004).	- Profile of Mood States (POMS) - Subjective symptoms form - closed questions on diagnosed diseases, and life events affecting mood	Non-RCT Intervention 2 time points Beginning and end of winter swimming season (Oct-Jan)	Y	- Tension and fatigue scores in the swimmers significantly decreased over the course of the swimming period. - The negative memory and mood state points were also lower after four months than at the beginning. - Changes in the controls were not significant. - Results from the Subjective Symptoms form indicated that winter swimmers exhibited more vigour and less fatigue than the controls. - The swimmers felt themselves more vigorous, energetic, active, and brisk than the controls after the winter swimming period.
Lindeman et al. (2002).	- The Crown Crisp Experiential Inventory (CCEI) - The twenty-item version of the Toronto Alexithymia Scale (TAS-20)	Non RCT Intervention 3 time points; before, during and after winter swimming period October, January, May	N (largely unclear)	- When different WS subgroups were compared to the controls, some minor differences emerged, but no common differences in the mental health of the groups were found. - The mental health of WS was not better than controls. -WS were not significantly more alexithymic than the control as was hypothesised.
Massey et al. (2020).	- Abbreviated POMS - The Short Warwick–Edinburgh Mental Well-being Scale (SWEMWBS) 22	Non RCT Interventio 3 time points over 10 weeks SWEMWBS administered before the first pool session (Wk1), before the first sea session (Wk4) and before the last sea session (Wk10) POMS administered after the sessions on Wk1, Wk4 and Wk10	Y	- Novice outdoor swimmers had acute and chronic reductions in negative mood and acute increases in positive mood. These differences were significantly greater than controls. - Controls who sat on the beach had mood scores that fluctuated over the course of the study but were similar at the start and finish. Controls did however also have improvements to wellbeing compared to the start.
Burlingham et al. (2022)	- Patient Health Questionnaire, 9-item version (PHQ-9) - Generalised Anxiety Disorder Assessment, 7-item version (GAD-7) - The Work and Social Adjustment Scale (WSAS) - Levels of inflammation inferred from C-reactive protein (CRP)	- Convergent Mixed Methods with observational quantitative component - 3 time-points: before and at the end of the intervention, then 3 months later	Y	- High levels of acceptability with very few participants dropping out and very high levels of attendance. - Reductions in mean PHQ-9, GAD-7 and WSAS scores between pre- and post intervention indicating improvements to anxious and depressive symptoms. - Scores raised compared to post-intervention at 3-month follow up but still lower than pre-intervention. - Inconclusive inflammation data due to issues with CRP measurement.

3.3.1. *Cross sectional design (n = 1)*

When Demori et al. (2021) compared winter swimmers (n = 107) with non-winter swimmers (n = 121), winter swimming was a significant predictor of higher perceptions of psycho-physical wellbeing (evidenced by higher self-perceptions of physical health and significantly lower general stress index scores than controls; beta = 0.42, p = 0.010, partial η2 = 0.26). Conclusions are limited as physical health was self-reported by recall, and wellbeing was assessed with non-validated questionnaires. The authors used the Single-Item Measure of Personality (SIMP; Woods & Hampson, 2006) to account for individual differences of personality and found that higher scores of emotional stability were associated with lower stress index scores (beta = 0.23, $p < 0.001$, partial η2 = 0.26). Even with accurate effect size estimates, it is important to consider the limitations of the chosen measures; the SIMP has significantly less validity compared to measures with a greater number of items or even other single-item measures of personality (Credé et al., 2012), and using unvalidated measures prevents clear comparison with other research.

3.3.2. *Observational (n = 1)*

Van Tulleken and colleagues' (2018) single case study assessed OWS as a treatment for intractable depression, reporting on symptom reduction of depression and anxiety against DSM-5 and ICD-10 criteria. The findings suggest that regular OWS significantly reduced depressive symptoms to sub-clinical levels over three months, replacing medication as a main form of treatment, with continued significant benefits after one year. Such promising results demonstrate the plausibility of using OWS alongside treatment as usual to ameliorate clinically depressive and anxious symptoms, however it is impossible to generalise from a single case study, and further research should aim to replicate and extend this design using design protocols that reduce the risk of observer bias.

3.3.3. *Non RCT intervention (n = 3)*

Lindeman et al. (2002) assessed MH psychopathology (free-floating anxiety, phobic anxiety, obsessionality, depression, somatic anxiety, hysteria) using the Crown Crisp Experiential Inventory (CCEI) and alexithymia (the inability to recognize or describe one's own emotions, which has been linked to depression and suicidal behaviour) with the twenty-item version of the Toronto Alexithymia Scale (TAS-20). Data was collected at three time points: before, during and after the winter swimming period. Results were mixed, with minor differences observed in comparison to controls, however no common differences in MH of the groups were observed and the MH scores of swimmers were not significantly different than controls. Additionally, neither frequency nor length of swimming for the swimmers was associated with MH scores. Although the mean difference in TAS score was significantly increased for winter swimmers in comparison to controls between time point 1 and 3, this significance was marginal (p = 0.0456). Caution should be exercised in interpreting this finding as there were multiple

comparisons, increasing the risk of type 1 error on a relatively small sample size (25 for the experimental group and 11 for the control).

Other studies measured general wellbeing or mood. Huttunen et al. (2004) used the Profile of Mood States (POMS) to assess changes in tension, fatigue, vigour, and hostility, and a Subjective Symptom form to assess subjective mood, memory function, general alertness, sleep quality and somatic symptoms. Assessing symptoms before and after the winter swimming season, there were significant reductions in regular winter swimmers' tension and fatigue scores ($p = 0.034$ and $p = 0.001$) and reductions in negative memory and mood state points ($p = 0.023$ and $p = 0.024$). A strength of this study is that it was controlled for; the winter swimmers reported more vigour and less fatigue than controls, self-reporting feeling more vigorous, energetic, active, and brisk than controls by the end of the season. Changes in controls' scores were not significant. While the research presents multiple significant relationships, effect size is not reported which limits interpretation of the strength of the relationship between winter swimming and its potential benefits to health and wellbeing. Furthermore, the allocation process poses risk of bias due to the lack of blinding of the participants (the control group consisted of friends of those in the experimental group).

Massey et al. (2020) examined mood (abbreviated POMS) and wellbeing (Short Warwick–Edinburgh Mental Well-being Scale [SWEMWBS]) over three time points. They compared novice swimmers transitioning from indoor pool swimming to sea swimming with friends of the swimmers who acted as controls by watching from the beach. The swimmers had acute increases in positive mood (Esteem and Vigor subscales, $p < 0.001$) and acute and long-lasting reductions in negative mood (Tension, Anger, Depression, and Confusion and Total Mood Disturbance [TMD] sub-scales; $p < 0.001$, $d = 1.1–1.7$), with TMD also reducing between sessions ($p < 0.001$, $d = 0.08$). Wellbeing increased during the programme in swimmers ($p < 0.001$, $d = 3.7$) and controls ($p = 0.019$, $d = 0.2$), moreover the researchers observed significantly greater mood and wellbeing improvements in the swimmers against controls at the final swim ($p = 0.034$, $r = 0.23$). The results provide some insights into how OWS may relate to mood and wellbeing although they only demonstrate small effect sizes excluding the increase in wellbeing scores from the course of the programme which boasted a moderate effect size. Again, risk of bias is present due to lack of blinding and controls consisting of friends of the swimming participants, and high attrition (23.5%) that is not adequately accounted for in the analysis raises concerns about responder bias.

3.3.4. Mixed methods ($n = 1$)

The one paper in our review that utilised a mixed methods approach had quantitative primary outcomes examining the acceptability and engagement of OWS as an intervention for anxiety and depression (Burlingham et al., 2022). Secondary outcomes examined the feasibility of the 9-item Patient Health Questionnaire (PHQ-9), 7-item Generalised Anxiety Disorder Assessment (GAD-7), The Work and Social Adjustment Scale (WSAS), and the feasibility of using a C-reactive protein device to measure levels of inflammation. Researchers found high levels of acceptability with a 90.1% attendance rate (382 sessions attended of a possible 424) and a median attendance of 8 sessions. Adverse events were minor, anticipated, and managed in a way that enabled participants to continue the intervention. At 3-month follow up, 34 of the 52 participants were continuing to swim at least once per week. Conclusions about secondary outcomes were severely limited with researchers providing effect size estimates but no indication of significance testing. Reductions in mean severity scores between pre- and post-intervention were large in PHQ-9 ($M = 5.1$ from 13, Cohen's $d = 1.4$), GAD-7 ($M = 5.0$ from 12.2, $d = 1.7$), and WSAS ($M = 8.4$ from 17.0, $d = 1.1$).

Researchers also noted moderate increases in all measures at 3-month follow-up compared to post-intervention, though they remained lower than pre-intervention levels (PHQ-9, $M = 7.0$; GAD-7, $M = 5.6$; WSAS, $M = 11.4$). While this demonstrates the feasibility of using these measures in this context, the lack of thorough statistical analysis and a control group, alongside a relatively small sample size, opens the research up to multiple forms of bias and prevents any conclusions being made about the effect of this intervention on these outcomes. Inflammation data were not analysed due to significant issues with data collection.

3.4. Review question 3b: what qualitative evidence exists for the experiences of open water swimmers? If so, is there evidence for experiencing MH and wellbeing impacts alongside OWS?

A thematic analysis was conducted with the qualitative research, utilising two researchers for this process, following steps laid out by Braun and Clarke (2012) to support summarising the qualitative papers. Qualitative data was extracted from each study, and the researchers familiarised themselves with the data before embarking on data coding. Once each study was coded, the researcher began to develop themes, to reflect patterns of meaning across the data, as well as offering a summary of findings. This process was repeated for each study, after which the themes and codes across all studies were examined together, leading to the refinement of themes, and a final thematic map which allowed the researchers to generate new insight and explanations of findings, as well as a summary of the swimmers' experiences. The researchers took a

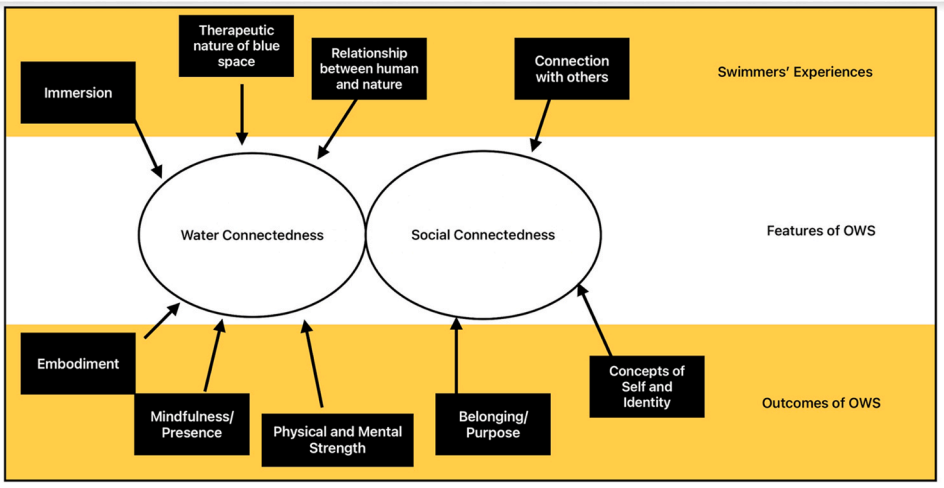

Fig. 1.3. Thematic map of the themes found across the qualitative articles.

mainly inductive and semantic approach to the analysis (Clarke et al., 2015), based on the assumptions of critical realism.

Two overarching themes were developed, Water Connectedness and Social Connectedness, each with sub themes described below (also summarised in Fig. 1.3). Water Connectedness included: immersion, relationship between human and water, blue space as therapeutic, embodiment, mindfulness/presence and psychological and physical strength. Social Connectedness included: connection with others, belonging/purpose and concepts of self identity. The MH and wellbeing benefits identified in swimmers' experiences run through both overarching themes of water and social connectedness, as connection with water, others, and oneself, appeared to be experienced as a transformative therapeutic effect.

3.4.1. Water Connectedness

Humans' connection with the water was described in many ways across all papers. Overall, it appeared to be comprised of a strong relationship between humans, water, and the places they chose to swim. People's experiences in the water were an immersive, submergent entanglement of human and non-human sensory experiences, an embodied experience, and becoming intimate with and closer to the water and themselves. Nature Connectedness is a well-established phenomenon (Howell et al., 2011) describing the intimate relationship that can exist between humans and the natural world, and which can positively impact MH and wellbeing. However, the term Water Connectedness is a better reflection of the findings in this review, as it captures the specific, watery aspect of nature that humans connect with, and this in turn shapes how they relate to and understand the rest of the natural world around them.

3.4.1.1. Immersion. As suggested in the literature, OWS is somewhat unique in its immersive nature. Immersion creates a full sensory experience for participants where they feel like they become a part of the natural world, or 'at one' with the water. This could feel truly wild, and difficult to describe or explain as people connected to something greater-than-human, the water, and wildlife forms in and around the water. This is not always present in other green and blue therapies, and such immersion appears to deepen the connection between humans and nature, which is proposed as a key factor influencing the positive relationship between blue space and health (White et al., 2020).

- *"Swimming in open water facilitated a deeper connection in comparison to walking in nature. When immersed in water, participants felt they were "part of it"" (Murray & Fox, 2021).*
- *"Many swimmers described how they felt part of the natural world when immersed in the sea." (Denton & Aranda, 2020).*
- *"Wild swimming is an intense multisensory activity, and full-body immersion in water may stimulate a unique nature engagement that is distinct to that experienced during other activities and forms of exercise." (McDougall et al., 2022).*

Connection between the land and sea-bodies has been seen as essential to the therapeutic accretion of OWS, as human bodies encounter non-human elements (Foley, 2017), which unites humans with that which is primordially wild within them (Hoare, 2013).

- *"… and connection to the more-than-human, for example, …... feeling of "being in a pod of dolphins" (Britton & Foley, 2021).*

This immersion extends beyond the water to the surrounding environments, whether a coastal landscape or an inland landscape which provides exposure to both green and blue spaces simultaneously.

- *"The lochs in which the majority of our participants swam tend to be surrounded by woodlands and vegetation, providing a combined experience of blue space, with a backdrop of green space" (McDougall et al., 2022).*

3.4.1.2. Relationship between human and water. Some described how regular OWS lead to a deepened knowing and understanding of the water, and surrounding physical and temporal environments, which was essential to the experience and identity of the swimmer.

- *"an 'authentic' outdoor swimming experience is tied into knowing the water, being in it in a sensual, engaged manner and appreciating the relationship between body and water" (Moles, 2021).*
- *"Participants connected with the temporal environment of nature – cycles of daylight, seasons and weather." (Murray & Fox, 2021).*

In knowing the water came an understanding of the risks of OWS and the need to take precautions. The risks differed across bodies of water. Inland environments provided some security for loch swimmers as more contained spaces without currents, however brought their own challenges such as less natural buoyancy. The cold water was cautiously approached by many swimmers, with regular swimmers developing a personal awareness of one's limits in the water, as well as rituals designed to protect against the risks of hypothermia or cold-water shock.

- *"Swimmers also discussed a growing awareness of their 'limits' as they became more experienced, often drawing upon incidents of overexposure to cold water or 'near misses" (McDougall et al., 2022).*
- *"The challenges included worries about initially getting in, panicking whilst in the water and struggling with managing the cold both during and after swimming" (Burlingham et al., 2022).*
- *"Participants also described pre- and post-swim rituals that aimed to minimise the risks of cold water, including route planning and following an efficient strategy of warming up, such as preparing warm drinks and clothes and easy access to a car" (McDougall et al., 2022).*

Despite being labelled as a risk, this internal and external awareness was seen in many ways as mindful as participants got to know oneself and the environment around them better. All participants reported a humbling respect for the power of the watery environment and saw this as an essential aspect of the embodied experience (Costello et al., 2019).

- *"Although noted here as a risk-mitigation technique, the need to listen to one's body and breathing aligns closely with mindfulness and meditation and exemplifies the close connection between risk and health benefits experienced during wild swimming" - (McDougall et al., 2022).*
- *"Respect for the power of the water" (Foley, 2017).*
- *"… the water is more in control than you are noting" (Britton & Foley, 2021).*
- *"… a finer attunement to risk … and a recognition of being in an environment that is both known and utterly unknown." (Foley, 2015).*

Research into other adventure sports indicates they can provide positive health and wellbeing outcomes (Denton & Aranda, 2020; Gass et al., 2012), as voluntary risk taking can help people face fears, accomplish self-actualisation (Lupton, 2013; Lupton & Tulloch, 2002), build self-esteem and enhance psychological resilience (Ewert & Yoshino, 2011).

For some, surrendering control to the elements was a metaphor for letting go, which soothed the body. This sense of letting go was enhanced by feeling buoyant and weightless, particularly in the sea water, as participants allowed the water to hold and support them.

- *"… a certain powerlessness and even a lack of control in swimming that they found soothed their body … finding a place to literally let the body go." (Foley, 2015).*

- *"When the movement is manageable the feeling of being rocked or lifted up and down by the water is enjoyable and offers a sense of being held" (Denton & Aranda, 2020).*
- *"This literal perspective shift afforded by the ability to float on one's back and look upward at the sky, while feeling weightless, can allow for a greater sense of embodiment and letting go …" (Britton & Foley, 2021).*

Previous work with war veterans suffering from post-traumatic stress disorder (PTSD), depression, anxiety, and stress, found physical feelings of buoyancy and weightlessness in open marine water activity to positively influence treatment outcomes, alongside other sensory experiences (Krpalek et al., 2020). Sensations of weightlessness have also been reported to enable a sense of freedom for people with physical impairments, enhancing self-concept and personal confidence (Carin-Levy & Jones, 2007).

Participants described a strong affinity and attachment to the place they swam, which became a refuge from everyday life to which they repeatedly returned, deepening their relationship to that place and to that body of water.

- *"As well as a connectedness from being in the sea, swimmers often swam in the same location and so developed a connectedness from a familiarity with a particular part of the sea." (Denton & Aranda, 2020).*
- *"Once in the water, a place affect emerged from the emotions and experiences of being there …" (Foley, 2017).*
- *Lochs are likely to be calmer and stiller than other blue spaces, such as rivers and the sea, where flow and tides are present … the still water surface was often referred to as 'glass'-like. Still conditions appeared to contribute to the mental health and well-being benefits previously discussed. Some participants found calm water conditions better for facilitating relaxation" (McDougall et al., 2022).*

The accretive therapeutic benefits from and appreciation for a specific place (White et al., 2010), can generalise to greater appreciation of other blue spaces, as people become ethically aware of water care, recognising the interconnectedness of environmental health and human health (Bell et al., 2018; Britton & Foley, 2021; Wyles et al., 2017).

3.4.1.3. Blue space as therapeutic. The watery space itself could be therapeutic; a place to take pain or grieve and heal, or a refuge from mental health problems. In some cases, it replaced medication, in others it became so essential to wellbeing that not swimming felt like a loss to wellbeing.

- *"… some saw their swimming practice as equivalent to a drug or medicine for their mental health" (Costello et al., 2019).*
- *"… personal histories of swimming helped them come to terms with loss, expressed through a physical act that helped fix emotional health connections in time and space." (Foley, 2017).*
- *"Many participants reported a positive impact on their mental health, including improved confidence and increased motivation. Some even described it as life changing" (Burlingham et al., 2022).*

With most studies reporting on the experiences of long-term, regular OW swimmers, it was suggested that OWS is an accretive practice, with wellbeing benefits increasing over time.

- *"Transformations also occurred in the mood of the swimmers as a result of their swim. It seemed that this was due to the capacity of being in the sea to be 'healing', 'resourcing', and 'a way to escape'. These transformations could be both immediate but could also 'accrete', as suggested by Foley (2017), as the embodied and emplaced activity of sea swimming has a deeper impact over time." (Denton & Aranda, 2020).*
- *"The happiness or 'buzz' that was experienced during loch swimming also extended beyond the swim itself. Some participants suggest these positive emotional responses are extended throughout one's day or even longer-term" (McDougall et al., 2022)*
- *Immediately after the swim participants described feeling both alive, energetic, and elated and feeling calm and relaxed. These changes in mood lasted for a few hours or into the next day(s)" (Burlingham et al., 2022).*

This supports a growing body of research which has investigated the value of natural blue spaces for MH and wellbeing. Simply being in blue spaces can support attention restoration and stress reduction (Hartig et al., 2014; Korpela et al., 2008; White et al., 2010) and improve depression (Dempsey et al., 2018). In a recent study by Throsby (2013) OWS was even likened to Prozac, appearing 'affectively transformative' for MH and wellbeing.

3.4.1.4. Embodiment. Embodiment describes a transition from the thinking mind to the feeling body.

- *"Through the action of swimming the swimmer's attention would get further drawn towards their body and away from other thoughts." (Denton & Aranda, 2020).*

Participants described how this fully immersive sensory experience made them finely attuned to the feeling of the water around them, the feelings in their body, and how these experiences intermingled to create an almost unified movement of body and water.

- *"When able to synchronise the movement of their bodies to the movement of the water this connection deepened …" (Denton & Aranda, 2020).*
- *"The body finds a rhythm; stroke, stroke, breathe. Everything is contained and produced in that repeated motion … Your sensory perceptions alter … distinctive for the water you are in." (Moles, 2021).*
- *"Particular qualities of water, especially the power/energy of waves, the feeling of waves breaking over the body, or the sensation of water pressure on the skin/body, were commented on." (Britton & Foley, 2021).*

Embodied practices involved deeply tuning into the body, engaging in breathwork and observing the environment around them, at times ritualistically before full immersion.

- *"Preparing for immersion often required developing an awareness of place through direct contact/embodiment practices, such as breathing exercises or observing the sea conditions (tide, wind, size of waves) from the beach before" (Britton & Foley, 2021).*

When exploring OWS, wellbeing is considered as emerging from an embodied and kinesthetic standpoint (Spinney, 2015; lisahunter, 2018). During moments of 'dysfunction' the body becomes the focus of one's attention (Leder, 1990), as it responds to the challenging environment by functioning in new, unfamiliar ways (e.g., in novice divers; Merchant, 2011). However, evidence suggests that sports requiring a high level of conscious body awareness can also involve 'intense embodiment' (Allen-Collinson & Owton, 2015); in such cases the body can become the focus of an individual's attention without the negative connotations of 'dysfunction'. Rather, the body emerges into consciousness as strong and capable. In OWS, swimmers may become intensely aware of their bodies during immersion, and subsequently both 'dys-appear' in moments of discomfort and 'eu-appear' during moments of intense embodiment (Zeiler, 2010). The state of total awareness that is achieved in these moments is referred to as 'flow' in the literature (Csikszentmihalyi, 1997) which research argues provides psychological benefits (Seligman & Csikszentmihalyi, 2000).

3.4.1.5. Mindfulness/presence. As well as experiencing embodiment, full body immersion led swimmers to experience moments of true mindfulness, as their minds were shifted to the present moment,

whether by choice or force.

- *"Many participants highlighted that loch swimming provided opportunities to be mindful and peaceful. Interestingly, some participants spoke of the notion of forced mindfulness, where the practice of loch swimming and the physical challenge of safely immersing oneself in cold water, forced the need to 'be present' (McDougall et al., 2022)."*

Time in the water profoundly impacted how swimmers perceived and managed their daily lives, by disrupting habitual patterns and offering participants a new perspective on their world. Whether in shock response to the cold water, the full sensory immersion, or the physical distance from everyday life, swimmers found themselves leaving their stressors at shore, connecting to their bodies and the present moment, and becoming completely absorbed in the flow of body in water. For some swimming was like pressing a reset button, with the chance to start afresh post immersion.

- *"… staying present and aware of the body in response to conditions, swell, current by using breath, relaxing and releasing tension …" (Britton & Foley, 2021).*
- *"… the physical practice of swimming as a respite from everyday stressors" (Costello et al., 2019).*
- *"Janet spoke of a more instantaneous mental relief as a result of loch swimming: 'If I'm having like a bad day or anxious about something then after the swim, that kind of disappears.'" (McDougall et al., 2022)*
- *"The interaction between swimmer and sea seemed to disrupt habitual perspectives and patterns are disrupted and this allowed a different, and refreshed way of seeing the world … Considering oneself as a part of something larger than oneself, rather than being at the centre, can helpfully offer a different perspective to one's life" (Denton & Aranda, 2020).*

For some, this culmination of presence, embodiment and connection with the natural world was even spiritual.

- *"… some of our participants also described their experiences in the ocean as spiritual, and as feeling at 'one with the water'" (Costello et al., 2019).*
- *"… a shared social identity among swimmers, something deeper than shared banter. This was experienced as unity and a common spirituality, even if people engaged in the occupation for different reasons" (Murray & Fox, 2021).*

Time spent in blue spaces has been called a 'rest bite', away from everyday stresses, anxieties, or disabilities, where wellbeing can be revived (Marshall et al., 2019; Wheaton et al., 2017; Wheeler et al., 2012). In increasingly urbanised lives, natural blue spaces offer an escape from over stimulating environments, and a place for quiet contemplation (Hartig et al., 2011; Throsby, 2013). Other sports such as cycling or surfing have already recognised how being physically active in a natural space at the same time as being connected to the present moment can benefit MH and wellbeing (Spinney, 2015; lisahunter, 2018). Scuba diving, another blue activity, shows promising evidence for reducing PTSD in war veterans, who learnt mindfulness skills which they later applied to their daily lives, improving relaxation and family relationships (Krpalek et al., 2020). Similar experiences and outcomes may be viable in OWS.

3.4.1.6. Psychological and physical strength. Swimmers developed psychological strength, as they learnt to navigate (largely) cold and changeable water, risks, and emotions (fear, anxiety, frustration, and excitement). This improved self-efficacy, resilience and personal mastery that extended into their daily lives.

- *"There seemed to be a psychological strength, derived from swimming, which helped in other areas of life. In this study swimmers described being more able to manage in their lives as a result of an increased sense of psychological resilience or confidence in themselves and their abilities as they had taken on the challenge of the sea" (Denton & Aranda, 2020).*
- *"… having the mental strength to face anything: "there's nothing you can throw at me now" [participant B] … "battling with the waves" enabled her to withstand emotional vulnerability (participant E)" (Murray & Fox, 2021).*
- *"managing to overcome these challenges seemed to be key to the positive impact of the course. Participants reported learning new skills, gaining greater understanding of the water and developing strategies for managing cold. Many described moments where they felt proud of their achievements. Over the course they reported increased confidence and enjoyment of being in the water … they reported being more able to manage unexpected challenges as a result of new coping strategies and a greater self-confidence." (Burlingham et al., 2022).*

OWS can serve as a resource for resilience (Nimrod & Shrira, 2016). Self-belief can develop from receiving encouragement from others or even vicariously through watching others perform an activity successfully (Bandura, 1977), so OWS groups may have the capacity to facilitate self-efficacy through not only personal mastery but also mentoring, vicarious experiences and persuasion (Costello et al., 2019). Surfers and swimmers have reported valuing the challenging nature of their blue space activities, uncovering hidden and unknown strengths within themselves which fed back into their daily lives (Denton & Aranda, 2020).

The open water also provided a place to maintain and restore health, ridding some of lingering ailments and promoting recovery from injuries. With the swimming population of the included studies being skewed towards older age, notably the open water acted for some as a mechanism for healthy ageing, assisting age related health issues and providing a lower impact activity with the physiological benefits of (most frequently cold) water (Knechtle et al., 2020). Although swimmers were not naïve to the negative impact cold water could have on one's physical health, largely the water appeared a place of restoration.

- *"In later life, the practice of swimming as maintainer and restorer of health (re)emerged" (Foley, 2017).*
- *"They also reported improvements to physical health which included reduced joint pain and improved sleep." (Burlingham et al., 2022).*
- *"Some participants suggested that regular loch swimming assisted in age-related health issues. In some cases, this was related to feeling able to exercise again despite health and age-related issues limiting their ability to take part in other forms of exercise. Phil, who had recently suffered a series of heart attacks, suggested that swimming offered an alternative form of physical activity to replace other exercise that was too challenging for him during his heart attack recovery period." (McDougall et al., 2022).*
- *"Furthermore, some participants believed that regular loch swimming 'eased' several menopausal symptoms. Rachel was unsure if this easing was related to the physical or mental impact of loch swimming" (McDougall et al., 2022).*

OWS may take away the barriers that age and mobility issues cause for engagement in physical activity, allowing a different view of ageing or disabled bodies (Bhatti, 2006) and a broader range of people to enjoy the MH benefits of physical activity (Richardson et al., 2005; Rosenbaum et al., 2014). Unhealthy land bodies can become transformed in open water (Throsby, 2013) challenging people's perceptions of their bodily burdens and allowing an inclusivity and acceptance in exercise which other sports may not permit (Foley, 2015).

3.4.2. Social connectedness

OWS brought people together, offering a sense of belonging, purpose, and identity, which are important for health and wellbeing (Haslam et al., 2009; Morris, 2021).

3.4.2.1. Connection with others. Participants appreciated the opportunity for short positive interactions with likeminded people, within and outside of the water, whilst some enjoyed the company of others without the need for words.

- *"People talked between groups, and it was common to catch another swimmer's eye and smile as you stumbled pulling on a wetsuit" (Moles, 2021).*
- *"Tracy, suggested that whilst she enjoyed the social element of swimming, she preferred swimming with people who were not overly talkative and allowed her to enjoy her own experience" (McDougall et al., 2022).*
- *"This type of unique interaction is described by Kevin: 'There is a bond there when you're swimming that isn't necessarily through talking' (Kevin)" (McDougall et al., 2022).*

Such moments offered stimulating conversations, social support, or light-hearted banter.

- *"a strong network of social support beyond members' shared morning beach ritual." (Costello et al., 2019).*
- *"… lovely banter among swimmers was experienced through helping strangers: "put on wetsuits" and "helping women put their bras on" to letting strangers know the mood of the sea" (Murray & Fox, 2021).*

Whether swimming alone or actively engaging in conversation, people appreciated the presence and support from others. By being together, bodies in water, there was an intermingling and intimacy different from normal social boundaries.

- *"Personal space is eroded by the flow of the water, the power of the waves herds bodies together, and uneven rocks and pebbles on entry and exit make people stumble into each other." (Moles, 2021).*
- *"… the sense of other bodies being alongside seemed to impact on the swimming experience. In more challenging conditions there was a feeling of being in it together which engendered a motivation that would be difficult to find without an ally equally prepared to take the plunge." (Denton & Aranda, 2020).*
- *"They also valued finding like-minded people, who were supportive, and enjoyed the shared experience" (Burlingham et al., 2022).*

Group based participatory activities are known to significantly contribute to healthy ageing (Haslam et al., 2016), dementia (Ward et al., 2021), MH (Stickley et al., 2018), mood disorders (Sims-Gould et al., 2017) health, and wellbeing (Ford et al., 2012). Social prescribing (Dayson, 2017; Mossabir et al., 2015) is based on this premise, where patients benefit from community-based support groups. However, Costello et al. (2019) suggest that focusing on formalised groups may overshadow the potential benefits that informal, self-sustaining groups can offer, such as those seen in OWS. The mere presence of others in blue space, without active social 'engagement' may be enough to have a positive social impact on some people (Bell et al., 2015).

3.4.2.2. Belonging/purpose. Older swimmers particularly valued having routine with their daily or weekly swims. Some would attend even if unable to swim, indicating a sense of belonging or community that was valued even without swimming.

- *"Meeting people and swimming with them can offer moments of togetherness and belonging that are significant (both in the moment and often extending beyond it)." (Moles, 2021).*
- *"For many, this provided a backbone to their day. The swim, or the sea, gives purpose to any conversation with topics discussed often the same. It perhaps gives an easy way of being with others as it requires little more than they want to be in the water" (Denton & Aranda, 2020).*
- *Many participants spoke of post-swim activities, which were often prearranged as part of a weekend swim. The post-swim culture was highlighted regularly as an important component of the loch swimming experience … Many participants suggested that the social component of their loch swimming experience outweighs the importance of the swim itself." (McDougall et al., 2022).*

These findings corroborate the conceptual understanding of the importance of a purposeful and meaningful existence for all ages (Baumeister et al., 2013; Slade, 2010) and for healthy ageing (Sims, 2017). Structure and routine are seen in Foley's (2017) work as the mechanisms through which the accretive therapeutic benefits of OWS occur, expanding the notion of routine from an individual perspective to a community-based perspective of commitment to a group, with even the mere perception of social support being found to offer people an indication of being loved and valued (Stewart & Clarke, 1995).

Although some swimmers had concerns about being excluded or judged for choice of swim wear or swimming prowess, for many swimming felt like a place where you could come exactly as you are, without judgement, and feel acceptance regardless of age, gender, body shape or swimming style.

- *"There were some participants, however, who reported having anxiety about being part of a group, as a result of feeling nervous about meeting new people, discomfort of being in a swimming costume or fears of being less competent." (Burlingham et al., 2022)*
- *"Within the club in this study, as with other sea swimming locations, there was an acceptance of people that want to swim in different ways; that the vigour of swimming may change as a result of size, age or gender" (Denton & Aranda, 2020).*

Positive relationships are key to people continuing exercise (Bauman et al., 2012), so given the known importance of exercise for MH and wellbeing (Richardson et al., 2005; Rosenbaum et al., 2014) a huge advantage of OWS is the inclusivity of different genders, ages, and body types (Throsby, 2013). OWS may however exclude people who are not competent swimmers, people from lower socio-economic backgrounds (who are perhaps less likely to live near clean accessible natural water) or certain ethnic groups who may not have learnt to swim (Bell et al., 2019; Burdsey, 2016).

3.4.2.3. Concepts of self and Identity. The immersive, natural experience could have powerful effects on people's sense of self and identity. Whether this involved remembering childhood memories or creating a new sense of self. Over time, repeated experiences in open water seemed to become a strong aspect of the swimmers' identity and shared values, both as individuals and as a community.

- *"When being in the sea they felt the same enjoyment and freedom as they had as a child" (Denton & Aranda, 2020).*
- *"The interaction between the sea and the swimmer resulted in changes in swimmers' experience of themselves. These transformations ranged from identifiable stages within a swim, to longer term as a result of regular swimming" (Denton & Aranda, 2020).*
- *"Respect is earned through the embodiment of these values and ideals of outdoor swimming … reminds every one of their shared values and motives." (Moles, 2021).*
- *"Janet also provided an example of how immersion in water can promote fun and playful behaviours, which may be explained by immersion in water evoking childhood memories and childlike behaviours" (McDougall et al., 2022).*

This resonates with previous research which found a sense of personal growth and meaningfulness to be key themes of wellbeing (Pritchard et al., 2020), with the open water perhaps even triggering a

type of memory therapy as people reflect with a smile on the past (Coleman & Kearns, 2015). Similarly, in another study in open water space, wellbeing was found not to come from following a list of activities, but instead from a sense of coming home to themselves through the process of 'losing themselves to a new way of dwelling and being' (Healey-Ogden & Austin, 2011, p. 93), finding aspects of the OWS space, such as nature, spirituality, creativity, and play, to significantly foster wellbeing. Through engagement with open water, people can formulate an identity consistent with their values, which may involve shedding societal expectations and instead finding one's true purpose (Murray & Fox, 2021; Wicks, 2005).

4. Discussion

There is a range of quantitative, and qualitative evidence that exists for the MH and wellbeing benefits of OWS. Quantitative evidence suggests that OWS can lead to improvement of mood, reduction of MH symptoms, and improved wellbeing. Qualitative findings described the multidimensional ways in which OWS was experienced as a positive, enriching process supporting MH and wellbeing and offered new ways of understanding these experiences, for example through embodied-kinesthetic approaches. It is important to note that in answering research question two, and critically appraising the research, the quality assessment indicates there are significant limitations, particularly in the quantitative research, so conclusions should be drawn carefully.

Overall, there was a clear finding that OWS allows connection with oneself, the water and others, and this was experienced as offering many benefits to MH and wellbeing, directly, indirectly, and reciprocally. It is interesting to note how a single experience – OWS – could incorporate so many factors known to support MH, and that, when clean and accessible, OWS offers a free resource for many that transcends gender, age, and body types. Regardless of why people initially chose to swim, they would still experience benefits across other domains, as OWS acted as a continuous affective and emotional practice, co-producing an 'embodied and emotional therapeutic accretion' (Foley, 2017, p. 49).

This review demonstrates how MH and wellbeing can be understood through a multidimensional lens, and that the impact of OWS may act on various pathways leading to positive changes to self, health, and wellbeing (Britton & Foley, 2021). This is in line with positive psychology views, which suggests that MH treatments should look beyond mental illness within an individual and explore ways of contributing to 'the fulfilled individual and thriving community' (Seligman & Csikszentmihalyi, 2000, p. 5). In 2008 the New Economics Foundation identified five ways to improve wellbeing (connect, be active, take notice, learn, and give); an idea now reflected in many government health strategies (Denton & Aranda, 2020). This review indicates how OWS may offer something important relevant to each of these five points, and as such could be a sound strategy for improving wellbeing in the general population. Furthermore, in line with Todres and Galvin (2010) existential model of wellbeing, OWS may provide both 'mobility' (a sense of adventure, excitement and vitality, and a connection to existential possibilities beyond day-to-day life) and 'dwelling' (a sense of being at home through a deep connection with the water, the blue space, and others) which together entwine to improve wellbeing (Galvin & Todres, 2013).

As this review demonstrated, OWS engenders care and connection for blue spaces and recognition of the importance of blue spaces for our own wellbeing. Such experiences are likely to lead to growing concern about how the natural world is cared for in return (Bell et al., 2015), with evidence that a stronger relationship between humans and nature is positively associated with pro-environmental behaviours (Mayer & Frantz, 2004; Pritchard et al., 2020). It is possible that OWS leads people to become more 'ecocentric' (Brymer & Oades, 2009), as immersion in the water leads to a deepening knowledge and intimacy with nature which may in return increase our wish to care for nature (Burls, 2007). Growing such reciprocal relationships is essential in transforming how people relate to and care for natural spaces, and in the context of the climate and biodiversity crises, such 'inner' and 'outer' transformations may be an essential part of society's response to mitigating disasters.

It is also possible that growing one's nature connectedness in this way may indirectly support people who feel distress about the global crisis ('eco-distress') which is believed to be distress felt in response to environmental damage as well as climate change (Hogg et al., 2021; Doherty et al., 2021). Although we cannot infer causation from qualitative research, directionality is suggested as the literature describes changes occurring over time (Foley, 2017), however far more research with varying research designs is required in this area to better understand the ways in which nature connection, immersive blue space activities, and environmental concern and care are interrelated.

4.1. Future directions and clinical implications

Most of the quantitative studies had a high risk of bias, relying on self-reported or unvalidated measures. Dropout rates were often high or unexplained, results were somewhat mixed, and most effect sizes (when reported) were small. A difficulty for quantitative studies is lack of comparability, as MH and wellbeing can be so broadly defined, and each research team studied these dimensions from a different perspective, making comparisons and summaries across studies challenging. This review has thus shown that although quantitative research exists and offers an indication of potential psychological benefits of OWS, there is still a lot of work to be done. Future researchers should consider using standardised measures of MH and/or wellbeing which allow for more generalisable findings. Van Tulleken's (2018) single case study was a good example of how this could be done, however it could have been strengthened by using reliable and valid measures of MDD and anxiety instead of DSM-5 criteria. Future studies may benefit from being longitudinal and comparative, as this allows for the comparison of both within- and between-groups differences.

There were also limitations in terms of the quality of the qualitative studies included in this review. The interdisciplinary nature of the published studies may have explained some of the variability in how studies were reported. Overall, the review indicates a need for clearer study aims, and methodological detail. Another limitation of the literature overall is that most qualitative papers engaged with regular swimmers, who were already familiar with OWS; this leaves questions about the type of person who may choose to engage in OWS and how this affects conclusions drawn from the work. It also means we fail to gain an understanding of how novice swimmers experience OWS. It may be interesting to capture the experiences of new open water swimmers also, particularly ones engaging in the blue activity for MH and wellbeing motivated reasons.

If this was to be seen in future years as a potential response to clinically significant issues of MH and wellbeing, there are numerous barriers standing in the way of integrating OWS into mental health care. The obvious barrier is the cleanliness and accessibility of OWS; progress may need to be made to the cleaning of waterways and open water spaces before more formal OWS interventions could be conducted. Secondly, OWS lessons may need to be held to help people adjust to the outdoor environment and support people who are lacking in the confidence or skills to engage in the activity. From the studies which provided demographic information it's clear that OWS lacks diversity. The present piece cannot draw conclusions as to why this may be, however, it is worth considering the cultural context of where OWS is most common, and how this might link to access to blue spaces (Haeffner et al., 2017).

4.2. Limitations

The scoping review protocol underwent several amendments as stated; however, this was done in response to a growing understanding of the research area and is encouraged in the scoping review literature (Pollock et al., 2021). These updates were transparently discussed

throughout. With large, detailed qualitative papers found, it may have been beneficial to focus on either quantitative or qualitative papers to allow greater analysis and more inference to be made from the papers which is a limitation of a scoping review (Lockwood et al., 2019; Pollock et al., 2021). This area may benefit from a more detailed qualitative review being conducted next.

5. Conclusions

In summary, open water swimming offers people an alternative way to better know their surroundings, themselves, and others. Through an interweaving of people and nature, swimmers are offered a new sense of being and belonging. Blue spaces are an entanglement of experiences involving embodiment, mindful presence, surrendering, courage and community, holding different associations and meanings for everyone, and yet binding people together through a new form of connection. Everyday momentary experiences in blue spaces offer a refuge from daily life, and repeated experiences build towards a therapeutic accretion which for some may sustain mental health and wellbeing across a lifetime. Despite the compelling evidence, a large portion of our blue spaces in England are currently unswimmable due to degraded and polluted waterways, with a lack of safe and clean water spots available for swimmers and bathers. However, emerging research highlights the reciprocal relationship that exists between human and planetary health, offering the promise that as humans spend more time enjoying nature, they may want to care for nature more in return. Such findings require further research and exploration as a possible resource for mental health services, however the beginnings of this research offer a clear message to us – if we wish to care for our own health we must also protect the health of our wild and precious blue spaces, entering into a relationship of reciprocity with nature which allows both humans and the planet to live well.

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