

STUDENT FEEDBACK FORM

This section details the *extent* to which the assessment criteria are demonstrated by you, which in turn determines your mark. The marks available for each category of skill are shown. Lecturers will use the space provided to comment on the achievement of the task(s), including those areas in which you have performed well and areas that would benefit from development/improvement

Generic Assessment Criteria	Marks available	Marks awarded
1. Engagement with Literature Skills		
	20	
2. Knowledge and Understanding Skills		
	20	
3. Cognitive and Intellectual Skills		
	30	
4. Practical Application Skills		
	20	
5. Transferable Skills for Life and Professional Practice		
	10	

Assessment Mark (Assessment marks are subject to ratification at the Exam Board. These comments and marks are to give feedback on module work and are for guidance only until they are confirmed.)	Late Submission Penalties (tick if appropriate)		%
	Up to 1 week late (40% Max)		
	Over 1 week late (0%)		

TABLE OF CONTENTS

<u>AN INVESTIGATION OF OUTDOOR SWIMMING AND REPORTED HEALTH BENEFITS TO UNDERSTAND POSSIBLE MOTIVATIONS BEHIND THE INCREASING NUMBER OF PEOPLE COLD WATER SWIMMING</u>	<u>2</u>
INTRODUCTION	2
PSYCHOLOGICAL BENEFITS	6
PHYSIOLOGICAL BENEFITS.....	8
CONCLUSION	11
<u>REFERENCES.....</u>	<u>12</u>

An investigation of outdoor swimming and reported health benefits to understand possible motivations behind the increasing number of people cold water swimming

Introduction

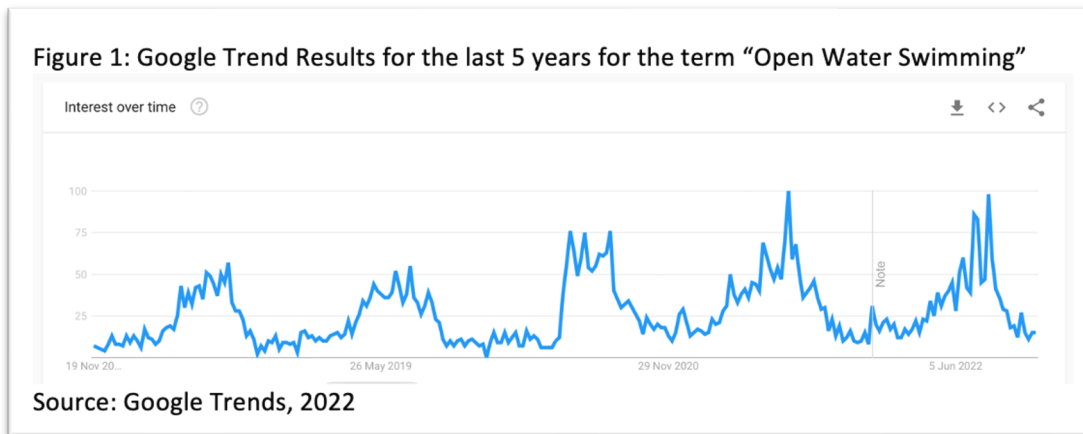
Swimming in natural settings has seen a resurgence since the Covid-19 pandemic as pools remained closed and people elected to take their exercise outside and into nature (Jenkins *et al.*, 2021). Long before the pandemic, the Romantic poets wrote about the beauty of wild swimming. Lord Byron, born with a club foot, was regularly seen swimming in the lagoon and canals of Venice. His account of a marathon three hour and forty-five minute swim from Venice Lido to Santa Chiara via the Grand Canal in June 1818 has been preserved in his letter of 21st February 1821 to “Mr Murray” (Byron, 1821). Prior to this, in 1810 Byron had succeeded in swimming across the “Hellesport”, a challenging 5km stretch of tidal water separating Europe from Asia, now known as the Dardanelles (Jarvis, 2015). With his achievements at both Hellesport and Venice, it is possible that he could be simultaneously the most famous yet unrecognised outdoor swimmer of the last 200 years.

In more recent years, the popularity of outdoor swimming has been growing steadily as the benefits of aquatic environments, or “blue spaces”, have become better known and accepted (Geneshka *et al.*, 2021). In the BlueHeath 2020 project, the term “blue spaces” was comprehensively categorised into “Urban Inland”, “Rural Inland”, “Urban Coastal” and “Rural Coastal” to make a distinction between the types of blue spaces found in each setting type (BlueHealth, 2020). The term “blue mind” and title of the book by marine biologist Wallace J Nichols, is a concept used to describe the meditative state experienced by some individuals when exposed to blue spaces (Nichols W, 2018). Ulrich (1981) attributed this state to altered psychophysiological status in alpha waves, heart rate and emotion (Ulrich, 1981). This state of calm may be attributed to one or many direct psychological benefits. Alternatively, a heightened sense of peace may be as a result of intrinsic motivation whereby an individual considers the act of outdoor swimming to be an integral part of who they are as a person (Deci and Ryan, 2017).

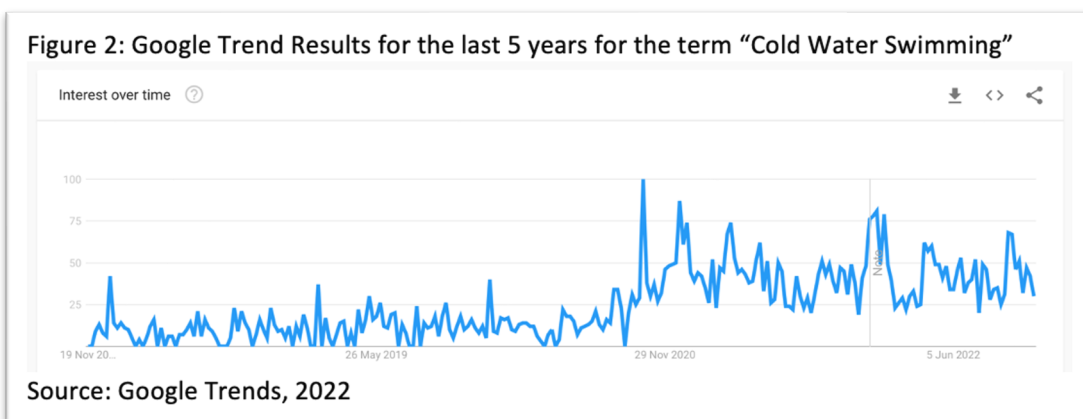
According to the 2018 Swim England Swim Census, 7.5m people swam in blue spaces (Swim England, 2019). The 2021 “Trends in Outdoor Swimming” report estimated the number of individuals participating in outdoor swimming in the UK to have increased by between 1.5 to 3 times between 2019 and 2020. This increase was largely attributed to the Covid-19 pandemic with 1 in 5 people surveyed stating the closure of their regular indoor pool as their reason for moving to outdoor swimming options. Interestingly, it is women outdoor swimmers whose numbers have increased, up 15% compared to 2017 numbers (2017, 50%; 2018, 55%; 2020, 65%) with 67% of all outdoor swimmers in the 2020 survey aged between 40 and 60 (2017 mean for females: 47.7, males 49.6 compared to 2020 mean for females: 49.8 and 53.2 for males) (Outdoor Swimmer, 2021).

The term “outdoor swimming” describes a variety of venues from outdoor pools or lidos to more natural locations such as the sea, lakes and rivers (Massey *et al.*, 2022). Outdoor swimming can also be classified into a number of different categories: open water swimming which tends to refer to organised swimming events such as marathon swimming; wild swimming ie swimming in often remote natural settings; and winter, chill or cold-water swimming (Outdoor Swimmer, 2021). Typically, outdoor pools are only open through the summer months, closing over the cooler months forcing hardier swimmers to seek out the alternative swim settings which nature provides.

Social media and the internet have also both played their part in promoting and making outdoor swimming locations more appealing. The Instagram hashtag #wildswimming currently has 672,929 followers, with a feed packed with perfectly posed images of swimmers delicately wading into a multitude of stunning locations (Instagram, 2022). Figure 1 below illustrates Google Trends peak interest data for the last five years for the term “outdoor swimming” revealing peak interest in the term in July 2021 and August 2022 (Google Trends, 2022b).



A similar search using the term “cold water swimming” highlights the emerging trend (figure 2) with peaks in interest in December 2020 corresponding with the second UK Covid-19 lockdown (Google Trends, 2022a).



Looking beyond social media trends however, there appears to be a wider, less superficial movement emerging as increased numbers of people of all ages and abilities start to discover the physical and mental uplifts associated with year-round outdoor swimming (Knechtle *et al.*, 2020).

With a UK average coastal sea surface temperature of 11.9°C in 2020 (Kendon *et al.*, 2021), most water around the British Isles are cold enough to induce cold water shock (Royal Life Saving Society UK, 2022). Inland water temperatures have greater variability ranging from to zero degrees over winter up to mid-20°C in summer months. This means that most UK outdoor swimming falls under the “cold” or “chill” swimming definition (Griffiths, 2022). Many organised groups have formed,

specifically dedicated to the activity, such as The Outdoor Swimming Society (The Outdoor Swimming Society, 2022), Beyond Swim (Beyond Swim UK, 2022), Chill UK (Chill Therapy CIC, 2021), and Chillswim (Epic Events Ltd, 2022) which offer paid access to supervised wild swim sessions at designated locations and catering for the specific needs of recreational, therapeutical or performance swimmers. By contrast, the Bluetits Chill Swimmers help facilitate free, informal swims, bringing together a “flock” for like-minded individuals of all ages, shapes and abilities. Formed in Pembrokeshire in 2014, the Bluetits community is free to join and welcomes anyone with an interest in chill swimming to participate as often as they wish either by supporting from the shore or taking to the water. The group ethos is: “fun, trust, inclusivity and Challenging our Limits, Together” (The Bluetits, 2022). As a self-confessed Bluetit, the author is able to confirm from personal experience that swims take place in beautiful locations; include conversation with strangers and friends; involve copious amounts of silliness; a simple dip or more strenuous swim dependent on your ability or preference on the day and back on dry land there is always a warm drink and chat for anyone wishing to stay.

In order to understand the growing phenomenon of cold water swimming in the UK (Outdoor Swimmer, 2021), it is necessary to explore what motivates increasing numbers of people to willingly immerse themselves in cold water, in many cases all year round, an action many people would consider to be a particularly unpleasant experience. Motivations could be health related, either or both physiological and psychological in nature (Knechtle *et al.*, 2020); whereas for others it may be as simple as the thrill of training for a cold water challenge (Massey *et al.*, 2022).

Cath Pendleton, the “Merthyr Mermaid”, is an outstanding example of the power of cold water swimming on motivation and mental strength. Through her discovery of a love of swimming long distances in very cold environments, belief in her ability grew and through a process of progressive self-efficacy (Bandura, 1997), she was able to progress from being a recreational swimmer to a 2km open water swim and ultimately achieving the accolade of being the first person to swim an ice mile inside the Antarctic circle (BBC One, 2022). This same strength of mind is observed in every cold water swimmer who challenges themselves to enter the water in all weathers

and temperatures. It is also possible however, that rather than self-regulation (Deci and Ryan, 2017) the mental resilience demonstrated is as a result of improved mental and physical health and wellness.

Psychological Benefits

Mid-life, the life stage which captures the largest proportion of UK cold water swimmers, is also the most vulnerable life stage for depression. Gondek et al (2022) identified the diminishing quality and quantity of leisure time in mid-lifers who are likely to be subject to the conflicting demands of children and aging parents at the same time. This, they speculate, may result in poor mental health (Gondek *et al.*, 2022). Alongside the degenerative effects of aging and progression of chronic pain and age-related health conditions (Hazell, Smith and Jones, 2019), this may provide an insight into why over two-thirds of the outdoor swimming population is aged 40-60 as they seek distraction and escape from their daily burdens.

A review of the literature to determine the strength of evidence for mental health benefits of cold water swimming on different populations revealed a lack of high-quality studies specifically associating cold water swimming with alleviation of adverse psychological conditions. One qualitative web survey of 722 cold water swimmers by Massey et al (2022) reported a 44.32 times higher probability of improved mental health in those participating in cold water swimming than those not, though no specific causality was found (Massey et al., 2022). Limitations of this particular study include the absence of age data meaning it is not possible to relate the findings to the largely middle aged cold water swimming demographic who are also those most likely to suffer with psychological conditions. At the other end of the research spectrum, the frequently cited study “Open water swimming as a treatment for major depressive disorder” (van Tulleken *et al.*, 2018) presented evidence from a single case.

The remaining studies reviewed reported a number of different psychological benefits. A small qualitative POMS (Profile of Mood States), controlled study of 64 undergraduate students by Kelly and Bird (2022) concluded that even a single 20-minute session of cold water immersion could significantly increase “vigour” and

“self-esteem” sub scales and reduce negative mood state in the intervention group. This effect was achieved through cold water immersion rather than the action of swimming in cold water (Kelly and Bird, 2022) suggesting a 20 minute cold water dip could be as effective as a swim. As this involved University students, the findings may not be directly comparable with the middle-aged swimming population who make up 67% of all outdoor swimmers. However the findings are useful and good news for less confident swimmers who will be gaining equivalent positive boosts to mood state from “dipping” to those who engage in more active swimming.

Depression is a condition commonly associated with negative affect, particularly where self-determination theory basic psychological needs of autonomy, competence and relatedness are unsatisfied (Deci and Ryan, 2017). This aligns with the findings of Handling *et al* (2002) which identified: “self-perceived social isolation” (relatedness) which included “lack of companionship”, “feeling left out”, “feeling isolated from others” and “feeling lonely”; along with poor general health (autonomy) as predictors for depression in middle age (Handling *et al.*, 2022). The very act of intentionally swimming in a cold environment requires a degree of competency in order not only to undertake the skill of swimming but also to risk assess and maintain awareness of the environment, surroundings, potential dangers and body temperature. It is possible therefore, that for some, cold water swimming serves as a mediator for meeting the basic psychological needs by restoring a sense of having control over their own actions and choices; being able to participate in activities that promote happiness and accomplishment and which include a sense of social inclusion and community (White *et al.*, 2021). One qualitative study of five cold water swimmers undertaken in Ireland reported that the pass-time also allowed them to take time for themselves (autonomy); diminished negative emotions; and made them feel connected to nature, socially and to their true self (relatedness) (Murray and Fox, 2021). Using phenomenological analysis of interviews with six regular sea swimmers, Denton and Aranda (2020) were able to identify three states associated with sea swimming: “transformative”, “connecting” and “re-orienting”, all of which were positively associated with improved mental health and wellbeing (Denton and Aranda, 2020) and similarly align with Deci and Ryan’s basic psychological needs. Clearly, based largely on subjective and anecdotal evidence, cold water swimming has a positive effect on mood state however high quality, objectively measured, large

cohort studies remain scarce. The findings of a feasibility study looking at the effectiveness of two weekly sessions cold water swimming on general well-being and depression in psychiatric patients (Hjorth *et al.*, 2022) are eagerly awaited and will add to the existing literature.

Physiological Benefits

In 1989, the National Aeronautics and Space Administration (NASA) set out a distinction between “acclimatisation” (adaptation to a number of environmental factors such as changes of seasons and climatic changes) as opposed to “acclimation” which is the adaptation to a particular or specific environmental factor (Kaciuba-Uscilko and Greenleaf, 1989). Physiological changes following voluntary exposure to cold water are fascinating and have been extensively investigated (Espeland, de Weerd and Mercer, 2022). Whilst psychological research tends to be limited to qualitative research, physiological research has the benefit of being able to directly monitor physiological changes arising from an intervention such as cold water immersion. Despite this, much of the existing research is limited in the participants and methods selected, often focussing on young, healthy, elite or cold-adapted athletes. The body’s cold shock response to full body exposure to water sub 14°C is in an initial gasp reflex, rapid, uncontrolled breathing (hyperventilation), increased heart rate (tachycardia) and elevated blood pressure (hypertension). A range of research exists exploring and recording the effects of the cold water shock response; the role of mitochondria in maintaining core body temperature (thermoregulation), insulin resistance and obesity; the cardiovascular system; the respiratory system and the immune system.

Mitochondria are responsible for the process of converting energy in the form of blood glucose or lipids in the blood stream into ATP, the form of energy used by cells. When exposed to cold, an acclimated body will boost metabolic processes in order to maintain temperature homeostasis (thermoregulation) (Espeland, de Weerd and Mercer, 2022) a process which demands extra energy to be produced rapidly to stave off hypothermia. Brown adipose tissue (BAT) is rich in mitochondria, playing a key role in thermoregulation though commonly believed to account for no more than approximately 150ml of total body fat (Carpentier *et al.*, 2018). When exposed to

cold and in the absence of sufficient immediate energy, the body is able to recruit white adipose tissue (WAT) which is low in mitochondria through a process of “beiging”, increasing the number of mitochondria in WAT to intensify the number of metabolically active adipocytes to facilitate glucose and lipid metabolism required for thermoregulation (Peres Valgas da Silva *et al.*, 2019). Research has established that due to its efficient metabolism of glucose, BAT has a positive effect on insulin resistance and obesity. In their 2019 review, Peres Valgas da Silva *et al.* found that cold induced thermoregulation required greater glucose uptake than all other tissues combined, upregulating insulin sensitivity and glucose metabolism to meet increased mitochondrial activity in BAT. Due to the stimulus that cold water has on BAT and the conversion of WAT to metabolically active “beige” adipose tissue, the potential for cold water swimming as a therapy for middle-aged related metabolic conditions such as obesity and Type 2 Diabetes Mellitus is the subject of increasing research (Kusminski and Scherer, 2012; Gibas-Dorna *et al.*, 2016; Peres Valgas da Silva *et al.*, 2019; Theodorou and Kabir, 2019).

Reviewing the literature relating to the effects of cold water swimming on the cardiovascular system revealed studies simultaneously reporting positive effects whilst urging caution for individuals new to cold water swimming (Manolis *et al.*, 2019). Recorded benefits are “mild oxidative stress” mediating improved antioxidant protection against inflammation, a precursor in cardiovascular diseases (coronary heart disease, atherosclerosis, stroke, thrombosis) (Saltykova, 2019). Cold water swimming also confers the same cardiovascular benefits for patients with skeletomuscular conditions whilst enabling aerobic exercise due to weightlessness from being in water (Manolis *et al.*, 2019). Stressors associated with hyperthermia and cold water shock such as vasodilation and constriction due to thermoregulation; tachycardia from the release of adrenaline and hyperventilation; and elevated blood pressure due to increased cardiac output all pose considerable health risks particularly for those with pre-existing conditions of the heart or circulatory system (Ikäheimo, 2018). Any or all of these responses could lead to loss of consciousness and death by drowning (Espeland, de Weerd and Mercer, 2022). To summarise the evidence reviewed, clearly there are cardiovascular benefits to be derived from cold water swimming but only where the participant has been adequately acclimated and

in the absence of pre-existing cardiovascular conditions prevalent in middle-age (NICE, 2022).

Infections of the respiratory system, specifically upper respiratory tract infections such as the common cold, are allegedly lower in cold water swimmers. This was the finding of one study where cold water swimmers were partnered with an indoor swimmer (Collier *et al.*, 2015) whereas Tipton *et al* (2017) were more sceptical, pointing out that existing cold water swimmers may have a preconception of the benefits of their chosen sport which could influence their responses and recollection of illnesses (Tipton *et al.*, 2017). Manolis *et al*'s 2019 review referenced epidemiological data evidencing a 40% reduction in upper respiratory tract infections in acclimated swimmers exercising in unpolluted marine water (Manolis *et al.*, 2019). Infections are associated with compromised immune function, a consideration when swimming in polluted water and concern for 60% of swimmers (Caren, 1981; Outdoor Swimmer, 2021). It would therefore be logical to expect to see specific reference to immune system status as part of the method for studies investigating respiratory tract infections in cold water swimmers. Despite the common belief that cold water swimming boosts the immune system, this appears to be largely anecdotal and it is necessary to conclude there is insufficient evidence to confirm any benefit of cold water swimming on the immune system. This should be an area for further research and would be especially relevant for common autoimmune conditions such as rheumatoid arthritis, with a typical onset age between 30 and 60, to quantify whether any physiological benefits on the immune system exist.

It is evident that cold water swimming has the potential for physiological benefits. A lack of research, specifically the benefits for middle-agedness and aging generally, means it is not possible to map all benefits to the 40-60 year old demographic however improved mitochondrial activity, insulin sensitivity and glucose metabolism are significant mitigants against chronic metabolic conditions (Espeland, de Weerd and Mercer, 2022). When carefully acclimated, upregulated antioxidant protection reduces systemic inflammation. Chronic systemic inflammation is a precursor for autoimmune disorders, cancer, neurodegenerative disorders, cardiovascular disease, diabetes mellitus, chronic kidney disease (CKD) and non-alcoholic fatty liver disease (NAFLD) and autoimmune and neurodegenerative disorder. In reducing

inflammation through improved antioxidant protection, (Furman *et al.*, 2019) the risks of chronic inflammatory conditions reduced though as already identified, age and condition specific research is needed to better understand the effects of cold water swimming in aging adults generally.

Conclusion

An interrogation of the popularity, trends and demographics for cold water swimming has revealed a cyclical yet growing trend, particularly amongst women, with the majority of swimmers are between the ages of 40-60. This population is likely to be time poor as they juggle work and family demands and their physical and mental health may become impaired as a result. Physiological benefits exist and contribute to the satisfaction of basic psychological needs of autonomy (mobility, mental capacity and resilience); competence (cold tolerance and the ability to swim or maintain body position in cold water); and relatedness (social and/or environmental connection). Having experienced the intangible benefits of cold water swimming first hand, the author now concludes that their initial exhilaration on entering the water followed by a deep state of relaxation, mental escape and oneness with the water are deeply rooted in the pastime's satisfaction of basic psychological needs (Ryan, Kuhl and Deci, 1997). Drowning, hypothermia and cardiovascular event risks aside, cold water swimming does appear to be a positive experience for anyone motivated to participate.

Word Count: 3295

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