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A WEB-BASED, HEALTH PROMOTION TOOL TO COMBAT  
SEDENTARY BEHAVIOUR AND ASSOCIATED HEALTH  
CONDITIONS IN THE WORK ENVIRONMENT

Degree Programme in Health Care (Welfare Technology)

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## A WEB-BASED, HEALTH PROMOTION TOOL TO COMBAT SEDENTARY BEHAVIOUR AND ASSOCIATED HEALTH CONDITIONS IN THE WORK ENVIRONMENT

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The subject of this research and development project was to detail the design philosophy and implementation of a technological health promotion product. This web-based, health promotion product aims to proactively combat sedentary behaviour (and its associated health conditions) in the office environment. The basic idea of this web-based tool was to disseminate evidence-based, therapeutic exercise guidance to healthcare professionals delivering a workplace exercise and education service (identified as PowerBreak). Utilisation of the online environment for dissemination was desirable, as the PowerBreak service shall be provided throughout varying locations by a range of physiotherapists. Additionally, an online, single point of reference for these guidelines ensures evidence-based practices and consistency in the delivery of the PowerBreak service.

The theoretical component of the research outlined the problem of sedentary behaviour in the workplace and its effect on overall health status. It highlighted the benefits associated with implementing workplace health and productivity programs and identified the role of healthcare professionals, in particular physiotherapists, in addressing this physical inactivity epidemic.

The research development process identified the necessary approaches, tools and processes supporting development of the health promotion tool. To guide this process, several research questions were defined.

The development process leveraged information derived within the research development process and underlying theoretical component, leading to development, design and initial testing of the health promotion product. The resulting health promotion product was subsequently outlined, in addition to anecdotal feedback from healthcare professionals using the product. Overall, feedback was positive, highlighting several key beneficial features and future potential improvements to refine the tool.

## CONTENTS

|         |   |    |
|---------|---|----|
| 1       | INTRODUCTION.....   | 5  |
| 2       | PURPOSE AND OBJECTIVES OF THESIS.....                                   | 6  |
| 3       | THEORETICAL COMPONENT.....  | 7  |
| 3.1     | Global Impact of Noncommunicable Diseases and Physical Inactivity ..... | 7  |
| 3.2     | The Effect of Sedentary Behaviour in the Office Environment .....       | 8  |
| 3.3     | Benefits Associated with Workplace Health and Productivity Programs ... | 10 |
| 3.4     | Physiotherapists' Role in the Prevention of Physical Inactivity .....   | 11 |
| 4       | RESEARCH DEVELOPMENT PROCESS .....                                      | 12 |
| 4.1     | RQ-001 - Health Promotion Model .....                                   | 13 |
| 4.1.1   | Sense of Coherence (SOC).....   | 14 |
| 4.1.2   | Generalised Resistance Resources (GRRs) .....                           | 15 |
| 4.1.3   | Employing Salutogenic Approaches within the Health Promotion<br>Product | 16 |
| 4.1.4   | Salutogenic Health Indicator Scale (SHIS) .....                         | 17 |
| 4.2     | RQ-002 – Collation of Healthcare Research and Challenges.....           | 17 |
| 4.2.1   | Joanna Briggs Institute Model - Overview.....                           | 18 |
| 4.2.2   | Increasing Amount of Research Publications.....                         | 21 |
| 4.2.3   | Research Accessibility.....   | 21 |
| 4.2.4   | Validity of Research and Associated Findings.....                       | 22 |
| 4.2.5   | Translation and Interpretation of Research .....                        | 23 |
| 4.2.6   | Leveraging Modern Technologies for Knowledge Translation (KT) .....     | 24 |
| 4.3     | RQ-003 – Dissemination of Information .....                             | 26 |
| 4.3.1   | Dissemination Using Existing Social Media Resources .....               | 27 |
| 4.3.2   | Web Content Management System (WCMS) .....                              | 28 |
| 5       | DEVELOPMENT PROCESS .....   | 33 |
| 5.1     | PowerBreak Philosophy .....   | 33 |
| 5.2     | Health Promotion Product Framework .....                                | 34 |
| 5.3     | Product Design and Development .....                                    | 36 |
| 5.3.1   | Monthly Education Topic Structure .....                                 | 36 |
| 5.3.2   | Resources for Collation of Research .....                               | 38 |
| 5.3.2.1 | Research .....  | 38 |
| 5.3.2.2 | Expertise .....   | 40 |
| 5.3.2.3 | Discourse and Social Media .....  | 41 |
| 5.4     | Product Dissemination Using a WCMS .....                                | 43 |
| 5.4.1   | WordPress   | 43 |

|  |    |
|--|----|
| 5.4.2 Content Hierarchy, Level 1 – Main Page View .....                          | 44 |
| 5.4.3 Content Hierarchy, Level 2 – Monthly Education Topic View .....            | 45 |
| 5.4.4 Content Hierarchy, Level 3 – Sub-topics and Links to External<br>Resources | 47 |
| 5.4.5 WCAG 2.0, Level A Compliance.....  | 48 |
| 5.5 Initial Product Feedback .....   | 49 |
| 6 CONCLUSIONS .....  | 51 |
| 7 DISCUSSION .....   | 53 |
| REFERENCES.....  | 56 |

## 1 INTRODUCTION

Increasingly sedentary behaviour has resulted in the increased prevalence of chronic disease and an associated decline in physio-psycho-social health worldwide (World Health Organization 2013). The office environment and associated prolonged static postures are contributors to the rise in health conditions relating to reduced physical activity and capacity (musculoskeletal pathologies/disorders, psychosocial disorders etc.). This increased prevalence of chronic diseases and associated disorders has resulted in significant economic burden to organisations, governments and their associated healthcare systems.

Physiotherapists are uniquely placed within the healthcare system, possessing appropriate technical knowledge and skills to facilitate a reduction in the occurrence (and associated impact) of these work environment related health issues. Challenges arise however, with ensuring the application of up-to-date, evidence-based practices during the provision of physiotherapeutic intervention. These challenges are multifactorial, with current estimates identifying a 17-year lag between the completion of research and translation of these new practices into healthcare professional's practice (Morris, Wooding et al. 2011).

When considering health promotion from a modern perspective, it is pertinent to take into consideration the influence of the rapid, worldwide, digital development that is shaping today's society. These technological resources offer tremendous potential in influencing health promotion, management and prevention strategies. Accordingly, the utilization of modern resources is a necessity in the fight against physical inactivity and chronic disease.

## 2 PURPOSE AND OBJECTIVES OF THESIS

This thesis shall detail and accompany the design and development of an innovative, technological health promotion product, aiming to reduce physical inactivity and promote physiological, psychological and social (physio-psycho-social) health in the workplace environment. Accordingly, the purpose of this thesis is to detail the underlying theoretical background, research development process and development process leading to the conception of the health promotion tool.

The objective of this thesis is to develop a health promotion tool, to support the provision of “PowerBreak” therapeutic exercise and education sessions. The PowerBreak service shall be delivered by physiotherapists to workplace employees, in an effort to reduce chronic pathologies/disorders associated with the office environment and prolonged static postures. The health promotion tool shall be developed for use by physiotherapists delivering the PowerBreak service to organizations. The tool shall disseminate information through the online environment (via a Web Content Management System), providing physiotherapists with up-to-date, evidence-based practices for use during the provision of PowerBreak sessions. Utilisation of the online environment for dissemination is desirable, as the PowerBreak service shall be provided throughout varying locations, by a range of physiotherapists. Additionally, an online, single point of reference for these guidelines promotes the provision of a consistent, evidence-based PowerBreak service.

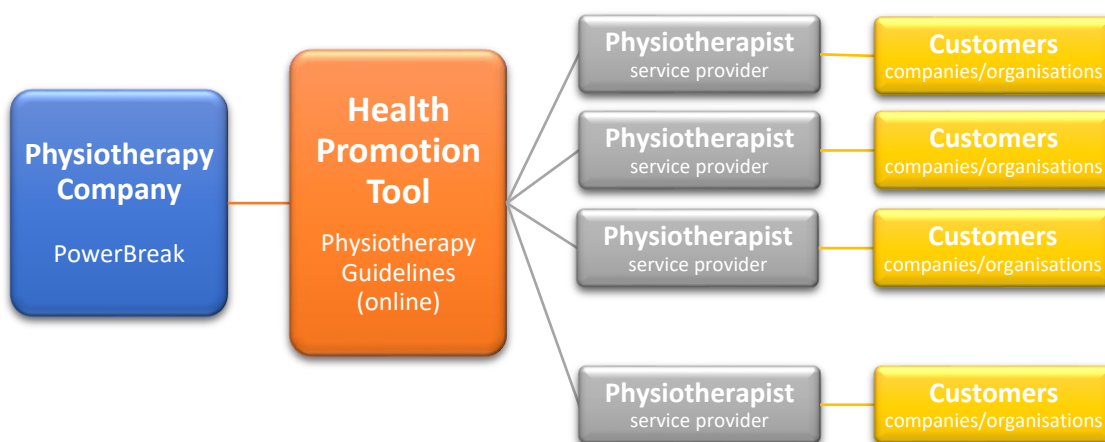


Figure 1 – Placement of the Health Promotion Tool within the PowerBreak System

### 3 THEORETICAL COMPONENT

The theoretical component of this thesis focusses on the global burden of chronic disease, with particular focus on the associated productivity and economic impact within the workplace environment. In addition, the potential role of physiotherapists in the campaign against physical inactivity is highlighted, along with some key challenges hindering the provision of up-to-date, evidence-based practices.

#### 3.1 Global Impact of Noncommunicable Diseases and Physical Inactivity

Noncommunicable Diseases (NCDs), also known as chronic diseases, may be defined as any medical condition or disease that is non-infectious or non-transferrable among people. Types of NCDs can include: cardiovascular disease, cancer, musculoskeletal disease, chronic respiratory disease, diabetes, chronic neurological disorders and unintentional injuries. The prevalence of NCDs within modern society represents a topic of great consequence, both nationally and on a global scale. Accordingly, several global and national initiatives have been initiated in recent times. (World Health Organization 2013).

Currently, NCDs are the leading cause of death globally, with an estimated 36 million deaths in 2008. This equates to 63% of the total 57 million deaths that occurred globally. These deaths compromised mainly of cardiovascular diseases (48% of NCDs), cancers (21%), chronic respiratory diseases (12%) and diabetes (3.5%). In addition, the cumulative output loss due to these four major NCDs, together with associated mental disorders, represents a significant global financial burden. It is estimated that the aforementioned NCDs constitute an estimated global cost of US\$ 47 trillion. (World Health Organization 2013).

The World Health Organisation (WHO) has invested significant resources into the investigation of NCDs and their associated causes, trends and preventions. This research has identified that a large percentage of NCDs are preventable through the reduction of four modifiable, behavioural risk factors. These include tobacco use (~6 million deaths per year from direct tobacco use and second-hand smoke), physical

inactivity (~3.2 million deaths per year), harmful use of alcohol (~2.3 million deaths per year) and unhealthy diet (obesity and overweight causes ~2.8 million deaths per year). (World Health Organization 2011a).

Globally, it is estimated approximately 31% of adults aged fifteen and over are insufficiently active (men 28% and women 34%). In Finland, it is estimated that 56% of adults and as low as 13% of adolescents are sufficiently active (Figure 2) (World Health Organization 2011b; World Health Organization 2018).

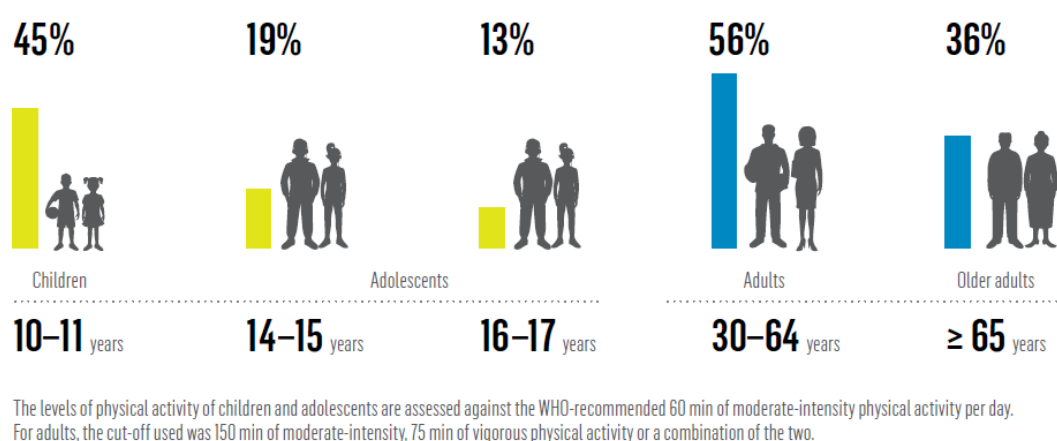


Figure 2 - Estimated Prevalence of Sufficient Physical Activity Levels, Finland 2018 (World Health Organization 2018)

People who are insufficiently physically active have a 20 - 30% increased risk of all-cause mortality. Appropriate levels of physical activity correlates to a reduction in NCDs, associated comorbidities and mental health issues (i.e. improved physio-psycho-social health status). Regular physical activity reduces the risk of cardiovascular disease, (including high blood pressure), diabetes, breast cancer, colon cancer and depression. (World Health Organization 2013; World Health Organization 2011a).

### 3.2 The Effect of Sedentary Behaviour in the Office Environment

From an industry perspective, decreased on-the-job productivity and employee absence due to health-related issues, results in significant cost to employers (above

and beyond medical spending). In the USA alone, work-related health losses are estimated to cost industry more than \$260 billion each year (Mitchell & Bates 2011).

In Finland, musculoskeletal disorders are one of the biggest contributors to pain, reduced functional capacity, work disability and early retirement. More than a million workers have chronic musculoskeletal disorders and another million suffer from acute musculoskeletal disorders related to work. The costs attributed to these work-related musculoskeletal disorders within Finland amounts to close to €2 billion per year. It should also be noted, in recent years, sickness absenteeism resulting from musculoskeletal disorders has increased. Accordingly, national programmes have been launched within Finland to facilitate prevention of these disorders. When analysing the most prevalent problems for occupational health and safety (OH&S) in Finland, coping with work, stress, mental well-being and musculoskeletal disorders have been identified as the most significant (Figure 3) (World Health Organization 2012).

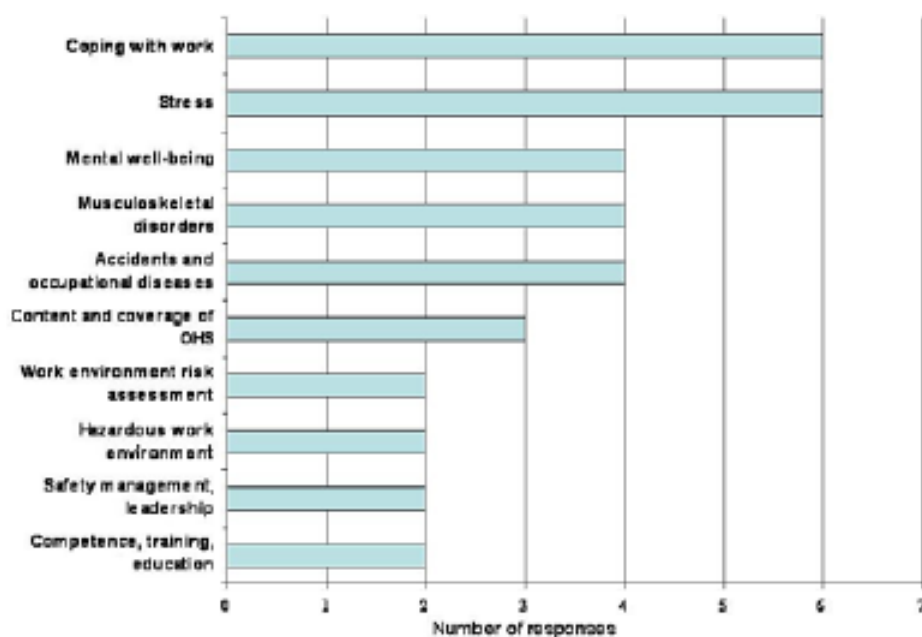


Figure 3 – Causes of OH&S problems in Finland (World Health Organization 2012)

When contemplated from an industry perspective, reduced physical inactivity offers immense potential for impacting upon the key areas of decreased on-the-job productivity and employee absenteeism. From a mental health perspective, physical activity has been shown to have an anxiety-reducing effect. Single sessions of moderate intensity exercise have also been shown to reduce short term reactions to

stress and enhance recovery from stressors. Additionally, the positive benefits of physical activity on musculoskeletal disorders are numerous. For example, evidence demonstrates that physical activity can facilitate recovery from lower back pain, in addition to reducing risk of suffering from this musculoskeletal disorder. (Executive 2002) As such, decreasing physical inactivity within the work environment offers one fundamental mechanism for companies wishing to develop an effective health and productivity strategy.

### 3.3 Benefits Associated with Workplace Health and Productivity Programs

Studies indicate that the incorporation of appropriate health and productivity programs results in significant financial and productivity benefits. Companies with effective health and productivity programs have demonstrated superior human capital and financial outcomes. This includes: 11% higher revenue per employee, lower medical trends by 1.2%, 1.8 fewer days absent per employee and 28% higher shareholder returns. Companies with effective health and productivity programs are also more likely to have lower healthcare costs, lower levels of presenteeism (i.e. working while sick), fewer lost days due to disabilities and lower levels of turnover relative to their industry peers. When defining health and productivity program effectiveness, several factors have been identified as fostering successful outcomes. These include but are not limited to: reducing lifestyle-related health risks in the employee population, reducing the impact of chronic disease in the employee population, encouraging employees to participate in healthy lifestyle programs and creating a corporate culture of health in the organization (Worldwide 2009).

Accordingly, health and productivity programs that effect upon the key areas of decreased on-the-job productivity and employee absence (i.e. coping with work, stress, mental well-being and musculoskeletal disorders) has the potential to offer significant productivity and financial gains to industry.

### 3.4 Physiotherapists' Role in the Prevention of Physical Inactivity

Physiotherapists are increasingly confronted with diseases associated with physical inactivity. As experts in movement and exercise, with a thorough knowledge of functional anatomy and pathology, physiotherapists are ideally placed to promote, guide, prescribe and manage exercise activities. (Verhagen & Engbers 2009).

Physical activity offers a powerful intervention for strength, power, endurance, flexibility, balance, relaxation, and the remediation of pathophysiology, impairments, activity limitations and participation restrictions. Along with the WHO, the World Confederation for Physical Therapy (WCPT) has recognised the importance of physical activity in the battle against NCDs and drafted a policy accordingly. This policy identifies the potential roles of physiotherapists and member organisations in the management of NCDs. Amongst these roles, the WCPT encourages physiotherapists and member organisations to advocate physical exercise, educate health professional communities, and support interprofessional collaborative practices. (World Confederation for Physical Therapy 2014).

From an industry (and health and productivity program) perspective, utilising physical activity intervention, coupled with an associated education program offers immense potential. Studies have demonstrated that the introduction of workplace physical activity programs may be beneficial to employees. Sessions focussing on teaching safe, efficient and effective exercise, in addition to focussing on educating employees regarding the myths of exercise and identifying the expected outcomes from exercise participation, have been shown to increase physical activity levels (Executive 2002; National Institute for Health and Care Excellence (NICE) 2008).

## 4 RESEARCH DEVELOPMENT PROCESS

The research presented within the theoretical component section highlighted the need for improved strategies in workplace orientated health promotion. Additionally, it identified physiotherapy as a potential profession to disseminate health promotion strategies to this audience.

Prior to addressing this identified problem, a research development process facilitates determination of the necessary tools and concepts required to develop the health promotion tool. It begins with identification of a health promotion model, ideally employing preventative strategies leveraging patient education, motivation and empowerment. This form of health promotion strategy is desirable, as it actively promotes health in an effort to keep people well, rather than focussing on symptomatic treatment for individuals already possessing illness/disease.

The second key concept relates to the collection and dissemination of healthcare research and information. This can be further broken-down into two parts. The first part relates to the collection of research relevant to the promotion of health in the workplace. There are a number of challenges related to the collation and associated interpretation of research, which shall be discussed further. The second relates to potential dissemination methods for this information. Consideration is required into how to present this data to physiotherapists delivering the health promotion intervention.

The research development process facilitates identification of the necessary approaches, tools and processes supporting the development of the health promotion product (i.e. feeding into the development process). To support the research development process, three research questions this health promotion tool aims to address may be conceptualised (Table 1).

Table 1 – Research development process, research questions

| ID            | Research Question  |
|---------------|--|
| <b>RQ-001</b> | What is a suitable health promotion model/framework for promoting health within the work environment?  |
| <b>RQ-002</b> | What resources are available to support the collation of research-orientated physiotherapeutic information/data and what are the key challenges? |
| <b>RQ-003</b> | How are RQ-001 and RQ-002 applied and then presented/disseminated as an end product?   |

#### 4.1 RQ-001 - Health Promotion Model

When considering health promotion, many interventions and theoretical texts have a tendency to focus on disease prevention and utilise disease specific terminology. Medical intervention and its associated policies also have a tendency to focus those whom already possess disease or infirmity, with preventative medicine focussing on individuals already possessing identified risk factors. Resistance against this pathogenic orientation of health promotion has resulted in the formation of health promotion concepts that are negentropic and actively promote health, rather than just being low on risk factors. (Antonovsky 1996).

The health promotion tool being developed under this thesis aims to actively promote health within the work environment. Therefore, a proactive, health promotion model provides a desirable foundation for the health promotion tool under development, with an overall aim to ‘keep people well’ rather than treating symptoms or reducing specific risk factors.

The salutogenic model aims foster a lifestyle, focusing on entities that add to healthfulness and wellbeing, rather than factors causing sickness and disease. The underlying concept operates under the assumption that that the human system (as all living systems) is inherently flawed, subject to unavoidable entropic processes and unavoidable final death. As such, the human body at any given point in time can sit somewhere along a ‘ease/dis-ease continuum’ (Figure 4). (Antonovsky 1996).

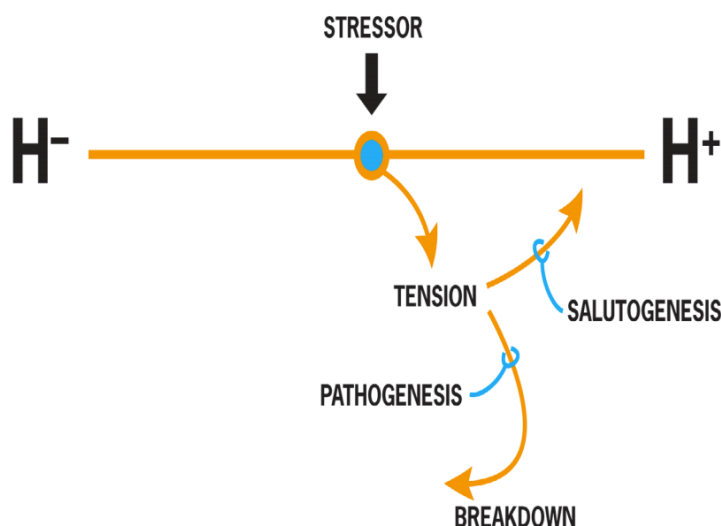


Figure 4 - Antonovsky's classic health continuum (Lindström 2010)

The 'ease/dis-ease continuum' is illustrated as a horizontal line, with each end representing opposite aspects of the health spectrum, from a total absence of health (H-) to complete health (H+). An individual (or collective) would be positioned somewhere along this line. At any given time, the individual may be acted upon by a stressor, which possesses the ability to disrupt their position on the continuum and place their body under tension. From this tension, either the pathogenic forces overwhelm the individual causing breakdown, or they regain health through salutogenesis and move towards healthfulness (H+). (Lindström 2010).

Two core concepts are essential to salutogenic theory, the Sense of Coherence (SOC) and the availability of Generalised Resistance Resources (GRRs). According to Antonovsky, people who have sufficient and adequate GRRs at their disposal (and learn how to use them), can gradually develop a resilient SOC.

#### 4.1.1 Sense of Coherence (SOC)

An individual's SOC is a facilitating factor in the movement towards health (H+). This SOC is essentially a life orientation that helps provide people with the ability to identify and use one's own health resources. The SOC reflects an individual's ability to respond to stressful situations or noxious stimulus, through utilisation of the three

components forming the SOC. Theoretically, SOC is divided into the components: comprehensibility, manageability and meaningfulness. (Antonovsky 1996).

An individual with a strong SOC will wish to be motivated to cope (meaningfulness), believe that the health challenge is understood (comprehensibility), and believe that resources to cope are available (manageability). Studies indicate that a strong SOC is strongly associated with perceived good health, especially mental health. Additionally, individuals that have developed a strong SOC appear to manage disease (impacting any/all facets of physio-psycho-social health) better than those with a less developed SOC. Understanding this empowerment process facilitates the provision of interventions aimed at improving individuals' comprehensibility, manageability and meaningfulness (Suominen & Lindstrom 2008).

#### 4.1.2 Generalised Resistance Resources (GRRs)

Development of an individual's SOC is a life-long learning process, which is dependent on the existence and availability of GRRs. These GRRs facilitate development of an individual's SOC, providing a person with various meaningful and coherent life experiences, thanks to the resources at the person's disposal. These resources may be internal or external to the individual, including factors such as: environment, life experiences, health behaviour, material/financial resources, stress management strategies, existence of NCDs etc. Accordingly, provision of therapeutic intervention and associated education (focussing on meaningfulness, comprehensibility and manageability), provides an individual with additional GRRs, thus strengthening their SOC, facilitating salutogenesis and increased physio-psycho-social health status (Figure 5) (Lindström 2010).

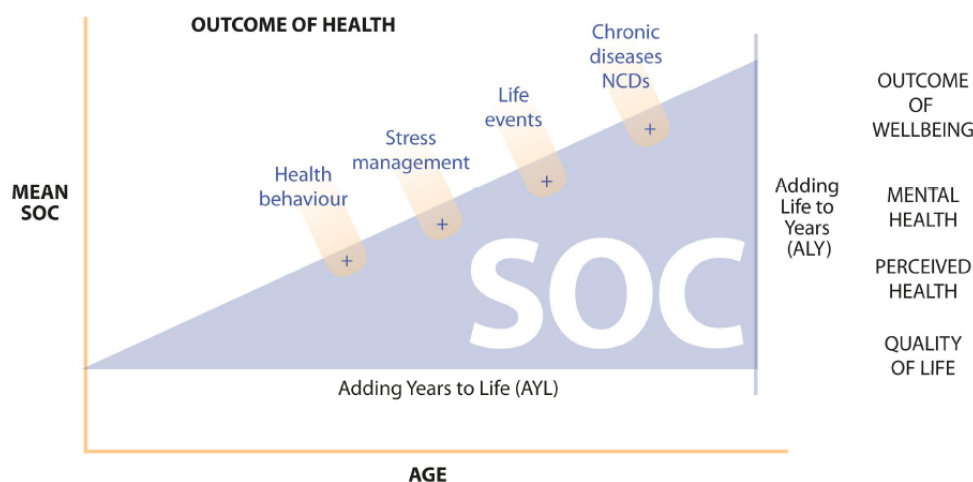


Figure 5 - Health outcomes related to the development of a strong SOC (Lindström 2010)

#### 4.1.3 Employing Salutogenic Approaches within the Health Promotion Product

Numerous alternative, yet interrelated concepts exist within the salutogenic framework, focussing on health promotion concepts that are negentropic and actively promoting health. These concepts fall under the ‘salutogenic umbrella’ (Figure 6), emphasising synergy or coherence between individuals, groups and the surrounding socio-economic, cultural and psycho-emotional environment (Lindström 2010).

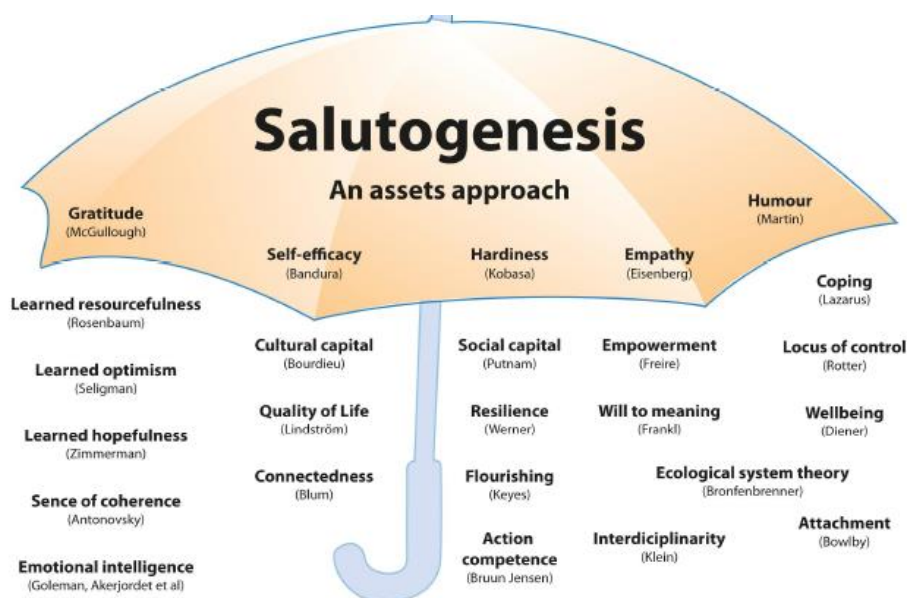


Figure 6 - The ‘Salutogenic Umbrella’ (Lindström 2010)

The primary goal of the health promotion product designed and developed in conjunction with this thesis is to promote overall health in the workplace (i.e. reduce chronic pathologies/disorders associated with the work environment). To support this process, the health promotion product shall ideally employ preventative strategies, in an effort to combat avoidable NCDs and reduce associated risk factors. The salutogenic model provides an ideal framework for supporting the development process, helping individuals (or groups) to move toward healthfulness through patient education (comprehensibility), motivation (meaningfulness) and empowerment (manageability). This underlying philosophy shall be utilised to promote improved ‘resources for life’, by helping customers develop their SOC and GRRs. To achieve this, the health promotion product shall provide customers with the tools required to improve/regain health through salutogenesis and move towards healthfulness.

#### 4.1.4 Salutogenic Health Indicator Scale (SHIS)

The SHIS was developed due to the lack of measurement instruments for the experience of work and health (from a salutogenic perspective). It serves as a useful tool for measuring indicators of health from a salutogenic and holistic perspective. The SHIS has been developed and scientifically tested within the framework of work-related health promotion programs, with results demonstrating high validity and reliability. The questionnaire involves twelve questions, answered on a six-point scale (from positive to negative). The results can be summated to provide a value of salutogenic health indicators overall. The higher the value the better indicators of health. Tools such as the SHIS may be used to assess the impact of the health promotion product on salutogenic health for employees in the workplace (Bringsén, Andersson et al. 2009).

## 4.2 RQ-002 – Collation of Healthcare Research and Challenges

The health promotion product shall be founded on the concept of evidence-based, physiotherapeutic practices. A number of challenges arise however, with ensuring the collation and subsequent application of up-to-date, evidence-based practices. The process of evidence-based healthcare (collation and interpretation of research, and its

subsequent practical application) is a multifactorial process, involving numerous components and stakeholders. Accordingly, there are several potential challenges associated with translating research into practice, particularly when using traditional forms of evidence generation.

The complex and ever-changing healthcare environment means that there is no single, linear approach that will work every time to move evidence into policy and practice. There are a considerable number of frameworks and models available today that have been designed to articulate the process of moving evidence into practice. For example, the Joanna Briggs Institute (JBI) Model of evidence-based healthcare serves as a useful guide to inform academic and clinical organizations to practice evidence-based healthcare, and shall be used in this context to support the collation and dissemination of data relating to the health promotion product.

#### 4.2.1 Joanna Briggs Institute Model - Overview

The JBI model was developed to provide an overview of the complete cycle of evidence-based healthcare, from the generation of knowledge through to its implementation in practice. It serves as a useful tool for facilitating development of the health promotion tool, particularly when considering the generation, synthesis and transfer of evidence and its overarching segments/principles. As such, an overview of this model is considered pertinent to the development of the health promotion product (Jordan, Lockwood et al. 2018).

The JBI model may be represented using three layers of concentric circles (Figure 7). The first layer indicates the central component of the model, representing the ‘pebble of knowledge.’ Evidence-based healthcare is central to the JBI model. To support evidence-based healthcare and clinical decision making, healthcare professionals should take into consideration the intervention’s impact with respect to the FAME (Feasibility, Appropriateness, Meaningfulness and Effectiveness) scale. This forms the central ‘pebble of knowledge.’ Surrounding the ‘pebble of knowledge’ are five segments, each possessing three outer segments. The inner segments provide the JBI model’s conceptualisation of the major steps involved in the process of achieving an evidence-based approach to clinical decision-making, whereas the outer segments

operationalise the component parts of the model and articulate how they might be actioned in a pragmatic way (Jordan, Lockwood et al. 2019).

Table 2 provides a more detailed overview of these segments.



Figure 7 – Joanna Briggs Institute Model (Jordan, Lockwood et al. 2018)

Although the JBI Model provides a useful guideline, several challenges exist with practically collating research-based information and associated translation into practice (with respect to the health promotion tool under development). These key challenges are presented in the subsequent sections.

Table 2 – Components of the JBI Model (Jordan, Lockwood et al. 2019)

| Inner Segment   | Outer Segments  |
|---|---|
| <b>Evidence Based Healthcare</b> - Evidence-based healthcare is central to the JBI model. This is represented by the central ‘pebble of knowledge.’   | <ul style="list-style-type: none"> <li>• <b>Feasible</b> - The extent to which an activity is practical and practicable. Whether or not an activity or intervention is physically, culturally or financially practical (within a given context).</li> <li>• <b>Appropriate</b> - The extent to which an intervention or activity fits within a situation.</li> <li>• <b>Meaningful</b> - Relates to the personal experience, opinions, values, thoughts, beliefs and interpretations of patients or clients.</li> <li>• <b>Effectiveness</b> - The extent to which an intervention when used appropriately achieves the intended effect.</li> </ul> |
| <b>Global Health</b> - Starting point for the model. Global health issues are both the driver and reason for evidence-based practice.   | <ul style="list-style-type: none"> <li>• <b>Sustainable impact</b> – Positive improvements need to be long-term.</li> <li>• <b>Engagement and collaboration</b> – At all levels it is imperative to address global health issues.</li> <li>• <b>Knowledge needed</b> – Gathering knowledge regarding what people need, what resources are available, and what limits constraint choices.</li> </ul>   |
| <b>Evidence Generation</b> – Various levels of evidence generation exist and are not merely limited to scientific research.   | <ul style="list-style-type: none"> <li>• <b>Research</b> – Quantitative and qualitative research conducted to answer a specific question.</li> <li>• <b>Expertise</b> – Expertise, including patient preferences and values.</li> <li>• <b>Discourse</b> – Broad term including various forms of communication and debate.</li> </ul>   |
| <b>Evidence Synthesis</b> – Evaluation or analysis and collection of a research evidence and opinion on a specific topic to aid decision-making in healthcare.  | <ul style="list-style-type: none"> <li>• <b>Systematic review</b> – The core of evidence synthesis is the systematic review of literature on a particular condition, intervention or issue.</li> <li>• <b>Evidence summary</b> – Smaller scale evidence summary (or rapid review) to synthesise evidence in a timely manner.</li> <li>• <b>Guidelines</b> – Trustworthy clinical guidelines linked to evidence (or emerging systematic reviews). Conducted using transparent processes, including extensive, external peer review.</li> </ul>   |
| <b>Evidence Transfer</b> – The co-active, participatory process to advance access to an uptake of evidence and local contexts. It is a causal phenomenon consisting of factors that enable, facilitate and support evidence implementation (that is more than just a single interaction). | <ul style="list-style-type: none"> <li>• <b>Active dissemination</b> - Involves active methods to spread information such as email or social media, formats to encourage motivation or uptake (e.g. infographics, decision aids, icon arrays), and knowledge spreaders (e.g. champions or thought leaders).</li> <li>• <b>Systems integration</b> – Integration of evidence into systems.</li> <li>• <b>Education</b> – Vital component of evidence transfer.</li> </ul>  |
| <b>Evidence Implementation</b> - Purposeful in enabling a set of activities designed to engage key stakeholders with research evidence, to inform decision makers and to generate sustained improvement in the quality of health care delivery.   | <ul style="list-style-type: none"> <li>• <b>Context analysis</b> – Any implementation strategy should carefully consider and analyse the context and setting for implementation, including a consideration of how ready the organisation is for change.</li> <li>• <b>Facilitation of change</b> – Change requires a facilitator or driver of change, in an engaged process with all stakeholders.</li> <li>• <b>Evaluation of processes and outcomes</b> - To determine the impact of change, data on processes and outcomes should be collected as part of any implementation project.</li> </ul>   |

#### 4.2.2 Increasing Amount of Research Publications

The first challenge relates to the digital age and the ever-increasing amount of research, information and data. There is a vast amount of new research constantly being published. For example, a search for articles on PubMed which include the word ‘physiotherapy’ illustrates the increasing amount of publications every year. In 2019 alone, nearly 10,000 articles were published (Figure 8). The amount of emerging and existing research can be overwhelming, creating significant burden on healthcare professionals attempting to maintain evidence-based practices. Due to the rapidly increasing amount of research publications, clinically relevant papers are becoming more and more difficult to find, thus requiring significant time and resources associated with collating and updating knowledge.

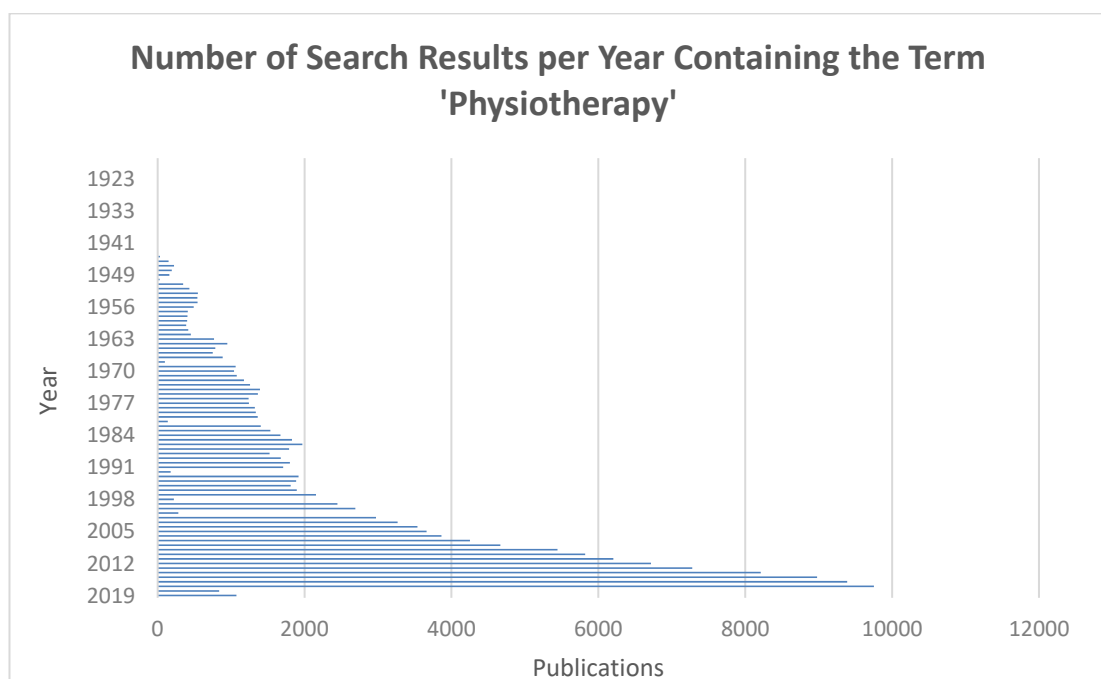


Figure 8 – Number of search results containing the term ‘Physiotherapy’ per year ([Pubmed](#))

#### 4.2.3 Research Accessibility

Another challenge arises when considering availability and access to this research-orientated information. The existing systems of research and dissemination of results have remained relatively unchanged for numerous years, typically relying on journals

and conference proceedings which charge for access to information (through publication paywalls). Publication paywalls withhold a substantial amount of research results from the scientific community and society as a whole. This in turn hinders the scientific enterprise in its very foundations and hampers associated uptake by clinicians and society. This is further illustrated by studies which indicate that it currently takes an average of 17 years to translate research findings into clinical use/incorporation (Morris, Wooding et al. 2011; Schiltz 2018).

Science may be considered an institution of organised criticism, relying on the scrutiny and testing of other researchers to function optimally. Furthermore, new research builds on established results from previous research. These barriers to access of information therefore hinder progression. It's only possibility to work optimally is if research results are made openly available to the scientific community. Additionally, research indicates that the lag between research and practical application possesses financial implications. For example, shortening the lag between bench and bedside improves the rate of financial return and overall benefit of cardiovascular related research (Morris, Wooding et al. 2011; Schiltz 2018).

#### 4.2.4 Validity of Research and Associated Findings

Challenges also arise when considering the validity of research findings. In the past, the communication of healthcare research and articles has relied heavily on academic journals for dissemination of information. This format of information dissemination presents several potential challenges. In order to publish research and associated findings/evidence to an academic journal, a complex and multi-part process must first be undertaken. Once the necessary information has been gathered, a report must then be generated in accordance with the relevant journal's formatting and referencing requirements. This report will typically then progress through a several reviews, with the authors addressing any/all potential concerns or gaps in the academic processes at each stage. Once the report has been amended to address these concerns, it may then be published within the academic journal (Ioannidis 2005).

The level of review does not necessarily translate to increased validity of research. Peer review is typically considered a gold standard in scientific research. That being

said, peer review does not mean that the research is perfect, complete or correct. Peer review is merely the beginning of a study's active public life, not the culmination. Upon publication, it is then ready to be put out to the community of relevant experts for challenging, testing, and refining (Ioannidis 2005).

Other factors can also impact the validity of findings. For example a research finding is less likely to be true when the studies conducted in a field are smaller; when effect sizes are smaller; when there is a greater number and lesser preselection of tested relationships; where there is greater flexibility in designs, definitions, outcomes, and analytical models; when there is greater financial and other interest and prejudice; and when more teams are involved in a scientific field in chase of statistical significance (Ioannidis 2005).

#### 4.2.5 Translation and Interpretation of Research

In addition to the convoluted process of publishing and communicating academic research, several challenges relating to knowledge translation also appear to exist. Knowledge translation (KT) may be defined as “the synthesis, exchange, and application of knowledge by relevant stakeholders to accelerate the benefits of global and local innovation in strengthening health systems and improving people's health” (Pablos-Mendez & Shademani 2006). Studies indicate that there are challenges with the interpretation of research and associated results. Often key information is missing in the translation of this information. This indicates an issue, or roadblock in KT utilising existing formats. Barton et al identifies four primary barriers to KT from academic journals. These relate to article access, difficulty in comprehension for the reader, lack of reader engagement, and the time needed to consume this text heavy format (Barton & Merolli 2017).

Scientific writing formats often include significant amounts of jargon and technical wording. This can make translation of information within academic journals particularly difficult (especially if English isn't a reader's native language). Often academic research is quite verbose, typically containing 3000 to 5000 words. This represents a barrier to KT, requiring significant time to read and acquire information from these resources (Barton & Merolli 2017).

#### 4.2.6 Leveraging Modern Technologies for Knowledge Translation (KT)

Digital innovation has been underutilised in KT, especially when compared to mainstream media. The utilisation of social media offers several opportunities (and challenges) in the facilitation of accessible, timely and engaging research. The application of evidence-based practices is of particular importance to healthcare professionals; however the previously outlined challenges restrict KT and the subsequent application of evidence-based practices in the clinic. Therefore, embracing digital and social media to re-shape KT in healthcare has huge potential to improve the efficiency and reach of the current academic journal publication model (Barton & Merolli 2017).

Healthcare professionals report a number of potential benefits in using social media, including: networking with colleagues or peers; disseminating, sharing and accessing information in a timely fashion; improving disease-specific knowledge; continuing professional development and medical education; crowd-sourcing advice and keeping up to date with news and research. Perhaps most importantly, digital tools and social media offer potentially rapid dissemination of information, thus potentially reducing the existing 17-year lag in translating research findings into practice (Barton & Merolli 2017).

There are several digital and social media platforms (and content types) suited to facilitating KT. From a popularity perspective, Facebook and Twitter currently appear to be the most utilised by healthcare professionals. Considering Facebook's 1.7 billion active monthly users and Twitter's 313 million active monthly users, these social media platforms offer significant potential in the collation and dissemination of healthcare research. It has also been postulated that there is a correlation between journals with an active Twitter profile having a higher mean impact factor. Other social media platforms such as Instagram also offer increased potential for KT. In recent years Instagram has grown significantly, reaching 1 billion active monthly users. Although Instagram restricts access to outside media attachments and links, it offers another potential mechanism for dissemination of images, infographics and video tutorials (Barton & Merolli 2017).

There are several other social media platforms and content types suited to facilitating KT. Blogs facilitate dissemination of research-based information, however are able to utilise less scientific presentation of findings. Blogging is suitable for presenting content in a more succinct, digestible and engaging format. In addition, numerous scientific journals (for example the British Journal of Sports Medicine) now employ blogging to enhance KT of their scientific publications. Podcasts may offer a similarly attractive format for content delivery in this context, allowing KT through expert commentary and research summaries via easy to access audio channels. Several prominent researchers and scientific journals have also identified the potential benefit of podcasts, adding this service to their existing platforms.

Infographics also facilitate KT, offering the ability to complement written messages in an effort to optimise engagement. Content presented in visual format has demonstrated increased engagement and retention compared to text-based information. In academic journals and associated publications, the use of images/figures is often limited. Research indicates that impactful infographics typically take just 2 to 3 minutes to digest, which is a significant improvement on the time burden required to read and comprehend a lengthy journal article. Similarly, video-based content is highly engaging, with reports suggesting video is six times more likely to be shared than images. Platforms such as Instagram and YouTube can be valuable resources for KT. Video resources can facilitate efficient summary of research findings via author interviews, animations, and other formats to ensure research impact and KT (Barton & Merolli 2017).

Digital innovation has also resulted in the emergence of numerous online courses, resources and open-access research-based websites. From a physiotherapeutic perspective, websites such as Physiopedia and its associated premium access service Physiopedia Plus offer resources for supporting KT. Physiopedia is a UK based charity that brings value to the global physiotherapy profession with its free, open and continually updating knowledge resource. This living, community edited website is now the largest Physiotherapy resource in the world. The site currently has over 2 million visits every month, from nearly every country in the world. The Physiopedia charity also provides free online courses. These courses provide accessible education and professional development all around the globe. Other websites such as

ResearchGate offer a free professional network for scientists and researchers to share, discover, and discuss research.

Although offering numerous potential benefits, caution should be exercised, as the often-simplified format of delivery in these digital and social media orientated tools can impair quality and accuracy of KT. It may be challenging to link digital resources to their underlying/substantiating research. In addition, the inability to identify nonverbal behaviours and subtexts can lead to misinterpretation of information. Consideration should also be made when considering the source of information. Often those who have the largest online following are frequently not the same people that generated the evidence under discussion. It is also important to seek balance on important issues. Social media has the potential for proliferation of echo chambers and filter bubbles where users tend to follow sources that agree with their underlying beliefs. Table 3 highlights some of the strengths and weaknesses when comparing social media and peer reviewed journals (Cook, O'Connell et al. 2018).

Table 3 – Strengths and weaknesses of social media and peer reviewed journal articles (Barton, Merolli 2017)

| Quality   | Social Media | Peer Reviewed Article |
|---|--------------|-----------------------|
| Peer reviewed                                       | ✗            | ✓                     |
| Easily accessible                                   | ✓            | sometimes             |
| Time efficient                                      | ✓            | ✗                     |
| Engaging  | ✓            | ✗                     |
| Comprehensible by health professionals and patients | ✓            | ✗                     |
| Rapid dissemination                                 | ✓            | ✗                     |
| Fosters rapid two-way communication                 | ✓            | ✗                     |

#### 4.3 RQ-003 – Dissemination of Information

The emergence of modern technologies offers additional mechanisms for delivering academic research. Additionally, utilization of these technologies has the potential to

address several of the barriers associated with existing forms of academic information dissemination and KT. This section outlines the research development associated with RQ-003, with a particular focus on methods for disseminating information within the health promotion product. The development process section shall subsequently identify the design and development of the health promotion product, addressing RQ-003.

#### 4.3.1 Dissemination Using Existing Social Media Resources

Social media-based tools offer one possibility for dissemination of health promotion information and research. Social media (including social networks, blogs, media-sharing platforms etc.) are user-centred, internet-based tools that foster online collaboration, sharing, communication, participation and creation of user-generated content. A number of opportunities (and delivery formats) exist, to help researchers leverage social media, potentially facilitating more efficient and effective communication of information and research (i.e. supporting KT). While the collaborative aspects of social media-based tools are potentially beneficial, they possess several challenges, risks and limitations as stand-alone tools. Several of the potential risks associated with the use of these tools has been discussed in the preceding section. In particular, the casual and self-regulatory nature of social media tools possess a risk to the accuracy of information presented.

To provide a comprehensive health promotion product, several resources for collating information are desirable. With respect to the subsequent dissemination of collated information, use of a single social media resource may not be appropriate. Many social media tools possess a character limit when posting content (Table 4). This potentially restricts the amount of information delivered. For more complex topic areas, this character limit may not be sufficient to communicate pertinent information.

Table 4 – Common social media resources, character limitations (Buffer 2019)

| Social Media Resource | Character Limit |
|-----------------------|-----------------|
| Facebook pages        | 5,000           |
| Facebook groups       | 5,000           |
| Instagram profiles    | 2,200           |
| Twitter profiles      | 280             |
| LinkedIn pages        | 1,300           |
| LinkedIn profiles     | 1,300           |
| Pinterest boards      | 500             |

Challenges also arise when attempting to share resources across varying platforms. While some systems operate on an open architecture concept, others utilize a more restricted system, with limited ability to share content from other social media resources. Some social media platforms even limit ability to repost content internally. Additionally, social media tools possess limitations regarding the format of content (video, image etc.) and text (formatting, titles, layout etc.), thus creating challenges when attempting to promote and enhances KT. As such, a web-based system for content management and dissemination would potentially offer increased flexibility and capability as a tool for disseminating information from multiple resources.

#### 4.3.2 Web Content Management System (WCMS)

In recent years, the utilization of the Web and associated Web Content Management Systems (WCMSs) has rapidly increased. In this period of tremendous growth, the web requires guidance to realize its full potential. Web standards are this guidance. These standards help ensure that everyone has access to information, and also facilitates understandable and intuitive web development (which in turn, potentially also enhances KT).

The World Wide Web Consortium (W3C) is an international industry consortium dedicated to “leading the Web to its full potential.” W3C are responsible for the development of open specifications to enhance the interoperability of web-related

products. For example, the Web Content Accessibility Guidelines (WCAG) 2.0 provides recommendations to make it easier for individuals with special needs to use the Web. Within the context of the health promotion product under development, it is not necessary to ensure full compliance to WCAG 2.0 initially. The guideline however can serve as a useful tool to support the development of a well-structured, intuitive, web-based health promotion product. Table 5 identifies an overview of WCAG 2.0, Level A guidelines considered relevant to the design of health promotion product (Caldwell, Cooper et al. 2008).

Table 5 – Web Content Accessibility Guidelines (WCAG) 2.0, Level A, guidelines relevant to the health promotion product

| <b>Guideline</b>                           | <b>Summary</b>  |
|--|---|
| <b>1.3.1<br/>Info and Relationships</b>    | Information, structure, and relationships conveyed through presentation can be programmatically determined or are available in text.  |
| <b>1.3.2<br/>Meaningful Sequence</b>       | When the sequence in which content is presented affects its meaning, a correct reading sequence can be programmatically determined.   |
| <b>1.3.3<br/>Sensory Characteristics</b>   | Instructions provided for understanding and operating content do not rely solely on sensory characteristics of components such as shape, size, visual location, orientation, or sound.  |
| <b>1.4.2<br/>Audio Control</b>             | If any audio on a Web page plays automatically for more than 3 seconds, either a mechanism is available to pause or stop the audio, or a mechanism is available to control audio volume independently from the overall system volume level. |
| <b>2.4.1<br/>Bypass Blocks</b>             | A mechanism is available to bypass blocks of content that are repeated on multiple Web pages.   |
| <b>2.4.2<br/>Page Titled</b>               | Web pages have titles that describe topic or purpose.   |
| <b>2.4.3<br/>Focus Order</b>               | If a Web page can be navigated sequentially and the navigation sequences affect meaning or operation, focusable components receive focus in an order that preserves meaning and operability.  |
| <b>2.4.4<br/>Link Purpose (in context)</b> | The purpose of each link can be determined from the link text alone or from the link text together with its programmatically determined link context, except where the purpose of the link would be ambiguous to users in general.          |
| <b>3.2.1<br/>On Focus</b>                  | When any component receives focus, it does not initiate a change of context.  |
| <b>3.2.2<br/>On Input</b>                  | Changing the setting of any user interface component does not automatically cause a change of context unless the user has been advised of the behaviour before using the component.   |
| <b>3.3.2<br/>Labels or Instructions</b>    | Labels or instructions are provided when content requires user input.   |

To support the development of the health promotion tool, some form of content management (CM) process or system is essential. The central functionality of a WCMS is the provision and management of content. This content can take numerous forms, including Hyper Text Mark-up Language (HTML), Extensible Mark-up Language (XML), images, videos, documents and dynamic content generated from relational databases. CM is more than just creating a website, it is in fact an overall process for collecting, managing and publishing content to various outlets (McKeever 2003).

Utilization of a WCMS within the scope of this project is attractive for numerous reasons. Firstly, a WCMS supports a wide diversity of electronic data forms. Considering the numerous challenges with the provision of information and associated KT using traditional delivery mechanisms, a tool that supports flexibility in the delivery information is desirable. This flexibility can facilitate information dissemination in various formats (text, image, video etc.), in addition to leveraging embedded content from social media resources. A WCMS also supports content hierarchy with potentially unlimited depth and size (e.g. WCAG 2.0, 1.3.1, 1.3.2, 2.4.2 and 2.4.3). This facilitates presentation of information in varying levels and formats (Figure 9). For example, a simplified page view for content can be used initially to provide an overview for a particular topic. The user can then utilize content hierarchy to read more detailed information on a sub-topic by navigating deeper within the hierarchy (e.g. WCAG 2.0, 2.4.1). This can support KT by separating content into more manageable components, potentially simplifying the provision of information on complex learning topics (e.g. WCAG 2.0, 2.4.3). In addition, the WCMS can support integrated file managers, meaning that additional supporting resources can be attached to content (e.g. WCAG 2.0, 2.4.4).

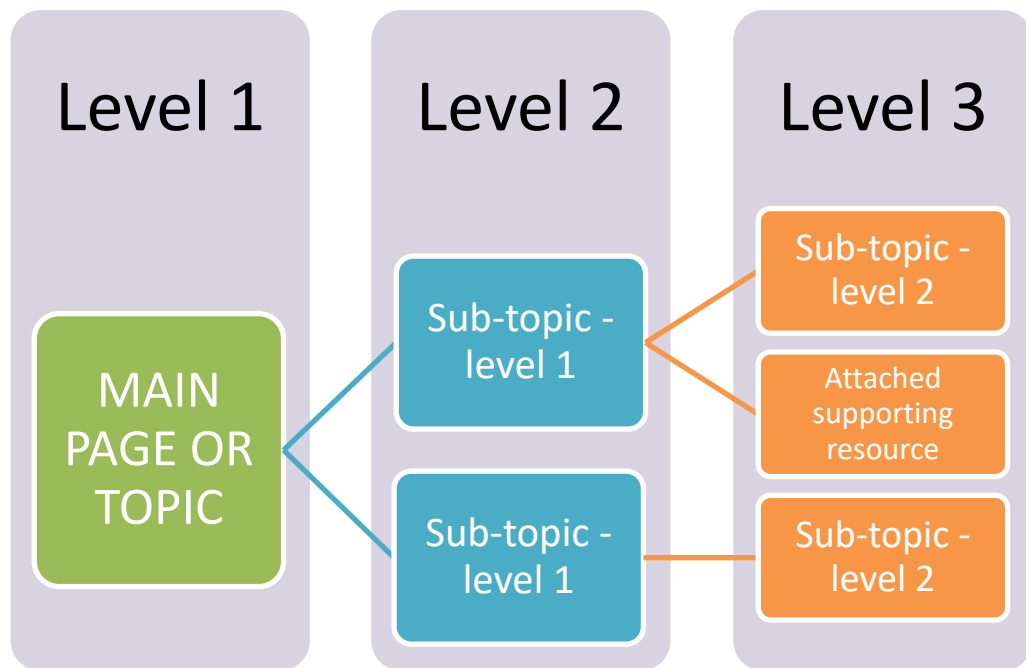


Figure 9 – Content hierarchy example

Intuitive indexing, search and retrieval features are also supported by WCMSs (e.g. WCAG 2.0, 3.2.2). As the health promotion product grows, the ability to easily search for specific content within the WCMS is desirable (e.g. WCAG 2.0, 2.4). This promotes efficient information discovery and associated interpretation.

In time, the content within the WCMS will require updating to ensure the provision of up-to-date information and practices. Revision capabilities and features associated with a WCMS allow content to be updated and edited after the initial publication. The ability to use revision control also tracks any changes made to content or files by individuals (if editing of content by other stakeholders is supported). This facilitates accountability across the organization and ensures traceability.

A WCMS can also support numerous levels of group-based permission systems. This helps define and control the level of access and control both administrators and end users will have when using the WCMS. Allowing users (other than the administrators) to create and edit content also facilitates collaboration. This can take-on numerous potential formats, including integrated and online help, discussion boards etc. Promoting collaboration and discussion, also supports the development of the

organization's community. This is particularly desirable when considering an organization's geographic dispersion. WCMSs facilitate communication of information, irrespective of physical location.

There are a number of potential tools available when considering WCMSs, each with varying capabilities. Of particular interest is an easy-to-use editor interface, particularly if contributors/editors do not possess a technical background. The editor interface can incorporate an admin panel to facilitate multiple language support. Although this may not be an initial target for the health promotion product, it's important to consider possibilities related to expansion of the service. Finally, WCMSs can also support marketing. Content from contributors, associated research and feedback can all be collated and tailored to facilitate future advertising.

## 5 DEVELOPMENT PROCESS

The development process section details information associated with the development, design and initial testing of the health promotion product. To provide context for the health promotion product, the PowerBreak service philosophy is initially outlined. It is important to identify the key elements associated with the PowerBreak service, as this provides the framework from which the health promotion product has been developed. This leads into the development process for the health promotion product itself.

The product design and development shall be subsequently presented, outlining the monthly education topic structure and resources utilised to facilitate development of these topics. These resources are discussed with respect to evidence-based practices and the associated evidence generation levels (refer to Section 4.2.1, “Joanna Briggs Institute Model – Overview”).

The design and development of the WCMS utilised for dissemination of the health promotion product is then outlined. This section aims to address RQ-003, presenting how the research development process and underlying theoretical background are applied (i.e. RQ-001 and RQ-002) to facilitate design of the health promotion tool. The design and development of the WCMS is outlined, detailing the content hierarchy levels. In addition, the product’s compliance to WCAG 2.0, Level A is discussed in further detail (refer to Section 4.3.2, “Web Content Management System”). Finally, the initial product feedback, based on anecdotal feedback from physiotherapists testing the product is discussed.

### 5.1 PowerBreak Philosophy

The PowerBreak service consists of guided therapeutic exercise and education sessions, delivered within the workplace. The sessions are conducted by physiotherapists (refer to Section 3.4) and are typically performed twice per week, lasting for approximately 15-minutes per session. When considering companies or organizations, management ideally want to maximise productivity whilst ensuring

minimal downtime (i.e. reduce keeping employees away from workstations and productive work). Anecdotal evidence from several companies previously involved with the PowerBreak service suggests a 12-15 minute therapeutic session is ideal (from an organizational perspective). As such, sessions are designed to be efficient whilst maximizing potential efficacy.

From a therapeutic perspective, studies indicate that positive clinical outcomes may be achieved within these short/succinct sessions, when conducted on a regular basis. For example, one study demonstrated that as little as 2-minutes of daily progressive resistance training for 10 weeks results in clinically relevant reductions of pain and tenderness in healthy adults with frequent neck/shoulder symptoms. Improvements in muscle strength were also noted, following this short-duration, regular training (Andersen, Saervoll et al. 2011).

From a comprehensibility perspective (refer to Section 4.1.1), short sessions also provide a platform for incremental education. This facilitates education on key topics affecting the physio-psycho-social health status of employees in the workplace. Combined physiotherapy and education have demonstrated positive results, highlighting the efficacy of this treatment approach in producing positive symptomatic and functional change in populations suffering from chronic pain. In addition, physiotherapist-led pain education and management classes (such as PowerBreak) offer a cost-effective alternative to usual outpatient physiotherapy and are associated with less healthcare use. A more widespread adoption of physiotherapist-led pain management could also result in considerable cost savings for healthcare providers and organisations (Critchley, Ratcliffe et al. 2007; Moseley 2002).

## 5.2 Health Promotion Product Framework

The health promotion product shall be aimed at the physiotherapists delivering the PowerBreak service to organisations (Figure 10 illustrates the flow of information: from the health promotion tool, through to the customer, via physiotherapists). The intention is to provide the PowerBreak service package throughout numerous cities/locations. As such, the online environment shall be used for the health promotion

product, as it provides an ideal mechanism for the dissemination of information, irrespective of geographic location.

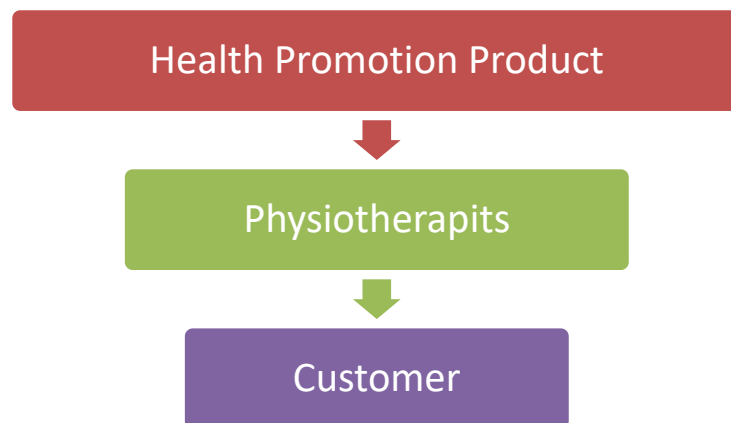


Figure 10 – Health promotion product, information flow

The short physiotherapeutic exercise and education sessions provide a platform for incremental education. To facilitate education on key topics affecting the physio-psycho-social health status of employees in the workplace, PowerBreak sessions shall possess a monthly education topic/theme. Over the course of a month, education shall be delivered utilizing a segmented approach, building upon the information delivered within the previous sessions. This potentially results in the transfer of a significant total volume of knowledge over the course of the monthly topic/theme. Augmenting this incremental education with therapeutic exercise aims to promote meaningfulness, comprehensibility and manageability, thus strengthening individual's SOC and providing them with additional GRRs that facilitate salutogenesis and increased physio-psycho-social health status (refer to Section 4.1).

This health promotion tool shall provide physiotherapists with information on the monthly education topic/theme. The language within the tool shall be aimed at the physiotherapists delivering the service. The content provided within each monthly education topic shall be derived from a range of evidence generation and synthesis orientated tools (refer Section 4.2.1), in addition to less formal sources (refer to Section 4.2.6). An online, single point of reference for the monthly education topics aims to ensure consistency in the delivery of the PowerBreak service package.

### 5.3 Product Design and Development

This section addresses RQ-003 (refer to Sections 4 and 4.3). It presents how the research development process and associated information are applied to facilitate design of the health promotion product. This is achieved with reference to the previous research questions, RQ-001 and RQ-002 (refer to Sections 4.1 and 4.2), and details how we are bringing the theoretical components and previous research questions into an end product/solution.

Initially, the monthly education topic structure associated with the health promotion product is presented. The structure has been designed to provide necessary education materials for physiotherapists using the product, in addition to defining the structure for incremental education within PowerBreak sessions. This structure was developed with reference to RQ-001 (refer to Section 4.1). The monthly education topic structure aims to augment incremental education with therapeutic exercise, to strengthen individual's SOC and provide them with additional GRRs that facilitate salutogenesis and increased physio-psycho-social health status. Subsequently, the collation of information used in the health promotion product is discussed. The resources utilized are based on RQ-002, using a combination of traditional and modern resources in an effort to balance quality of data and KT (refer to Section 4.2). This leads into the following section, detailing the medium for dissemination and design of the health promotion product, based on RQ-003's research development process (refer to Section 4.3).

#### 5.3.1 Monthly Education Topic Structure

The delivery of information within the monthly education topics shall aim to follow a specific structure. This structure is designed to ensure consistency in the health promotion product, its education material and provision of the service. Table 6 identifies the main sections for each monthly education topic. Sub-sections shall also be utilized to ensure intuitive layout of the monthly topics. It should also be noted that some topics may span multiple months, due to the complexity of the subject and its impact on physio-psycho-social health in the workplace (for example, lower back pain). For these more complex, multi-month topics the education material shall be

expanded (in particular the section relating to suggested PowerBreak session breakdown).

Table 6 – Monthly Education Topic Structure

| Section   | Content  |
|---|--|
| <b>1. Introduction</b>                              | Introduces the topic for the month and its importance within the workplace setting. It provides an overview of the topic, including some highlights and potential areas of note or caution.  |
| <b>2. Functional anatomy</b>                        | Outlines anatomy and function related to the monthly topic area. Taking into consideration the fact that physiotherapists receive a thorough education on anatomy and movement, this section is fairly high-level.   |
| <b>3. Key terms and references</b>                  | A list of important terms relevant to the month's education topic. In addition to terms and their definitions, where appropriate, some reference values and statistics are also highlighted.   |
| <b>4. Patient education</b>                         | This section provides potential topic areas for discussion and education during provision of PowerBreak sessions. This section is typically the largest component of the education resource. Depending on the size and complexity of the topic area, some topics may span multiple months. In these cases, it would not be ideal to cover all of the information presented within this section during a single month, however the information can provide supporting information for education/discussion purposes (in addition to supporting the subsequent month's education).<br>This section also contains the following sub-sections: |
| <b>4.1 Typical signs / symptoms of impairment</b>   | Useful for supporting physiotherapeutic intervention. Although this subject is potentially extending beyond the scope of the PowerBreak service, it is important for service providers to be aware of potential red flags.   |
| <b>4.2 Assessment based exercises and resources</b> | Outlines some simple assessment techniques based on the topic area. Some assessment tools can also be used to support therapeutic exercise.  |
| <b>4.3 Teaching techniques and sample movements</b> | Outlines sample movements suitable for teaching during the PowerBreak sessions. Considering the workplace-based nature of the service provision, limitations can exist with respect to space available to perform movements, attire of participants, desired intensity levels etc. Guidelines to support education may also be provided, to ensure use of non-threatening, patient specific language.  |
| <b>5. Suggested session breakdown</b>               | Provides a guideline for the weekly breakdown of sessions. Each week has a focus area and recommendations for content to be covered during education.  |
| <b>6. Other supporting materials</b>                | Additional, optional information for physiotherapy providers, should they wish to deepen their knowledge on a topic area. This includes links to resources such as blog posts, podcasts, books etc.  |
| <b>7. References</b>                                | Research and resources utilised to generate the monthly topic.   |

### 5.3.2 Resources for Collation of Research

Various levels of evidence generation exist, to support the collation process of resources associated with the health promotion product. Potential resources are numerous and are not merely limited to scientific research. Research, expertise and discourse are all useable to support development of the health promotion product's monthly education topics (refer to Section 4.2.1). In addition, modern technologies shall be utilized in an effort to address challenges associated with translation of traditional forms of evidence generation (refer to Sections 4.2.2, 4.2.3, 4.2.4 and 4.2.5). These challenges potentially inhibit KT and the subsequent application of evidence-based practices. Therefore, the health promotion product shall also incorporate digital and social media in an effort to improve efficiency and efficacy of KT (refer to Section 4.2.6).

There are several resources and content types, including digital and social media platforms, that the health promotion product shall leverage to facilitate KT. Numerous levels of evidence generation are available from an evidence-based healthcare perspective and are discussed in the subsequent sections (refer to Section 4.2.1).

#### 5.3.2.1 Research

Physiotherapy journals and associated research publications are associated with the highest quality level of evidence generation. There are many methods available to assess the relative performance of journals. Journal rankings and scores may be used to assess the track record of publications. For example, the SCImago Journal & Country Rank (SJR) is a publicly available portal that includes journal rankings and scientific indicators (with reference to the Elsevier database). With SJR, journals can be grouped by subject area (27 major thematic areas), subject category (313 specific subject categories) or by country. The citation data utilized by SJR is obtained from over 34,100 titles, from more than 5,000 international publishers and country performance metrics from 239 countries worldwide. For the subject category of "physical therapy, sports therapy and rehabilitation", SJR supports filtering of journals by rank. To calculate rankings, a journal's impact is expressed by using the average number of weighted citations received for a selected year by the documents published

in the journal in the three previous years. For the health promotion product, the top-ranking journals shall be used to support collection of information (Table 7).

Table 7 – SJR top ranked journals, with subject “*physical therapy, sports therapy and rehabilitation*”

| Top 10 Journals - All   | Top 10 Journals - Open access   |
|---|---|
| 1. American Journal of Sports Medicine                                  | 1. International Journal of Behavioural Nutrition and Physical Activity |
| 2. Sports Medicine  | 2. African Journal of Disability  |
| 3. British Journal of Sports Medicine                                   | 3. Journal of Athletic Training   |
| 4. International Journal of Behavioural Nutrition and Physical Activity | 4. Journal of Physiotherapy   |
| 5. Medicine and Science in Sports and Exercise                          | 5. Journal of Sports Science and Medicine                               |
| 6. Exercise and Sport Sciences Reviews                                  | 6. Journal of Rehabilitation Medicine                                   |
| 7. Journal of Science and Medicine in Sport                             | 7. BMC Sports Science, Medicine and Rehabilitation                      |
| 8. Journal of Head Trauma Rehabilitation                                | 8. Brazilian Journal of Physical Therapy                                |
| 9. Scandinavian Journal of Medicine and Science in Sports               | 9. Journal of Sport and Health Science                                  |
| 10. Archives of Physical Medicine and Rehabilitation                    | 10. Biology of Sport  |

ResearchGate is an alternative resource for collation of research. Founded in 2008, ResearchGate is a professional network for scientists and researchers. It was created as a tool to support collaboration, due to challenges associated with first-hand collaboration with colleague in varying geographic locations. ResearchGate’s mission is to connect the world of science and make research open to all. It is essentially a social platform for researchers, allowing professionals to share and access publications; connect and collaborate with colleagues, peers, co-authors, and specialists; ask questions, get answers, and solve research problems; share updates about current projects; and receive statistics regarding individuals interested in specific research. ResearchGate has over 15 million members from all over the world using the platform. It offers an excellent tool for accessing open-access research and has been

used extensively in the development of the health promotion product. In particular, it served as a useful tool for contacting authors responsible for research articles hidden behind journal paywalls.

#### 5.3.2.2 Expertise

In addition to journals, several research-orientated websites contain a variety of free and paid access materials. Although this is not an exhaustible list, it identifies several expertise-based resources used in the creation of the health promotion product.

Physiopedia is a UK-based charity that has developed a free, open-source and continually updating knowledge resource. Physiopedia's mission is to improve global health through universal access to physiotherapy knowledge. This community edited website is the largest Physiotherapy resource in the world, with over 2 million visitors every month. In addition, Physiopedia offers a range of free and paid courses through its Physiopedia Plus platform. The platform has numerous sponsors and strategic partners, including the World Confederation for Physiotherapy (WCPT); American Physical Therapy Association (APTA); and numerous universities, clinics, and professional organisations.

Physio Network is a network of healthcare professionals, working together to provide a monthly review service featuring the latest and most clinically relevant research in physiotherapy. The network was developed to address challenges in KT, providing a more efficient method for professionals to keep up-to-date with emerging research. In addition to monthly reviews, Physio Network also offers free resources, including blog posts, infographics, and audio reviews. The research reviews developed by Physio Network have also been approved as a continued professional development (CPD) tool by the British Journal of Sports Medicine (BJSM).

Science for Sport is a network of healthcare professionals, working together to provide an online learning resource for all things related to sports science. With so much conflicting, opinion-based information online, it was created to build a reliable and trustworthy source for research related to sports performance. Science for Sport creates educational content, including articles, videos, podcasts, infographics, and a "Research

Digest”. Content is created by a network of researchers and highly experienced healthcare professionals in the field of sports science. Although there is a sporting focus to the materials provided by Science for Sport, research related to musculoskeletal pathologies, pain etc. are relevant to the work environment.

Founded in 2012, Physiotutors is a resource for physiotherapy students and practitioners. Physiotutor’s mission is to offer a consistent, reliable and high-quality source for educational material, with a particular focus on anatomy, physiology, and orthopaedic assessment. Physiotutors offers a number of free resources, including educational videos, evidence-based research outcomes and new developments in the world of physiotherapy. The service is constantly expanding its services to offer courses, learning materials etc.

#### 5.3.2.3 Discourse and Social Media

There is traditionally less rigor associated with the development (and review) of content at this level of evidence generation. Caution should therefore be exercised in ensuring the quality and reputation of sources utilized within the health promotion product. Conversely, the less restrictive nature of information synthesis can result in the creation of materials that more readily support efficient KT (refer to Section 4.2.6). The online nature of these discourse-orientated systems makes it possible to rapidly disseminate information, combating several challenges associated with traditional methods of research dissemination (refer to Section 4.2). They also offer the capability of direct communication with an engaged audience, without the time delays associated with traditional, print-based publications. The online ecosystem also encourages a multidirectional flow of information, allowing healthcare practitioners and researchers to engage with numerous stakeholders, including policymakers, non-government agencies, and community groups. Discourse can exist in many potential forms, several of which have been leveraged in the development of the health promotion tool.

Blogs are a powerful way to employ KT, offering the possibility of deconstructing research into more readily digestible content. Blogs can support KT by offering summaries in plain language. Blogs also offer the possibility of community engagement, as a system of interconnecting and interacting social media platforms

with the potential to empower researchers and practitioners to connect, share and collaborate.

Podcasts offer an alternative communication medium. They can be either video or audio files, which are often downloadable by users. The content can vary from a short summaries of research findings to longer discussions covering a particular health topic. Some individuals find audio content an efficient and convenient method for keeping up-to-date with relevant research. As an example, both Cochrane (internationally recognized as the benchmark for high-quality information about the effectiveness of healthcare) and the BJSM use audio podcasts to keep individuals in touch with the latest research findings.

Social media platforms are another potential method for collating research. Twitter is an interactive social media platform. It allows accounts to send messages of up to 280-characters. Twitter is a popular social media platform for healthcare researchers. Healthcare practitioners and researchers predominantly use Twitter for content analysis, surveillance, engagement, recruitment, intervention, and network analysis (Sinnenberg, Buttenheim et al. 2017). Facebook and Instagram are also social media platforms, offering the possibility of communicating healthcare information using text, images (for example, infographics) or video. Additionally, these platforms can serve as virtual support groups, for individuals battling disease or pathology, and patient leaders who have successfully navigated various health challenges. Other platforms, such as YouTube communicate information via video, arguably the most engaging medium for communicating information.

The value of these less formal methods of information dissemination have been identified by numerous research journals, health institutions and organizations. Several of the resources presented within the research and expertise sections also utilize a combination of discourse-orientated platforms or mediums to support dissemination of information. For example, the BJSM has adopted an array of mediums for enhancing KT, including use of blog posts, podcasts, infographics and social media (Twitter, Facebook, Instagram, YouTube etc.).

## 5.4 Product Dissemination Using a WCMS

Of all the methods identified in the preceding sections (refer to Sections 4.3 and 5.3.2), each have advantages and disadvantages. Adopting use of a WCMS offers the potential to leverage many of the advantages of the methods identified, allowing use of the desirable components, whilst avoiding many of their associated limitations. This section addresses RQ-003, detailing how we are bringing the theoretical components and previous research questions into an end product (i.e. the delivery mechanism utilized). This section leverages information gathered with respect to RQ-001 (the health promotion model identified) and RQ-002 (the resources utilized for the collation of associated health promotion materials), presenting the end product and its dissemination method (thus addressing RQ-003).

### 5.4.1 WordPress

WordPress is one of the most popular WCMSs, responsible for approximately 33% of internet content. WordPress is also the fastest growing CMS, with roughly 500+ new sites being built daily. Part of the appeal of this platform is the fact that users do not necessarily need to possess a technical background. Depending on the desired function of the WCMS, users are able to leverage a number of pre-built themes and designs, without requiring the ability to program. In addition, WordPress contains various plugins, allowing users to increase functionality of their WCMS with relative ease. There are currently 50,000+ WordPress plugins in the official directory, with additional plugins being created by users every day (Karol 2019).

WordPress was selected as the platform for the health promotion product. For the purposes of building the initial prototype, several key plugins were utilized. To support rapid prototyping of the visual interface, a plugin called Elementor was selected. Elementor is a drag and drop style editor, reducing the requirement for coding. It supports development for desktop, tablet and mobile interfaces. In addition, the free version of this plugin comes with a template library, including prebuilt widgets to streamline development and support rapid prototyping. The combination of WordPress and Elementor provides a toolset that supports flexibility in the delivery of information. This flexibility facilitates information dissemination in various formats

(text, image, video etc.), in addition to leveraging embedded content from social media resources. In addition, WordPress and Elementor support revision control, tracking any changes made to content or files by individuals.

The WCMS also supports content hierarchy. For the health promotion product, three levels are used to communicate information to users. Level 1 is the main page view, essentially acting as the entry point for healthcare providers using the tool. Level 2 contains the main content for each monthly education topic. Level 3 consists of attachments or links to external resources.

#### 5.4.2 Content Hierarchy, Level 1 – Main Page View

The top level of the health promotion product's hierarchy is the health provider main page view (Figure 11). This provides a brief overview of the PowerBreak concept, before presenting a list of the monthly learning topics as a slider view. Users can scroll left or right to see an overview of the upcoming and previous month's learning topics.

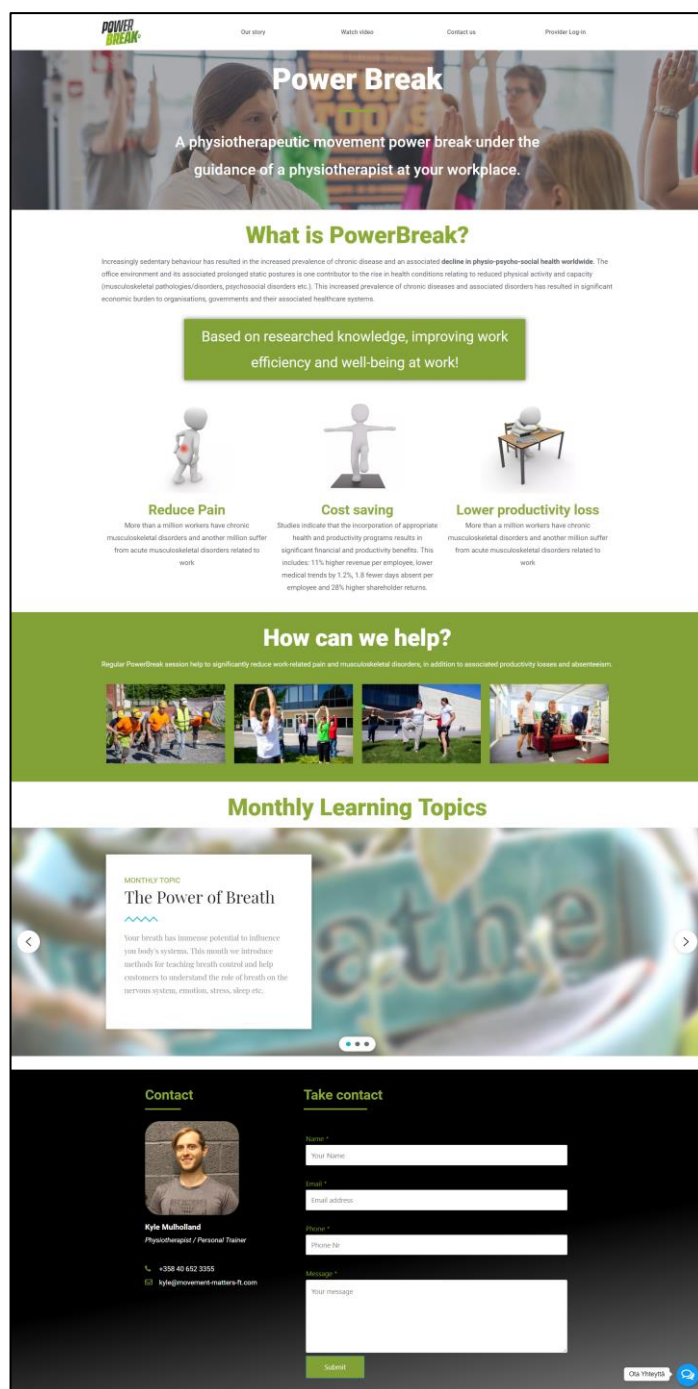


Figure 11 – Content hierarchy, level 1 - Main page view

#### 5.4.3 Content Hierarchy, Level 2 – Monthly Education Topic View

This is the fundamental level for the health promotion product. It is the second level in the content hierarchy and provides all the relevant information to the healthcare provider for delivering the PowerBreak service to companies (per Section 5.3.1). To

support navigation a table of content is provided. Users can access the table of content for quick navigation by pressing the appropriate button (i.e. button stating “*Table of Content*”) at the top of the page. This opens a modal view with the monthly learning topic’s headings and subheadings (Figure 12). To provide intuitive search and retrieval features, a search bar is also included, to facilitate easy searching within the page’s content. Both the table of content button and search bar have been inserted into a common section, that always remains visible. It essentially sticks to the top of the page when scrolling, to support navigation and searching (Figure 13).

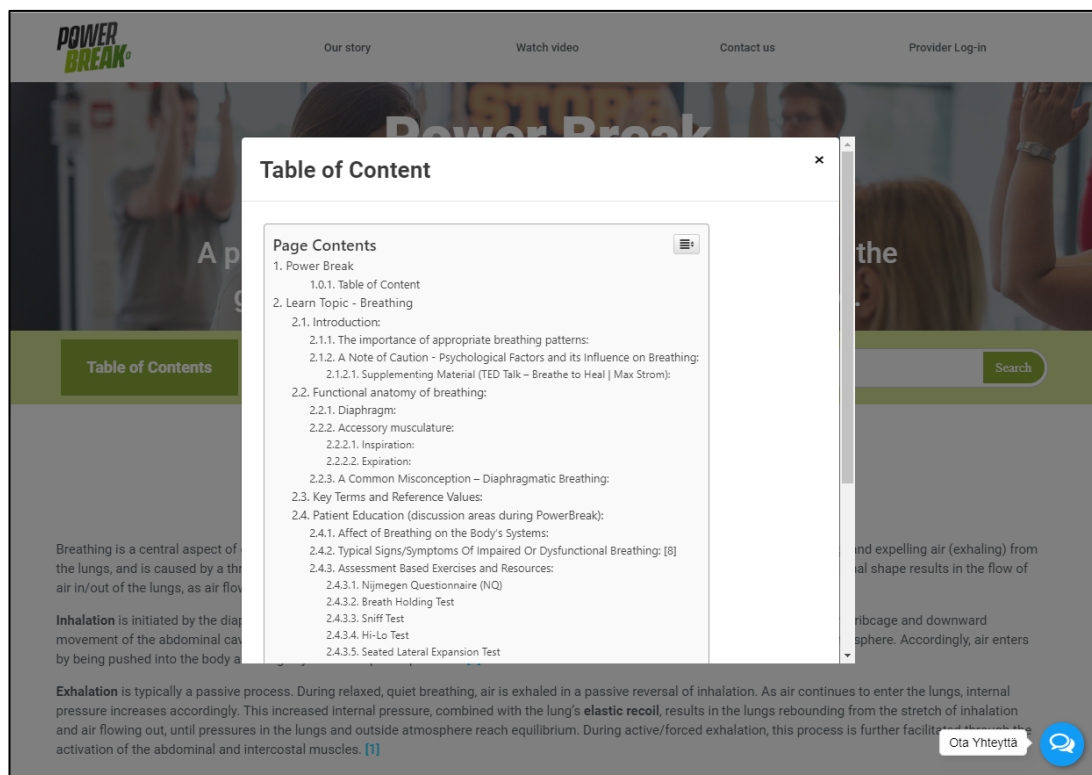


Figure 12 - Content hierarchy, level 2 – Table of content

**POWER BREAK**

Our story Watch video Contact us Provider Log-in

# Power Break

A physiotherapeutic movement power break under the guidance of a physiotherapist at your workplace.

Table of Contents Search

## Learn Topic - Breathing

### Introduction:

Breathing is a central aspect of our whole being and is one of our most vital functions. It involves the process of taking air into (inhaling) and expelling air (exhaling) from the lungs, and is caused by a three-dimensional changing of shape in the thoracic and abdominal cavities. This change in three-dimensional shape results in the flow of air in/out of the lungs, as air flows from zones of higher pressure to lower pressure.

**Inhalation** is initiated by the diaphragm and supported by the intercostal muscles. Contraction of the diaphragm causes expansion of the ribcage and downward movement of the abdominal cavity. This resultant increase in thoracic volume creates negative pressure comparative to the outside atmosphere. Accordingly, air enters by being pushed into the body and lungs by the atmospheric pressure. [1]

**Exhalation** is typically a passive process. During relaxed, quiet breathing, air is exhaled in a passive reversal of inhalation. As air continues to enter the lungs, internal pressure increases accordingly. This increased internal pressure, combined with the lung's **elastic recoil**, results in the lungs rebounding from the stretch of inhalation and air flowing out, until pressures in the lungs and outside atmosphere reach equilibrium. During active/forced exhalation, this process is further facilitated by activation of the abdominal and intercostal muscles. [1]

Ota Yhteyttä

Figure 13 - Content hierarchy, level 2 – Monthly education topics

#### 5.4.4 Content Hierarchy, Level 3 – Sub-topics and Links to External Resources

The WCMS supports multiple file formats and delivery mechanisms. This allows the tool to leverage the benefits of various healthcare research collation sources (refer to Section 4.2.6 and 5.3.2). For example, videos may be embedded within the monthly education topics to support KT (for example, from YouTube, Instagram, Facebook etc.). Numerous other information delivery formats may also be employed by the WCMS to facilitate KT (Figure 14). Audio podcasts, images and even interactable, three-dimensional anatomical images can be incorporated/embedded into the platform. Additional links may also be provided to external content for additional reading, viewing or listening, should the format not be supported by the WCMS.

Table of Contents

Search

Search

### Supplementing Material (TED Talk – Breathe to Heal | Max Strom):

With anxiety, stress, and sleep dysfunction skyrocketing around the globe, it's time we look at the unspoken reasons why. These debilitating challenges can be meaningfully impacted with ten to twenty minutes of breathing exercises per day. Max Strom, who has taught breath-work for 20 years, reveals his insights into the healing power of the breath.

### Functional anatomy of breathing:

#### Action of Breathing – Part 1: Mechanisms

- External intercostal muscles pull up the ribs and expand the chest
- Muscle fibres in the diaphragm contract and increase lung volume

The diaphragm is the principal muscle that causes three-dimensional shape change in the thoracic and abdominal cavities. It can be likened to a parachute in shape, with the dome-like nature of the diaphragm created by the organs it encloses and supports. The diaphragm forms the floor of the thoracic cavity and the roof of the abdominal cavity. It should also be noted that the right side of the dome is higher than the left. This is due to the liver pushing up from below the right side and the heart pushing down from the left side. [5]

BodyParts3D © The Database Center for Life Science  
Increased under: [Diaphragm](#)

Ota Yhteyttä

Figure 14 - Content hierarchy, level 3 – Embedded and external resources

#### 5.4.5 WCAG 2.0, Level A Compliance

Within the context of the health promotion product, several WCAG 2.0, Level A guidelines were identified, to support the development of a well-structured, intuitive, web-based health promotion product (refer to Section 4.3.2). Compliance to these guidelines was desirable to enhance the interoperability the web-based product. In addition, it provides a starting point for supporting future use by individuals with special needs. Table 8 presents the health promotion product features and association to WCAG 2.0, Level A guidelines.

Table 8 – Health promotion product WCAG 2.0, Level A compliance

| Health Promotion Product Feature/Component   | Guidelines   |
|--|--------------|
| Content hierarchy presented in a meaningful sequence, facilitating presentation of information across varying levels.  | 1.3.1, 1.3.2 |
| Content presented in a range of formats to support KT using varying sensory characteristics (e.g. text, image, video).   | 1.3.3        |
| Videos and associated audio sources have mechanisms available to pause or stop the video/audio, and control audio volume independently from the overall system volume level. | 1.4.2        |
| Floating section presented to support easy access to table of content and associated navigation to desired content section/heading.  | 2.4.1        |
| Pages are titled, with appropriate sub-headings.   | 2.4.2        |
| Content presented in sequential order, with key content receiving focus (e.g. alternate colour, bolded) in a manner that preserves meaning and operability.                  | 2.4.3        |
| All links to external content possess descriptions to provide context and avoid ambiguity.   | 2.4.4        |
| Interactive components do not initiate a change of context when receiving focus.   | 3.2.1        |
| Changes in user interface settings do not automatically cause a change of context.   | 3.2.2        |
| Labels or instructions are provided when content requires user input (e.g. search bar with prompt).  | 3.3.2        |

## 5.5 Initial Product Feedback

The initial iteration of the health promotion product was provided to physiotherapists familiar with delivering the PowerBreak service to organisations. This consisted of the full content hierarchy for a single monthly education topic. Anecdotal feedback from this initial iteration was generally positive. Physiotherapists commented that the health promotion product was easily navigable, with content flow intuitive and understandable. The incorporation of a floating header section providing access to the table of content and a search functionality was seen as desirable, particularly when the monthly education topic contains large amounts of content. The combined use of text, video, audio and image-based materials also received positive feedback. In addition to providing alternatives to support KT, these embedded resources also provided excellent supplementing materials for use during PowerBreak sessions. For example, infographics could be shown to PowerBreak participants to provide added value to sessions.

With respect to future improvements, in particular the length of the monthly topics was highlighted. Although features exist to quickly navigate between sections and sub-topics, the entire monthly education topic can potentially be quite large. Sub-sections could possibly be separated across separate pages. Alternatively, content under sub-sections could be expandable/collapsible to condense content.

## 6 CONCLUSIONS

The increased prevalence of chronic diseases and associated disorders in the workplace have resulted in significant economic burden to organisations, governments and their associated healthcare systems. As such, new tools leveraging emerging technologies are required to facilitate positive change in this area. This thesis has detailed the theory, research development and development processes associated with the creation of a tool/product to influence health promotion, management and prevention strategies in the workplace environment.

The research presented within the theoretical component (refer to Section 3) provided background, highlighting this global problem and the need for improved strategies in workplace orientated health promotion.

The research development process (refer to Section 4) provided additional insight. To guide development of the health promotion product, three research questions were defined. This involved identification of a health promotion model to support active promotion of health within the work environment (RQ-001). An evidence-based healthcare model was also outlined to guide the collation of data relating to the health promotion product, whilst being aware of potential challenges associated with translating research into practice using traditional forms of evidence generation (RQ-002). The final research question leveraged the preceding information gathered, with the objective to amalgamate the theoretical components and previous research questions into an end product (thus addressing RQ-003).

The development process (refer to Section 5) then presented the health promotion product design. This included the PowerBreak philosophy, framework and detailed information on practical development. A WCMS was employed in the development of the health promotion product due to its potential to leverage many of the advantages of the tools, processes and methodologies identified in previous sections; allowing use of the desirable components, whilst avoiding many of their associated limitations.

Anecdotal feedback of the initial iteration of the design was positive. The health promotion tool was seen as a useful, intuitive and motivating tool to support KT. Future iterations of the health promotion product shall refine the user interface and

presentation/layout of content within the content hierarchy. Furthermore, additional monthly education topic areas shall be developed.

In conclusion, technological resources offer tremendous potential to influence health promotion, management and prevention strategies. Health promotion tools, such as that developed under this thesis, offer an alternative means to actively promote holistic (salutogenic) health within the work environment.

## 7 DISCUSSION

Overall, I feel that the development process of the health promotion product and associated documentation (i.e. this thesis) went successfully. When looking back, I can identify two key challenges connected to this process. The first key challenge relates to beginning the thesis and transitioning my mindset. The second key challenge relates to connecting, or building the bridge, between theory and the final solution.

With respect to the first key challenge, I found it difficult initially to transition from a theoretical mindset (i.e. that typically seen in a bachelor level thesis), to a more analytical mindset (i.e. that typically seen in a master level thesis). I was looking to discuss the underlying theory that led to the conception of the health promotion product in greater detail than what was perhaps required. In addition, I was planning to briefly discuss creation of the product, only presenting the solution as a result of the theoretical component. Discussions with my supervisor, in addition to reading other's theses, helped to shift my mindset. Once I was better able to understand the expectations and mindset of a master level thesis, I was able to generate an appropriate outline for the thesis. Although presenting the theoretical background remains important, it serves as more of an introduction. The key components are more focussed on the research development process, and then subsequently linking this to the underlying theory, to derive the development process. In particular, the formulation of the research questions (under the research development process) served as an excellent framework.

The second key challenge related to creating the link between theory, research development and the end product. There are so many theoretical guidelines and models that can potentially be applied to facilitate a link between these sections (i.e. taking the reader from the problem to the solution). Once again, the formulation of the research questions helped to guide this process. Once established, I was able to delve deeper into these topic areas, identifying the underlying frameworks to support development of the health promotion product.

When considering the collation of research (i.e. RQ-002), the JBI model provided an excellent foundation. In particular, the evidence generation and associated outer-

segments formed the framework for justifying the resources utilised within the health promotion product. Numerous levels of evidence generation are available from an evidence-based healthcare perspective, and as part of the development process, the end product's collated materials were outlined using the JBI model as a guideline.

With respect the dissemination of information and WCMSs (i.e. RQ-003), WCAG 2.0 provided an excellent framework to guide the development of a well-designed, web-based tool and associated user interface. Compliance to the WCAG 2.0, Level A recommendations could then be examined following creation of the health promotion product, to highlight any potential useability issues.

When considering what went well, development of the initial iteration of the health promotion product was perhaps the smoothest process. This was due to several reasons, including: having developed a WCMS tool in the past; the ability to rapidly develop and iterate the user interface (using the visual builder); and having previously collated the content for the initial learning topic. These factors helped to simplify the creation process. It would have been a much more involved process attempting to create the WCMS and associated education topics without any previous experience.

I believe there were a number of limitations associated with the project. Much like the publication of research findings, this thesis outlines only the first step in an iterative process. WCMSs are living systems, requiring modification and update based on emerging capabilities and user feedback. As this is the first iteration of the WCMS, numerous elements shall become more refined as the product evolves. Although rapid prototyping helps with the synthesis and initial testing of the health promotion product, elements such as section layouts, spacing, platform supportability etc. shall require further development before this can be considered a commercial product.

Another limitation relates to the limited initial test group for the health promotion product. As physiotherapists shall be the primary user of the tool, anecdotal feedback regarding user experience and content was gathered from this group. More thorough (and structured) testing of the health promotion product is required in the future. In particular, it would be desirable to also gather feedback from the end user of the PowerBreak service (i.e. workplace employees receiving the service). Tools such as

the SHIS could be used to support this process and determine whether the education topics promote improved salutogenic health.

Overall, I feel that the process went relatively well, once I had established the appropriate mindset and defined the initial layout of the thesis. I am extremely happy to have created a useful tool, which I hope in the near future will be used to support preventative interventions in the fight against NCDs. I plan to continue working on the health promotion tool, continuing to build on the monthly education topics. I look forward to seeing its application in the workplace soon!

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